

**ANNA UNIVERSITY, CHENNAI  
AFFILIATED INSTITUTIONS  
REGULATIONS 2017  
B. TECH. TEXTILE CHEMISTRY  
CHOICE BASED CREDIT SYSTEM**

**1. Programme Educational Objectives (PEOs)**

Bachelor of Textile Chemistry curriculum is designed to prepare the graduates having attitude and knowledge to

- a) Have powerful base to pursue a successful professional and technical career
- b) Have strong foundation in basic sciences, mathematics, engineering and experimentation skills to comprehend the manufacturing processes and provide practical and innovative solutions.
- c) Have knowledge on the theory and practices in the field of textile chemistry and allied areas to manage textile chemical processing industry and provide techno-economic solutions to the problems.
- d) Engross in life-long learning to keep abreast with emerging technology
- e) Practice and inspire high ethical values and maintain high technical standards

**2. Programme Outcome (POs)**

1. Ability to apply knowledge of mathematics, science and engineering in textile wet processing and product design.
2. Ability to apply knowledge on fiber, yarn, fabric manufacture, fabric structure, chemical processing and testing of textiles in the field of textile wet processing.
3. Ability to apply the knowledge on theory of colouration, chemistry of dyes on product development
4. Ability to identify and solve technological problems in textile wet processing industry
5. Ability to analyze and apply knowledge in the field of design and production of textile products using computational platforms and software tools.
6. Commitment to implement the professional and ethical values.
7. Use the techniques, skills, and modern tools necessary for practicing in the textile wet processing industry.
8. Ability to communicate effectively and work in interdisciplinary groups.
9. Ability to review, comprehend and report technological development.

**3. PEOs / POs Mapping**

PEO	POs								
	1	2	3	4	5	6	7	8	9
<b>a</b>	√	√	√	√	√			√	
<b>b</b>	√				√	√	√		√
<b>c</b>		√	√	√	√		√		√
<b>d</b>				√	√		√	√	
<b>e</b>						√		√	

#### 4. Semester Course wise POs Mapping

		Course Title	1	2	3	4	5	6	7	8	9	
Year I	SEMESTER I	Communicative English						√		√	√	
		Engineering Mathematics I	√			√	√		√		√	
		Engineering Physics	√			√						
		Engineering Chemistry	√	√		√						
		Problem Solving and Python Programming	√				√		√		√	
		Engineering Graphics	√		√		√		√		√	
		Problem Solving and Python Programming Laboratory					√		√		√	
		Physics and Chemistry Laboratory	√	√		√						
	SEMESTER II	Technical English							√		√	√
		Engineering Mathematics II	√				√		√		√	
		Physics of Materials	√	√	√	√					√	
		Chemistry for Technologists		√	√		√					
		Basic Electrical and Electronic Engineering	√		√				√		√	
		Basics of Textile Technology		√	√	√						
		Engineering Practices Laboratory	√		√	√			√			
Applied Chemistry Laboratory		√	√		√							
Year II	SEMESTER III	Probability and Statistics	√				√		√		√	
		Engineering Mechanics for Textile Technologists	√		√	√			√			
		Organic Chemistry	√	√	√	√						
		Characteristics of Textile Fibres		√		√						
		Technology of Spinning Process		√		√			√		√	
		Fabric Manufacturing		√		√			√		√	
		Yarn and Fabric Manufacturing Laboratory		√		√			√			
		Fibre Science Laboratory		√	√							
		Interpersonal Skills / Listening and Speaking						√		√	√	
	SEMESTER IV	Solid Mechanics for Textile Technologists	√		√	√						
		Production of Manufactured Fibre		√	√	√						
		Principles and Theory of Dyeing	√	√	√	√			√		√	
		Textile Quality Evaluation		√	√	√						
		Chemistry and Technology of Intermediates and Dyes	√	√	√	√						
		Preparation of Textiles for Coloration	√	√	√	√			√			
		Wet Processing Preparation Laboratory	√	√	√	√						
		Textile Chemical Analysis Laboratory	√	√	√	√			√			
		Advanced Reading and Writing						√		√	√	
Year III	SEMESTER V	Environmental Science and Engineering	√	√				√				
		Chemistry of Textile Auxiliaries		√	√	√						
		Dyeing of Synthetic Materials	√		√	√	√		√			

		Dyeing of Cellulosic Materials	√	√	√	√			√		
		Dyeing of Protein Materials		√	√	√					
		Technology of Printing		√	√	√			√		√
		Professional Communication									
		Dyeing of Synthetic Textile Laboratory		√	√	√					
		Textile Dyeing and Printing Laboratory		√	√	√					
	<b>SEMESTER VI</b>										
		Wet Processing Machinery	√	√	√	√			√		
		Technology of Finishing		√	√	√			√		√
		Instrumental Methods of Chemical Analysis		√	√	√			√		
		Garment Production and Processing		√	√	√					√
		Computer Colour Matching		√	√	√					
		Textile Finishing Laboratory		√	√	√					
	<b>SEMESTER VII</b>	Garment Production and Processing Laboratory		√	√	√					
Effluent Treatment and Pollution Control			√	√	√		√				
Financial Management in Textile Industry					√		√		√	√	
Process and Quality control in Textile Wet Processing			√	√	√			√			
Product Development Laboratory			√	√	√			√		√	
Problem Analysis and Case Studies in Wet Processing Laboratory			√	√	√			√		√	
Internship *					√		√	√	√	√	
<b>SEMESTER VIII</b>	Project Work		√	√	√		√	√	√	√	

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**B. TECH. TEXTILE CHEMISTRY**  
**CHOICE BASED CREDIT SYSTEM**  
**I TO VIII SEMESTERS (FULL TIME) CURRICULA AND SYLLABI**

**SEMESTER I**

S. No.	COURSE CODE	COURSE TITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
<b>THEORY</b>								
1	HS8151	Communicative English	HS	4	4	0	0	4
2	MA8151	Engineering Mathematics I	BS	4	4	0	0	4
3	PH8151	Engineering Physics	BS	3	3	0	0	3
4	CY8151	Engineering Chemistry	BS	3	3	0	0	3
5	GE8151	Problem Solving and Python Programming	ES	3	3	0	0	3
6	GE8152	Engineering Graphics	ES	6	2	0	4	4
<b>PRACTICALS</b>								
7	GE8161	Problem Solving and Python Programming Laboratory	ES	4	0	0	4	2
8	BS8161	Physics and Chemistry Laboratory	BS	4	0	0	4	2
<b>TOTAL</b>				<b>31</b>	<b>19</b>	<b>0</b>	<b>12</b>	<b>25</b>

**SEMESTER II**

S. No.	COURSE CODE	COURSE TITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
<b>THEORY</b>								
1	HS8251	Technical English	HS	4	4	0	0	4
2	MA8251	Engineering Mathematics II	BS	4	4	0	0	4
3	PH8254	Physics of Materials	BS	3	3	0	0	3
4	CY8292	Chemistry for Technologists	BS	3	3	0	0	3
5	BE8251	Basic Electrical and Electronics Engineering	ES	3	3	0	0	3
6	TT8251	Basics of Textile Technology	PC	3	3	0	0	3
<b>PRACTICALS</b>								
7	GE8261	Engineering Practices Laboratory	ES	4	0	0	4	2
8	CY8261	Applied Chemistry Laboratory	BS	4	0	0	4	2
<b>TOTAL</b>				<b>28</b>	<b>20</b>	<b>0</b>	<b>8</b>	<b>24</b>

**SEMESTER III**

S. No.	COURSE CODE	COURSE TITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
<b>THEORY</b>								
1	MA8391	Probability and Statistics	BS	4	4	0	0	4
2	TT8391	Engineering Mechanics for Textile Technologists	ES	5	3	2	0	4
3	CY8291	Organic Chemistry	ES	3	3	0	0	3
4	TT8351	Characteristics of Textile Fibres	PC	4	4	0	0	4
5	FT 8301	Technology of Spinning Processes	PC	3	3	0	0	3
6	FT8491	Fabric Manufacturing	PC	3	3	0	0	3
<b>PRACTICALS</b>								
7	TC8311	Yarn and Fabric Manufacturing Laboratory	PC	4	0	0	4	2
8	TT8361	Fibre Science Laboratory	PC	2	0	0	2	1
9	HS8381	Interpersonal Skills/Listening and Speaking	EEC	2	0	0	2	1
<b>TOTAL</b>				<b>30</b>	<b>20</b>	<b>2</b>	<b>8</b>	<b>25</b>

**SEMESTER IV**

S. No.	COURSE CODE	COURSE TITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
<b>THEORY</b>								
1	TT8452	Solid Mechanics for Textile Technologists	ES	3	3	0	0	3
2	TT8451	Production of Manufactured Fibre	PC	3	3	0	0	3
3	TC8401	Principles and Theory of Dyeing	PC	3	3	0	0	3
4	FT8691	Textile Quality Evaluation	PC	3	3	0	0	3
5	TC8402	Chemistry and Technology of Intermediates and Dyes	PC	3	3	0	0	3
6	TC8403	Preparation of Textiles for Coloration	PC	3	3	0	0	3
<b>PRACTICALS</b>								
7	TC8411	Wet Processing Preparation Laboratory	PC	4	0	0	4	2
8	TC8412	Textile Chemical Analysis Laboratory	PC	4	0	0	4	2
9	HS8461	Advanced Reading and Writing	EEC	2	0	0	2	1
<b>TOTAL</b>				<b>28</b>	<b>18</b>	<b>0</b>	<b>10</b>	<b>23</b>

**Note:** Internship for a duration of two weeks during the Semester summer vacation should be undergone by the students for which assessment will be done during VII semester.

### SEMESTER V

S. No.	COURSE CODE	COURSE TITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
<b>THEORY</b>								
1.	GE8291	Environmental Science and Engineering	HS	3	3	0	0	3
2.	TC8501	Chemistry of Textile Auxiliaries	PC	3	3	0	0	3
3.	TC8502	Dyeing of Synthetic Materials	PC	3	3	0	0	3
4.	TC8503	Dyeing of Cellulosic Materials	PC	3	3	0	0	3
5.	TC8504	Dyeing of Protein Materials	PC	3	3	0	0	3
6.	TC8505	Technology of Printing	PC	3	3	0	0	3
7.		Open Elective I*	OE	3	3	0	0	3
<b>PRACTICALS</b>								
8.	TC8511	Dyeing of Synthetic Textile Laboratory	PC	4	0	0	4	2
9.	TC8512	Textile Dyeing and Printing Laboratory	PC	4	0	0	4	2
10.	HS8581	Professional Communication	EEC	2	0	0	2	1
<b>TOTAL</b>				<b>31</b>	<b>21</b>	<b>0</b>	<b>10</b>	<b>26</b>

\* - Course from the curriculum of the other UG Programmes

### SEMESTER VI

S. No.	COURSE CODE	COURSE TITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
<b>THEORY</b>								
1	TC8601	Wet Processing Machinery	PC	3	3	0	0	3
2	TC8602	Technology of Finishing	PC	3	3	0	0	3
3	TC8603	Instrumental Methods of Chemical Analysis	PC	3	3	0	0	3
4	TC8604	Garment Production and Processing	PC	3	3	0	0	3
5	TC8605	Computer Colour Matching	PC	3	3	0	0	3
6		Professional Elective I	PE	3	3	0	0	3
7		Professional Elective II	PE	3	3	0	0	3
<b>PRACTICALS</b>								
8	TC8611	Textile Finishing Laboratory	PC	4	0	0	4	2
9	TC8612	Garment Production and Processing Laboratory	PC	4	0	0	4	2
<b>TOTAL</b>				<b>29</b>	<b>21</b>	<b>0</b>	<b>8</b>	<b>25</b>

**Note:** Internship for a duration of two weeks during the Semester summer vacation should be undergone by the students for which assessment will be done during VII semester.

### SEMESTER VII

S. No.	COURSE CODE	COURSE TITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
<b>THEORY</b>								
1.	TC8701	Effluent Treatment and Pollution Control	PC	3	3	0	0	3
2.	TT8751	Financial Management in Textile Industry	PC	3	3	0	0	3
3.	TC8702	Process and Quality control in Textile Wet Processing	PC	3	3	0	0	3
4.		Professional Elective III	PE	3	3	0	0	3
5.		Open elective II*	OE	3	3	0	0	3
<b>PRACTICALS</b>								
6.	TC8711	Product Development Laboratory	PC	4	0	0	4	2
7.	TC8712	Problem Analysis and Case Studies in Wet Processing Laboratory	PC	4	0	0	4	2
8.	TC8713	Internship **	EEC	0	0	0	0	2
<b>TOTAL</b>				<b>23</b>	<b>15</b>	<b>0</b>	<b>8</b>	<b>21</b>

\* - Course from the curriculum of the other UG Programmes

\*\* - vide IV semester and VI semester

### SEMESTER VIII

S. No.	COURSE CODE	COURSE TITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
<b>THEORY</b>								
1		Professional Elective IV	PE	3	3	0	0	3
2		Professional Elective V	PE	3	3	0	0	3
<b>PRACTICALS</b>								
3	TC8811	Project Work	EEC	20	0	0	20	10
<b>TOTAL</b>				<b>26</b>	<b>6</b>	<b>0</b>	<b>20</b>	<b>16</b>

**TOTAL CREDITS: 185**

### PROFESSIONAL ELECTIVES

#### PROFESSIONAL ELECTIVE I, SEMESTER VI

S. No.	COURSE CODE	COURSE TITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
1.	TC8001	Modern Printing Technology	PE	3	3	0	0	3
2.	TC8002	Analysis of Textile Chemicals	PE	3	3	0	0	3
3.	TT8080	Textile Costing	PE	3	3	0	0	3
4.	GE8076	Professional Ethics in Engineering	PE	3	3	0	0	3

**PROFESSIONAL ELECTIVE II, SEMESTER VI**

S. No.	COURSE CODE	COURSE TITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
1.	TT8792	Technical Textiles	PE	3	3	0	0	3
2.	TT8093	Textile Reinforced Composites	PE	3	3	0	0	3
3.	TT8091	Clothing Comfort	PE	3	3	0	0	3
4.	TT8081	Textile EXIM Management	PE	3	3	0	0	3
5.	GE8075	Intellectual Property Rights	PE	3	3	0	0	3
6.	TT8791	Operations Research in Textile Industry	PE	3	3	0	0	3

**PROFESSIONAL ELECTIVE III, SEMESTER VII**

S. No.	COURSE CODE	COURSE TITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
1.	TC8003	Nonwoven Fabrics and speciality Fabrics	PE	3	3	0	0	3
2.	TC8004	Advanced Wet Processing Machinery	PE	3	3	0	0	3
3.	TC8005	Energy Management and Conservation in Textile Industry	PE	3	3	0	0	3
4.	GE8071	Disaster management	PE	3	3	0	0	3
5.	TT8073	Eco-Friendly dyes, chemicals and Processing	PE	3	3	0	0	3
6.	TT8072	Coated Textiles	PE	3	3	0	0	3
7.	TT8077	Medical Textiles	PE	3	3	0	0	3
8.	GE8074	Human Rights	PE	3	3	0	0	3
9.	GE8077	Total Quality Management	PE	3	3	0	0	3
10.	GE8072	Foundation Skills in Integrated Product Development	PE	3	3	0	0	3

**PROFESSIONAL ELECTIVE IV, SEMESTER VIII**

S. No.	COURSE CODE	COURSE TITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
1.	TC8006	Nanotechnology in Textile Processing	PE	3	3	0	0	3
2.	TT8491	Knitting Technology	PE	3	3	0	0	3
3.	GE8073	Fundamentals of Nanoscience	PE	3	3	0	0	3

**PROFESSIONAL ELECTIVE V, SEMESTER VIII**

S. No.	COURSE CODE	COURSE TITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
1.	TT8092	Denim Manufacturing	PE	3	3	0	0	3
2.	TT8851	Bonded Fabrics	PE	3	3	0	0	3
3.	MG8791	Supply Chain Management	PE	3	3	0	0	3



### SUBJECT WISE AREA DETAILS

#### HUMANITIES AND SOCIAL SCIENCES (HS)

S. No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	HS8151	Communicative English	HS	4	4	0	0	4
2.	HS8251	Technical English	HS	4	4	0	0	4
3.	GE8291	Environmental Science and Engineering	ES	3	3	0	0	3

#### BASIC SCIENCES (BS)

S. No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	MA8151	Engineering Mathematics I	BS	4	4	0	0	4
2.	PH8151	Engineering Physics	BS	3	3	0	0	3
3.	CY8151	Engineering Chemistry	BS	3	3	0	0	3
4.	BS8161	Physics and Chemistry Laboratory	BS	4	0	0	4	2
5.	MA8251	Engineering Mathematics II	BS	4	4	0	0	4
6.	PH8254	Physics of Materials	BS	3	3	0	0	3
7.	CY8292	Chemistry for Technologists	BS	3	3	0	0	3
8.	CY8261	Applied Chemistry Laboratory	BS	4	0	0	4	2
9.	MA8391	Probability and Statistics	BS	4	4	0	0	4

#### ENGINEERING SCIENCES (ES)

S. No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	GE8151	Problem Solving and Python Programming	ES	3	3	0	0	3
2.	GE8152	Engineering Graphics	ES	4	2	0	4	4
3.	GE8161	Problem Solving and Python Programming Laboratory	ES	4	0	0	4	2
4.	BE8251	Basic Electrical and Electronics Engineering	ES	3	3	0	0	3
5.	GE8261	Engineering Practices Laboratory	ES	4	0	0	4	2
6.	TT8391	Engineering Mechanics for Textile Technologists	ES	5	3	2	0	4
7.	CY8291	Organic Chemistry	ES	3	3	0	0	3
8.	TT8452	Solid Mechanics for Textile Technologists	ES	3	3	0	0	3

#### PROFESSIONAL CORE (PC)

S. No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
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1.	TT8251	Basics of Textile Technology	PC	3	3	0	0	3
2.	TT8351	Characteristics of Textile Fibres	PC	4	4	0	0	4
3.	FT 8301	Technology of Spinning Processes	PC	3	3	0	0	3
4.	FT8491	Fabric Manufacturing	PC	3	3	0	0	3
5.	TC8311	Yarn and Fabric Manufacturing Laboratory	PC	4	0	0	4	2
6.	TT8361	Fibre Science Laboratory	PC	2	0	0	2	1
7.	TT8451	Production of Manufactured Fibre	PC	3	3	0	0	3
8.	TC8401	Principles and Theory of Dyeing	PC	3	3	0	0	3
9.	FT8691	Textile Quality Evaluation						
10.	TC8402	Chemistry and Technology of Intermediates and Dyes	PC	3	3	0	0	3
11.	TC8403	Preparation of Textiles for Coloration	PC	3	3	0	0	3
12.	TC8411	Wet Processing Preparation Laboratory	PC	4	0	0	4	2
13.	TC8412	Textile Chemical Analysis Laboratory	PC	4	0	0	4	2
14.	TC8501	Chemistry of Textile Auxiliaries	PC	3	3	0	0	3
15.	TC8502	Dyeing of Synthetic Materials	PC	3	3	0	0	3
16.	TC8503	Dyeing of Cellulosic Materials	PC	3	3	0	0	3
17.	TC8504	Dyeing of Protein Materials	PC	3	3	0	0	3
18.	TC8505	Technology of Printing	PC	3	3	0	0	3
19.	TC8511	Dyeing of Synthetic Textile Laboratory	PC	4	0	0	3	2
20.	TC8512	Textile Dyeing and Printing Laboratory	PC	4	0	0	3	2
21.	TC8601	Wet Processing Machinery	PC	3	3	0	0	3
22.	TC8602	Technology of Finishing	PC	3	3	0	0	3
23.	TC8603	Instrumental Methods of Chemical Analysis	PC	3	3	0	0	3
24.	TC8604	Garment Production and Processing	PC	3	3	0	0	3
25.	TC8605	Computer Colour Matching	PC	3	3	0	0	3
26.	TC8611	Textile Finishing Laboratory	PC	4	0	0	4	2
27.	TC8612	Garment Production and Processing Laboratory	PC	4	0	0	4	2
28.	TC8701	Effluent Treatment and Pollution Control	PC	3	3	0	0	3
29.	TT8751	Financial Management in Textile Industry	PC	3	3	0	0	3
30.	TC8702	Process and Quality control in Textile Wet Processing	PC	3	3	0	0	3

31.	TC8712	Problem Analysis and Case Studies in Wet Processing Laboratory	PC	4	0	0	4	2
32.	TC8711	Product Development Laboratory	PC	4	0	0	4	2

**EMPLOYABILITY ENHANCEMENT COURSES (EEC)**

S. No.	COURSE CODE	COURSE TITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
1.	HS8381	Interpersonal Skills/Listening and Speaking	EEC	2	0	0	2	1
2.	HS8461	Advanced Reading and Writing	EEC	2	0	0	2	1
3.	HS8581	Professional Communication	EEC	2	0	0	2	1
4.	TC8713	Internship	EEC	4	0	0	4	3
5.	TC8811	Project Work	EEC	20	0	0	20	10

**SUMMARY**

S. NO.	SUBJECT AREA	CREDITS AS PER SEMESTER								CREDITS TOTAL
		I	II	III	IV	V	VI	VII	VIII	
1.	HS	4	4							8
2.	BS	12	12	4						28
3.	ES	9	5	7	3	3				27
4.	PC		3	13	19	19	19	13		86
5.	PE						6	3	6	15
6.	OE					3		3		6
7.	EEC			1	1	1		2	10	15
	<b>Total</b>	<b>25</b>	<b>24</b>	<b>25</b>	<b>23</b>	<b>26</b>	<b>25</b>	<b>21</b>	<b>16</b>	<b>185</b>

**OBJECTIVES:**

- To develop the basic reading and writing skills of first year engineering and technology students.
- To help learners develop their listening skills, which will, enable them listen to lectures and comprehend them by asking questions; seeking clarifications.
- To help learners develop their speaking skills and speak fluently in real contexts.
- To help learners develop vocabulary of a general kind by developing their reading skills

**UNIT I SHARING INFORMATION RELATED TO ONESELF/FAMILY& FRIENDS 12**

**Reading-** short comprehension passages, practice in skimming-scanning and predicting-  
**Writing-** completing sentences - developing hints. **Listening-** short texts- short formal and informal conversations. **Speaking-** introducing oneself - exchanging personal information-  
**Language development-** Wh- Questions- asking and answering-yes or no questions- parts of speech. **Vocabulary development--** prefixes- suffixes- articles.- count/ uncount nouns.

**UNIT II GENERAL READING AND FREE WRITING 12**

**Reading** - comprehension-pre-reading-post reading- comprehension questions (multiple choice questions and /or short questions/ open-ended questions)-inductive reading- short narratives and descriptions from newspapers including dialogues and conversations (also used as short Listening texts)- register- **Writing** – paragraph writing- topic sentence- main ideas- free writing, short narrative descriptions using some suggested vocabulary and structures –**Listening-** telephonic conversations. **Speaking** – sharing information of a personal kind—greeting – taking leave- **Language development** – prepositions, conjunctions **Vocabulary development-** guessing meanings of words in context.

**UNIT III GRAMMAR AND LANGUAGE DEVELOPMENT 12**

**Reading-** short texts and longer passages (close reading) **Writing-** understanding text structure- use of reference words and discourse markers-coherence-jumbled sentences  
**Listening** – listening to longer texts and filling up the table- product description- narratives from different sources. **Speaking-** asking about routine actions and expressing opinions. **Language development-** degrees of comparison- pronouns- direct vs indirect questions- **Vocabulary development** – single word substitutes- adverbs.

**UNIT IV READING AND LANGUAGE DEVELOPMENT 12**

**Reading-** comprehension-reading longer texts- reading different types of texts- magazines  
**Writing-** letter writing, informal or personal letters-e-mails-conventions of personal email-  
**Listening-** listening to dialogues or conversations and completing exercises based on them.  
**Speaking-** speaking about oneself- speaking about one's friend- **Language development-** Tenses- simple present-simple past- present continuous and past continuous- **Vocabulary development-** synonyms-antonyms- phrasal verbs

**UNIT V EXTENDED WRITING 12**

**Reading-** longer texts- close reading –**Writing-** brainstorming -writing short essays – developing an outline- identifying main and subordinate ideas- dialogue writing-**Listening** – listening to talks- conversations- **Speaking** – participating in conversations- short group conversations-**Language development-**modal verbs- present/ past perfect tense - **Vocabulary development-**collocations- fixed and semi-fixed expressions

**OUTCOMES:**

**At the end of the course, learners will be able to:**

- Read articles of a general kind in magazines and newspapers.
- Participate effectively in informal conversations; introduce themselves and their friends and express opinions in English.
- Comprehend conversations and short talks delivered in English
- Write short essays of a general kind and personal letters and emails in English.

**TEXT BOOKS:**

1. Board of Editors. **Using English** A Coursebook for Undergraduate Engineers and Technologists. Orient BlackSwan Limited, Hyderabad: 2015.
2. Richards, C. Jack. **Interchange Students' Book-2** New Delhi: CUP, 2015.

**REFERENCES**

1. Bailey, Stephen. **Academic Writing: A practical guide for students**. New York: Rutledge,2011.
2. Comfort, Jeremy, et al. **Speaking Effectively : Developing Speaking Skillsfor Business English**. Cambridge University Press, Cambridge: Reprint 2011.
3. Dutt P. Kiranmai and RajeevanGeeta. **Basic Communication Skills**, Foundation Books: 2013.
4. Means,L. Thomas and Elaine Langlois. **English & Communication For Colleges**. CengageLearning ,USA: 2007.
5. Redston, Chris & Gillies Cunningham **Face2Face** (Pre-intermediate Student's Book & Workbook) Cambridge University Press, New Delhi: 2005.

**MA8151**

**ENGINEERING MATHEMATICS – I**

**L T P C  
4 0 0 4**

**OBJECTIVES :**

- The goal of this course is to achieve conceptual understanding and to retain the best traditions of traditional calculus. The syllabus is designed to provide the basic tools of calculus mainly for the purpose of modelling the engineering problems mathematically and obtaining solutions. This is a foundation course which mainly deals with topics such as single variable and multivariable calculus and plays an important role in the understanding of science, engineering, economics and computer science, among other disciplines.

**UNIT I DIFFERENTIAL CALCULUS**

**12**

Representation of functions - Limit of a function - Continuity - Derivatives - Differentiation rules - Maxima and Minima of functions of one variable.

**UNIT II FUNCTIONS OF SEVERAL VARIABLES**

**12**

Partial differentiation – Homogeneous functions and Euler's theorem – Total derivative – Change of variables – Jacobians – Partial differentiation of implicit functions – Taylor's series for functions of two variables – Maxima and minima of functions of two variables – Lagrange's method of undetermined multipliers.

**UNIT III INTEGRAL CALCULUS** **12**

Definite and Indefinite integrals - Substitution rule - Techniques of Integration - Integration by parts, Trigonometric integrals, Trigonometric substitutions, Integration of rational functions by partial fraction, Integration of irrational functions - Improper integrals.

**UNIT IV MULTIPLE INTEGRALS** **12**

Double integrals – Change of order of integration – Double integrals in polar coordinates – Area enclosed by plane curves – Triple integrals – Volume of solids – Change of variables in double and triple integrals.

**UNIT V DIFFERENTIAL EQUATIONS** **12**

Higher order linear differential equations with constant coefficients - Method of variation of parameters – Homogenous equation of Euler's and Legendre's type – System of simultaneous linear differential equations with constant coefficients - Method of undetermined coefficients.

**TOTAL : 60 PERIODS**

**OUTCOMES :**

After completing this course, students should demonstrate competency in the following skills:

- Use both the limit definition and rules of differentiation to differentiate functions.
- Apply differentiation to solve maxima and minima problems.
- Evaluate integrals both by using Riemann sums and by using the Fundamental Theorem of Calculus.
- Apply integration to compute multiple integrals, area, volume, integrals in polar coordinates, in addition to change of order and change of variables.
- Evaluate integrals using techniques of integration, such as substitution, partial fractions and integration by parts.
- Determine convergence/divergence of improper integrals and evaluate convergent improper integrals.
- Apply various techniques in solving differential equations.

**TEXT BOOKS :**

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 43<sup>rd</sup> Edition, 2014.
2. James Stewart, "Calculus: Early Transcendentals", Cengage Learning, 7<sup>th</sup> Edition, New Delhi, 2015. [For Units I & III - Sections 1.1, 2.2, 2.3, 2.5, 2.7(Tangents problems only), 2.8, 3.1 to 3.6, 3.11, 4.1, 4.3, 5.1(Area problems only), 5.2, 5.3, 5.4 (excluding net change theorem), 5.5, 7.1 - 7.4 and 7.8].

**REFERENCES :**

1. Anton, H, Bivens, I and Davis, S, "Calculus", Wiley, 10<sup>th</sup> Edition, 2016.
2. Jain R.K. and Iyengar S.R.K., "Advanced Engineering Mathematics", Narosa Publications, New Delhi, 3<sup>rd</sup> Edition, 2007.
3. Narayanan, S. and Manicavachagom Pillai, T. K., "Calculus" Volume I and II, S. Viswanathan Publishers Pvt. Ltd., Chennai, 2007.
4. Srimantha Pal and Bhunia, S.C, "Engineering Mathematics" Oxford University Press, 2015.
5. Weir, M.D and Joel Hass, "Thomas Calculus", 12<sup>th</sup> Edition, Pearson India, 2016.

**OBJECTIVES:**

- To enhance the fundamental knowledge in Physics and its applications relevant to various streams of Engineering and Technology.

**UNIT I PROPERTIES OF MATTER 9**

Elasticity – Stress-strain diagram and its uses - factors affecting elastic modulus and tensile strength – torsional stress and deformations – twisting couple - torsion pendulum: theory and experiment - bending of beams - bending moment – cantilever: theory and experiment – uniform and non-uniform bending: theory and experiment - I-shaped girders - stress due to bending in beams.

**UNIT II WAVES AND FIBER OPTICS 9**

Oscillatory motion – forced and damped oscillations: differential equation and its solution – plane progressive waves – wave equation. Lasers : population of energy levels, Einstein’s A and B coefficients derivation – resonant cavity, optical amplification (qualitative) – Semiconductor lasers: homojunction and heterojunction – Fiber optics: principle, numerical aperture and acceptance angle - types of optical fibres (material, refractive index, mode) – losses associated with optical fibers - fibre optic sensors: pressure and displacement.

**UNIT III THERMAL PHYSICS 9**

Transfer of heat energy – thermal expansion of solids and liquids – expansion joints - bimetallic strips - thermal conduction, convection and radiation – heat conductions in solids – thermal conductivity - Forbe’s and Lee’s disc method: theory and experiment - conduction through compound media (series and parallel) – thermal insulation – applications: heat exchangers, refrigerators, ovens and solar water heaters.

**UNIT IV QUANTUM PHYSICS 9**

Black body radiation – Planck’s theory (derivation) – Compton effect: theory and experimental verification – wave particle duality – electron diffraction – concept of wave function and its physical significance – Schrödinger’s wave equation – time independent and time dependent equations – particle in a one-dimensional rigid box – tunnelling (qualitative) - scanning tunnelling microscope.

**UNIT V CRYSTAL PHYSICS 9**

Single crystalline, polycrystalline and amorphous materials – single crystals: unit cell, crystal systems, Bravais lattices, directions and planes in a crystal, Miller indices – inter-planar distances - coordination number and packing factor for SC, BCC, FCC, HCP and diamond structures - crystal imperfections: point defects, line defects – Burger vectors, stacking faults – role of imperfections in plastic deformation - growth of single crystals: solution and melt growth techniques.

**TOTAL : 45 PERIODS****OUTCOMES:**

Upon completion of this course,

- the students will gain knowledge on the basics of properties of matter and its applications,
- the students will acquire knowledge on the concepts of waves and optical devices and their applications in fibre optics,

- the students will have adequate knowledge on the concepts of thermal properties of materials and their applications in expansion joints and heat exchangers,
- the students will get knowledge on advanced physics concepts of quantum theory and its applications in tunneling microscopes, and
- the students will understand the basics of crystals, their structures and different crystal growth techniques.

#### TEXT BOOKS:

1. Bhattacharya, D.K. & Poonam, T. "Engineering Physics". Oxford University Press, 2015.
2. Gaur, R.K. & Gupta, S.L. "Engineering Physics". Dhanpat Rai Publishers, 2012.
3. Pandey, B.K. & Chaturvedi, S. "Engineering Physics". Cengage Learning India, 2012.

#### REFERENCES:

1. Halliday, D., Resnick, R. & Walker, J. "Principles of Physics". Wiley, 2015.
2. Serway, R.A. & Jewett, J.W. "Physics for Scientists and Engineers". Cengage Learning, 2010.
3. Tipler, P.A. & Mosca, G. "Physics for Scientists and Engineers with Modern Physics". W.H. Freeman, 2007.

**CY8151**

**ENGINEERING CHEMISTRY**

**L T P C  
3 0 0 3**

#### OBJECTIVES:

- To make the students conversant with boiler feed water requirements, related problems and water treatment techniques.
- To develop an understanding of the basic concepts of phase rule and its applications to single and two component systems and appreciate the purpose and significance of alloys.
- Preparation, properties and applications of engineering materials.
- Types of fuels, calorific value calculations, manufacture of solid, liquid and gaseous fuels.
- Principles and generation of energy in batteries, nuclear reactors, solar cells, wind mills and fuel cells.

#### UNIT I WATER AND ITS TREATMENT

**9**

Hardness of water – types – expression of hardness – units – estimation of hardness of water by EDTA – numerical problems – boiler troubles (scale and sludge) – treatment of boiler feed water – Internal treatment (phosphate, colloidal, sodium aluminate and calgon conditioning) external treatment – Ion exchange process, zeolite process – desalination of brackish water - Reverse Osmosis.

#### UNIT II SURFACE CHEMISTRY AND CATALYSIS

**9**

Adsorption: Types of adsorption – adsorption of gases on solids – adsorption of solute from solutions – adsorption isotherms – Freundlich's adsorption isotherm – Langmuir's adsorption isotherm – contact theory – kinetics of surface reactions, unimolecular reactions, Langmuir - applications of adsorption on pollution abatement.

Catalysis: Catalyst – types of catalysis – criteria – autocatalysis – catalytic poisoning and catalytic promoters - acid base catalysis – applications (catalytic convertor) – enzyme catalysis–



Michaelis – Menten equation.

### **UNIT III ALLOYS AND PHASE RULE**

**9**

Alloys: Introduction- Definition- properties of alloys- significance of alloying, functions and effect of alloying elements- Nichrome and stainless steel (18/8) – heat treatment of steel. Phase rule: Introduction, definition of terms with examples, one component system -water system - reduced phase rule - thermal analysis and cooling curves - two component systems - lead-silver system - Pattinson process.

### **UNIT IV FUELS AND COMBUSTION**

**9**

Fuels: Introduction - classification of fuels - coal - analysis of coal (proximate and ultimate) - carbonization - manufacture of metallurgical coke (Otto Hoffmann method) - petroleum - manufacture of synthetic petrol (Bergius process) - knocking - octane number - diesel oil - cetane number - natural gas - compressed natural gas (CNG) - liquefied petroleum gases (LPG) - power alcohol and biodiesel. Combustion of fuels: Introduction - calorific value - higher and lower calorific values- theoretical calculation of calorific value - ignition temperature - spontaneous ignition temperature - explosive range - flue gas analysis (ORSAT Method).

### **UNIT V ENERGY SOURCES AND STORAGE DEVICES**

**9**

Nuclear fission - controlled nuclear fission - nuclear fusion - differences between nuclear fission and fusion - nuclear chain reactions - nuclear energy - light water nuclear power plant - breeder reactor - solar energy conversion - solar cells - wind energy. Batteries, fuel cells and supercapacitors: Types of batteries – primary battery (dry cell) secondary battery (lead acid battery, lithium-ion-battery) fuel cells – H<sub>2</sub>-O<sub>2</sub> fuel cell.

**TOTAL: 45 PERIODS**

#### **OUTCOMES:**

- The knowledge gained on engineering materials, fuels, energy sources and water treatment techniques will facilitate better understanding of engineering processes and applications for further learning.

#### **TEXT BOOKS:**

1. S. S. Dara and S. S. Umare, "A Textbook of Engineering Chemistry", S. Chand & Company LTD, New Delhi, 2015
2. P. C. Jain and Monika Jain, "Engineering Chemistry" Dhanpat Rai Publishing Company (P) LTD, New Delhi, 2015
3. S. Vairam, P. Kalyani and Suba Ramesh, "Engineering Chemistry", Wiley India PVT, LTD, New Delhi, 2013.

#### **REFERENCES:**

1. Friedrich Emich, "Engineering Chemistry", Scientific International PVT, LTD, New Delhi, 2014.
2. Prasanta Rath, "Engineering Chemistry", Cengage Learning India PVT, LTD, Delhi, 2015.
3. Shikha Agarwal, "Engineering Chemistry-Fundamentals and Applications", Cambridge University Press, Delhi, 2015.

**OBJECTIVES:**

- To know the basics of algorithmic problem solving
- To read and write simple Python programs.
- To develop Python programs with conditionals and loops.
- To define Python functions and call them.
- To use Python data structures — lists, tuples, dictionaries.
- To do input/output with files in Python.

**UNIT I ALGORITHMIC PROBLEM SOLVING 9**

Algorithms, building blocks of algorithms (statements, state, control flow, functions), notation (pseudo code, flow chart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion). Illustrative problems: find minimum in a list, insert a card in a list of sorted cards, guess an integer number in a range, Towers of Hanoi.

**UNIT II DATA, EXPRESSIONS, STATEMENTS 9**

Python interpreter and interactive mode; values and types: int, float, boolean, string, and list; variables, expressions, statements, tuple assignment, precedence of operators, comments; modules and functions, function definition and use, flow of execution, parameters and arguments; Illustrative programs: exchange the values of two variables, circulate the values of n variables, distance between two points.

**UNIT III CONTROL FLOW, FUNCTIONS 9**

Conditionals: Boolean values and operators, conditional (if), alternative (if-else), chained conditional (if-elif-else); Iteration: state, while, for, break, continue, pass; Fruitful functions: return values, parameters, local and global scope, function composition, recursion; Strings: string slices, immutability, string functions and methods, string module; Lists as arrays. Illustrative programs: square root, gcd, exponentiation, sum an array of numbers, linear search, binary search.

**UNIT IV LISTS, TUPLES, DICTIONARIES 9**

Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing - list comprehension; Illustrative programs: selection sort, insertion sort, mergesort, histogram.

**UNIT V FILES, MODULES, PACKAGES 9**

Files and exception: text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions, modules, packages; Illustrative programs: word count, copy file.

**OUTCOMES:****Upon completion of the course, students will be able to**

- Develop algorithmic solutions to simple computational problems
- Read, write, execute by hand simple Python programs.
- Structure simple Python programs for solving problems.
- Decompose a Python program into functions.
- Represent compound data using Python lists, tuples, dictionaries.

- Read and write data from/to files in Python Programs.

**TOTAL : 45 PERIODS**

**TEXT BOOKS:**

1. Allen B. Downey, ``Think Python: How to Think Like a Computer Scientist'', 2<sup>nd</sup> edition, Updated for Python 3, Shroff/O'Reilly Publishers, 2016 (<http://greenteapress.com/wp/think-python/>)
2. Guido van Rossum and Fred L. Drake Jr, "An Introduction to Python – Revised and updated for Python 3.2, Network Theory Ltd., 2011.

**REFERENCES:**

1. Charles Dierbach, "Introduction to Computer Science using Python: A Computational Problem-Solving Focus, Wiley India Edition, 2013.
2. John V Guttag, "Introduction to Computation and Programming Using Python", Revised and expanded Edition, MIT Press , 2013
3. Kenneth A. Lambert, "Fundamentals of Python: First Programs", CENGAGE Learning, 2012.
4. Paul Gries, Jennifer Campbell and Jason Montojo, "Practical Programming: An Introduction to Computer Science using Python 3", Second edition, Pragmatic Programmers, LLC, 2013.
5. Robert Sedgewick, Kevin Wayne, Robert Dondero, "Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016.
6. Timothy A. Budd, "Exploring Python", Mc-Graw Hill Education (India) Private Ltd., 2015.

**GE8152**

**ENGINEERING GRAPHICS**

**L T P C**

**2 0 4 4**

**OBJECTIVES:**

- To develop in students, graphic skills for communication of concepts, ideas and design of Engineering products.
- To expose them to existing national standards related to technical drawings.

**CONCEPTS AND CONVENTIONS (Not for Examination)**

**1**

Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning.

**UNIT I PLANE CURVES AND FREEHAND SKETCHING**

**7+12**

Basic Geometrical constructions, Curves used in engineering practices: Conics – Construction of ellipse, parabola and hyperbola by eccentricity method – Construction of cycloid – construction of involutes of square and circle – Drawing of tangents and normal to the above curves.

Visualization concepts and Free Hand sketching: Visualization principles –Representation of Three Dimensional objects – Layout of views- Freehand sketching of multiple views from pictorial views of objects

**UNIT II PROJECTION OF POINTS, LINES AND PLANE SURFACE**

**6+12**

Orthographic projection- principles-Principal planes-First angle projection-projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes

- Determination of true lengths and true inclinations by rotating line method and traces  
Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.

**UNIT III PROJECTION OF SOLIDS 5+12**

Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to one of the principal planes by rotating object method.

**UNIT IV PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES 5+12**

Sectioning of above solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other – obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids cylinders and cones.

**UNIT V ISOMETRIC AND PERSPECTIVE PROJECTIONS 6+12**

Principles of isometric projection – isometric scale –Isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions - Perspective projection of simple solids-Prisms, pyramids and cylinders by visual ray method .

**TOTAL: 90 PERIODS**

**OUTCOMES:**

On successful completion of this course, the student will be able to

- familiarize with the fundamentals and standards of Engineering graphics
- perform freehand sketching of basic geometrical constructions and multiple views of objects.
- project orthographic projections of lines and plane surfaces.
- draw projections and solids and development of surfaces.
- visualize and to project isometric and perspective sections of simple solids.

**TEXT BOOK:**

1. Natrajan K.V., “A text book of Engineering Graphics”, Dhanalakshmi Publishers, Chennai, 2009.
2. Venugopal K. and Prabhu Raja V., “Engineering Graphics”, New Age International (P) Limited, 2008.

**REFERENCES:**

1. Basant Agarwal and Agarwal C.M., “Engineering Drawing”, Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.
2. Bhatt N.D. and Panchal V.M., “Engineering Drawing”, Charotar Publishing House, 50<sup>th</sup> Edition, 2010.
3. Gopalakrishna K.R., “Engineering Drawing” (Vol. I&II combined), Subhas Stores, Bangalore, 2007.
4. Luzzader, Warren.J. and Duff,John M., “Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production, Eastern Economy Edition, Prentice Hall of India Pvt. Ltd, New Delhi, 2005.
5. N S Parthasarathy And Vela Murali, “Engineering Graphics”, Oxford University, Press, New Delhi, 2015.
6. Shah M.B., and Rana B.C., “Engineering Drawing”, Pearson, 2<sup>nd</sup> Edition, 2009.

**Publication of Bureau of Indian Standards:**

1. IS 10711 – 2001: Technical products Documentation – Size and lay out of drawing sheets.
2. IS 9609 (Parts 0 & 1) – 2001: Technical products Documentation – Lettering.
3. IS 10714 (Part 20) – 2001 & SP 46 – 2003: Lines for technical drawings.
4. IS 11669 – 1986 & SP 46 – 2003: Dimensioning of Technical Drawings.
5. IS 15021 (Parts 1 to 4) – 2001: Technical drawings – Projection Methods.

**Special points applicable to University Examinations on Engineering Graphics:**

1. There will be five questions, each of either or type covering all units of the syllabus.
2. All questions will carry equal marks of 20 each making a total of 100.
3. The answer paper shall consist of drawing sheets of A3 size only. The students will be permitted to use appropriate scale to fit solution within A3 size. The examination will be conducted in appropriate sessions on the same day

**GE8161****PROBLEM SOLVING AND PYTHON PROGRAMMING  
LABORATORY****L T P C  
0 0 4 2****OBJECTIVES:**

- To write, test, and debug simple Python programs.
- To implement Python programs with conditionals and loops.
- Use functions for structuring Python programs.
- Represent compound data using Python lists, tuples, dictionaries.
- Read and write data from/to files in Python.

**LIST OF PROGRAMS**

1. Compute the GCD of two numbers.
2. Find the square root of a number (Newton's method)
3. Exponentiation (power of a number)
4. Find the maximum of a list of numbers
5. Linear search and Binary search
6. Selection sort, Insertion sort
7. Merge sort
8. First n prime numbers
9. Multiply matrices
10. Programs that take command line arguments (word count)
11. Find the most frequent words in a text read from a file
12. Simulate elliptical orbits in Pygame
13. Simulate bouncing ball using Pygame

**PLATFORM NEEDED**

Python 3 interpreter for Windows/Linux

**OUTCOMES:****Upon completion of the course, students will be able to**

- Write, test, and debug simple Python programs.
- Implement Python programs with conditionals and loops.
- Develop Python programs step-wise by defining functions and calling them.
- Use Python lists, tuples, dictionaries for representing compound data.
- Read and write data from/to files in Python.

**TOTAL :60 PERIODS**

<b>BS8161</b>	<b>PHYSICS AND CHEMISTRY LABORATORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	<b>(Common to all branches of B.E. / B.Tech Programmes)</b>	<b>0</b>	<b>0</b>	<b>4</b>	<b>2</b>

**OBJECTIVES:**

- To introduce different experiments to test basic understanding of physics concepts applied in optics, thermal physics, properties of matter and liquids.

**LIST OF EXPERIMENTS: PHYSICS LABORATORY (Any 5 Experiments)**

- Determination of rigidity modulus – Torsion pendulum
- Determination of Young's modulus by non-uniform bending method
- (a) Determination of wavelength, and particle size using Laser  
(b) Determination of acceptance angle in an optical fiber.
- Determination of thermal conductivity of a bad conductor – Lee's Disc method.
- Determination of velocity of sound and compressibility of liquid – Ultrasonic interferometer
- Determination of wavelength of mercury spectrum – spectrometer grating
- Determination of band gap of a semiconductor
- Determination of thickness of a thin wire – Air wedge method

**TOTAL: 30 PERIODS**

**OUTCOMES:**

Upon completion of the course, the students will be able to

- apply principles of elasticity, optics and thermal properties for engineering applications.

**CHEMISTRY LABORATORY: (Any seven experiments to be conducted)**

**OBJECTIVES:**

- To make the student to acquire practical skills in the determination of water quality parameters through volumetric and instrumental analysis.
- To acquaint the students with the determination of molecular weight of a polymer by viscometry.

- Estimation of HCl using  $\text{Na}_2\text{CO}_3$  as primary standard and Determination of alkalinity in water sample.
- Determination of total, temporary & permanent hardness of water by EDTA method.
- Determination of DO content of water sample by Winkler's method.
- Determination of chloride content of water sample by argentometric method.
- Estimation of copper content of the given solution by Iodometry.
- Determination of strength of given hydrochloric acid using pH meter.
- Determination of strength of acids in a mixture of acids using conductivity meter.
- Estimation of iron content of the given solution using potentiometer.
- Estimation of iron content of the water sample using spectrophotometer (1, 10-Phenanthroline / thiocyanate method).
- Estimation of sodium and potassium present in water using flame photometer.
- Determination of molecular weight of polyvinyl alcohol using Ostwald viscometer.
- Pseudo first order kinetics-ester hydrolysis.
- Corrosion experiment-weight loss method.
- Determination of CMC.
- Phase change in a solid.
- Conductometric titration of strong acid vs strong base.

**OUTCOMES:**

- The students will be outfitted with hands-on knowledge in the quantitative chemical analysis of water quality related parameters.

**TOTAL: 30 PERIODS****TEXTBOOKS:**

1. Vogel's Textbook of Quantitative Chemical Analysis (8<sup>TH</sup> edition, 2014)

**HS8251****TECHNICAL ENGLISH****L T P C  
4 0 0 4****OBJECTIVES:****The Course prepares second semester engineering and Technology students to:**

- Develop strategies and skills to enhance their ability to read and comprehend engineering and technology texts.
- Foster their ability to write convincing job applications and effective reports.
- Develop their speaking skills to make technical presentations , participate in group discussions.
- Strengthen their listening skill which will help them comprehend lectures and talks in their areas of specialisation.

**UNIT I INTRODUCTION TECHNICAL ENGLISH 12**

**Listening-** Listening to talks mostly of a scientific/technical nature and completing information-gap exercises- **Speaking** –Asking for and giving directions- **Reading** – reading short technical texts from journals- newspapers- **Writing-** purpose statements – extended definitions – issue-writing instructions – checklists-recommendations-**Vocabulary Development-** technical vocabulary **Language Development** –subject verb agreement - compound words.

**UNIT II READING AND STUDY SKILLS 12**

**Listening-** Listening to longer technical talks and completing exercises based on them- **Speaking** – describing a process-**Reading** – reading longer technical texts- identifying the various transitions in a text- paragraphing- **Writing-** interpreting charts, graphs- **Vocabulary Development-**vocabulary used in formal letters/emails and reports **Language Development-** impersonal passive voice, numerical adjectives.

**UNIT III TECHNICAL WRITING AND GRAMMAR 12**

**Listening-** Listening to classroom lectures/ talks on engineering/technology -**Speaking** – introduction to technical presentations- **Reading** – longer texts both general and technical, practice in speed reading; **Writing-**Describing a process, use of sequence words- **Vocabulary Development-** sequence words- Misspelled words. **Language Development-** embedded sentences

**UNIT IV REPORT WRITING 12**

**Listening-** Listening to documentaries and making notes. **Speaking** – mechanics of presentations- **Reading** – reading for detailed comprehension- **Writing-** email etiquette- job application – cover letter –Résumé preparation( via email and hard copy)- analytical essays and issue based essays--**Vocabulary Development-** finding suitable synonyms-paraphrasing-. **Language Development-** clauses- if conditionals.

**UNIT V GROUP DISCUSSION AND JOB APPLICATIONS 12**

**Listening-** TED/Ink talks; **Speaking** –participating in a group discussion -**Reading**– reading and understanding technical articles **Writing**– Writing reports- minutes of a meeting- accident and survey-**Vocabulary Development- verbal analogies Language Development-** reported speech .

**TOTAL :60 PERIODS**

**OUTCOMES: At the end of the course learners will be able to:**

- Read technical texts and write area- specific texts effortlessly.
- Listen and comprehend lectures and talks in their area of specialisation successfully.
- Speak appropriately and effectively in varied formal and informal contexts.
- Write reports and winning job applications.

**TEXT BOOKS:**

1. Board of editors. **Fluency in English A Course book for Engineering and Technology.** Orient Blackswan, Hyderabad: 2016.
2. Sudharshana.N.P and Saveetha. C. **English for Technical Communication.** Cambridge University Press: New Delhi, 2016.

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1. Booth-L. Diana, **Project Work**, Oxford University Press, Oxford: 2014.
2. Grussendorf, Marion, **English for Presentations**, Oxford University Press, Oxford: 2007
3. Kumar, Suresh. E. **Engineering English.** Orient Blackswan: Hyderabad,2015.
4. Means, L. Thomas and Elaine Langlois, **English & Communication For Colleges.** Cengage Learning, USA: 2007
5. Raman, Meenakshi and Sharma, Sangeetha- **Technical Communication Principles and Practice.**Oxford University Press: New Delhi,2014.

**Students can be asked to read Tagore, Chetan Bhagat and for supplementary reading.**

**MA8251 ENGINEERING MATHEMATICS – II L T P C  
4 0 0 4**

**OBJECTIVES :**

- This course is designed to cover topics such as Matrix Algebra, Vector Calculus, Complex Analysis and Laplace Transform. Matrix Algebra is one of the powerful tools to handle practical problems arising in the field of engineering. Vector calculus can be widely used for modelling the various laws of physics. The various methods of complex analysis and Laplace transforms can be used for efficiently solving the problems that occur in various branches of engineering disciplines.

**UNIT I MATRICES 12**

Eigenvalues and Eigenvectors of a real matrix – Characteristic equation – Properties of Eigenvalues and Eigenvectors – Cayley-Hamilton theorem – Diagonalization of matrices – Reduction of a quadratic form to canonical form by orthogonal transformation – Nature of quadratic forms.

**UNIT II VECTOR CALCULUS 12**

Gradient and directional derivative – Divergence and curl - Vector identities – Irrotational and Solenoidal vector fields – Line integral over a plane curve – Surface integral - Area of a curved



surface - Volume integral - Green's, Gauss divergence and Stoke's theorems – Verification and application in evaluating line, surface and volume integrals.

### **UNIT III ANALYTIC FUNCTIONS 12**

Analytic functions – Necessary and sufficient conditions for analyticity in Cartesian and polar coordinates - Properties – Harmonic conjugates – Construction of analytic function - Conformal mapping – Mapping by functions  $w = z + c, cz, \frac{1}{z}, z^2$  - Bilinear transformation.

### **UNIT IV COMPLEX INTEGRATION 12**

Line integral - Cauchy's integral theorem – Cauchy's integral formula – Taylor's and Laurent's series – Singularities – Residues – Residue theorem – Application of residue theorem for evaluation of real integrals – Use of circular contour and semicircular contour.

### **UNIT V LAPLACE TRANSFORMS 12**

Existence conditions – Transforms of elementary functions – Transform of unit step function and unit impulse function – Basic properties – Shifting theorems -Transforms of derivatives and integrals – Initial and final value theorems – Inverse transforms – Convolution theorem – Transform of periodic functions – Application to solution of linear second order ordinary differential equations with constant coefficients.

**TOTAL: 60 PERIODS**

#### **OUTCOMES :**

After successfully completing the course, the student will have a good understanding of the following topics and their applications:

- Eigenvalues and eigenvectors, diagonalization of a matrix, Symmetric matrices, Positive definite matrices and similar matrices.
- Gradient, divergence and curl of a vector point function and related identities.
- Evaluation of line, surface and volume integrals using Gauss, Stokes and Green's theorems and their verification.
- Analytic functions, conformal mapping and complex integration.
- Laplace transform and inverse transform of simple functions, properties, various related theorems and application to differential equations with constant coefficients.

#### **TEXT BOOKS :**

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 43<sup>rd</sup> Edition, 2014.
2. Kreyszig Erwin, "Advanced Engineering Mathematics ", John Wiley and Sons, 10<sup>th</sup> Edition, New Delhi, 2016.

#### **REFERENCES :**

1. Bali N., Goyal M. and Watkins C., "Advanced Engineering Mathematics", Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.), New Delhi, 7<sup>th</sup> Edition, 2009.
2. Jain R.K. and Iyengar S.R.K., " Advanced Engineering Mathematics ", Narosa Publications, New Delhi , 3<sup>rd</sup> Edition, 2007.
3. O'Neil, P.V. "Advanced Engineering Mathematics", Cengage Learning India Pvt., Ltd, New Delhi, 2007.
4. Sastry, S.S, "Engineering Mathematics", Vol. I & II, PHI Learning Pvt. Ltd, 4<sup>th</sup> Edition, New Delhi, 2014.
5. Wylie, R.C. and Barrett, L.C., "Advanced Engineering Mathematics "Tata McGraw Hill Education Pvt. Ltd, 6<sup>th</sup> Edition, New Delhi, 2012.

<b>PH8254</b>	<b>PHYSICS OF MATERIALS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	(Common to courses offered in Faculty of Technology except Fashion Technology)	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**OBJECTIVES:**

- To introduce the physics of various materials relevant to different branches of technology

**UNIT I PREPARATION OF MATERIALS 9**

Phases - phase rule – binary systems – tie line rule – lever rule – phase diagram – invariant reactions - nucleation – homogeneous and heterogeneous nucleation – free energy of formation of a critical nucleus – Thin films – preparation: PVD, CVD method – Nanomaterials Preparation: wet chemical, solvothermal, sol-gel method.

**UNIT II CONDUCTING MATERIALS 9**

Classical free electron theory - expression for electrical conductivity – thermal conductivity, - Wiedemann-Franz law – electrons in metals: particle in a three-dimensional box- degenerate states – Fermi-Dirac statistics – density of energy states – electron in periodic potential (concept only) – electron effective mass – concept of hole. Superconducting phenomena, properties of superconductors – Meissner effect and isotope effect. Type I and Type II superconductors, High  $T_c$  superconductors – Magnetic levitation and SQUIDS.

**UNIT III SEMICONDUCTING MATERIALS 9**

Elemental Semiconductors - Compound semiconductors - Origin of band gap in solids (qualitative) - carrier concentration in an intrinsic semiconductor (derivation) – Fermi level – variation of Fermi level with temperature – electrical conductivity – band gap determination – carrier concentration in n-type and p-type semiconductors (derivation) – variation of Fermi level with temperature and impurity concentration – Hall effect – determination of Hall coefficient – LED - Solar cells.

**UNIT IV DIELECTRIC AND MAGNETIC MATERIALS 9**

Dielectric, Parnaelectric and ferroelectric materials - Electronic, Ionic, Orientational and space charge polarization – Internal field and deduction of Clausius Mosotti equation – dielectric loss – different types of dielectric breakdown – classification of insulating materials and their applications - Ferroelectric materials - Introduction to magnetic materials - Domain theory of ferromagnetism, Hysteresis, Soft and Hard magnetic materials – Anti-ferromagnetic materials – Ferrites, magnetoresistance materials.

**UNIT V NEW MATERIALS AND APPLICATIONS 9**

Metallic glasses – Shape memory alloys: Copper, Nickel and Titanium based alloys – graphene and its properties - Ceramics: types and applications – Composites: classification, role of matrix and reinforcement – processing of fibre reinforced plastics and fibre reinforced metals – Biomaterials: hydroxyapatite – PMMA – Silicone - Sensors: Chemical Sensors - Bio-sensors – conducting, semiconducting and photoresponsive polymers.

**TOTAL : 45 PERIODS**

**OUTCOMES:**

At the end of the course, the students will able to

- gain knowledge on phase diagrams and various material processing methods,
- acquire knowledge on basics of conducting materials, superconductors and their applications
- get knowledge on the functioning of semiconducting materials and their applications in

LED and solar cells,

- understand the functioning of various dielectric and magnetic materials ,
- have the necessary understanding on various advanced materials.

#### TEXT BOOKS:

1. Balasubramaniam, R. "Callister's Materials Science and Engineering". Wiley India Pvt. Ltd. 2014.
2. Kasap, S.O. "Principles of Electronic Materials and Devices". McGraw-Hill Education, 2007.
3. Wahab, M.A. "Solid State Physics: Structure and Properties of Materials". Narosa Publishing House, 2009.

#### REFERENCES

1. Askeland, D. "Materials Science and Engineering". Brooks/Cole, 2010
2. Raghavan, V. "Materials Science and Engineering : A First course". PHI Learning, 2015.
3. Smith, W.F., Hashemi, J. & Prakash. R. "Materials Science and Engineering". Tata Mcgraw Hill Education Pvt. Ltd., 2014.

**CY8292**

**CHEMISTRY FOR TECHNOLOGISTS**

**L T P C**  
**3 0 0 3**

#### **UNIT I UNIT PROCESSES**

**9**

Nitration, Sulphonation, Halogenation, Esterification, Amination, Saponification and Hydrogenation – Role of the above unit processes in such industries as petroleum, drugs, pharmaceuticals and organic synthesis.

#### **UNIT II REACTION MECHANISMS**

**9**

Free radical, substitutions, electrophilic, addition, aromatic electrophilic substitutions, nucleophilic additions, condensation reactions, nucleophilic substitutions in aliphatic and aromatic compounds, cyclo-additions, rearrangements-Beckmann and Fries rearrangement reactions.

#### **UNIT III OILS, FATS, SOAPS & LUBRICANTS**

**9**

Chemical constitution, Chemical analysis of oils and fats – acid, saponification and iodine values, Definitions, determinations and significance. Definition, mechanism of lubrication, preparation of petrolubes, desirable characteristics – viscosity, viscosity index, carbon residue, oxidation stability, flash and fire points, cloud and pour points, aniline point. Semisolid lubricant – greases, preparation of sodium, lithium, calcium and axle greases and uses, consistency test and drop point test. Solid lubricants – graphite and molybdenum disulphide.

#### **UNIT IV CHEMICALS AND AUXILIARIES**

**9**

Preparation, properties and uses of bleaching powder, sodium hypochlorite, hydrogen peroxide, chlorine dioxide. Estimation of available chlorine in hypochlorite bleach liquor. Determination of strength of hydrogen peroxide.

**UNIT V COLORANTS****9**

Theory of color and constitution: chromophore and auxochrome, classification of dyes based on application. Chemistry and synthesis of azo dye (Methyl red, Methyl orange and Congo red)

**TOTAL: 45 PERIODS****TEXTBOOKS:**

1. Dhara S. S., "A Text Book of Engineering Chemistry", 12<sup>th</sup> Ed., S. Chand & Co. Ltd., New Delhi, 2016.
2. Jain. P.C. and Monica Jain, "Engineering Chemistry", Dhanpet Rai & Sons, New Delhi, 2012.
3. Shikha Agarwal, "Engineering Chemistry-Fundamentals and Applications", Cambridge University Press, Delhi, 2015.

**REFERENCES:**

1. W.L. McCabe, J.C. Smith and P. Harriot, Unit Operations of Chemical Engineering, 7<sup>th</sup> Edition, McGraw Hill Education, 2005.
2. B.K. Sharma, "Industrial chemistry", Krishna Prakashan Media (P) Ltd, Meerut, 2011.
3. Shore J., "Colourants and Auxiliaries: Volume II Auxiliaries", Wood head Publishing Ltd., 2002.
4. Shenai V. A., "Chemistry of Dyes and Principles of Dyeing", Sevak Publications, Mumbai, 1995.
5. Trotman E. R., "Dyeing and Chemical Technology of Textile Fibres", B.I Publishing Pvt. Ltd., New Delhi, 1994.

**BE8251****BASIC ELECTRICAL AND ELECTRONICS ENGINEERING****L T P C****3 0 0 3****OBJECTIVES:**

- To explain the basic theorems used in Electrical circuits and the different components and function of electrical machines.
- To explain the fundamentals of semiconductor and applications.
- To explain the principles of digital electronics
- To impart knowledge of communication.

**UNIT I ELECTRICAL CIRCUITS & MEASUREMENTS****9**

Fundamental laws of electric circuits– Steady State Solution of DC Circuits – Introduction to AC Circuits –Sinusoidal steady state analysis– Power and Power factor – Single Phase and Three Phase Balanced Circuits. Classification of instruments – Operating Principles of indicating Instruments

**UNIT II ELECTRICAL MACHINES****9**

Construction, Principle of Operation, Basic Equations and Applications of DC Generators, DC Motors, Single Phase Transformer, single phase induction Motor.

**UNIT III SEMICONDUCTOR DEVICES AND APPLICATIONS****9**

Introduction - Characteristics of PN Junction Diode – Zener Effect – Zener Diode and its Characteristics – Half wave and Full wave Rectifiers – Voltage Regulation.  
Bipolar Junction Transistor – CB, CE, CC Configurations and Characteristics – Elementary Treatment of Small Signal Amplifier.

**UNIT IV DIGITAL ELECTRONICS 9**

Binary Number System – Boolean Algebra theorems– Digital circuits - Introduction to sequential Circuits– Flip-Flops – Registers and Counters – A/D and D/A Conversion –digital processing architecture.

**UNIT V FUNDAMENTALS OF COMMUNICATION ENGINEERING 9**

Introduction – Elements of Communication Systems– Modulation and Demodulation: Principles of Amplitude and Frequency Modulations. Digital Communication - Communication Systems: Radio, Antenna, TV, Fax, ISDN, Microwave, Satellite and Optical Fibre (Block Diagram Approach only).

**TOTAL: 45 PERIODS**

**OUTCOMES:**

- ability to identify the electrical components and explain the characteristics of electrical machines.
- ability to identify electronics components and understand the characteristics

**TEXT BOOKS:**

1. D P Kothari and I.J Nagarath, "Electrical Machines "Basic Electrical and Electronics Engineering", McGraw Hill Education(India) Private Limited, Third Reprint ,2016
2. S.K.Bhattacharya "Basic Electrical and Electronics Engineering", Pearson India, 2011
3. Sedha R.S., "Applied Electronics", S. Chand & Co., 2006.

**REFERENCES:**

1. A.E.Fitzgerald, David E Higginbotham and Arvin Gabel, "Basic Electrical Engineering", McGraw Hill Education(India) Private Limited, 2009
2. Del Toro, "Electrical Engineering Fundamentals", Pearson Education, New Delhi, 2007
3. Leonard S Bobrow, " Foundations of Electrical Engineering", Oxford University Press, 2013
4. Mahmood Nahvi and Joseph A. Edminister, "Electric Circuits", Schaum' Outline Series, McGraw Hill, 2002.
5. Mehta V K, "Principles of Electronics", S.Chand & Company Ltd, 1994.
6. Nagsarkar T K and Sukhija M S, "Basics of Electrical Engineering", Oxford press 2005.

**TT8251**

**BASICS OF TEXTILE TECHNOLOGY**

**L T P C**

**3 0 0 3**

**OBJECTIVES**

- To enable the students to learn about the basics of fibre forming, yarn production, fabric formation, coloration of fabrics and garment manufacturing

**UNIT I BASICS OF FIBRE SCIENCE AND SPINNING 13**

Definition of fibre, classification of textile fibers; polymer and polymerization; fibre production principles – wet spinning, dry spinning, melt spinning, gel spinning, dope spinning; characteristics of cotton, viscose, wool, silk, polyester, nylon, polypropylene; sequence of machineries in short staple yarn spinning from ginning to cone winding and their objectives.

**UNIT II BASICS OF FABRIC PRODUCTION 13**

Woven fabric – warp, weft, weaving, path of warp; looms – classification, handloom and its parts, powerloom, automatic looms, shuttleless looms, special type of looms; preparatory

machines for weaving process and their objectives; basic weaving mechanism - primary, secondary and auxiliary mechanisms; knitting – classification, principle, types of fabrics; nonwoven process –classification, principle, types of fabrics.

**UNIT III BASICS OF CHEMICAL PROCESSING 9**

Objectives of the processes - singeing, desizing, scouring, bleaching, mercerization; dyeing-classification of dyes, types of dyeing techniques; printing –types and styles of printing; finishing treatments – chemical and mechanical finishing.

**UNIT IV BASICS OF GARMENT MANUFACTURING 5**

Anthropometry, basic principles of pattern making and grading, marker planning, spreading, cutting, sorting, sewing, finishing and packing.

**UNIT V BASIC FIBRE, YARN AND FABRIC PROPERTIES 5**

Essential fibre properties- cotton and polyester; yarn numbering systems; essential yarn properties; fabric specifications and essential fabric properties

**TOTAL : 45 PERIODS**

**OUTCOMES:**

- The students will have the knowledge on the basics of fibre forming polymers, weaving the yarns into fabric, coloration of the fabrics and manufacturing of garments.

**TEXT BOOKS:**

1. Hornberer M., Eberle H., Kilgus R., Ring W. and Hermeling H., "Clothing Technology: From Fibre to Fabric", Europa Lehrmittel Verlag, 2008, ISBN: 3808562250 / ISBN: 978-3808562253.
2. Wynne A., "Motivate Series-Textiles", Maxmillan Publications, London, 1997.
3. Carr H. and Latham B., "The Technology of Clothing Manufacture" Backwell Science, U.K., 1994, ISBN: 0632037482 / ISBN:13: 9780632037483

**REFERENCES:**

1. Banerjee N. N., "Weaving Mechanism", Textile Book House, ISBN: B001A1S41A, 1986.
2. Booth J. E., "Textile Mathematics Volume 3", The Textile Institute, Manchester, 1977, ISBN: 090073924X.
3. Marks R. and Robinson T. C., "Principles of Weaving", The Textile Institute, Manchester, 1989, ISBN: 0900739258.
4. Mishra G. S., "Introductory Polymer Chemistry", John Wiley & Sons, Dhanpat Rai & Co. Pvt. Ltd., 2003, ISBN: 8122404715 / ISBN: 9788122404715.
5. Oxtoby E., "Spun Yarn Technology ", Butterworth, London, 1987, ISBN: 1483129381 / ISBN: 9781483129389.
6. Trotman E. R., "Dyeing and Chemical Technology of Textile Fibres", B.I Publishing Pvt. Ltd., New Delhi, 1994, ISBN: 0471809101 / ISBN: 9780471809104.

**GE8261 ENGINEERING PRACTICES LABORATORY L T P C  
0 0 4 2**

**OBJECTIVES:**

- To provide exposure to the students with hands on experience on various basic engineering practices in Civil, Mechanical, Electrical and Electronics Engineering.

## GROUP A (CIVIL & MECHANICAL)

### I **CIVIL ENGINEERING PRACTICE** **13**

#### **Buildings:**

- (a) Study of plumbing and carpentry components of residential and industrial buildings. Safety aspects.

#### **Plumbing Works:**

- (a) Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, elbows in household fittings.
- (b) Study of pipe connections requirements for pumps and turbines.
- (c) Preparation of plumbing line sketches for water supply and sewage works.
- (d) Hands-on-exercise:  
Basic pipe connections – Mixed pipe material connection – Pipe connections with different joining components.
- (e) Demonstration of plumbing requirements of high-rise buildings.

#### **Carpentry using Power Tools only:**

- (a) Study of the joints in roofs, doors, windows and furniture.
- (b) Hands-on-exercise:  
Wood work, joints by sawing, planing and cutting.

### II **MECHANICAL ENGINEERING PRACTICE** **18**

#### **Welding:**

- (a) Preparation of butt joints, lap joints and T- joints by Shielded metal arc welding.
- (b) Gas welding practice

#### **Basic Machining:**

- (a) Simple Turning and Taper turning
- (b) Drilling Practice

#### **Sheet Metal Work:**

- (a) Forming & Bending:
- (b) Model making – Trays and funnels.
- (c) Different type of joints.

#### **Machine assembly practice:**

- (a) Study of centrifugal pump
- (b) Study of air conditioner

#### **Demonstration on:**

- (a) Smithy operations, upsetting, swaging, setting down and bending. Example – Exercise – Production of hexagonal headed bolt.
- (b) Foundry operations like mould preparation for gear and step cone pulley.
- (c) Fitting – Exercises – Preparation of square fitting and V – fitting models.

## GROUP B (ELECTRICAL & ELECTRONICS)

### III **ELECTRICAL ENGINEERING PRACTICE** **13**

1. Residential house wiring using switches, fuse, indicator, lamp and energy meter.
2. Fluorescent lamp wiring.
3. Stair case wiring
4. Measurement of electrical quantities – voltage, current, power & power factor in RLC

circuit.

5. Measurement of energy using single phase energy meter.
6. Measurement of resistance to earth of an electrical equipment.

#### **IV ELECTRONICS ENGINEERING PRACTICE**

**16**

1. Study of Electronic components and equipments – Resistor, colour coding measurement of AC signal parameter (peak-peak, rms period, frequency) using CR.
2. Study of logic gates AND, OR, EX-OR and NOT.
3. Generation of Clock Signal.
4. Soldering practice – Components Devices and Circuits – Using general purpose PCB.
5. Measurement of ripple factor of HWR and FWR.

**TOTAL: 60 PERIODS**

#### **OUTCOMES:**

On successful completion of this course, the student will be able to

- fabricate carpentry components and pipe connections including plumbing works.
- use welding equipments to join the structures.
- Carry out the basic machining operations
- Make the models using sheet metal works
- Illustrate on centrifugal pump, Air conditioner, operations of smithy, foundry and fittings
- Carry out basic home electrical works and appliances
- Measure the electrical quantities
- Elaborate on the components, gates, soldering practices.

#### **LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:**

##### **CIVIL**

- |   |          |
|---|----------|
| 1. Assorted components for plumbing consisting of metallic pipes, plastic pipes, flexible pipes, couplings, unions, elbows, plugs and other fittings. | 15 Sets. |
| 2. Carpentry vice (fitted to work bench)  | 15 Nos.  |
| 3. Standard woodworking tools   | 15 Sets. |
| 4. Models of industrial trusses, door joints, furniture joints  | 5 each   |
| 5. Power Tools: (a) Rotary Hammer   | 2 Nos    |
| (b) Demolition Hammer   | 2 Nos    |
| (c) Circular Saw  | 2 Nos    |
| (d) Planer  | 2 Nos    |
| (e) Hand Drilling Machine   | 2 Nos    |
| (f) Jigsaw  | 2 Nos    |

##### **MECHANICAL**

- |   |         |
|---|---------|
| 1. Arc welding transformer with cables and holders                            | 5 Nos.  |
| 2. Welding booth with exhaust facility  | 5 Nos.  |
| 3. Welding accessories like welding shield, chipping hammer, wire brush, etc. | 5 Sets. |
| 4. Oxygen and acetylene gas cylinders, blow pipe and other welding outfit.    | 2 Nos.  |
| 5. Centre lathe   | 2 Nos.  |
| 6. Hearth furnace, anvil and smithy tools                                     | 2 Sets. |
| 7. Moulding table, foundry tools  | 2 Sets. |



- |   |           |
|---|-----------|
| 8. Power Tool: Angle Grinder                              | 2 Nos     |
| 9. Study-purpose items: centrifugal pump, air-conditioner | One each. |

**ELECTRICAL**

- |   |         |
|---|---------|
| 1. Assorted electrical components for house wiring                  | 15 Sets |
| 2. Electrical measuring instruments                                 | 10 Sets |
| 3. Study purpose items: Iron box, fan and regulator, emergency lamp | 1 each  |
| 4. Megger (250V/500V)   | 1 No.   |
| 5. Power Tools: (a) Range Finder                                    | 2 Nos   |
| (b) Digital Live-wire detector                                      | 2 Nos   |

**ELECTRONICS**

- |   |         |
|---|---------|
| 1. Soldering guns   | 10 Nos. |
| 2. Assorted electronic components for making circuits                 | 50 Nos. |
| 3. Small PCBs   | 10 Nos. |
| 4. Multimeters  | 10 Nos. |
| 5. Study purpose items: Telephone, FM radio, low-voltage power supply |         |

**CY8261**

**APPLIED CHEMISTRY LABORATORY**

**L T P C**

**0 0 4 2**

**OBJECTIVE**

- To make the student acquire practical skills in the wet chemical and instrumental methods for quantitative estimation of nitrite in water, cement, oil, coal, Phenol

**LIST OF EXPERIMENTS (Any ten experiments)**

1. Determination of Redwood / Saybolt numbers, kinematic viscosity and viscosity index of lubricating oils
2. Determination of flash point, fire point, cloud and pour point of oils
3. Determination of acid value, iodine value of oils and saponification value.
4. Determination of COD of water samples
5. Determination of total, temporary & permanent hardness of water by EDTA method.
6. Estimation of HCl using  $\text{Na}_2\text{CO}_3$  as primary standard and determination of alkalinity in water sample.
7. Determination of purity of washing soda and strength of a commercial acid
8. Estimation of available chlorine in hypochlorite solution
9. Estimation of strength of hydrogen peroxide
10. Estimation of Phenol.
11. Determination of Calorific value using Bomb calorimeter

**TOTAL: 60 PERIODS**

**OUTCOME**

- Familiarization with equipment like viscometers, flash and fire point apparatus etc
- Familiarization of methods for determining COD
- Familiarization of a few simple synthetic techniques for soap

**TEXT BOOKS**

1. Daniel R. Palleros, "Experimental organic chemistry" John Wiley & Sons, Inc., New York, 2001.
2. Furniss B.S. Hannaford A.J, Smith P.W.G and Tatchel A.R., Vogel's Textbook of practical organic chemistry, LBS Singapore, 2010.

**OBJECTIVE:**

- This course aims at providing the required skill to apply the statistical tools in engineering problems.
- To introduce the basic concepts of probability and random variables.
- To introduce the basic concepts of two dimensional random variables.
- To acquaint the knowledge of testing of hypothesis for small and large samples which plays an important role in real life problems.
- To introduce the basic concepts of classifications of design of experiments which plays very important roles in the field of agriculture and statistical quality control.

**UNIT I      PROBABILITY AND RANDOM VARIABLES      12**

Probability – The axioms of probability – Conditional probability – Baye’s theorem - Discrete and continuous random variables – Moments – Moment generating functions – Binomial, Poisson, Geometric, Uniform, Exponential and Normal distributions.

**UNIT II      TWO - DIMENSIONAL RANDOM VARIABLES      12**

Joint distributions – Marginal and conditional distributions – Covariance – Correlation and linear regression – Transformation of random variables – Central limit theorem (for independent and identically distributed random variables).

**UNIT III      TESTING OF HYPOTHESIS      12**

Sampling distributions - Estimation of parameters - Statistical hypothesis - Large sample tests based on Normal distribution for single mean and difference of means -Tests based on t, Chi-square and F distributions for mean, variance and proportion - Contingency table (test for independent) - Goodness of fit.

**UNIT IV      DESIGN OF EXPERIMENTS      12**

One way and Two way classifications - Completely randomized design – Randomized block design – Latin square design -  $2^2$  factorial design.

**UNIT V      STATISTICAL QUALITY CONTROL      12**

Control charts for measurements (X and R charts) – Control charts for attributes (p, c and np charts) – Tolerance limits - Acceptance sampling.

**TOTAL: 60 PERIODS**

**OUTCOMES:**

Upon successful completion of the course, students will be able to:

- Understand the fundamental knowledge of the concepts of probability and have knowledge of standard distributions which can describe real life phenomenon.
- Understand the basic concepts of one and two dimensional random variables and apply in engineering applications.
- Apply the concept of testing of hypothesis for small and large samples in real life problems.
- Apply the basic concepts of classifications of design of experiments in the field of agriculture and statistical quality control.
- Have the notion of sampling distributions and statistical techniques used in engineering and management problems.

**TEXT BOOKS:**

1. Johnson, R.A., Miller, I and Freund J., "Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 8<sup>th</sup> Edition, 2015.
2. Milton. J. S. and Arnold. J.C., "Introduction to Probability and Statistics", Tata McGraw Hill, 4<sup>th</sup> Edition, 2007.

**REFERENCES:**

1. Devore. J.L., "Probability and Statistics for Engineering and the Sciences", Cengage Learning, New Delhi, 8<sup>th</sup> Edition, 2014.
2. Papoulis, A. and Unnikrishnapillai, S., "Probability, Random Variables and Stochastic Processes", McGraw Hill Education India, 4<sup>th</sup> Edition, New Delhi, 2010.
3. Ross, S.M., "Introduction to Probability and Statistics for Engineers and Scientists", 3<sup>rd</sup> Edition, Elsevier, 2004.
4. Spiegel. M.R., Schiller. J. and Srinivasan, R.A., "Schaum's Outline of Theory and Problems of Probability and Statistics", Tata McGraw Hill Edition, 2004.
5. Walpole. R.E., Myers. R.H., Myers. S.L. and Ye. K., "Probability and Statistics for Engineers and Scientists", Pearson Education, Asia, 8<sup>th</sup> Edition, 2007.

**TT8391            ENGINEERING MECHANICS FOR TEXTILE TECHNOLOGISTS            L T P C**  
**3 2 0 4**

**OBJECTIVE:**

- To develop capacity to predict the effect of force and motion in the course of carrying out the design functions of engineering

**UNIT I            BASICS AND STATICS OF PARTICLES            15**

Introduction – Units and Dimensions – Laws of Mechanics – Lami's theorem, Parallelogram and triangular Law of forces — Vectorial representation of forces – Vector operations of forces - additions, subtraction, dot product, cross product – Coplanar Forces – rectangular components – Equilibrium of a particle – Forces in space – Equilibrium of a particle in space – Equivalent systems of forces – Principle of transmissibility .

**UNIT II            EQUILIBRIUM OF RIGID BODIES            15**

Free body diagram – Types of supports –Action and reaction forces –stable equilibrium – Moments and Couples – Moment of a force about a point and about an axis – Vectorial representation of moments and couples – Scalar components of a moment – Varignon's theorem – Single equivalent force –Equilibrium of Rigid bodies in two dimensions – Equilibrium of Rigid bodies in three dimensions

**UNIT III            PROPERTIES OF SURFACES AND SOLIDS            15**

Centroids and centre of mass– Centroids of lines and areas - Rectangular, circular, triangular areas by integration – T section, I section, - Angle section, Hollow section by using standard formula –Theorems of Pappus -Area moments of inertia of plane areas – Rectangular, circular, triangular areas by integration – T section, I section, Angle section, Hollow section by using standard formula – Parallel axis theorem and perpendicular axis theorem –Principal moments of inertia of plane areas – Principal axes of inertia-Mass moment of inertia –mass moment of inertia for prismatic, cylindrical and spherical solids from first principle – Relation to area moments of inertia.

**UNIT IV DYNAMICS OF BODIES 15**

Displacements, Velocity and acceleration, their relationship – Relative motion – Curvilinear motion -Newton's laws of motion – Work Energy Equation– Impulse and Momentum – Impact of elastic bodies.

**UNIT V FRICTION AND ELEMENTS OF RIGID BODY DYNAMICS 15**

Friction force – Laws of sliding friction – equilibrium analysis of simple systems with sliding friction –wedge friction-. Rolling resistance -Translation and Rotation of Rigid Bodies – Velocity and acceleration – General Plane motion of simple rigid bodies such as cylinder, disc/wheel and sphere.

**TOTAL: 75 PERIODS**

**OUTCOMES:**

- Ability to explain the differential principles applies to solve engineering problems dealing with force, displacement, velocity and acceleration.
- Ability to analyse the forces in any structures.
- Ability to solve rigid body subjected to dynamic forces.

**TEXT BOOKS:**

1. Beer, F.P and Johnson Jr. E.R. "Vector Mechanics for Engineers (In SI Units): Statics and Dynamics", 8th Edition, Tata McGraw-Hill Publishing company, New Delhi (2004)
2. Vela Murali, "Engineering Mechanics", Oxford University Press (2010)

**REFERENCES:**

1. Hibbeler, R.C and Ashok Gupta, "Engineering Mechanics: Statics and Dynamics", 11<sup>th</sup> Edition, Pearson Education (2010).
2. Irving H. Shames and Krishna Mohana Rao. G., "Engineering Mechanics – Statics and Dynamics", 4<sup>th</sup> Edition, Pearson Education (2006).
3. J. L. Meriam and L.G.Kraige, "Engineering Mechanics - Statics - Volume 1, Dynamics Volume 2, Third Edition, John Wiley & Sons, (1993).
4. Rajasekaran, S and Sankarasubramanian, G., "Engineering Mechanics Statics and Dynamics", 3<sup>rd</sup> Edition, Vikas Publishing House Pvt. Ltd., (2005).

**CY8291 ORGANIC CHEMISTRY L T P C  
3 0 0 3**

**OBJECTIVE:**

- To enable the students to learn the type of components in which organic reactions take place and also to know the preparation of the essential organic compounds.

**UNIT I ORGANIC REACTION MECHANISM 9**

Electrophilic reactions-Friedel crafts reaction, Riemer Tiemann reaction, Beckmann rearrangements; nucleophilic reactions- aldol condensation, perkin reaction, benzoin condensation; free radical reaction-halogenation of alkane, addition of HBr on alkene in presence of peroxide; allylic halogenation - using N-Bromo Succinamide (NBS), thermal halogenation of alkene  $\text{CH}_3 - \text{CH} = \text{CH}_2$ .

**UNIT II CARBOHYDRATES 9**

Introduction – mono and disaccharides – important reactions – polysaccharides – starch and cellulose – derivatives of cellulose – carboxy methyl cellulose and gun cotton – structural aspects of cellulose

**UNIT III POLYNUCLEAR AROMATICS AND HETEROCYCLES 9**

Classification of polynuclear aromatics. naphthalene preparation, properties and uses. Classification of heterocyclic compounds. Furan, thiophene, pyrrole, pyridine, quinoline, isoquinoline - preparation, properties and uses.

**UNIT IV AMINO ACIDS AND PROTEINS 9**

Classification, preparation (Strecker, Skraup, Gabriel phthalimide) and properties of Amino acids.

Composition and classification of proteins. Structure of proteins – tests for proteins – general properties and relations of proteins – hydrolysis of proteins.

**UNIT V DRUGS & DYES 9**

Classification and properties of drugs. Penicillin sulpha drugs, mode of action, synthesis of sulphanilamide, chloroquine and chloroamphenicol.

Colour and constitution, chromogen and chromophore. Classification of dyes based on structure and mode of dyeing. Synthesis of dyes. Malachite green, methyl orange, congo red, phenolphthalein.

**TOTAL: 45 PERIODS**

**OUTCOMES:**

- At the end of the course students will have knowledge on various reaction mechanism, preparation of organic compounds and their properties.

**TEXTBOOKS:**

1. B.S.Bhal and Arun Bhal, "A Text Book of Organic Chemistry", 17<sup>th</sup> Ed., S Chand & Co. New Delhi, 2005.
2. R.T. Morrison and R.N. Boyd "Organic Chemistry", 7<sup>th</sup> Ed., Prentice Hall Inc. USA, 2010.

**REFERENCES:**

1. Jonathan Clayden, Nick Greeves, Stuart Warren and Peter Wothers, "Organic Chemistry", Oxford University Press, 2<sup>nd</sup> Ed., New Delhi, 2013.
2. K.S. Tiwari, N.K. Vishnoi, S.N. Mehrotra, "A Text Book of Organic Chemistry", Vikas Publishing House, 2<sup>nd</sup> Ed., New Delhi, 2006.

**TT8351****CHARACTERISTICS OF TEXTILE FIBRES****L T P C****4 0 0 4****OBJECTIVES:**

To enable the students to understand the

- Structure and morphology of textile fibres
- Physical characteristics textile fibres

**UNIT I STRUCTURE AND MORPHOLOGY 18**

Classification of fibres; study of morphological structures of fibers; physical properties of fibres. order and disorder in fibre structure; molecular conformations – planar zig-zag, helical, lamellar, and spherulite conformations; Transmission and Scanning electron microscopes-principle; construction and working; X-ray diffraction techniques – estimation of crystallinity; Infrared radiation and dichroism techniques; chemical element and group identification by transmittance and optical density methods, molecular orientation estimation



4. Hearle J.W.S., "Polymers and Their Properties: Fundamentals of Structures and Mechanics Vol 1", Ellis Horwood, England, 1982, ISBN: 047027302X | ISBN-13: 9780470273029 36
5. Greaves. P. H., and Saville B.P., "Microscopy of Textile Fibres", Bios Scientific, U.K., 1995, ISBN: 1872748244 | ISBN-13: 9781872748245
6. Seville. B. P., "Physical Testing of Textiles", Woodhead Publishing, 1999,ISBN: 1855733676 | ISBN-13: 9781855733671
7. Hearle J. W. S., and Peters. R. H., "Fibre structure", Elsevier Ltd, 1963, ISBN: 1483212211 | ISBN-13: 9781483212210

**FT8301**

**TECHNOLOGY OF SPINNING PROCESSES**

**L T P C**

**3 0 0 3**

**OBJECTIVE:**

- To enable the students to understand various processes involved in conversion of fibre to yarn by ring spinning system and other modern spinning systems.

**UNIT I OPENING AND CLEANING 9**

Linear density systems for textile materials; Ginning – objectives, types, working principle and ginning performance on yarn quality; opening and cleaning – objectives of blow room machines, principle of opening, cleaning and blending machines, contamination clearers and safety devices; chute feed system

**UNIT II CARDING AND DRAWING 9**

Carding – objectives, principles of carding, working of carding machine; drawing machine – objectives, drafting system – types and applications, principles of auto levellers

**UNIT III COMBING AND ROVING 9**

Comber preparation – objectives, principles of sliver lap ribbon lap and super lap formers; comber - principle of combing, sequence of combing operation; roving machine – objectives, working principle and operation

**UNIT IV RING SPINNING AND YARN PLYING 9**

Ring spinning machine – objectives, working principle and operation; condensed yarn spinning – principles, merits; two-folding of yarns –package preparation, working principle, resultant count calculation; fancy yarn – types, method of production and applications

**UNIT V NEW SPINNING PROCESS 9**

Principles of yarn formation and material flow – rotor, friction, air-jet and air vortex spinning machines ; core, wrap spinning system, comparison of yarn properties

**TOTAL: 45 PERIODS**

**OUTCOMES:**

Upon completion of this course, the student shall understand

- Process sequence for producing different types of yarns
- Principle of machines used for production of yarn

**TEXT BOOKS:**

1. Klein W., "The Technology of Short-staple Spinning ", The Textile Institute, Manchester, 1998.

- Oxtoby E., "Spun Yarn Technology ", Butterworth, London, 1987, ISBN: 0408014644 /ISBN- 13: 9780408014649.

**REFERENCES:**

- Klein W., "The Rieter Manual of Spinning, Vol.1", Rieter Machine Works Ltd., Winterthur, 2014, ISBN 10 3-9523173-1-4 / ISBN 13 978-3-9523173-1-0.
- Klein W., "The Rieter Manual of Spinning, Vol.2", Rieter Machine Works Ltd., Winterthur, 2014, ISBN 10 3-9523173-2-2 / ISBN 13 978-3-9523173-2-7.
- Klein W., "The Rieter Manual of Spinning, Vol.3", Rieter Machine Works Ltd., Winterthur, 2014, ISBN 10 3-9523173-3-0 / ISBN 13 978-3-9523173-3-4
- Klein W., and Stalder H., "The Rieter Manual of Spinning, Vol.4", Rieter Machine Works Ltd., Winterthur, 2014, ISBN: 10 3-9523173-4-9 / ISBN: 13 978-3-9523173.
- Ernst H., "The Rieter Manual of Spinning, Vol.5", Rieter Machine Works Ltd., Winterthur, 2014, ISBN: 10 3-9523173-5-7 / ISBN: 13 978-3-9523173-5-8
- Stalder H., "The Rieter Manual of Spinning, Vol.6", Rieter Machine Works Ltd., Winterthur, 2014, ISBN: 10 3-9523173-6-5 / ISBN: 13 978-3-9523173-6-5.
- Thomas Weide, "The Rieter Manual of Spinning, Vol.7", Rieter Machine Works Ltd., Winterthur, 2014, ISBN: 10 3-9523173-7-3 / ISBN: 13 978-3-9523173-7-2.
- Lord P. R., "Yarn Production: Science, Technology and Economics", The Textile Institute, Manchester, 2003, ISBN: 1855736969 | ISBN-13: 9781855736962
- Doraiswamy I., Chellamani P., and Pavendhan A., "Cotton Ginning, Textile Progress", The Textile Institute, Manchester, 1993, ISBN: 1870812484 / ISBN: 978-1870812481.
- Salhotra K. R., and Ishtiaque S. M., "Rotor Spinning; its Advantages", Limitations and Prospects in India, ATIRA, Ahmedabad, 1995
- Trommer G., "Rotor Spinning", Meliand Textile benchte GmbH, Rohrbacher, 1995, ISBN: 3871505099 | ISBN-13: 9783871505096
- Lawerence C. A., and Chen K. Z., "Rotor Spinning", Textile Progress, The Textile Institute, Manchester, 1984, ISBN: 0900739681 / ISBN: 978-0900739682

**FT8491**

**FABRIC MANUFACTURING**

**L T P C  
3 0 0 3**

**OBJECTIVES:**

- To teach preparatory processes and machinery for weaving
- To teach weaving and non-woven technologies of fabric manufacturing and the machinery used.

**UNIT I**

**9**

Purpose and types of cone winding machines- Yarn clearers -Mechanical, Electrical Pirn winding machine – Types – yarn faults. Warping & Sectional warping machines. Sizing – size ingredients.

**UNIT II**

**18**

Basic concepts of looms. Types of Looms – handloom – power loom – Automatic looms. Primary motions of a loom. Basic Principles of Tappet looms, Dobby looms, Drop box Looms, Jacquard looms – Card cutting.

**UNIT III**

**9**

Basic concepts of Shuttle less looms – Rapier, projectile and Air jet looms. Salient features. Analysis of fabric defects.



**UNIT IV****9**

Non-Woven fabrics - Types – different methods of production of non wovens, Properties and application of non woven fabrics.

**TOTAL: 45 PERIODS****OUTCOMES:**

After successful completion of this course, the students should be able to acquire knowledge on,

- Processes and machinery for weaving,
- Warp & weft knitting and non-woven technologies of fabric manufacturing and the machinery used.

**TEXT BOOKS:**

1. Talukdar M.K., Sriramulu P.K. and Ajgaonkar D.B., "Weaving: Machines, Mechanisms, Management", Mahajan Publishers, Ahmedabad, 1998, ISBN: 81-85401-16-0
2. Marks R. and Robinson T.C., "Principles of Weaving", The Textile Institute, Manchester, 1989, ISBN: 0 900739 258

**REFERENCES:**

1. PR. Lord and Mohammed, "Weaving: Conversion of yarn to fabric", M.H.Merrine Publishing Co. Ltd., VK, 1998.
2. Spencer D.J., "Knitting Technology", Peramon press Oxford, 1982.
3. Russell S., "Hand Book of Nonwovens", Textile Institute, Manchester, 2004.
4. Paling D.F., "Warp Knitting Technology" Columbine Press Baxton, 1975.
5. W.S. Murphy, "Hand Book of Weaving", Abhishek Publications 2001.

**TC8311****YARN AND FABRIC MANUFACTURING LABORATORY****L T P C****0 0 4 2****OBJECTIVES:**

To enable the students to

- Get practical experience in the yarn spinning, weaving preparatory and weaving machines
- Learn material passage and identify the parts of machines of spinning and weaving machines

**LIST OF EXPERIENTS**

1. Material passage and production calculation in
  - Blow room scutcher
  - Carding machine
  - Comber
  - Draw frame
  - Speed frame
2. Material passage, draft, twist and production calculation in ring frame
3. Material passage and production calculation in winding machine
4. Timing diagram of weaving machine
5. Shedding mechanisms - Tappet, dobby
6. Jacquard mechanism
7. Picking mechanism and calculation of shuttle speed
8. Beat-up mechanism
9. Let-off and take-up mechanism
10. Auxiliary mechanisms

**TOTAL: 60 PERIODS**

**OUTCOMES:**

Upon completion of this practical course, the students shall be able to

- Understand the material passage in the machine, draw gearing diagram, identify the components of spinning and weaving machines
- Calculate draft, twist and production rate of spinning machines
- Understand the mechanism of weaving machine

**LAB EQUIPMENTS**

LIST OF EQUIPMENT FOR BATCH OF 30 STUDENTS

1. Blow room Line	– 1 No.
2. Carding machine	– 1 No.
3. Drawing machine	– 1 No.
4. Comber preparatory and combing machines	– 1 No.
5. Roving machine	– 1 No.
6. Ring Frame	– 1 No.
7. Cone / Cheese winding machine	– 1 No.
8. Pirn winding machine	– 1 No.
9. Loom with tappet shedding	– 1 No.
10. Loom with dobby shedding	– 1 No.
11. Loom with jacquard	– 1 No.
12. Loom with dropbox	– 1 No.

**TT8361**

**FIBRE SCIENCE LABORATORY**

**L T P C  
0 0 2 1**

**OBJECTIVES:**

To enable the students to understand the

- Identification of fibres by different methods
- Method of characterization of fibres

**LIST OF EXPERIMENTS**

1. Identification of fibres by feel, microscopic view, burning behavior and solubility
  - Natural cellulose fibres
  - Natural protein fibres
  - Regenerated cellulose fibres
  - Polyamide fibres
  - Polyester fibres
  - Polyolefin fibres
2. Determination of density of various fibres by density gradient column
3. Determination of denier of synthetic fibres by gravimetric method
4. Determination of Moisture Regain and Moisture content of fibres
5. Determination of the percentage of spin finish of synthetic fibres
6. Determination of wax content of the cotton fibres
7. Determination of the blend proportion
  - Natural/ regenerated cellulose
  - Cellulose/ protein fibres
  - Cellulose/polyester fibres

- Natural cellulose/ regenerated cellulose/polyester
8. Thermo gravimetric analysis of fibres using thermograms  
9. FTIR analysis of polymers and fibres from spectrum

**TOTAL: 30 PERIODS**

**OUTCOMES:**

Upon completion of this course, the student shall be able to

- Identify the given fibres using cross section, dissolution in solvent and burn test practically.
- Determine important properties of fibres
- Determine blend proportion of different fibres in a blended material

**LABORATORY EQUIPMENT**

LIST OF EQUIPMENT FOR BATCH OF 30 STUDENTS

1. Microscope – 1 No.
2. Weighing balance – 1 No.
3. Conditioning Chamber – 1 No.

**HS8381**

**INTERPERSONAL SKILLS/LISTENING AND SPEAKING**

**L T P C**

**0 0 2 1**

**OBJECTIVES: The Course will enable learners to:**

- Equip students with the English language skills required for the successful undertaking of academic studies with primary emphasis on academic speaking and listening skills.
- Provide guidance and practice in basic general and classroom conversation and to engage in specific academic speaking activities.
- improve general and academic listening skills
- Make effective presentations.

**UNIT I**

Listening as a key skill- its importance- speaking - give personal information - ask for personal information - express ability - enquire about ability - ask for clarification Improving pronunciation - pronunciation basics taking lecture notes - preparing to listen to a lecture - articulate a complete idea as opposed to producing fragmented utterances.

**UNIT II**

Listen to a process information- give information, as part of a simple explanation - conversation starters: small talk - stressing syllables and speaking clearly - intonation patterns - compare and contrast information and ideas from multiple sources- converse with reasonable accuracy over a wide range of everyday topics.

**UNIT III**

Lexical chunking for accuracy and fluency- factors influence fluency, deliver a five-minute informal talk - greet - respond to greetings - describe health and symptoms - invite and offer - accept - decline - take leave - listen for and follow the gist- listen for detail

**UNIT IV**

Being an active listener: giving verbal and non-verbal feedback - participating in a group discussion - summarizing academic readings and lectures conversational speech listening to and participating in conversations - persuade.

## UNIT V

Formal and informal talk - listen to follow and respond to explanations, directions and instructions in academic and business contexts - strategies for presentations and interactive communication - group/pair presentations - negotiate disagreement in group work.

**TOTAL: 30 PERIODS**

**OUTCOMES: At the end of the course Learners will be able to:**

- Listen and respond appropriately.
- Participate in group discussions
- Make effective presentations
- Participate confidently and appropriately in conversations both formal and informal

### TEXT BOOKS:

1. Brooks, Margret. **Skills for Success. Listening and Speaking. Level 4** Oxford University Press, Oxford: 2011.
2. Richards, C. Jack. & David Bholke. **Speak Now Level 3.** Oxford University Press, Oxford: 2010

### REFERENCES

1. Bhatnagar, Nitin and Mamta Bhatnagar. **Communicative English for Engineers and Professionals.** Pearson: New Delhi, 2010.
2. Hughes, Glyn and Josephine Moate. **Practical English Classroom.** Oxford University Press: Oxford, 2014.
3. Vargo, Mari. **Speak Now Level 4.** Oxford University Press: Oxford, 2013.
4. Richards C. Jack. **Person to Person (Starter).** Oxford University Press: Oxford, 2006.
5. Ladousse, Gillian Porter. **Role Play.** Oxford University Press: Oxford, 2014

**TT8452**

**SOLID MECHANICS FOR TEXTILE TECHNOLOGISTS**

**L T P C  
3 0 0 3**

### OBJECTIVE:

- To teach the students on design of support column, beams, pipelines, storage tanks and reaction columns and tanks after undergoing this course. This is precursor for the study on process equipment design and drawing.

### **UNIT I STRESS, STRAIN AND DEFORMATION OF SOLIDS 9**

Rigid bodies and deformable solids – forces on solids and supports – equilibrium and stability – strength and stiffness – tension, compression and shear stresses – Hooke’s law and simple problems – compound bars – thermal stresses – elastic constants and poisson’s ratio.

### **UNIT II TRANSVERSE LOADING ON BEAMS 9**

Beams – support conditions – types of Beams – transverse loading on beams – shear force and bending moment in beams – analysis of cantilevers, simply – supported beams and over hanging beams – relationships between loading, S.F. and B.M. In beams and their applications – S.F.& B.M. diagrams.

### **UNIT III DEFLECTIONS OF BEAMS 9**

Double integration method – Macaulay’s method – Area – moment theorems for computation of slopes and deflections in beams.

**UNIT IV STRESSES IN BEAMS 9**

Theory of simple bending – assumptions and derivation of bending equation ( $M/I = F/Y = E/R$ ) – analysis of stresses in beams – loads carrying capacity of beams – proportioning beam sections – leaf springs – flitched beams – shear stress distribution in beams – determination of shear stress in flanged beams.

**UNIT V TORSION 9**

Torsion of circular shafts – derivation of torsion equation ( $T/J = fs/R = C\theta/L$ ) – stress and deformation in circular and hollow shafts – stepped shafts – shafts fixed at both ends – stresses in helical springs – deflection of springs – spring constant.

**TOTAL: 45 PERIODS**

**OUTCOME:**

- Upon completion of the program the student will be able to design the support columns, beams in a textile industrial point of view. And also they can overcome defects in the existing construction.

**TEXT BOOKS:**

1. Junarkar, S.B., Mechanics of Structure Vol. 1, 21<sup>st</sup> Edition, Character Publishing House, Anand, Indian, (1995)
2. William A.Nash, Theory and Problems of Strength of Materials, Schaum's Outline Series. McGraw Hill International Editions, Third Edition, 1994.
3. Bansal, R.K, Strength of Materials, Laxmi Publications(P) Ltd., Fourth Edition 2010

**REFERENCE:**

1. Elangovan, A., Thinma Visai Iyal (Mechanics of Solids in Tamil), Anna University, Madras, 1995.

**TT8451 PRODUCTION OF MANUFACTURED FIBRE L T P C  
3 0 0 3**

**OBJECTIVES:**

- To enable the students to learn about the polymer rheology and the laws, and various spinning techniques of polymers
- To expose the students to advances in the spinning process

**UNIT I POLYMER RHEOLOGY 9**

Transport Phenomena in Fibre Manufacturing- Heat and mass; Polymer rheology-Newtonian and non-newtonian fluids, factors affecting shear viscosity; conditions of fibre forming polymers; Melt instabilities.

**UNIT II MELT SPINNING 9**

Melt Spinning- Polymer Selection and Preparation, equipment, properties and applications of polyester, polyamide and polypropylene fibers.

**UNIT III SOLUTION SPINNING 9**

Solution spinning- Polymer Selection and Preparation, equipment, properties and applications of acrylic, polyurethane and regenerated cellulose fibres.

**UNIT IV POST SPINNING OPERATIONS 9**

Neck drawing, drawing systems, influence of drawing on structure and properties of fibres; Types of heat setting, influencing parameters on heat setting, influence of heat setting on fibre behavior; Spin finish composition and application; texturing.

**UNIT V DEVELOPMENTS IN FIBER SPINNING 9**

Liquid crystal spinning; Gel spinning; Profile fibres, hollow & porous fibres; Speciality fibres polyglycolic acid, polylactic acid, chitosan fibres preparation properties and applications.

**TOTAL: 45 PERIODS**

**OUTCOMES:**

Upon completion of this course, the student shall be able to understand

- Polymer rheology and the laws
- Various spinning techniques of polymers parameter involved in spinning synthetic yarn
- Need of various post spinning operations
- Advances in the spinning process

**TEXT BOOKS:**

1. Kothari V. K., "Textile Fibres: Development and Innovations", Vol. 2, Progress in Textiles, IAFL Publications, New Delhi, 2000
2. Vaidya A. A., "Production of Synthetic Fibres", Prentice Hall of India Pvt. Ltd., New Delhi, 1988
3. Nakasjima (English edition, edited by Kajiwara K. and McIntyre J. E.), "Advanced Fibre Spinning Technology", Wood head Publication Ltd., England, 1994.

**REFERENCES:**

1. Gupta V. B. and Kothari V. K. (Editors), "Manufactured Fibre Technology", Kluwer Academic Publishers, 1997.
2. Cook J. G., "Handbook of Textile Fibres: Vol. 2: Man Made Fibres", The Textile Inst., 5<sup>th</sup> Ed. 1984.
3. Srinivasa Murthy H. V., "Introduction to Textile Fibres", Textile Association, India, 1987.

**TC8401 PRINCIPLES AND THEORY OF DYEING L T P C  
3 0 0 3**

**OBJECTIVES:**

- To expose the students about the mechanics of dyeing
- To enable the students to learn about colour, combinations of colours, their source and measurement
- To expose the students to the factors influencing the dyeing

**UNIT I CHEMICAL KINETICS 9**

Kinetics, characteristics of second order reaction – concept of activation energy – Arrhenius equation – Theory of absolute reaction rates – Kinetics of Enzyme Catalyzed reactions., Effect of temp on reaction rate, Steady state principle. Kinetic of dyeing. Factors affecting the kinetics of dyeing.

**UNIT II ADSORPTION AND CATALYSIS 9**

Physical and Chemical adsorption – Important isotherms – Freundlich and Langmuir adsorption isotherms. Homogeneous catalysis – Heterogeneous catalysis, acid – base catalysis, Enzyme catalysis – Applications of catalysis in industries.

**UNIT III ELECTROCHEMISTRY 9**

Electrical Conductance – Specific conductance – Equivalent conductance – variation with dilution - Kohlrausch's law – Galvanic cells – EMF and its measurement – Reference electrode

– Standard Hydrogen electrode – Nernst equation Electrochemical series – Applications of EMF measurements.

**UNIT IV FIBER PROPERTIES AND ITS EFFECT ON DYEING 9**

Influence of Fibre structure, – Dyeing behaviour of drawn, heat set and texturizing of textile materials. Interpretation between dye molecules and fibre polymeric chains – Description of monolayer technique and continuous variable methods for the identification of dye – fibre bonds. Substantivity and affinity of dyes with textile materials. Thermodynamic derivations of affinity equations.

**UNIT V FACTORS INFLUENCING DYEING 9**

Glass transition temperature and its effect on dye stability and dye diffusion temperature. Diffusion of dyes – Fick's first and second law of diffusion. Equilibrium absorption and diffusion co-efficient of dye molecules. Derivation of William Landed Ferry (WLF) equation and its significances on textile dyeing. Concept of free volume and solubility parameter. Idea about partition co-efficient.

**TOTAL: 45 PERIODS**

**OUTCOMES:**

Upon completion of the course, the students will be able to

- Explain the mechanics of dyeing
- Explain the factors influencing dyeing
- Work in the dye houses of textile processing industry

**TEXT BOOKS:**

1. Puri B.H. and Sharma L.R. Principles of Physical Chemistry, S. Nagin Chand and Company, Delhi, 1994
2. Gordon M. Barrow, Physical Chemistry, Sixth edition, Tata McGraw-Hill, 1998

**REFERENCES:**

1. Peters.A.T and Freeman,H.S "Physico – Chemical Principles of Colour Chemistry", Blackie, ISBN:0751402109.1995
2. Johnson A, "The Theory of Colouration of Textiles", SDC 2<sup>nd</sup> Edition,1998.

**FT8691 TEXTILE QUALITY EVALUATION L T P C  
3 0 0 3**

**OBJECTIVE:**

- To infuse understanding of yarn, fabric and apparel testing methods

**UNIT I CONSTRUCTION CHARACTERISTICS 9**

Basic fabric particulars – Measurement of ends and picks per inch, count of warp and weft, determination of the type of weave, measurement of length, width, thickness and Area density (GSM); warp and weft crimp measurements for spun and filament yarn fabrics, the cover factor calculations; Fabric sampling techniques

**UNIT II STRENGTH CHARACTERISTICS 9**

Tensile strength measurement – ravelled strip test and grab test – mechanical and electronic measuring systems. Tear strength – importance – measuring systems. Bursting strength and its measurement. Ballistic impact strength. Universal tensile tester - principle and operation

**UNIT III COMFORT AND SURFACE CHARACTERISTICS 9**

Fabric stiffness – principle of measurement of flexural rigidity; Drapeability – measurement of drape coefficient; Crease recovery measurement techniques. Wrinkle recovery assessment using standard grades; Principle and functioning of air permeability testers, water repellency, contact angle and fabric shrinkage testing; Fabric abrasion resistance – measuring technique; Fabric pilling resistance – methods of determination.

**UNIT IV SPECIAL CHARACTERISTICS 5**

Fabric bending hysteresis testing; Shear hysteresis measurements; Fabric compression and decompression behaviour; Fabric surface roughness and friction measurements; Fabric tensile hysteresis measurements; Fabric flame resistance testing methods; Moisture and thermal characteristics.

**UNIT V FABRIC AND GARMENT INSPECTION 13**

Fabric inspection – Manual, semi-automatic and Automatic Inspection systems, classification of fabric defects, independent product quality certification, acceptable quality level, MIL standards and final inspection. Inspection of garments for defects - sewing, pressing, finishing and packaging defects.

**TOTAL: 45 PERIODS**

**OUTCOMES:**

The student will have knowledge on

- Methods by which the physical and mechanical properties of textile materials and products are measured and investigated
- Sampling and yarn quality parameters testing
- Fabric and garment quality parameters testing

**TEXT BOOKS:**

1. Booth J.E., "Principle of Textile Testing", Butterworth Publications, London, 1989
2. Kothari V. K., "Testing and Quality Management", Progress in Textile Technology Vol.1, IAFL Publications, New Delhi, 1999
3. Sara J. Kadolph., "Quality Assurance for Textiles and Apparels", Fair Child Publications, New York, 1998

**REFERENCES:**

1. Saville, B.P. "Physical Testing of Textiles", Woodhead Publishing Ltd., England, 2004.
2. Grover E G and Hamby D. S "Hand Book of Textile testing and quality Control", Wiley Eastern Pvt. Ltd., New Delhi, 1969.
3. Ruth clock and Grace Kunz., "Apparel Manufacture – Sewn Product Analysis", Upper Sadle River Publications, New York, 2000
4. Pradip V. Mehta., "Managing Quality in the Apparel Industry", NIFT Publication, India, 1998
5. Slater K., "Physical Testing and Quality Control", The Textile Institute, Vol.23, No.1/2/3 Manchester, 1993
6. Arindam Basu, "Textile Testing-Fiber, Yarn & Fabric", SITRA, India, 2001.



**OBJECTIVES:**

- To enable the students to learn about the raw materials & purification of intermediates for dyes preparation
- To explain the students about the basic chemistry & mechanism in dye & dye intermediates preparation

**UNIT I INTRODUCTION TO DYES 9**

Coal tar – fractional distillation and their products. Aromatic hydrocarbons from petroleum. Introduction to primary and intermediate chemicals for dyes. Relation between Colour and Chemical Constitution.. CI Name and Number.

**UNIT II UNIT PROCESSES 9**

Unit processes in organic synthesis such as halogenation, nitration, Sulphonation, esterification, alkylation ,acetylation, hydroxylation, and diazotisation with suitable examples.

**UNIT III AROMATIC INTERMEDIATES 9**

Systematic study of important intermediates from benzene, chlorobenzene, toluene, nitrobenzene, aniline, phenol, salicylic acid, naphthalene and anthraquinone.

**UNIT IV DYE INTERMEDIATES 9**

Classification of dyes and intermediates. Introduction to azines, oxazines, thiazines, xanthine, acridine, Diphenyl and triphenyl methane dyes.

**UNIT V DYES 9**

Introduction to their chemistry and preparation of – Anthraquinone vat dyes, indigoid, solubilised vat dyes, reactive dyes, disperse dyes, Blueing and Fluorescent brightening agents.

**TOTAL: 45 PERIODS**

**OUTCOME:**

Upon completion of the course, the students will be able to

- Understand about the dyes and their intermediates which is an integral backbone of textile wet processing industry

**TEXT BOOKS:**

1. Shenai,.V.A., "Introduction to the Chemistry of Dyestuffs", Sevak Publications,Mumbai 1995
2. Shore,J. (Ed)., "Colorants and auxiliaries, Volume 1,;Colorants", SDC, Blackwells, Leeds, 1990,
3. Shore,J. (Ed)., "Colorants and auxiliaries, Volume 2: Auxiliaries", SDC, Blackwells, Leeds, 1990,

**REFERENCES:**

1. Venkatraman.K., "The Chemistry of Synthetic Dyes" – Vol. I & II, Academic press, London, 1990
2. David.R.Waring, Geoffrey Hallas, The Chemisry and Application of Dyes, SDC,1990.

**OBJECTIVE:**

- To facilitate the students to learn about the pre-treatments of various kinds of textile materials involved in textile wet processing industries.

**UNIT I SINGEING & DESIZING 9**

Impurities present in different fibres, Inspection of grey goods and lot preparation. Shearing and Cropping Singeing of cotton and blended fabrics. Yarn singeing - Singeing of tubular knitted fabrics. Tigh trope, Slack rope washing. Acid desizing and its limitations, enzyme desizing – Open width washing machine. Degumming of silks using soap, soap and soda ash, acids, amines and enzymes.

**UNIT II MERCERISATION 9**

Mercerizing - conditions. Physical and Chemical changes – Mercerizing of coloured goods P/C blends and tubular knits. Typical recipe for desizing of different materials – different desizing methods. Effects of Time, Tension, Caustic Concentration, Temp on mercerizing effects. Stack mercerizing, Hot mercerizing, mercerizing of blending fabrics.

**UNIT III SCOURING 9**

Principles of Scouring: jumbo/JT-10, Vapourlac and soft flow machine, Chemical and auxiliaries for Scouring - Scouring of coloured goods – Degumming of Silk, Scouring of wool, silk P/C, P/V blends – Scouring of Jute, Souring of synthetic textiles, Solvent Scouring, Bio Scouring. Auxiliaries required for scouring of different materials and with respect to different materials.

**UNIT IV BLEACHING 9**

Principles of Bleaching: Importance of whiteness and whiteness retention – Bleaching mechanism of Hydrogen Peroxide, Hypo chlorites and Sodium chlorite – Parameters involved in bleaching action – Merits and Demerits of each bleaching agent – bleaching in rope form bleaching in Kier, Jumbo Jigger – Continuous \scouring and Bleaching of cotton goods in open width and rope form using H<sub>2</sub>O<sub>2</sub> – Yarn Scouring and Bleaching using Cabinet hank dyeing machine. Bleaching of p/c blend in open width form by Pad roll and continuous methods using Hydrogen Peroxide and Sodium chlorite, bleaching of Jute – Knitted fabric bleaching on winches, soft flow – The concept of full bleaching –Mechanism of Whitening effect. Blueing agents and its use. Combined Bleaching & whitening. Typical recipe for bleaching of different fibres.

**UNIT V DEVELOPMENTS 9**

Developments in grey preparation – combined processing enzymatic scouring & bleaching, cold bleaching; prograde process (liquid ammonia mercerization) Developments in desizing, Scouring, Bleaching and mercerizing, plasma based preparation, ozone bleaching.

**TOTAL: 45 PERIODS****OUTCOMES:**

Upon completion of the course, the students will be able to

- Design wet processing techniques such as singeing, desizing, mercerizing, scouring and bleaching of different textile materials at desired levels.
- Understand the process control of pre treatment processes

**TEXT BOOKS:**

1. Trotman, E.R., Textile Scouring and Bleaching, Charless Griffins, Com. Ltd., London 1990.
2. Shenai V.A., Technology of Bleaching and Mercerizing, Sevak Publications, Wadala, Chennai, 1991.
3. Charles Tomasno, Chemistry and Technology of fabric Preparation and Finishing, North Carolina State University, USA, 1992

**REFERENCES:**

1. Nalankilli.G, Edwin Sundar.A, Chemical Preparatory Processes for Textiles, NCUTE Publications, New Delhi, 2002
2. Karmakar, S.R., Chemical Technology in the Pre-Treatment Processes of Textiles. Elsevier Science, 1999
3. Chakraborty, J.N, Fundamentals and Practices in colouration of textiles, Woodhead Publishing India, 2009, ISBN – 13: 978-81-908001-4-3.

**TC8411****WET PROCESSING PREPARATION LABORATORY****L T P C  
0 0 4 2****OBJECTIVE:**

- To practice the students in the tests carried out at preparatory section of the wet processing of textile materials

**LIST OF EXPERIMENTS**

1. Determination of starch content in Enzyme desizing.
2. Determination of residual starch in acid desizing
3. Determination of scouring loss.
4. Bleaching of scoured fabric with hydrogen peroxide.
5. Comparison between bleached and bleached & optical brightened treated sample for whiteness and reflectance value.
6. Determination of the yellowing of hypochlorite bleached (soured/not soured, but washed) fabrics.
7. Effect of time/ temperature in bleaching with hypochlorite (whiteness and strength loss).
8. Effect of pH/ available chlorine in bleaching with hypochlorite (whiteness and strength loss)
9. Scouring & Bleaching of knitted cotton fabrics in winch
10. Scouring & Bleaching of woven blend fabrics in jigger.
11. Bleaching of knitted fabrics in jigger.
12. Degumming & Bleaching of silk.
13. Scouring and Bleaching of wool using hydrogen peroxide.

**TOTAL: 60 PERIODS****OUTCOMES:**

Upon completion of this practical course, the students would be able to

- Determine the contents of chemicals
- Efficiency of different processes of wet processing preparatory
- Carryout scouring and bleaching of different textile materials

**LIST OF EQUIPMENT FOR BATCH OF 30 STUDENTS**

1. Jigger – 1 No.
2. Winch – 1 No.

3. Water Bath with heating facility – 1 No.
4. Tensile Strength Tester – 1 No.
5. Computer colour Matching system – 1 No.
6. pH Meter – 3 Nos.
7. Weighing balance – 1 No.

**TC8412**

**TEXTILE CHEMICAL ANALYSIS LABORATORY**

**L T P C**

**0 0 4 2**

**OBJECTIVE:**

- To practice the students in evaluation of chemicals and dyes used in textile wet processing industry

**LIST OF EXPERIMENTS**

1. Estimation of the Efficiency of the wetting agent.
2. Estimation of strength of oxidizing agent.
3. Estimation of strength of reducing agent.
4. Estimation of strength of dispersing agent.
5. Estimation of strength of Optical Brightening agent.
6. Characterization of oils.
7. Evaluation of the inorganic substances in Textile processing.
8. Identification of dye powder.
9. Identification of the dye in the dyed fabric
10. Estimation of percentage purity of the dye solution.
11. Evaluation of the finishing chemicals

**TOTAL: 60 PERIODS**

**OUTCOMES:**

- On completion of this course, the students would be able to estimate different types of chemicals used for wet processing of textile materials.
- They would also be able to identify the dyes and estimate purity of dye solution.

**LIST OF EQUIPMENTS FOR BATCH OF 30 STUDENTS**

1. Beaker Dyeing machine – 1 No.
2. Dye Bath – 1 No.
3. Weighing Balance – 1 No.
4. Stop Watch – 1 No.
5. Soxhlet Apparatus – 1 No.

**HS8461**

**ADVANCED READING AND WRITING**

**L T P C**

**0 0 2 1**

**OBJECTIVES:**

- Strengthen the reading skills of students of engineering.
- Enhance their writing skills with specific reference to technical writing.
- Develop students' critical thinking skills.
- Provide more opportunities to develop their project and proposal writing skills.

## UNIT I

**Reading** - Strategies for effective reading-Use glosses and footnotes to aid reading comprehension- Read and recognize different text types-Predicting content using photos and title **Writing**-Plan before writing- Develop a paragraph: topic sentence, supporting sentences, concluding sentence –Write a descriptive paragraph

## UNIT II

**Reading**-Read for details-Use of graphic organizers to review and aid comprehension **Writing**- State reasons and examples to support ideas in writing- Write a paragraph with reasons and examples- Write an opinion paragraph

## UNIT III

**Reading**- Understanding pronoun reference and use of connectors in a passage- speed reading techniques-**Writing**- Elements of a good essay-Types of essays- descriptive-narrative-issue-based-argumentative-analytical.

## UNIT IV

**Reading**- Genre and Organization of Ideas- **Writing**- Email writing- visumes – Job application-project writing-writing convincing proposals.

## UNIT V

**Reading**- Critical reading and thinking- understanding how the text positions the reader-identify **Writing**- Statement of Purpose- letter of recommendation- Vision statement

**TOTAL: 30 PERIODS**

## OUTCOMES:

**At the end of the course Learners will be able to:**

- Write different types of essays.
- Write winning job applications.
- Read and evaluate texts critically.
- Display critical thinking in various professional contexts.

## TEXT BOOKS:

1. Gramer F. Margot and Colin S. Ward **Reading and Writing (Level 3)** Oxford University Press: Oxford, 2011
2. Debra Daise, CharlNorloff, and Paul Carne **Reading and Writing (Level 4)** Oxford University Press: Oxford, 2011

## REFERENCES

1. Davis, Jason and Rhonda Llss. **Effective Academic Writing (Level 3)** Oxford University Press: Oxford, 2006
2. E. Suresh Kumar and et al. **Enriching Speaking and Writing Skills**. Second Edition. Orient Black swan: Hyderabad, 2012
3. Withrow, Jeans and et al. **Inspired to Write. Readings and Tasks to develop writing skills**. Cambridge University Press: Cambridge, 2004
4. Goatly, Andrew. **Critical Reading and Writing**. Routledge: United States of America, 2000
5. Petelin, Roslyn and Marsh Durham. **The Professional Writing Guide: Knowing Well and Knowing Why**. Business & Professional Publishing: Australia, 2004

**OBJECTIVES:**

- To study the nature and facts about environment.
- To finding and implementing scientific, technological, economic and political solutions to environmental problems.
- To study the interrelationship between living organism and environment.
- To appreciate the importance of environment by assessing its impact on the human world; envision the surrounding environment, its functions and its value.
- To study the dynamic processes and understand the features of the earth's interior and surface.
- To study the integrated themes and biodiversity, natural resources, pollution control and waste management.

**UNIT I ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY****14**

Definition, scope and importance of environment – need for public awareness - concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers – energy flow in the ecosystem – ecological succession – food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) – Introduction to biodiversity definition: genetic, species and ecosystem diversity – biogeographical classification of India – value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – Biodiversity at global, national and local levels – India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity. Field study of common plants, insects, birds; Field study of simple ecosystems – pond, river, hill slopes, etc.

**UNIT II ENVIRONMENTAL POLLUTION****8**

Definition – causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards – solid waste management: causes, effects and control measures of municipal solid wastes – role of an individual in prevention of pollution – pollution case studies – disaster management: floods, earthquake, cyclone and landslides. Field study of local polluted site – Urban / Rural / Industrial / Agricultural.

**UNIT III NATURAL RESOURCES****10**

Forest resources: Use and over-exploitation, deforestation, case studies- timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. case studies – Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification – role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles. Field study of local area to document environmental assets – river / forest / grassland / hill / mountain.

**UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT 7**

From unsustainable to sustainable development – urban problems related to energy – water conservation, rain water harvesting, watershed management – resettlement and rehabilitation of people; its problems and concerns, case studies – role of non-governmental organization- environmental ethics: Issues and possible solutions – climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies. – wasteland reclamation – consumerism and waste products – environment production act – Air (Prevention and Control of Pollution) act – Water (Prevention and control of Pollution) act – Wildlife protection act – Forest conservation act – enforcement machinery involved in environmental legislation- central and state pollution control boards- Public awareness.

**UNIT V HUMAN POPULATION AND THE ENVIRONMENT 6**

Population growth, variation among nations – population explosion – family welfare programme – environment and human health – human rights – value education – HIV / AIDS – women and child welfare – role of information technology in environment and human health – Case studies.

**TOTAL: 45 PERIODS**

**OUTCOMES:**

- Environmental Pollution or problems cannot be solved by mere laws. Public participation is an important aspect which serves the environmental Protection. One will obtain knowledge on the following after completing the course.
- Public awareness of environmental is at infant stage.
- Ignorance and incomplete knowledge has lead to misconceptions
- Development and improvement in std. of living has lead to serious environmental disasters

**TEXT BOOKS:**

1. Benny Joseph, "Environmental Science and Engineering", Tata McGraw-Hill, New Delhi, 2006.
2. Gilbert M. Masters, "Introduction to Environmental Engineering and Science", 2<sup>nd</sup> edition, Pearson Education, 2004.

**REFERENCES:**

1. Dharmendra S. Sengar, "Environmental law", Prentice hall of India PVT LTD, New Delhi, 2007.
2. Erach Bharucha, "Textbook of Environmental Studies", Universities Press(I) PVT, LTD, Hyderabad, 2015.
3. Rajagopalan, R, "Environmental Studies-From Crisis to Cure", Oxford University Press, 2005.
4. G. Tyler Miller and Scott E. Spoolman, "Environmental Science", Cengage Learning India PVT, LTD, Delhi, 2014.

**TC8501**

**CHEMISTRY OF TEXTILE AUXILIARIES**

**L T P C**

**3 0 0 3**

**OBJECTIVES:**

- To provide the knowledge on classification and types of textile auxiliaries
- To provide the knowledge on importance and basic functions of textile auxiliaries
- To enable the students to know about the chemistry of textile auxiliaries

**UNIT I** **9**  
Auxiliaries: Importance and functions; Surfactants: Mode of action and classification of surfactants – cationic, anionic, nonionic and amphoteric surfactants.

**UNIT II** **9**  
Auxiliaries associated with De-sizing, scouring, Bleaching of cellulosic fibres, Protein fibres and synthetic fibres.

**UNIT III** **9**  
Auxiliaries associated with Dyeing with Direct Dyes, Reactive, Vat, Azoic colors, Sulphur dyes, Acid dyes, Metal complex dyes, Basic and Disperse dyes.

**UNIT IV** **9**  
Auxiliaries associated with printing: Direct Style of Printing, Discharge style of Printing, Resist style of printing.

**UNIT V** **9**  
Auxiliaries used in Resin Finishing, Stiff finishing, soft finishing, Water repellent, Water Proof, Flame retardant, Soil release.

**TOTAL: 45 PERIODS**

**OUTCOMES:**

Upon completion of the course, the students will be able to

- Understand about the textile auxiliaries which would enable the student to work in the textile auxiliaries manufacturing companies.
- Perform research and development in the field of textile auxiliaries.

**TEXT BOOKS:**

1. Shennai.V.A, "Organic Textile Chemicals", Sevak Publication, Bombay, 1995
2. Vaidya.A.A, "Chemistry of Textile auxiliaries", Wheeler Publishing, New Delhi, 1999

**REFERENCE:**

1. John Shore, "Colourants & Auxiliaries" Wiley and Sons Ltd, New York, Volume I & II, 1999.
2. Chakraborty, J.N, "Fundamentals and Practices in colouration of Textiles", Woodhead Publishing India, 2009, ISBN-13:978-81-908001-4-3

**TC8502**

**DYEING OF SYNTHETIC MATERIALS**

**L T P C**

**3 0 0 3**

**OBJECTIVES:**

To enable the students to

- Understand the colouration of synthetic textiles in the field of mass colouration and dyeing
- Solve the shop floor problems in the colouration process and to expose the students to the latest developments in colouration of synthetic textiles

**UNIT I** **9**  
Mass Colouration of Polyester, Nylon, Acrylic and polypropylene, Advantages & Disadvantages of Mass Colouration; Difference between Mass Colouration and Dyeing.



**UNIT II** **9**  
Polyester Dyeing: carrier, HTHP and thermosol methods of dyeing. CD polyester dyeing, micro denier PET dyeing. Practical problems and their solutions. Stripping of dyed PET

**UNIT III** **9**  
Dyeing of Polyester Blends: Various shop floor practices of dyeing of polyester/cellulosic-blended fabrics. Practical problems and their solutions. Various shop floor practices of dyeing of polyester/wool blended fabrics. Practical problems and their solutions. Dyeing of polyester with cationic dyes. Dyeing of Micropolyester fabric and its blends. Practical problems in dyeing.

**UNIT IV** **9**  
Dyeing of nylon. Dyeing with acid dyes-High temperature dyeing. Low temperature dyeing of Nylon 6,6 – Dyeing with disperse dyes. Barriness of dyeing – Dyeing of polyamide cellulosic blends – polyamide/wool blends, polyamide/ polyester blends- Stripping of Nylon dyed material. Practical problems and remedies in Nylon Dyeing. Dyeing of unmodified and modified polypropylene.

**UNIT V** **9**  
Dyeing of Acrylic Fibres: – Dyeing with cationic dyes – Effect of fibre saturation value, pH-Cationic, Anionic and polymeric retarder systems –stripping of cationic dyes, dyeing with disperse dyes, dyeing of acrylic blends, differentially dyeable acrylic fibres.

**TOTAL: 45 PERIODS**

**OUTCOMES:**

Upon completion of the course, the students will be able to

- Understand the colouration of synthetic fibres and solving problems related to the process
- Perform research and development work in the field of colouration of synthetic textiles

**TEXT BOOKS:**

1. Gulrajani, M.L., "Polyester Dyeing", IIT, New Delhi,.2001
2. Vaidya, A.A., and Datye, K.V., "Chemical processing of Synthetic Fibres and Blends", John Wiley and Sons, New Delhi, 1995

**REFERENCES:**

1. Shore, J. "Blend Dyeing", SDC, London, ISBN: 0901956740. 1998.
2. Chakraborty, J.N, Fundamentals and Practices in colouration of Textiles, Woodhead Publishing India, 2009, ISBN-13:978-81-908001-4-3.

**TC8503** **DYEING OF CELLULOSIC MATERIALS** **L T P C**  
**3 0 0 3**

**OBJECTIVES:**

- To provide the knowledge on theory of dyeing of cellulosic fibrous material
- To provide the knowledge on classification, principle, shop floor practice & problems in the application of various dyes on cellulosic textiles
- To enable the students to understand machinery used for dyeing of cellulosic textile materials through class room discussion and field visits.

**UNIT I** **9**  
Basic concept of dye and pigment, Definition of affinity, substantivity, reactivity, exhaustion, depth of dyeing, percentage shade. Concepts of exhaust and padding techniques of dyeing. Basic mechanisms of dyeing techniques such as mechanical deposition, chemical fixation.

Classification of dyes according to methods of application. Influence of pretreatment on dyeing properties.

**UNIT II** **9**

Direct dyes: General properties, principles and method of application on cellulosic materials. Classification dyeing of cellulosic materials. Various after treatments to improve the wash fastness and light fastness. Practical problems and their remedies. Reactive dyes – Chemistry, concept of hot brand, cold brand, HE and vinyl sulphone reactive dyes, bifunctional and low salt reactive dyes, principle steps involved in dyeing of cellulosic materials. Practical problems remedy

**UNIT III** **9**

Dyeing of Indigo (synthetic indigo. Dyeing of cellulose materials with phthalogen blue, mineral khaki, aniline black, pigments. Azoic colours – Chemistry and general properties of Azoic colours – Concept of naphthols and bases.

**UNIT IV** **9**

Sulphur dyes – Chemistry and general properties of sulphur dyes. Principle steps involved in sulphur dyeing. Shop floor practices of dyeing of cellulosic materials with sulphur dyes. Stripping of sulphur dyes. Practical problems and their remedies.

**UNIT V** **9**

Vat dyes: Chemistry and general properties classification. Principle steps involved in dyeing. Various methods of application of on cellulosic yarn and fabric with vat dyes. Stripping practical problems – dyeing and remedies. Solubilised vat dyes: Chemistry and general properties – Principles steps involved in dyeing of cellulosic materials

**TOTAL: 45 PERIODS**

**OUTCOMES:**

Upon completion of the course, the students will be able to

- Dye the cellulosic textiles with different dyes
- Perform research and development in the field of dyeing of cellulosic textiles

**TEXT BOOKS:**

1. Shenai V.A. "Technology of Dyeing" 1995, Sevak Publications, Mumbai.
2. Shore, J. "Blend Dyeing", SDC, London, 1998 ISBN: 0901956740.

**REFERENCES:**

1. Madaras, G.W., Parish, G.J., and Shore, J., "Batchwise dyeing of woven cellulosic fabrics", SDC, London, 1993, ISBN: 0901956554.
2. Shore, J. "Cellulosic Dyeing", SDC Publication, London, 1995 ISBN: 0901956686.
3. Chakraborty, J.N., "Fundamentals and Practices in colouration of Textiles", Woodhead Publishing India, 2009, ISBN-13: 978-81-908001-4-3.

**TC8504**

**DYEING OF PROTEIN MATERIALS**

**L T P C**  
**3 0 0 3**

**OBJECTIVES:**

- To provide knowledge on theory dyeing of protein fibrous material
- To provide the knowledge on classification, principle, shop floor practice & problems in the application of various dyes on protein textiles

- To make the students understand the machines used for dyeing the protein textile materials through discussion and field visits.

**UNIT I** **9**

Pretreatment: Chemical composition of wool – Scouring of wool – Scouring in the form of loose wool, yarn and fabric – Milling, Grabbing and potting. Bleaching of wool – Carbonizing of wool – Chemical composition of silk – Degumming of silk with alkalis, Organic acid, organic amines and enzymes. Machines for degumming of silk yarn and fabrics. Bleaching of silk with reducing and oxidizing bleaching agents.

**UNIT II** **9**

Acid Dyes: Types based on application – Properties - Effect of electrolyte, temperature, time, pH and other dye bath assistants on dyeing of protein fibres Importance of isoelectric point in dyeing of protein fibres. Mechanism of dyeing protein fibres. Application procedure for dyeing of wool, silk, stripping and re-dyeing.

**UNIT III** **9**

Reactive Dyes: Types of reactive dyes used for dyeing protein fibres – Type of chemical reactions involved in dyeing of wool and silk with reactive dyes – application of monochloro, dichloro triazine dyes on wool and silk – application of vinyl sulphone, difluoro, mono chloro primidyl dyes, bromo acrylamide dyes and bifunctional dyes on wool and silk. Striping and redyeing.

**UNIT IV** **9**

Natural Dyes: Need for natural dyes – properties – classification – direct substantivity of – dyes with mordants – role of mordants – mordants suitable for protein fibres – dyeing of silk and wool with yellow dyes using turmeric, kamala, tesu, marigold, larkspur, dolu etc. Red dyes using safflower, manjit, patang and lac. Blue dyes using indigo. Black dyes using log wood. Advantages and drawbacks of natural dye. Striping and re-dyeing.

**UNIT V** **9**

Basic Dyes: Dyeing mechanism with protein fibres – application procedure of silk and wool mechanism of dyeing silk and wool with metal complex dyes – properties of chrome dyes – application procedure – chrome mordant, meta chrome and after chrome methods. Dyeing of wool with solubilised vat dyes.

**TOTAL: 45 PERIODS**

**OUTCOMES:**

Upon completion of the course, the students will be able to

- Dye protein textiles using different types of dyes
- Perform research and development work in the field of dyeing of protein textiles

**TEXT BOOKS:**

1. Bona, M., "An Introduction to Wool fabric finishing", The Textile Inst, Manchester, 1994, ISBN: 187081259X.
2. Gulrajani, M.L., and Gupta, S., "Wool dyeing and printing", IIT, New Delhi, 1990.
3. Gulrajani, M.L., "Chemical Processing of Silk", IIT, New Delhi, 1991.

**REFERENCES:**

1. Lewis, D.M., (Ed), "Wool dyeing", SDC, London, 1992, ISBN: 0901956538.
2. Brady, P.R., and Angliss, I.B., "Wool printing and wool dyeing", Textile progress, Vol.12, No3, The Textile Institute, Manchester, 1982, ISBN: 0900739614.

3. Chakraborty, J.N, "Fundamentals and Practices in colouration of Textiles", Woodhead Publishing India, 2009, ISBN-13:978-81-908001-4-3.

**TC8505**

**TECHNOLOGY OF PRINTING**

**L T P C**

**3 0 0 3**

**OBJECTIVE:**

- To enable the students to understand the fundamental concepts of printing of various kinds of fabrics using different colourants

**UNIT I**

**9**

Definition of printing – Difference between printing and dyeing – Pretreatment and Fabric requirements for printing – Design details of printing like repeat of design, squeegees, bolting cloth, Preparation of Screen – Table and Rotary machine – Ingredients in printing with functions and their concentration of usage.

**UNIT II**

**9**

Classification thickeners – Requirements to be a good thickener – Brief study on thickeners like CMC, Sodium Alginate, Indalca, Guar gum and Kerosene emulsion paste – Synthetics thickeners. Printing with Pigments, Classification of pigments, Synthetic binders, Catalyst, Cross Linking agents. Selection criteria for binders.

**UNIT III**

**9**

Printing with reactive dyes by steaming method, curing and silicate padding method – Advantages and Disadvantages of above methods– Printing with Rapid fast and Rapidogen colours, Printing with solubilised Vat dyes. IKAT Printing

**UNIT IV**

**9**

Colour and White Discharge of cotton and viscose dyed materials – Problems associated with Discharge style printing. Brief study on Discharging agents and their usage and limitations of usage, Different styles of Resist printing of cellulose materials, conversion style of discharge printing

**UNIT V**

**9**

Printing paste formulations, printing of silk with various classes for dyes. Direct, discharge and resist styles of printing. Print paste formulations. Direct, discharge and resist styles of printing on woolen materials.

**TOTAL: 45 PERIODS**

**OUTCOMES:**

Upon completion of the course, the students will be able to

- Understand the concepts of printing of fabrics
- Contribute more trends and new developments to the printing industry

**TEXT BOOKS:**

1. Shenai V.A. "Technology of Textile Processing Vol. IV" 1998, Sevak Publications, Mumbai.
2. Mills I.W.C. "Textile Printing" SDC Perkin House, 82, Grattom Rd, Yorkshire, England.1994, ISBN 0901956570.
3. Storey, J. "Manual of Textile Printing", Thames & Hudson, 1992, ISBN: 0500680280.

**REFERENCES:**

1. Kale D.G. "Principles of Cotton Printing edition – 2", Mahajan Books, Ahmedabad. 1979
2. Chakraborty, J.N, "Fundamentals and Practices in colouration of Textiles", Woodhead Publishing India, 2009, ISBN-13:978-81-908001-4-3

**TC8511****DYEING OF SYNTHETIC TEXTILE LABORATORY****L T P C****0 0 4 2****OBJECTIVE:**

- To practice the students in dyeing of synthetic textile materials

**LIST OF EXPERIMENTS**

1. Effect of water hardness & pH in dyeing of polyester with disperse dyes.
2. Dyeing of Polyester using carriers.
3. Dyeing of Polyester by HTHP methods.
4. Carrier dyeing of Polyester/Cotton blended fabrics in laboratory jigger machine.
5. Exhaust dyeing of Polyester/Cotton blended fabrics with disperse/reactive system.
6. Exhaust dyeing of Polyester/Cotton blended fabrics with disperse/vat system.
7. Dyeing of Polyester /Cotton blended fabrics with pigments
8. Exhaust dyeing of Polyester/Viscose blended fabrics with disperse/reactive system.
9. Exhaust dyeing of Polyester/Viscose blended fabrics with disperse/vat system.
10. Dyeing of Polyester/Wool blended fabrics using disperse/acid system.
11. Dyeing of Polyester/Wool blended fabrics using disperse/basic system.
12. Dyeing of Polyester/Wool blended fabrics using disperse/metal complex dyes.
13. Dyeing of micro denier polyester fabric in winch machine.
14. Matching of shades with the help of computer colour matching system.
15. Dyeing of acrylic fibre with cationic dyes.
16. Dyeing of Nylon fabrics

**TOTAL: 60 PERIODS****OUTCOMES:**

Upon completion of this practical course, the students would be able to

- Dye polyester and blends of polyester with different dyes
- Dye Nylon, acrylic and other synthetic fibres
- Match the shades with the help of computer colour matching system

**LIST OF EQUIPMENTS FOR BATCH OF 30 STUDENTS**

1. Beaker Dyeing machine - 1 No.
2. Water Bath with heating facility - 1 No.
3. Weighing Balance - 1 No.
4. Hardness Meter - 1 No.
5. pH Meter - 1 No.
6. Jigger - 1 No.
7. Padding mangle - 1 No.
8. Computer color matching system - 1 No.
9. Winch - 1 No.
10. HTHP Soft flow dyeing machine - 1 No.

**OBJECTIVE:**

- To train the students in pre-treatment, dyeing, printing and testing of textile materials

**LIST OF EXPERIMENTS**

- Desizing and scouring of fabric.
- Peroxide Bleaching of Cotton Yarn/Fabric.
- Degumming of silk.
- Identification of dyes.
- Dyeing of Cotton using Reactive dyes
- Dyeing of Cotton using Vat dye
- Dyeing of polyester using disperse dyes.
- Dyeing of polyester and cotton blend.
- Determination of wash, light, perspiration and rubbing fastness of dyed fabrics
- Printing of cotton fabric by direct technique.
- Determination of Whiteness and Yellowness indices.
- Determination of K/S of dyed fabrics using Spectrophotometer.
- Water proof and Flame retardant finishing of cotton
- Resin and softener finishes.
- Antimicrobial Finish Evaluation

**TOTAL:60 PERIODS****OUTCOME:**

Upon completing this practical course, the student would be able to

- Desize, scour, bleach, dye, print and finish the fabric with different types of chemicals and colourants
- Evaluate the fabrics for fastness and chemical process related properties

**LAB EQUIPMENTS FOR A BATCH OF 30 STUDENTS**

- Stainless vats (500 ml) – 15 Nos.
- Water bath – 2 Nos.
- Stirrer – 3 Nos.
- Steam ager – 1 No.
- Pilot padding mangle – 1 No.
- HTHP Beaker dyeing machine – 1 No.
- Pilot curing chamber – 1 No.
- Fastness tester for Washing, Light, Perspiration & Rubbing – 1 No.
- Printing table – 3 Nos.
- Spectrophotometer – 1 No.

**OBJECTIVES:**

The course aims to:

- Enhance the Employability and Career Skills of students
- Orient the students towards grooming as a professional
- Make them Employable Graduates
- Develop their confidence and help them attend interviews successfully

## UNIT I

Introduction to Soft Skills-- Hard skills & soft skills - employability and career Skills—Grooming as a professional with values—Time Management—General awareness of Current Affairs

## UNIT II

Self-Introduction-organizing the material - Introducing oneself to the audience – introducing the topic – answering questions – individual presentation practice— presenting the visuals effectively – 5 minute presentations

## UNIT III

Introduction to Group Discussion— Participating in group discussions – understanding group dynamics - brainstorming the topic -- questioning and clarifying –GD strategies- activities to improve GD skills

## UNIT IV

Interview etiquette – dress code – body language – attending job interviews– telephone/skype interview -one to one interview &panel interview – FAQs related to job interviews

## UNIT V

Recognizing differences between groups and teams- managing time-managing stress-networking professionally- respecting social protocols-understanding career management-developing a long-term career plan-making career changes

**TOTLA: 30 PERIODS**

### OUTCOMES:

**At the end of the course Learners will be able to:**

- Make effective presentations
- Participate confidently in Group Discussions.
- Attend job interviews and be successful in them.
- Develop adequate Soft Skills required for the workplace

### Recommended Software

1. Open Source Software
2. Win English

### REFERENCES:

1. Butterfield, Jeff **Soft Skills for Everyone**. Cengage Learning: New Delhi, 2015
2. **Interact** English Lab Manual for Undergraduate Students,. OrientBalckSwan: Hyderabad, 2016.
3. E. Suresh Kumar et al. **Communication for Professional Success**. Orient Blackswan: Hyderabad, 2015
4. Raman, Meenakshi and Sangeeta Sharma. **Professional Communication**. Oxford University Press: Oxford, 2014
5. S. Hariharanetal. **Soft Skills**. MJP Publishers: Chennai, 2010.

**TC8601**

**WET PROCESSING MACHINERY**

**L T P C**

**3 0 0 3**

### OBJECTIVES:

To enable to students to learn about the

- Working principles of wet processing machineries
- Operations of machines and its maintenance schedules and expose the students to the latest machineries used for wet processing.

**UNIT I FIBRE AND YARN PROCESSING 9**

Classification of Textile processing machinery: Batch – Semi-continuous – Continuous. Yarn – Rope, open width fabric processing machines. Loose stock dyeing machines: types. Yarn Processing: Singeing – Mercerizing. Yarn dyeing machines: Types - HTHP – Cabinet – Package. Dryers: Revolving cabinet - Pressurized package - continuous hank dryer – Radio frequency dryer.

**UNIT II FABRIC PROCESSING 9**

Singeing – Cropping – Shearing. Mercerizing - foam merceriser. J Box – Vapourloc - Semi continuous – Displacement washing - Centrifuging system – Winch: Modifications - Jigger: Jumbo - Universal. Pad dyeing machine: Pad – roll - Pad–batch – Vertical pad – Horizontal pad – Calculation of expression. Continuous dyeing range (CDR) – Thermosol - Beam dyeing - HTHP beam dyeing - Jet dyeing machines: Principle – Fully and partially flooded - Liquor flow – Airflow machine. Soft flow jet dyeing machine.

**UNIT III PRINTING MACHINES AND DRYERS 9**

Roller printing machinery. Screen printing: Automatic flat bet screen - Rotary screen. Thermo transfer printing machinery. Garment printing machines. Steamers – Agers – Curing process. Extraction of water: Hydroextractors - Cylinder drying - Stenters – High frequency stenter. Float dryers - Hot flue dryers - Perforated drum dryers – Heating systems – Steam – Thermic fluids – Heat requirement.

**UNIT IV FINISHING MACHINES AND WASHERS 9**

Calendars - Sanforizing machines – Raising – Emerising – Crepping. Milling – Crabbing - Decatising. Washing Machines: Mass transfer action – Counter-current – Intensification - Rope washing – Slack, tight water mangles - Suction drum washer - Horizontal washer.

**UNIT V HOSIERY AND GARMENT PROCESSING 9**

Scutcher – Detwisting – Rope piler – Tubular singeing, merceriser – Combined mercerizing and bleaching – Balloon pad – Tubular compacting - Relax dryer. Garment dyeing machinery: Horizontal - Overhead paddle dyeing machine - Rotary dyeing – Jet – Extractors – High temperature machines. Tumbler driers – Garment finishing machines.

**TOTAL: 45 PERIODS****OUTCOMES:**

Upon completion of the course, the students would

- Know various machinery used in yarn and fabric dyeing
- Know various machinery used for printing and finishing of fabrics which would help them in working in dyeing and printing industry

**TEXT BOOKS:**

1. Bhagwat R.S., "Hand book of Textile Processing Machinery" Colour publications, Mumbai 1999
2. Karmakar S R, Chemical Technology in the Pretreatment process of Textiles, Elsevier Publications, 1999.

**REFERENCES:**

1. Cegarra C., Puerte P., Valladperas J., "The Dying of textile Material" Textila Publishers, Italy, 1992.
2. Madaras G.W., Parish G.J., and Shore J., Batchurise dying of woven Cellulosic Fabrics(A Practical Guide) Society of dyers and Colurists Bradford, 1993.



3. Charles Tomassino, Chemistry and technology of fabric preparation and finishing, North Carolina State University, 1992.

**TC8602**

**TECHNOLOGY OF FINISHING**

**L T P C**

**3 0 0 3**

**OBJECTIVES:**

- To familiarize the students with the properties and application of various finishing agents on various textile materials through discussion, experimentation and observation.
- To enable the students to understand to solve the shop floor problems in the finishing
- To enable the students to understand different types of finishes required for different classes of textile materials of finishing and machines used for finishing through discussion and field visits.

**UNIT I**

**9**

Commercial importance of finishing and its classification. Resin finishing: Mechanism of creasing, Types of Resins .Anti crease, wash and wear, durable press resin finishing. Causes & remedies of strength losses of Resin finished fabric. Mechanism of Chlorine retention. Formaldehyde Release from Resin finished goods. Study about eco friendly method of anti crease finishing. Polycarboxilic acids for crease recovery finish.

**UNIT II**

**9**

Concept of Flame proof & flame retardancy. Concept of pyrolysis, Flame retardant finishes for cotton, Concept of waterproof and water repellent Finishes, Durable & Semi durable and Temporary finishes, Antimicrobial finish - Evaluation of anti microbial finish, Elastomeric finishes and Evaluation

**UNIT III**

**9**

Soil Release Finishing: Mechanism of soil retention & soil release. Various soil releases finishes for cotton, Polyester and its blends - Evaluation, Anti pilling Finishing: chemical and mechanical methods to produce anti pilling finish - Evaluation, UV Protection finishes- Evaluation. Detail study of antistatic finishes and Evaluation

**UNIT IV**

**9**

Detail study about mechanical finishing of textile materials like calendaring, compacting, raising, Sanforising, Peach finishing. Object of Heat setting. Various methods of heat setting and mechanism of heat setting. Foam Finishing:. Detailed study of various techniques of foam application. Drawbacks of foam finishing.

**UNIT V**

**9**

Brief study about stiffening and softening of textile materials, Mechanism in the weight reduction of PET by using alkali Micro encapsulation techniques in finishing process, Nano finish, Self cleaning finish. Brief study about Plasma Treatment. Study about Bio finishing

**TOTAL: 45 PERIODS**

**OUTCOMES:**

Upon completion of the course, the students would

- Know about the process of finishing of textile goods
- Understand the principle and method of application of various types of special finishes on textile fabrics

**TEXT BOOKS:**

1. V.A.Shennai, "Technology of Finishing", Vol X, Sevak Publications, Mumbai

2. Perkins, W.S., "Textile colouration and finishing", Carolina Academic Press., U.K, ISBN: 0890898855.2004

#### REFERENCES:

1. Microencapsulation in finishing, Review of progress of Colouration, SDC, 2001 62
2. Chakraborty, J.N, Fundamentals and Practices in colouration of Textiles, Woodhead Publishing India, 2009, ISBN-13:978-81-908001-4-3
3. W. D. Schindler and P. J. Hauser "Chemical finishing of textiles", Woodhead Publishing Cambridge England,2004.

**TC8603**

**INSTRUMENTAL METHODS OF CHEMICAL ANALYSIS**

**L T P C**

**3 0 0 3**

#### OBJECTIVES:

- To enable the students to analyse the textiles and chemicals through various analytical instruments
- To enable the students to interpret the results from analytical instruments

#### UNIT I

**9**

UV – VIS spectroscopy - Theory, Franck - Condon principle, Electronic transitions, Deviations from Beer's law – Instrumentation (block diagram only) - Applications. Infra red spectroscopy – Theory, Fundamental vibrations, Hook's law – Instrumentation (block diagram only)- Finger print region – Vibrations involved in H<sub>2</sub>O and CO<sub>2</sub> - Applications.

#### UNIT II

**9**

NMR spectroscopy – Theory, Relaxation Process – Instrumentation (block diagram only) – Chemical shift – Internal standard – TMS – Shielding and De- Shielding Effects – Factors influencing Chemical shift - Applications. Mass spectroscopy: Theory, Instrumentation (block diagram only) – Ionization Techniques – Electron impact ionization, Chemical ionization and Desorption techniques. Nitrogen rule, McLafferty rearrangement.

#### UNIT III

**9**

Potentiometric measurements – Ion selective electrodes – Glass electrode – Determination of pH – Buffers – Types of potentiometric titrations – Applications of Potentiometric measurements. Thermal Methods: Thermogravimetry – Factors affecting thermogravimetric curves – Instrumental and sample characteristics – Instrumentation (block diagram only) – Applications. Differential Thermal Analysis – Introduction – Factors affecting DTA curves – Environmental, Instrumental and Sample factors – Instrumentation (block diagram only) – Applications.

#### UNIT IV

**9**

Chromatographic Techniques – Introduction – classification – Theory, Instrumentation and Applications of Paper Chromatography, Thin Layer Chromatography, Column Chromatography, High Performance Liquid Chromatography and Gas – Liquid Chromatography.

#### UNIT V

**9**

Errors, Precision and Accuracy: Definitions, Significant figures – Types of Errors – Methods of expressing accuracy and precision, Confidence limits.

**TOTAL: 45 PERIODS**

#### OUTCOMES:

Upon completion of the course, the students will be able to

- Analyze the textiles and chemicals using different analytical instruments
- Interpret the results from analytical instruments

#### TEXT BOOKS:

1. Rouessac,F., "Chemical analysis – modern international method and techniques", Wiely, New Delhi, 1999.
2. Day, R.A., and Unerwood, A.L., "Qualitative inorganic analysis, 5<sup>th</sup> edition", Prentice-Hall of India, New Delhi, 2004.

#### REFERENCES:

1. Bona,M., "Modern control Techniques in textile finishing and making up", Eurotex, Blachwells Bookshop, London, 2001
2. Banwell,G.C., "Fundamentals of molecular spectroscopy", TMH, 2003.

<b>TC8604</b>	<b>GARMENT PRODUCTION AND PROCESSING</b>	<b>L T P C</b>
		<b>3 0 0 3</b>

#### OBJECTIVES:

- To enable the students to understand the basics of garment manufacturing, pattern making & sewing and garment wet processing
- To expose the students to various problems & remedies during garment manufacturing & processing

<b>UNIT I</b>	<b>PATTERN MAKING AND CUTTING</b>	<b>13</b>
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Human body measurements – Methods - Pattern making – Grading - Method. Marker planning: requirements – Efficiency – Method – Marker making. Spreading: Requirements – Methods - Nature of fabric package – Machines. Cutting: requirements – Hand shears- Straight knife - Round knife – Band knife– Computer control – Die – Laser - Plasma torch – Water jet.

<b>UNIT II</b>	<b>SEWING</b>	<b>14</b>
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Sewing machine fundamentals - Classification – Stitch forming mechanism – Industrial sewing machine working principle. Stitches –properties – Classes. Seams – Properties –Classes. Sewing threads – Types – Characteristics– Thread size – Ticket number.

<b>UNIT III</b>	<b>GARMENT DYEING</b>	<b>9</b>
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Developments in garment processing and its future – Pre treatments for Garments- Dyeing of cotton and P/C Blended garments using reactive dyes & vat dyes. Dyeing of socks and hose – Dyeing of fasteners – Machines for garment dyeing – Paddle, rotary torodial –Solvent dyeing, sancowad process – Dyeing of wool and silk garments – Dyeing of polyester garments Problems in garment dyeing Remedies– Considerations and precautions to be taken for garment Dyeing – Pros and Cons of garment dyeing

<b>UNIT IV</b>	<b>GARMENT FINISHING</b>	<b>9</b>
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Wash down effects, stone wash, Enzyme wash, Bio – polishing, sand blasting- ION wash, mud wash, chalk wash, leather finish, feather touch, ozone fading & anti – ozonisation- Stain repellent finish. Pressing need – influence – equipments. Stone washing machines, tumble dryer, used look finishing machines, garment finishers- shirt finishers, pant finishers, cabinet finishers, tunnel finishers– Garment care and care labeling.

**TOTAL: 45 PERIODS**

**OUTCOMES:**

Upon completion of the course, the students will

- Know about pattern making, cutting and sewing of apparels
- Know about dyeing and finishing of garments

**TEXT BOOKS:**

1. Gerry Cooklin, "Introduction to Clothing Manufacture" Blackwell Science Ltd., 1995.
2. Harrison.P.W Garment Dyeing, "The Textile Institute Publication", Textile Progress, Vol .19 No.2,1988

**REFERENCES:**

1. Grace I. Kunz, Ruth E. "Glock Apparel Manufacturing: Sewn Product Analysis", Prentice Hall; 4th edition , 2004.
2. Trotman.E.R."Dyeing and Chemical technology of textile fibres", B.I.Pub., New Delhi.1994.
3. NCUTE – Programme series, Finishing of Garments and Knits, held at Ichalkaranchi, IIT,Delhi.
4. NCUTE – Programme series, Garment Manufacturing Technology, IIT, New Delhi.

**TC8605****COMPUTER COLOUR MATCHING****L T P C****3 0 0 3****OBJECTIVES:**

To enable the students to understand various colour theories

- To simulate shade matching and predict recipes using CCM
- To discuss more about responsibilities of each department in garment industry and their working procedure

**UNIT I****9**

Colour perception, theories of colour vision, colour measurement. Reflectance Spectrophotometer-- Basic components of Reflectance Spectrophotometer-Types of Spectrophotometer Spectrophotometer performance Parameter-Spectrophotometer selection parameter-precautions for Spectrophotometer-Calibration of spectrophotometer-main features of morden spectrophotometer-New commercial spectrophotometer--Tristimulus colorimeters-Gloss metersmulti-angle spectrophotometer-Features of commercial multi-angle spectrophotometer-commercial multi-angle spectrophotometer-multi-angle viewing booth for visual assessment-new development multi -angle spectrophotometers-non-contact spectrophotometers -reflectance curves.

**UNIT II****9**

The CIE color specifications – Computation of tristimulus values-XYZ from reflectance values – The CIE standard illuminants – The CIE standard observer – computation of tristimulus values – chromaticity coordinates & chromaticity diagram – Features of CIE system – Limitations of the CIE systems – The CIELAB color specification – CIELAB color space – CIELCH color space – Kubelka – Munk relation & concentration of colorant – Features of kubelka-munk function – Modification to K-M theory,Four-Flux theory & Multi-Flux theory – Color difference equations & color difference calculations – color difference & grey scale rating – Metamerism & metameric index – Types of metamerism – Light booth for visual assessment of metamerism – color constancy & color inconstancy index – Pass/Fail – Shade short program – Relative dye strength analysis program – Whiteness / Yellowness index – yellowness index – Contrast ratio & opacity calculations – Reflectance of translucent samples – color matching programs – K-S data

generation – color matching – Ratch correction – statistical analysis in QA & color matching applications

**UNIT III** **9**

Sample preparation, presentation & measurement – Selection of spectrophotometer - Sample preparation & presentation – Textiles & dye application .The basic laboratory equipments for successful handling of computer color matching system – The CIE color specifications in textiles applications - The CIE color specifications of dyes – Change in Hue with increase in concentration – Chromaticity coordinates & chromaticity diagram – Dye gamut mapping – Setting tolerances – Studying the compatibility of dyes – Color difference assessment – Color difference assessment of self shades – color difference equations.

**UNIT IV** **9**

colour difference & metamerism – Metameric index & number of dyes per combination – Color inconstancy index(CII) – The Color inconstancy index of dyes – The CII & the concentration of a dye – The CII of mixtures of dyes – Fastness rating – Pass/Fail – Specifying tolerances –Shade sort – Shade sort using 555 method – Advanced shade sort methods – Color strength analysis – Relative strength methods – linear region of dyes – color strength & residual color difference – color strength of navy blue & black – color strength of dyes with the same color index number

**UNIT V** **9**

color strength of fluorescent dyes & residual color difference – whiteness index & yellowness index - whiteness index of various natural & man-made fibres - whiteness index using different WI equations –whiteness of OBA treated samples – whiteness & tint of OBA – Whiteness of OBA with tinting agent – Whiteness & aperture size of spectrophotometer – Whiteness on different spectrophotometers with PXF light source – Whiteness measurement with & without UV filter – Whiteness measurement of UV-filters with different cut-off wavelength – Whiteness index & the whiteness of basic substrate – effect of washing on whiteness – whiteness of white substrates for medicalware & hospitalware – calculating relative strength of OBA – Soil removal evaluation of detergents - yellowness index of white & near – white textile substrates –Studies in dye behaviour – Dye build-up properties - Linear and non linear behavior of dye – fastness properties –compatibility of dye standard depth and its calculation.

**TOTAL: 45 PERIODS**

**OUTCOMES:**

Upon completion of the course, the students will be able to

- Understand colour theories, different measures of colour and specifications
- Predict recipes using CCM which would enable them to provide job opportunity in the field of testing and to carry out research.

**TEXT BOOKS:**

1. Johnson,A, "The Theory of Colouration of Textiles", SDC 2nd Edition,1998
2. Peters.A.T and Freeman,H.S, "Analytical Chemistry of Synthetic Colorants", Blackie, ISBN 0751402087.1991

**REFERENCES:**

1. Peters.A.T and Freeman,H.S "Physico – Chemical Principles of Colour Chemistry", Blackie, ISBN:0751402109.1995
2. Colour Technology Tools, Techniques & Applications.

**TC8611**

**TEXTILE FINISHING LABORATORY**

**L T P C**

**0 0 4 2**

**OBJECTIVE:**

- To practice the students in finishing of textile materials for different requirements and end uses.

**LIST OF EXPERIMENTS**

1. Finishing of fabric using starch.
2. Finishing of fabric using softener
3. Buckram finish the given fabric sample using a suitable recipe.
4. Resin finishing.
5. Water repellent Finishing.
6. Finding the warp wise / weft wise shrinkage of the given fabric sample.
7. Crease recovery finishing of cotton.
8. Crease recovery finishing of P/C blends.
9. Comparison of different resins for crease recovery finishing of cotton.
10. Weight reduction of polyester.
11. Carbonisation of P/C blends.
12. Scroopy finish for silk.

**TOTAL: 60 PERIODS**

**OUTCOMES:**

Upon completing this course, the student would be able to

- Finish the fabric using starch, softners, resin, and water repellent, crease recovery finishes
- Finish the fabric for buckram finish and scroopy finish

**LIST OF EQUIPMENT FOR BATCH OF 30 STUDENTS**

- |                           |         |
|---------------------------|---------|
| 1. Padding mangle         | - 1 No. |
| 2. Curing oven            | - 1 No. |
| 3. Water Bath             | - 1 No. |
| 4. Hand Dryer             | - 1 No. |
| 5. Weighing Balance       | - 1 No. |
| 6. Laundrometer           | - 1 No. |
| 7. Crease recovery tester | - 1 No. |
| 8. Jigger                 | - 1 No. |

**TC8612**

**GARMENT PRODUCTION AND PROCESSING LABORATORY**

**L T P C**

**0 0 4 2**

**OBJECTIVE:**

- To practice the students in manufacturing of garments and chemical processing of garments

**LIST OF EXPERIMENTS**

1. Design and construct A-Line frock for kids.
2. Design and construct Ladies Skirt.
3. Design and construct T-Shirt for men.
4. Dyeing of garments
5. Printing of garments using plastisol ink.
6. Metallic prints on garments

7. discharge prints on garments
8. transfer printing on garments
9. Khadi printing on garments
10. Bio-polishing on garments
11. Wrinkle free finish on garments
12. Stain proof finish on garments

**TOTAL: 60 PERIODS**

**OUTCOMES:**

On completion of this course, the student would be able to

- Design and construct garments for children, women and men
- Print the garment with different colourants
- Finish the garment for different applications

**LIST OF EQUIPMENT FOR BATCH OF 30 STUDENTS**

- |                                  |           |
|----------------------------------|-----------|
| 1. Garment dyeing machine        | – 1 No.   |
| 2. Sewing machine                | – 10 Nos. |
| 3. Garment washing machine       | – 1 No.   |
| 4. Tumble dryer                  | – 1 No.   |
| 5. Ironing Table                 | – 1 No.   |
| 6. Table Screen printing Machine | – 1 No.   |

<b>TC8701</b>	<b>EFFLUENT TREATMENT AND POLLUTION CONTROL</b>	<b>L T P C</b>
		<b>3 0 0 3</b>

**OBJECTIVES:**

- To impart awareness about the pollution created by different stages of wet processing
- To familiarize the students about the importance of water and its analysis
- To enable the students to understand about the waste water treatment plants and various treatments carried out

**UNIT I 9**

Constituents of water and their effect on Textile wet processing –Water pollution – programmes which includes WHO, ISO standards for raw water criteria – Effluent discharge standards for inland surface water public sewers, on land for irrigation, marine coastal areas and drinking water parameters – Quality requirements of water for cotton and synthetic Textile processing . Water softening .Water analysis- Colour, pH value, dissolved solids, suspended solids, total hardness (Calcium + Magnesium)- EDTA method, total iron-thiocyanate method, Alkalinity, acidity , chlorides dissolved oxygen , BOD and COD.

**UNIT II 9**

Characteristics and treatment of cotton, synthetics and wool processing effluents. Reduction of pollution load. Introduction - Textile Effluent treatment methods–. Primary treatment methods - screening, sedimentation, equalisation, neutralisation, coagulation and flocculation.

**UNIT III 9**

Secondary treatment methods – Trickling filtration, Activated sludge process, aerated lagoons, secondary sedimentation, oxidation ponds, Anaerobic Digestion, sludge disposal, removal of interfering substances in secondary biological treatment.

**UNIT IV 9**

Tertiary treatment – Evaporation (solar and steam). Membrane technologies (MF, UF, NF & RO) ,Reverse osmosis, ion exchange and activated carbon treatment. Model schematic diagram for – Wastewater treatment plant for textile mills – Primary and Secondary units & Tertiary treatments, Quality parameters at entry and exit of RO. Chlorine trioxide treatment, ozone treatments, enzymatic decolourisation.

**UNIT V** **9**

Air Pollution – Gaseous and Aerosols – Effects of air pollution – Effect of Sulphur oxide on human health – Properties of air pollutants – control of air pollutants – Air pollution control equipment – Ambient air quality standards – Emission limits at chimney level –Noise pollution – Types of noise (Steady state noise – Impulse noise) –ill effects of noise –Noise measurement – Control of noise pollution – Shape noise levels in decibels.

**TOTAL: 45 PERIODS**

**OUTCOMES:**

Upon completion of the course, the students will be able to

- Understand the textile processing related causes for pollution
- Understand the effluent discharge standards and different processes involved in waste water treatment

Perform the research and development to produce zero discharge effluents

**TEXT BOOKS:**

1. Rao,C.S., “Environment Pollution control Engineering”, New age International Ltd. and Publishers, N.Delhi, 2004.
2. Reife, A., and Freeman, H.S., (Ed)., “Environmental chemistry of dyes and pigment”, Wiley., London, 2000, ISBN: 047158276.

**REFERENCES:**

1. Horrockks, A.R (Ed)., “Ecotextiles’98: Sustainable development”, The Text.Inst., Manchester 1999, ISBN: 1855732426.
2. Modak.P., “The textile industry and the environment”, UNEP:HMSO, Blackwells, Leeds, 2003, ISBN: 9280713671

<b>TT8751</b>	<b>FINANCIAL MANAGEMENT IN TEXTILE INDUSTRY</b>	<b>L T P C</b>
		<b>3 0 0 3</b>

**OBJECTIVES:**

To enable the students to understand

- Basics of financial management that are required for the textile industry
- Determination of cost of yarn, fabric and garment

**UNIT I** **18**

Costing - concepts; classification of costs; preparation of cost sheet; costing of yarn, fabric and garment; cost profit volume analysis, breakeven analysis

**UNIT II** **9**

Depreciation – method of computing depreciation; techniques of investment analysis – payback period method, accounting rate of return, Discounted Cash Flow methods - IRR, NPV, PI

**UNIT III** **9**



Capital structure; Sources and cost of capital; working capital management

#### **UNIT IV**

**9**

Tools for financial analysis and control- profit and loss account, balance sheet; ratio analysis - illustrations from textile unit

**TOTAL: 45 PERIODS**

#### **OUTCOMES:**

Upon completion of the course, the students will be able to

- Explain the basics of financial management applied to textile industry
- Understand the economical feasibility of capital investment, sources of capital and cost of capital applied

#### **TEXT BOOKS:**

1. M.Y. Khan and P.K.Jain, "Financial management, Text, Problems and cases" Tata McGraw Hill, 5<sup>th</sup> edition, 2008.
2. M. Pandey, "Financial Management", Vikas Publishing House Pvt. Ltd., 8<sup>th</sup> edition, 2007.
3. Khanna, O.P, "Industrial Engineering and Management", Dhanpat rai publications, New Delhi, 2005.

#### **REFERENCES:**

1. Bhav P.V. and Srinivasan V., "Costing Accounting to Textile Mills", ATIRA, Ahmadabad, 1976
2. Thukaram Rao M.E., "Cost and Management Accounting", New Age International, Bangalore, 2004
3. Thukaram Rao M.E., "Cost Accounting and Financial Management", New Age International, Bangalore, 2004
4. Prasanna Chandra, "Financial Management, Theory and Practice", Tata McGraw-Hill Publishing Company Ltd, 5<sup>th</sup> Edition, New Delhi, 2001
5. James C. Vanhorne, "Financial Management and Policy", Pearson Education Asia (Low Priced Edition) 12<sup>th</sup> Edition, 2002
6. Narang, G. B. S. and Kumar V., "Production and Costing", Khanna Publishers, New Delhi, 1988
7. Aswat Damodaran, "Corporate Finance Theory and Practice", John Wiley & Sons, 2000
8. Hrishikes Bhattacharya, "Working Capital Management, Strategies and Techniques", Prentice – Hall of India Pvt. Ltd., New Delhi, 2001
9. Khan and Jain, "Basic Financial Management and Practice", Tata McGraw Hill, New Delhi, 5<sup>th</sup> Edition, 2001

**TC8702**

#### **PROCESS AND QUALITY CONTROL IN TEXTILE WET PROCESSING**

**L T P C  
3 0 0 3**

#### **OBJECTIVES:**

- To enable the students to learn about the process control at machinery involved in the chemical processing
- To familiarize the students about the importance of process control and quality control
- To enable the students to learn the various quality control tests involved in chemical processing

#### **UNIT I**

**9**

Definition of Process control and Quality control – Need for quality control in textile wet processing – Flow charts indicating Process control and Quality control tests to be carried out in Desizing, Scouring, Bleaching, Souring, Mercerizing, Dyeing, Printing and finishing, Process

and quality control measures adopted in different methods of desizing and scouring along with assessment of degradation of cotton.

**UNIT II** **9**

Process and quality control measures adopted in sodium hypochlorite, hydrogen peroxide, Sodium chlorite bleaching and mercerisation process for batch and continuous process

**UNIT III** **9**

Critical parameters involved in dyeing of natural and synthetic fibers, Process and Quality control measures adopted in machine along with dyeing parameters in dyeing of cotton, Viscose, Polyester, Wool, Acrylic and Nylon and blends of P/C, P/V, Acrylic/Cotton, Cotton/Viscose/Wool and Nylon/Acrylic/Cotton. Dyeing defects and its remedial measures.

**UNIT IV** **9**

Process and quality control measures in printing natural and synthetic fibers with different methods and styles of printing.

**UNIT V** **9**

Process and quality control measures adopted in mechanical finishing- sanforizing, calendering process and chemical finishes.

**. TOTAL: 45 PERIODS**

**OUTCOMES:**

Upon completion of the course, the students will be able to

- Measure the quality particulars of textile material at different stages of chemical processing and know the standards carry out the various process and quality control measures during the chemical processing of textile materials

**TEXT BOOKS:**

1. Vaidya A.A. and Datye, K.K "Chemical processing of synthetic and blends", John Wiley and Sons, New York, 1995.
2. Shenai V.A. – Technology of Textile Processing, Vol.8 Evaluation of Textile Chemicals, 3<sup>rd</sup> Edn, Sevak Publications, Mumbai 1995.

**REFERENCES:**

1. Rouessac,F., "Chemical analysis – modern international method and techniques", Wiely, New Delhi, 1999.
2. Gurdeep Chatwal, Anand "Instrumental Methods of Chemical Analysis". Murthy.D.V.S, "Transducers and Instrumentation", Prentice Hall of India Ltd. 1999

**TC8711** **PRODUCT DEVELOPMENT LABORATORY** **L T P C**  
**0 0 4 2**

**OBJECTIVE:**

- To practice the students in developing the textile products based on wet processing

**LIST OF EXPERIMENTS**

1. Development of Low temperature peroxide bleached fabric
2. Development of combined desizing and scouring using enzymes
3. Development of dyed cotton fabric with Jigger
4. Development of dyed cotton fabric with Winch
5. Development of one bath dyeing of PET / cotton blends

6. Development of producing of aroma / Ayurvedic finishing on textile materials

**TOTAL: 60 PERIODS**

**OUTCOME:**

- Upon completing this practical course, the student would be able to develop textile products using dyeing, finishing with special finishes

**LIST OF EQUIPMENT FOR BATCH OF 30 STUDENTS**

1. Jigger - 1 No.
2. Winch - 1 No.
3. Padding mangle - 1 No.
4. Soft flow dyeing machine - 1 No.
5. Water Bath - 1 No.
6. Beaker dyeing machine - 1 No.

**TC8712 PROBLEM ANALYSIS AND CASE STUDIES IN WET PROCESSING  
LABORATORY**

**L T P C  
0 0 4 2**

**OBJECTIVE:**

- To expose the students to analysis of problems related to chemical processing of textile materials.

**LIST OF EXPERIMENTS**

Analysis of case studies in

1. Desizing
2. Scouring
3. Bleaching
4. Mercerizing
5. Dyeing
6. Printing
7. Finishing

**TOTAL: 60 PERIODS**

**OUTCOME:**

- Upon completing this practical course, the student would be able to analyse the problems and find solutions for problems related to wet processing of textile materials.

**LIST OF EQUIPMENT FOR BATCH OF 30 STUDENTS**

1. Padding mangle - 1 No.
2. Beaker Dyeing Machine - 1 No.
3. Hot air oven - 1 No.
4. Water Bath - 1 No.
5. Table screen Printing - 1 No.
6. Soft flow Dyeing Machine - 1 No.
7. IR Dyeing Machine - 1 No.
8. Steamer - 1 No.
9. Weighing Balance - 1 No.
10. Tensile strength tester - 1 No.
11. Jigger - 1 No.
12. Winch - 1 No.
13. Laundro Meter - 1 No.

14. Crock meter

- 1 No.

**TC8811**

**PROJECT WORK**

**L T P C**  
**0 0 20 10**

**OBJECTIVE:**

- To objective of the project work is to make use of the knowledge gained by the student at various stages of the degree programme.

The students are assigned project work related to product / process development, solution to the technical problems in industry and current research at national and international level. The student is required to submit a report at the end of semester based on the findings. The evaluation is made as per the Regulations of University.

**TC8001**

**MODERN PRINTING TECHNOLOGY**

**L T P C**  
**3 0 0 3**

**OBJECTIVE:**

- To enable the students to understand the concepts of modern printing technologies in printing of various kinds of fabrics using different colourants

**UNIT I**

**9**

Offset Printing-Rotogravure-Flexography-Letter press printing-Screen printing- Xerography printing-Ink jet printing-Digital printing-Lithography-Relief printing-Letter press printing-Electronic printing process-Electro photographic printing-Microcapsule printing-Thermal sublimation printing and wax transfer printing

**UNIT II**

**9**

Fabric preparation, Ink jet ink compositions; Mechanism of ink jet technology; Parameters influencing ink transfer; Colour depth in digital printing; Inks for printing – practical formulations; Precautions before and while printing; Selections of ink jet printers for fabric printing; Fixation / development of prints; After treatments.

**UNIT III**

**9**

Process control in printing. Process control parameters for printing machinery like rotary, flat bed, roller, loop steamers, agers, polymeriser, RIGHT FIRST TIME printings. Problems & remedies in printing.

**UNIT IV** **9**

Garment Printing. Various techniques of printing of garments. garment printing machineries and their recent developments. Recent developments in printing technology.

**UNIT V** **9**

Computer aided design systems for textile printing - Recent developments in textile printing machinery including automation. Developments in thickeners, water based binders,

**TOTAL: 45 PERIODS**

**OUTCOMES:**

Upon completion of the course, the students will be able to

- Understand the modern printing technologies available for printing textile fabrics.
- Contribute more trends and new development to the printing industry

**TEXT BOOKS:**

1. Ujjie, Digital Printing of Textiles, CRC,ISBN-10: 0849391008, Wood Head Publishing Ltd,UK,2006
2. Tyler, Textile Digital Printing Technologies, Textile Institute Publication UKVol.37 No.4, 2005
3. Chakraborty, J.N, Fundamentals and Practices in colouration of Textiles, Woodhead Publishing India, 2009, ISBN-13:978-81-908001-4-3

**REFERENCES:**

1. Miles.L.W.C., Textile Printing, Dyers company Publishing Trust, U.K., 1981
2. Shenai.V.A, "Technology of Printing", Sevak Publishers, Mumbai. 1990
3. Shore.J, Colorants & Auxiliaries, Vol. I & II, S.D.C, 1990

**TC8002** **ANALYSIS OF TEXTILE CHEMICALS** **L T P C**  
**3 0 0 3**

**OBJECTIVES:**

- To enable the students to understand the importance of testing and analysis of various fibres and chemicals used in wet processing
- To expose the students to the analysis, estimation techniques for processing chemicals

**UNIT I** **BASIC CONCEPTS** **9**

Need for an analytical laboratory – Testing for the quality of raw material for end product quality – Testing for toxic substances, Basic chemical calculations and solution stoichiometry.

**UNIT II** **ANALYSIS OF CHEMICALS IN PRETREATMENT** **9**

Hardness of water – Determination procedure – Iron in water – pH of solution – Importance – Estimation of pH of a solution – Efficiency of desizing agents – Estimation of enzyme activity – Saponification – Analysis of oil for acid value and soap value, Iodine value – Efficiency of a wetting agent — Foam stability – Ionic nature of detergent Determination of available chlorine in Sodium Hypochlorite solution and determination of strength of hydrogen peroxide.

**UNIT III ANALYSIS OF CHEMICALS IN DYEING AND PRINTING 9**

Identification of dyes in powder form and from the dyed material. Estimation of the purity of dyes Estimation of the Efficiency of a cationic dye-fixing agent – Evaluation of leveling agent. Estimation of caustic and hydros contents in vat dye liquor – Evaluation of Carriers – Evaluation of dispersing agent for its dispersion stability – Evaluation of oxidising and reducing agents used in printing paste.

**UNIT IV ANALYSIS OF FINISHING CHEMICALS 9**

Types of textile softeners – Evaluation of cationic softeners by Methylene Blue method and Bromophenol Blue method – Evaluation of Bon-ionic softeners using ferric cyanide method and Phosphomolybdic acid method and Ammonium cobalt Thiocyanate method – Evaluation of anionic softeners – Evaluation of reactive softeners – Evaluation of Polyethylene emulsions by Estimating total solids and active content Evaluation different resins by test is the treated samples for total solids, total Formaldehyde and free Formaldehyde – Evaluation of fluorescent brightening agent.

**UNIT V EVALUATION OF COMMON CHEMICALS 9**

Estimation of the purity of the following chemicals, such as Hydrochloric acid, Sulfuric acid, Sodium Hydroxide, Sodium carbonate, Sodium Bicarbonate, Sodium Chloride and Sodium Sulphate – Estimation of Hydrogen peroxide content by iodimetry and permanaganometry – Estimation of the oxalic acid – Analysis of Potassium dichromate for total chromium content – Analysis of soap for moisture content unsaponifiable fat free alkyl and the total fatty acid – Estimation of Sodium hydro sulphate. Analysis of Sodium sulphide for its reducing power. Estimation of chemicals in mixtures viz Sodium carbonate/Sodium hydroxide and Sodium carbonate/Sodium bicarbonate

**TOTAL: 45 PERIODS**

**OUTCOMES:**

Upon completion of the course, the students will be able to

- Analyse textile fibres and chemicals used for wet processing textile materials
- Analyse chemicals used for dyeing, printing and finishing

**TEXT BOOK:**

1. Peters, A.T., and Freeman,H.S., (Ed), "Analytical chemistry of synthetic colorants", Blackie, London, 1994, ISBN:0751402087.
2. Shennai.V.A, "Organic Textile Chemicals", Sevak Publication, Bombay, 1995
3. Vaidya.A.A, "Chemistry of Textile auxiliaries", Wheeler Publishing, New Delhi,1999

**REFERENCE:**

1. Reife, A., and Freeman, H.S.,(Ed)., "Environmental chemistry of dyes and pigment", Wiley., London, 1993, ISBN: 047158276.
2. John Shore, Colourants & Auxiliaries: Wiley and Sons Ltd, New York, Volume I & II,1999

**TT8080**

**TEXTILE COSTING**

**L T P C  
3 0 0 3**

**OBJECTIVE:**

- To impart the knowledge of costing techniques used in manufacturing of apparel products.

<b>UNIT I</b>	<b>9</b>
Cost accounting, elements of cost, classification of cost elements – examples from spinning and weaving mill; standard costing, analysis of variance; breakeven analysis, cost volume profit analysis	
<b>UNIT II</b>	<b>18</b>
Costing of yarn – material, labour, power and overhead expenses; allocation of costs to yarns in spinning mill running with different counts; costing of fabrics	
<b>UNIT III</b>	<b>9</b>
Working capital management in spinning, weaving and chemical processing unit – determination, sources, cost; Budget, types of budgets, budgeting and control in textile unit	
<b>UNIT IV</b>	<b>9</b>
Detailed project report – elements, preparation for textile unit	

**TOTAL: 45 PERIODS**

**OUTCOMES:**

Upon completion of this course, the student shall be able to

- Calculate the cost garment
- Understand the concept of preparation of cost sheet, budget and breakeven analysis

**TEXT BOOKS:**

1. Johnson Maurice, E. Moore, “Apparel Product Development”, Om Book Service, 2001.
2. Katherin McKelvy, “Fashion Source Book”, Om Book Service, 2001.

**REFERENCES:**

1. Pandey I. M., “Financial Management”, 10<sup>th</sup> Edition, Vikas Publishing House Pvt. Ltd., New Delhi, 2010, ISBN: 8125937145 / ISBN: 978-8125937142
2. Prasanna Chandra., “Financial Management, Theory and Practice”, 8<sup>th</sup> Edition, Tata McGraw-Hill Publishing Company Ltd, New Delhi, 2011, ISBN: 0071078401 / ISBN: 978-0071078405
3. Aswat Damodaran., “Corporate Finance Theory and Practice”, John Wiley & Sons, 2001, ISBN: 0471283320 | ISBN-13: 9780471283324
4. James C., Van Home., “Financial Management and Policy”, 12<sup>th</sup> Edition Prentice Hall of India Pvt. Ltd., New Delhi, 2001, ISBN: 0130326577 | ISBN-13: 9780130326577
5. Thukaram Rao M.E., “Cost and Management Accounting” New Age International, Bangalore, 2004, ISBN: 812241513X / ISBN: 978-8122415131
6. Khan., and Jain, “Basic financial Management & Practice”, 7th Edition, Tata McGraw Hill, New Delhi, 2014, ISBN: 933921305X / ISBN: 978-9339213053

**GE8076**

**PROFESSIONAL ETHICS IN ENGINEERING**

**L T P C**  
**3 0 0 3**

**OBJECTIVE:**

- To enable the students to create an awareness on Engineering Ethics and Human Values, to instill Moral and Social Values and Loyalty and to appreciate the rights of others.

**UNIT I**

**HUMAN VALUES**

**10**

Morals, values and Ethics – Integrity – Work ethic – Service learning – Civic virtue – Respect for others – Living peacefully – Caring – Sharing – Honesty – Courage – Valuing time –

Cooperation – Commitment – Empathy – Self confidence – Character – Spirituality – Introduction to Yoga and meditation for professional excellence and stress management.

**UNIT II ENGINEERING ETHICS 9**

Senses of 'Engineering Ethics' – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Models of professional roles - Theories about right action – Self-interest – Customs and Religion – Uses of Ethical Theories.

**UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION 9**

Engineering as Experimentation – Engineers as responsible Experimenters – Codes of Ethics – A Balanced Outlook on Law.

**UNIT IV SAFETY, RESPONSIBILITIES AND RIGHTS 9**

Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk - Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) – Discrimination.

**UNIT V GLOBAL ISSUES 8**

Multinational Corporations – Environmental Ethics – Computer Ethics – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Moral Leadership – Code of Conduct – Corporate Social Responsibility.

**TOTAL: 45 PERIODS**

**OUTCOMES:**

- Upon completion of the course, the student should be able to apply ethics in society, discuss the ethical issues related to engineering and realize the responsibilities and rights in the society.

**TEXT BOOKS:**

1. Mike W. Martin and Roland Schinzinger, "Ethics in Engineering", Tata McGraw Hill, New Delhi, 2003.
2. Govindarajan M, Natarajan S, Senthil Kumar V. S, "Engineering Ethics", Prentice Hall of India, New Delhi, 2004.

**REFERENCES:**

1. Charles B. Fleddermann, "Engineering Ethics", Pearson Prentice Hall, New Jersey, 2004.
2. Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, "Engineering Ethics – Concepts and Cases", Cengage Learning, 2009.
3. John R Boatright, "Ethics and the Conduct of Business", Pearson Education, New Delhi, 2003
4. Edmund G Seebauer and Robert L Barry, "Fundamentals of Ethics for Scientists and Engineers", Oxford University Press, Oxford, 2001.
5. Laura P. Hartman and Joe Desjardins, "Business Ethics: Decision Making for Personal Integrity and Social Responsibility" Mc Graw Hill education, India Pvt. Ltd., New Delhi, 2013.
6. World Community Service Centre, "Value Education", Vethathiri publications, Erode, 2011.



**Web sources:**

1. [www.onlineethics.org](http://www.onlineethics.org)
2. [www.nspe.org](http://www.nspe.org)
3. [www.globalethics.org](http://www.globalethics.org)
4. [www.ethics.org](http://www.ethics.org)

**TT8792****TECHNICAL TEXTILES****L T P C****3 0 0 3****OBJECTIVE:**

- To enable the students to learn about production, properties & application of various technical textile products viz., tyre cords, fabrics, belts, filter fabrics and medical textiles.

**UNIT I HIGH PERFORMANCE FIBRE 9**

Manufacture of glass filaments and staple fibre - manufacture of staple fibre yarn properties and applications of filament and staple fibre yarns. Asbestos Thread: Manufacturing process - properties and applications of asbestos yarn. Ultra High Modulus fibres - Carbon fibres - Aramid and related fibres.

**UNIT II TYRE CORDS AND FABRICS 9**

Requirements of tyre cord - suitability of various fibres-Polyester and Nylon tyre cords - manufacture of tyre cords - physical and mechanical property requirements of tyre cord fabrics-fabric design - Specifications - Rubberised textiles.

**UNIT III BELTS 9**

Conveyor belts - physical and mechanical properties-construction, manufacture of conveyor belts & power transmission belts. HOSE: Construction, applications and properties (physical and mechanical).

**UNIT IV FILTER FABRICS 9**

General consideration of filtration of solids from liquids, solid from gases, solids from solids, liquids from liquids, liquids from gases and gases from gases. PROTECTIVE CLOTHING: Fire protection-thermal protection - electro-magnetic protection - water proof fabrics - protection against microorganisms, chemicals and pesticides - protection against aerosols.

**UNIT V MEDICAL TEXTILES 9**

Surgical Textiles - Suture threads, Cardio Vascular Textiles - Knitted cardiac biological valves. Dialysis Textiles- Hollow fibres as dialysis membrane. Hospital Textiles - Operation and post operation clothing—disposable draperies; sanitary applications. GEO-TEXTILES: Geo Textile functions - raw materials - woven, non-woven and knitted geo textiles Applications of geo-textiles for drainage, separation, soil reinforcement, filtration and erosion control. Textile materials in foot-wear, automotive, agriculture and maritime applications.

**TOTAL: 45 PERIODS****OUTCOMES:**

Upon completion of the course, the students will be able to

- Understand different high performance fibres and their properties
- Explain various method of production of technical textiles, their properties and applications

**TEXT BOOKS:**

1. Horrocks A. R., Anand S.C., "Handbook of Technical Textiles", Woodhead Publishing, Cambridge, 2000
2. Adanur S., "Handbook of Industrial Textiles", Technomic Publication, Lancaster, 2001

**REFERENCES:**

1. Kanna M.C., Hearle, O Hear., Design and manufacture of Textile Composites, Textile progress , Textile Institute, Manchester, April 2004.
2. Scott, Textile for production, Textile progress , Textile Institute, Manchester, Oct. 2005.
3. Shishoo, Textile in spot, Textile progress, Textile Institute, Manchester, Aug. 2005
4. Fung W., Collins & Aikman Textiles in Automotive Engineering ,Woodhead Publishing Ltd., UK, 2000.
5. Kennady, Anand Miraftab, Rajandran, Medical Textile & Biomaterials for Health care, Woodhead publishing Ltd., UK, 2005.

**TT8093**

**TEXTILE REINFORCED COMPOSITES**

**L T P C  
3 0 0 3**

**OBJECTIVES:**

- To acquire knowledge on constituents of composite materials
- To get exposure to various composite manufacturing technologies and testing of composites

**UNIT I COMPOSITES REINFORCEMENT AND MATRICES 9**

Composites: introduction – definition – classification based on reinforcement and matrix - constituents. Matrix: thermoplastic and thermosetting matrices – properties – limitations – comparison - applications. Reinforcement Types – MMC, CMC, PMC – properties – limitations applications. Textile Reinforcement Forms – fibre, roving, fabric, mat, braid, etc. - properties – applications. High performance fibres: aramid- glass – boron – carbon. Prepregs and Preforms: properties – manufacturing. Testing of Reinforcement and Matrices.

**UNIT II COMPOSITES MANUFACTURING TECHNOLOGIES 9**

Lay-up & Automatic lay-up: working principle – advantages – limitations – applications. Resin Transfer Moulding: principle of operation – resin system & injection – mold materials - resin flow strategies - advantages – limitations – applications. Filament winding: principle of working – geometry of winding – types of winding – mandrels - advantages – limitations – applications. Pultrusion: process equipments - principle of operation – pull forming - advantages – limitations – applications. Consolidation techniques: Vacuum bagging – Pressure bagging.

**UNIT III DESIGN OF STRUCTURE WITH COMPOSITES 9**

Interface: definition – conditions for good interfacial reactions - interface mechanisms - surface treatments. Design of Composites: material selection - configuration selection – design requirements – design load definitions – optimization concepts - laminate design.

**UNIT IV MECHANICS AND TESTING OF COMPOSITES 9**

Geometric and Physical definitions. Lamina and Laminate: definition - angle of orientation mass density and ply thickness, fibre volume fraction (FVF) - critical fibre length - rule of mixture. Fibre Composites: strength and failure – fracture toughness – fatigue – impact – delamination – moisture expansion – conductivity – damage and failure modes. Testing of Composites: Destructive testing: tensile - compression – bending - shear – impact – ignition loss & matrix digestion – accelerated weathering test.

**UNIT V APPLICATIONS OF COMPOSITES 9**

Land Transport Applications: Automotive applications – rail road applications – mass transit applications – military applications. Marine Applications: boats – large power yachts – sail boats – pressure hulls – sonar domes – fairings – control surfaces – decking – pipes. Industrial Applications: antennas – bridges – cable cars – electrical and electronics. Composite Biomaterials: orthopaedic implants – femoral components for total hip arthroplasty – bone cement, articulation components. Construction applications: rebars – prestressing – rehabilitation – platforms – pedestrian bridges – cooling towers. Other applications: aircrafts, sports goods and aerospace.

**TOTAL: 45 PERIODS**

**OUTCOMES:**

Upon completion of this course, the student shall be able to

- Select different types of textile reinforcements and matrices for the manufacture of composites for getting different characteristics and
- Evaluate the characteristics of composites

**TEXT BOOKS:**

1. S.T. Peters, Chapman & Hall, “Hand Book of Composites”, Second Edition, ISBN 0 412 54020 7, 1998.
2. Robert M.Jones, Taylor & Francis, “Mechanics of Composite Materials”, Second Edition, 1999.

**REFERENCES:**

1. Güneri Akovali, “Hand book of Composite Fabrication” Rapra technology Ltd., UK, ISBN: 1-85957-263-4, 2001.
2. Isaac M.Daniel, Ori Ishai, “Engineering mechanics of Composite Materials”, Oxford University Press, UK, 1994.
3. A. Brent Strong, “Fundamentals of Composites Manufacturing” Society of Manufacturing Engineers, 2008.
4. Mel M. Schwartz, “Composite materials handbook” McGraw-Hill, 1992.
5. Stuart M. Lee, “International encyclopedia of composites” VCH, 1999.

**TT8091**

**CLOTHING COMFORT**

**L T P C  
3 0 0 3**

**OBJECTIVES:**

To enable the students to learn about the

- Important characteristics of the fabric responsible for its comfort properties and
- Different phenomena which take place in the fabric related to the comfort properties of the fabric

**UNIT I**

**9**

Comfort – types and definition; human clothing system, comfort perception and preferences

**UNIT II**

**9**

Psychological comfort; neuro-physiological comfort-basis of sensory perceptions; measurement techniques - mechanical stimuli and thermal stimuli

**UNIT III**

**9**

Thermo physiological comfort – thermoregulatory mechanisms of the human body, role of clothing on thermal regulations

**UNIT IV** **9**  
Heat and moisture transfer – moisture exchange, wearer’s temperature regulations, effect of physical properties of fibres, behaviour of different types of fabrics

**UNIT V** **9**  
Fabric tactile and mechanical properties - fabric prickliness, itchiness, stiffness, softness, smoothness, roughness, and scratchiness; predictability of clothing comfort performance

**TOTAL: 45 PERIODS**

**OUTCOMES:**

Upon completion of this course, the student shall be able to

- Understand different phenomena such as perception of comfort, fabric mechanical properties and, heat and moisture interaction and
- Correlate the property of the fabric with comfort to the wearer

**TEXT BOOKS:**

1. Apurba Das., and Alagirusamy R., “Science in clothing comfort”, Wood head Publishing India Pvt. Ltd., India, 2010, ISBN: 1845697898 | ISBN-13: 9781845697891
2. Guowen Song., “Improving comfort in clothing”, Wood head Publishing Ltd., UK, 2011, ISBN: 1845695399 | ISBN-13: 9781845695392
3. Ukponmwan J.O., “The Thermal-insulation Properties of Fabrics”, Textile Progress 24:4, 1-54, Taylor and Francis, UK, 1993, ISBN: 1870812654 | ISBN-13: 9781870812658.

**REFERENCES:**

1. Hassan M. Behery., “Effect of Mechanical and Physical Properties on Fabric Hand”, Wood head Publishing Ltd.,2005, ISBN: 1855739186 | ISBN-13: 9781855739185
2. Li Y., “The Science of Clothing Comfort”, Textile Progress 31:1-2, Taylor and Francis, UK, 2001, ISBN: 1870372247 | ISBN-13: 9781870372244
3. Laing R.M., and Sleivert G.G., “Clothing, Textile and Human Performance” Textile Progress 32:2, The Textile Institute, 2002, ISBN: 1870372514 | ISBN-13: 9781870372510.

**TT8081** **TEXTILE EXIM MANAGEMENT** **L T P C**  
**3 0 0 3**

**OBJECTIVE:**

- To give the students an exposure on international market for textile products, regulations with respect to export and import of textiles

**UNIT I** **5**  
International markets for yarns, woven fabrics; international market for cotton, silk, jute, wool and other fibres; export and import of textiles by India – current status, promotional activities

**UNIT II** **5**  
International markets for carpets and home textiles – product types, market potential and statistics, India - current status and promotional activities, role of export promotional councils

**UNIT III** **9**

International markets for woven piece goods, knitted garments, leather garments; statistics of international apparel market and trade; export incentives, role of AEPC, CII, FIEO, Textile Committee

**UNIT IV** **13**

Marketing – strategies, global brand building; logistics & SCM; role of export finances & EXIM banking, ECGC, Indian council of arbitration, FERA; impact of foreign trade on Indian economy

**UNIT V** **13**

Exim policy - customs act, acts relating to export/import of textile and apparel; Indian customs formalities - export documentation for excisable goods, import documentation, clearance of import goods; concepts - 100% export oriented units, export processing zones, special economic zones; duty drawback procedure; import/export incentives; licenses; case study

**TOTAL: 45 PERIODS**

**OUTCOMES:**

Upon completion of this course, the student shall have the knowledge on

- International market for textile products
- Global marketing strategies and
- EXIM policy and procedures

**TEXT BOOKS:**

1. Charles W.I. Hill and Arun Kumar Jain, "International Business", 6th edition, Tata Mc Graw Hill, 2009
2. John D. Daniels and Lee H. Radebaugh, "International Business", Pearson Education Asia, New Delhi, 2000
3. K. Aswathappa, "International Business", Tata Mc Graw Hill, 2008

**REFERENCES:**

1. Michael R. Czinkota, IlkkaA. Ronkainen and Michael H. Moffet, "International Business", Thomson, Bangalore, 2005
2. Aravind V. Phatak, Rabi S. Bhagat and Roger J. Kashlak, "International Management", Tata Mc Graw Hill, 2006
3. Oded Shenkar and Yaong Luo, "International Business", John Wiley Inc., Noida, 2004
4. Datey V.S., "Taxmann's Indirect Taxes", Taxmann Publications, 2008
5. Kapoor D.C., "Export Management", Vikas Publishing House Pvt. Ltd., 2009
6. Govindan N.S., "Indirect Taxes Made Easy", C.Sitaram & Co. Pvt.,

**GE8075**

**INTELLECTUAL PROPERTY RIGHTS**

**L T P C**

**3 0 0 3**

**OBJECTIVE:**

- To give an idea about IPR, registration and its enforcement.

**UNIT I INTRODUCTION**

**9**

Introduction to IPRs, Basic concepts and need for Intellectual Property - Patents, Copyrights, Geographical Indications, IPR in India and Abroad – Genesis and Development – the way from WTO to WIPO –TRIPS, Nature of Intellectual Property, Industrial Property, technological Research, Inventions and Innovations – Important examples of IPR.

**UNIT II REGISTRATION OF IPRs**

**10**

Meaning and practical aspects of registration of Copy Rights, Trademarks, Patents, Geographical Indications, Trade Secrets and Industrial Design registration in India and Abroad

**UNIT III AGREEMENTS AND LEGISLATIONS 10**

International Treaties and Conventions on IPRs, TRIPS Agreement, PCT Agreement, Patent Act of India, Patent Amendment Act, Design Act, Trademark Act, Geographical Indication Act.

**UNIT IV DIGITAL PRODUCTS AND LAW 9**

Digital Innovations and Developments as Knowledge Assets – IP Laws, Cyber Law and Digital Content Protection – Unfair Competition – Meaning and Relationship between Unfair Competition and IP Laws – Case Studies.

**UNIT V ENFORCEMENT OF IPRs 7**

Infringement of IPRs, Enforcement Measures, Emerging issues – Case Studies.

**TOTAL:45 PERIODS**

**OUTCOME:**

- Ability to manage Intellectual Property portfolio to enhance the value of the firm.

**TEXT BOOKS:**

1. V. Scople Vinod, Managing Intellectual Property, Prentice Hall of India pvt Ltd, 2012
2. S. V. Satakar, "Intellectual Property Rights and Copy Rights, Ess Ess Publications, New Delhi, 2002

**REFERENCES:**

1. Deborah E. Bouchoux, "Intellectual Property: The Law of Trademarks, Copyrights, Patents and Trade Secrets", Cengage Learning, Third Edition, 2012.
2. Prabuddha Ganguli,"Intellectual Property Rights: Unleashing the Knowledge Economy", McGraw Hill Education, 2011.
3. Edited by Derek Bosworth and Elizabeth Webster, The Management of Intellectual Property, Edward Elgar Publishing Ltd., 2013.

**TT8791 OPERATIONS RESEARCH IN TEXTILE INDUSTRY L T P C  
3 0 0 3**

**OBJECTIVES:**

To enable the students to learn about

- Various operations research (OR) methods that can be applied in the textile industry
- Designing of OR problem related to textile industry
- Method of solving OR problems

**UNIT I 9**

Scope of operation research, applications, limitations; linear programming problems – construction, solutions by graphical method, simplex method, Big M method; sensitivity analysis; application of LP technique for mixing optimization in spinning mill

**UNIT II 9**

Transportation problem – construction, initial basic feasible solution – North West Corner rule, lowest cost entry method, Vogel's Approximation Method; optimality test - ... method, stepping stone method; replacement analysis

**UNIT III 9**

Assignment problem – construction, solution by Hungarian method, application in textile industry; sequencing problems; integer programming – construction, solving by cutting plane method

**UNIT IV** **9**

Decisions theory - decisions under assumed certainty, decision under risk, decision under uncertainty, illustrations from textile industry; inventory control - EOQ models-deterministic models –probabilistic models, simulation theory, models, queuing system.

**UNIT V** **9**

Project planning and control models: CPM, PERT – network representation, determining critical path, project duration; crashing of project duration; resource leveling

**TOTAL: 45 PERIODS**

**OUTCOMES:**

Upon completion of the course, the students will be able to

- Design operations research problems that can be applied to textile industry.
- Solve the OR problems

**TEXT BOOKS:**

1. Hamdy A Taha, "An Introduction to Operations Research, Prentice Hall, 8<sup>th</sup> Edition.
2. Panneerselvam R., "Operations Research", Prentice Hall of India, 2002
3. Sharma J. K., "Operations Research: Theory and Applications", Macmillan, 1997

**REFERENCES:**

1. Hillier and Lieberman, "Introduction to Operations Research", McGraw-Hill International Edition, Seventh Edition, 2001
2. W.J. Fabrycky, P.M. Ghare & P.E. Torgersen, "Applied Operation Research and Management Science" Prentice Hall, New Jersey, 1984
3. Tulsian P.C., "Quantitative Techniques Theory and Problems", Dorling Kindersley (India) Pvt. Ltd., 2006
4. Ronald L. Rardin, "Optimization in Operations Research", Pearson Education, 1998
5. Srivastava U.K., Shenoy G.V., Sharma S. C., "Quantitative Techniques for Managerial Decision", Second Edition, New Age International (P) Ltd., 2007
6. Gupta P. K., Hira D.S., "Problems in Operations Research", S. Chand & Company, 2002
7. Mustafi C.K., "Operations Research: Methods and Practice", 3<sup>rd</sup> Edition, New Age International (P) Ltd., 2007

**TC8003** **NONWOVEN FABRICS AND SPECIALITY FABRICS** **L T P C**  
**3 0 0 3**

**OBJECTIVES:**

To enable the students to learn about

- Production of fabrics by different non woven technologies
- Finishing and testing non woven and to expose the students to specialty fabrics, their construction and applications

**UNIT I** **INTRODUCTION** **9**

Definition - Classification - Nonwoven manufacturing processes. Raw materials - Binders. Web forming - Lay process. Extrusion nonwovens-spun laying, spun bonding. Dry and wet lay process - Types - Raw materials - Fibre preparation - Process variables - Properties.





- To enable the students to learn about the working principles of wet processing machineries.
- To enable the students to know about the operations of machines and its maintenance schedules
- To expose the students to latest wet processing machineries

**UNIT I** **9**

Advances in continuous processing of cotton and wool materials - - Advances in heating systems hank and yarn dyeing machines(cheese and warp) - importance of winding in yarn dyeing — calculation of winding density - detailed maintenance schedule for cheese dyeing machines.

**UNIT II** **9**

Advances in Beam dyeing - Advances in soft flow, over flow, jet dyeing machines — Developments in jiggers,—Detail maintenance schedule for beam dyeing, jet dyeing and jiggers.

**UNIT III** **9**

Detail study and developments in vertical drying ranges - RF dryer, yarn dryer, tubular & open width knitted fabric dryer, Tumble dryer, developments in balloon padding, hydro extractor, rope opener, maintenance schedule for the above machines. Heating systems for hot air stenters, Clip & pin type of stenters; Jig stenters — over feeding system and its importance - Hot flue dryer — float dryer — maintenance schedule for the above machines.

**UNIT IV** **9**

Developments in preparation of screens for roller, rotary, flat bed screen printing machines. Principle and working of fully automatic flat bed screen printing machine – with programmer line diagram and its advantages - developments in agers - Developments in garment printing machines - various practical problems & possible remedies, Transfer printing machines and dyeing.

**UNIT V** **9**

Developments in finishing machineries — Calenders, sanforising machine, Back-filling machine, maintenance schedule for the above machineries. Shop floor problems & possible remedies in finishing department, Sand blasting machine, Peach finishing, Raising, Shearing machines.

**TOTAL: 45 PERIODS**

**OUTCOMES:**

Upon completion of this course, the student shall be able to

- Understand about the advances in wet processing of textile materials
- Understand about advanced wet processing machinery used in the industry

**TEXT BOOKS:**

1. Gokhle S.V. and Dhingra A.K., “Maintenance in Chemical Processing Department of Textile Mills”, , ATIRA, Ahmedabad,1984.
2. R.S.Bhagwat, “Development in Textile Processing Machines” Colour Publications pvt.Ltd, 2000.

**REFERENCES:**

1. Datye. K.V. and Vaidya. A.A., Chemical Processing of Synthetic fibres and blends, John Wiley & Sons, New York.1995
2. Chakravarth. R.R. Technology of Bleaching and Dyeing of Textile Fibres, Vol. 1 Part 2, , Mahajan Book Distributors, Ahmedabad. 1982

3. Usenko.V. Processing of Manmade Fibres, MIR Publishers, Moscow. 1995
4. Shirley Institute, Jet dyeing Machines, Shirley Institute Publications, (S 33),U.K.1981
5. Shenai V.A. Technology of Textile Processing, Sevak Publication, 306, Sri Hanuman Industrial Estate, GD Ambedkar Road, Wadala, Bombay.1995
6. Cegarra,J., Puente,P., and Valdeperas,J., "The dyeing of Textile materials", The Text. Inst., Manchester, 1998, ISBN: 1870812581.
7. Viallier,P., "Heat transfers in Textile finishing industry", Eurotex, 1991, Blackwells Bookshop, Leeds, U.K.

**TC8005 ENERGY MANAGEMENT AND CONSERVATION IN TEXTILE INDUSTRY**

**L T P C**  
**3 0 0 3**

**OBJECTIVES:**

To enable the students to learn about

- Consumption of energy at various sectors of textile industries
- Techniques of saving energy

**UNIT I SOURCES OF ENERGY 9**

Limitations of Natural resources. Unexploited energy sources and problems in their exploitation. Concept of energy management - need for energy conservation- global energy scenario with specific reference to India -Demand side Management (DSM).

**UNIT II ENERGY CONSUMPTION 9**

Spinning – Weaving – Knitting - Processing – Garmenting. Auxiliary machineries Component wise consumption - Specific energy consumption (UKG) - Cost of energy Vs sales value of textile product. Conservation of energy.

**UNIT III ENERGY AUDIT 9**

Concept - Types of audit - Instrumentation - methodology - analysis. Electrical and Thermal audit

**UNIT IV ENERGY CONSERVATION 9**

Techniques of energy saving: Energy efficient equipments for various processing machines and ancillaries – Preparatory – Spinning - Post Spinning - Weaving Wet Processing - Humidification/Air conditioning – Lighting – Compressors - Boilers – Generators. Different types of fuels. Economics of energy conservation techniques.

**UNIT V NON-CONVENTIONAL ENERGY SOURCES 9**

Solar energy: Different type of collectors – Photovoltaic cell - Wind energy - Bio energy - cogeneration. Environmental impact on energy. Analog - Digital - Computerized instruments Measurement techniques. Maintenance of instruments.

**TOTAL: 45 PERIODS**

**OUTCOME:**

- Upon completion of this course, the student would understand the consumption of energy at different stage of processing, energy audit procedure, energy conservation and different types of non conventional energy sources available.

**TEXT BOOKS:**

1. Energy Conservation in Textile Industry, SITRA, 1985
2. Vallier,P," Energy uses in the Textile Finishing Industry", Eurotex, 1990

3. Palaniappan C et al, "Renewable Energy Applications to Industries", Narose Publishing House, 1998.

#### REFERENCES:

1. Proceedings of International Seminar cum Exhibition ASIA Energy Vision 2020" - sustainable energy supply, November 15-17, 1996.
2. Proceedings of the Seminar, "Strategies for Sustainability of Energy Efficient and Environmental Friendly Technologies in Small and Medium Scale Sector", PSG College of Technology, November 24, 2000.
3. Pradeep Chaturvedi & Shaltni Joshi," Strategy for Energy Conservation in India", Concept Publishing Co. , 1995. Heat economy in Textile mills", ATIRA, Ahmedabad, 1996.
4. Energy conservation in Textile Industry", SITRA, Coimbatore, 1997.
5. Vallier, P., "Energy uses in the textile finishing industry", Eurotex, 1999.
6. Sang Yang Kim, Grady, P.L. and Hersh, S.P., "Energy consumption and conservation in the fibre producing and textile industry", Textile Progress , Vol. 13, No.3, Textile Inst., Manchester, 1983.

**GE8071**

**DISASTER MANAGEMENT**

**L T P C**

**3 0 0 3**

#### OBJECTIVES:

- To provide students an exposure to disasters, their significance and types.
- To ensure that students begin to understand the relationship between vulnerability, disasters, disaster prevention and risk reduction
- To gain a preliminary understanding of approaches of Disaster Risk Reduction (DRR)
- To enhance awareness of institutional processes in the country and
- To develop rudimentary ability to respond to their surroundings with potential disaster response in areas where they live, with due sensitivity

#### **UNIT I INTRODUCTION TO DISASTERS 9**

Definition: Disaster, Hazard, Vulnerability, Resilience, Risks – Disasters: Types of disasters – Earthquake, Landslide, Flood, Drought, Fire etc - Classification, Causes, Impacts including social, economic, political, environmental, health, psychosocial, etc.- Differential impacts- in terms of caste, class, gender, age, location, disability - Global trends in disasters: urban disasters, pandemics, complex emergencies, Climate change- Dos and Don'ts during various types of Disasters.

#### **UNIT II APPROACHES TO DISASTER RISK REDUCTION (DRR) 9**

Disaster cycle - Phases, Culture of safety, prevention, mitigation and preparedness community based DRR, Structural- nonstructural measures, Roles and responsibilities of- community, Panchayati Raj

Institutions/Urban Local Bodies (PRIs/ULBs), States, Centre, and other stake-holders- Institutional Processes and Framework at State and Central Level- State Disaster Management Authority(SDMA) – Early Warning System – Advisories from Appropriate Agencies.

#### **UNIT III INTER-RELATIONSHIP BETWEEN DISASTERS AND DEVELOPMENT 9**

Factors affecting Vulnerabilities, differential impacts, impact of Development projects such as dams, embankments, changes in Land-use etc.- Climate Change Adaptation- IPCC Scenario

and Scenarios in the context of India - Relevance of indigenous knowledge, appropriate technology and local resources.

**UNIT IV DISASTER RISK MANAGEMENT IN INDIA 9**

Hazard and Vulnerability profile of India, Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management, Institutional arrangements (Mitigation, Response and Preparedness, Disaster Management Act and Policy - Other related policies, plans, programmes and legislation – Role of GIS and Information Technology Components in Preparedness, Risk Assessment, Response and Recovery Phases of Disaster – Disaster Damage Assessment.

**UNIT V DISASTER MANAGEMENT: APPLICATIONS AND CASE STUDIES AND FIELD WORKS 9**

Landslide Hazard Zonation: Case Studies, Earthquake Vulnerability Assessment of Buildings and Infrastructure: Case Studies, Drought Assessment: Case Studies, Coastal Flooding: Storm Surge Assessment, Floods: Fluvial and Pluvial Flooding: Case Studies; Forest Fire: Case Studies, Man Made disasters: Case Studies, Space Based Inputs for Disaster Mitigation and Management and field works related to disaster management.

**TOTAL: 45 PERIODS**

**OUTCOMES:**

The students will be able to

- Differentiate the types of disasters, causes and their impact on environment and society
- Assess vulnerability and various methods of risk reduction measures as well as mitigation.
- Draw the hazard and vulnerability profile of India, Scenarios in the Indian context, Disaster damage assessment and management.

**TEXT BOOKS:**

1. Singhal J.P. "Disaster Management", Laxmi Publications, 2010. ISBN-10: 9380386427 ISBN-13: 978-9380386423
2. Tushar Bhattacharya, "Disaster Science and Management", McGraw Hill India Education Pvt. Ltd., 2012. **ISBN-10:** 1259007367, **ISBN-13:** 978-1259007361]
3. Gupta Anil K, Sreeja S. Nair. Environmental Knowledge for Disaster Risk Management, NIDM, New Delhi, 2011
4. Kapur Anu Vulnerable India: A Geographical Study of Disasters, IIAS and Sage Publishers, New Delhi, 2010.

**REFERENCES:**

1. Govt. of India: Disaster Management Act , Government of India, New Delhi, 2005
2. Government of India, National Disaster Management Policy,2009.

**TT8073 ECO - FRIENDLY DYES, CHEMICALS AND PROCESSING L T P C  
3 0 0 3**

**OBJECTIVES:**

- To impart knowledge about the environmental and ecological aspects of various chemicals, dyes and auxiliaries used in processing.

- To make the students aware of the alternative chemicals and dyes that can replace the harmful chemicals.
- To update the students on the various rules, regulation that governs the textile processing industry.

**UNIT I INTRODUCTION 9**

Need – Concepts – Environmental Issues – Eco Standards. Environmental friendly fibres – Harmful substances in natural fibres – Eco-standards. Banned amines and toxic substances – Sources of contaminations – Approaches for Eco-processing: Reduce – Recycle – Reuse.

**UNIT II ECO-FRIENDLY PREPARATION, DYEING, PRINTING AND FINISHING 9**

Eco-friendly fabric preparation methods – Solvent assisted preparation – ozone bleaching – peracetic acid. Hazardous nature of synthetic dyes – types of hazards – alternative dyes. Ecofriendly chemicals and auxiliaries in dyeing and finishing: Reducing agents – oxidizing chemical – thickeners – sequestering agents – biosurfactants. Eco-friendly finishing chemicals: Cross-linking treatment – formaldehyde free chemicals – softeners – biopolishing – flame retardant finish – preservatives.

**UNIT III ECO-AUDIT 9**

Eco-audit – Procedure – Environmental Impact Assessment – Sampling methods – Audit methods. Reduction of pollution by prevention – Eco-testing. Environment Management System – Developments – ISO 14000 - Concepts – Clauses – Certifying bodies - Certification. Occupational safety and Hazards: OHSAS 18000 – Concepts – Clauses – Certification Methods. Introduction to Social Accountability 8000.

**UNIT IV ECO-NORMS AND ECO-LABELING 9**

Need – Assessment of toxicity - Norms for toxic chemicals: Carriers – Emulsions - Formaldehyde – Pesticides – Amines – Halogenated compounds - Heavy metals – Inorganic chemicals. Norms for baby clothing and adult clothing. Eco-labelling – Trademarks - Toxic substances in textile processing – Precautions – Assessment – Standards - Certifying Bodies.

**UNIT V TESTING OF ECO-PARAMETERS 9**

Instrumental Analysis – Chromatographic Methods – Spectroscopy – Inductively Coupled Plasma. Detectors: Flame & photo ionization – electron capture – Thermal conductivity – Flame photometer. Interpretation of test results.

**TOTAL: 45 PERIODS**

**OUTCOME:**

- The study of this course would help the students to understand and comprehend the human and environmental hazards involved in day to day production activities in a textile wet processing mill. This also helps and supports the students in making socially responsible and economically viable solutions

**TEXT BOOKS:**

1. Chavan R.B., Radhakrishnan J., Environmental Issues - Technology Options for Textile Industry, IIT Delhi Publication, 1998
2. Reife A and Freeman H.S., Environmental Chemistry of dyes and pigments, Wiley, 2001, ISBN: 0471589276

**REFERENCES:**

1. Asokan R., Eco-Friendly Textile Wet Processing, NCUTE Publications, New Delhi, 2001

2. Eco friendly Textiles: Challenges to the Textile Industry, Textiles Committee, Mumbai, 1996.

**TT8072**

**COATED TEXTILES**

**L T P C**  
**3 0 0 3**

**OBJECTIVE:**

- To enable the students to understand need for coating of textiles, different methods of coating of textile fabrics

**UNIT I**

**9**

Rubber—Natural and Synthetic- Polyvinyl Chloride- Polyurethanes-Acrylic Polymers-Adhesive Treatment-Radiation-Cured Coatings Materials and Trends- Textile Fibers- Spinning- Woven Fabrics- Knitted Fabrics, Nonwoven Fabrics

**UNIT II**

**9**

Rheological Behavior of Fluids- Rheology of Plastics-Hydrodynamic Analysis of Coating, Clothing Comfort- Impermeable Coating-Breathable Fabrics

**UNIT III**

**9**

Coating Features -Methods of Coating- Knife Coating- Roll Coating-Dip Coating-Transfer Coating- Rotary Screen Printing- Calendering-Hot-melt Coating, General Characteristics Tensile Strength- Elongation- Adhesion- Tear Resistance-Weathering Behavior-Microbiological Degradation-Yellowing

**UNIT IV**

**9**

Synthetic Leather, Architectural Textiles, Fluid Containers, Tarpaulins, Automotive Air Bag Fabrics, Carpet Backing-Textile Foam Laminates for Automotive Interiors, Flocking, Fabrics for Chemical Protection-Thermochromic Fabrics, Temperature Adaptable Fabrics, Camouflage Nets Metal and Conducting Polymer-Coated Fabrics.

**UNIT V**

**9**

Test methods for coated fabric evaluation; environmental norms for the chemicals used in coating industry.

**TOTAL: 45 PERIODS**

**OUTCOMES:**

Upon completion of this course, the students would be able to understand

- Need of coating of textiles for different applications
- Methods of coating of textiles
- Testing of coated fabrics

**TEXT BOOKS:**

1. Fung. W., "Coated and Laminated Textiles", Wood head Publishing Limited., Cambridge., 2002., ISBN: 1 85573 576 8
2. Ghosh. S. K., "Functional Coatings", Wiley-VCH Verlag, GmbH & Co. KGaA, Weinheim, 2006, ISBN:3-527-31296-X 69
3. Guneu Akovali., Diveswar Banerjee., Sen A. K., and Dipak K. Setua., "Advances in polymer coated textiles", SmithersRapra, 2012
4. Ashish Kumar Sen., "Coated Textiles: Principles and Application", Technomic Publication, U.S.A., 2007, ISBN: 1420053450 | ISBN-13: 9781420053456

**REFERENCES:**

1. Sen A.K., "Coated Textiles: Principles and Application", Technomic Publication, U.S.A., 2001
2. W. C. Smith, "Journal of Coated Fabrics", Vol. 15, Jan., 1986, pp. 180–197
3. Mary Jo Waters, "Laboratory Methods for Evaluating Protective Clothing System Against Chemical Agents", Report no. CRDC-SP 84010, CRDC, Aberdeen Proving Ground, MD, U.S.A, 1984

**TT8077**

**MEDICAL TEXTILES**

**L T P C**

**3 0 0 3**

**OBJECTIVES:**

After successful completion of this course, the students should be able to

- Outline on medical textile industry
- Explain properties, types, applications of implantable, non-implantable and drug delivery textiles
- Discuss on property requirements, applications and testing of biopolymers and Tissue engineering
- Summarize different types and its properties of wound care and reusable medical textiles
- Compare the characteristics of different smart medical textiles and its applications.

**UNIT I INTRODUCTION 9**

Medical textiles – classification, current market scenario in international and national level – government initiatives; antimicrobial fibres and finishes; nano fibrous materials and films; super absorbent polymers; operating room garments; personal health care and hygiene products and their testing methods; applications of non-wovens in medicine; textiles in infection prevention control.

**UNIT II BIOPOLYMERS, TESTING AND TISSUE ENGINEERING 9**

Biopolymers: classification and their properties, requirements, and applications, testing methods; In vitro tests – direct contact, agar diffusion & elution methods – in vivo assessment of tissue compatibility. Tissue engineering: properties and materials of scaffolds- relationship between textile architecture and cell behavior – applications of textile scaffolds in tissue engineering.

**UNIT III IMPLANTABLES, NON-IMPLANTABLES AND DRUG DELIVERY 9**

Bandages-types, properties and applications; compression garments-types, properties and applications; sutures: types and properties; implantable textiles: hernia mesh – vascular prostheses – stents; Extra corporeal materials: Cartilage nerves – liver ligaments, kidney, tendons, cornea; Drug delivery textiles: classification – mechanism various fabrication methods – characterization – applications.

**UNIT IV WOUND CARE AND REUSABLE MEDICAL TEXTILES 9**

Wound: types and healing mechanism- textile materials for wound dressing – bio active dressing – anti microbial textiles dressing – composite dressing – testing of wound care materials; Wound compression textiles; Reusable medical textiles: types, advantages, physical properties and performance — reusable processing methods.

**UNIT V SMART MEDICAL TEXTILES AND LEGAL ISSUES 9**

Smart textiles – types, characteristics – smart textiles in wound care; applications of phase change and shape memory materials – monitoring pregnancy, children and cardio patients – mobile health monitoring ; electronics in medical textiles; Smart textiles in rehabilitation and

applications; textile sensors for healthcare ;legal and ethical values involved in the medical textile materials.

**TOTAL: 45 PERIODS**

**OUTCOMES:**

Upon completion of this course, the student shall know the

- Types of materials available for biomedical applications
- Functional requirements of textile structures for specific end use and
- Selection and characterization of textile materials used for biomedical applications

**TEXT BOOKS:**

1. Allison Mathews and Martin Hardingham , “Medical and Hygiene Textile Production - A Hand Book”, Intermediate Technology Publications, 1994
2. Anand S.C., Kennedy J.F. Miraftab M. and Rajendran S., “Medical Textiles and Biomaterials for Health Care”, Wood head Publishing Ltd., 2006
3. Joon B. Park. and Joseph D. Bronzino., “Biomaterials – Principles and Applications”, CRC Press Boca Raton London, NewYork, Washington, D.C. 2002

**REFERENCES:**

1. Anand S., “ Medical Textiles”, Textile Institute, 1996, ISBN: 185573317X
2. Horrocks A.R. and Anand S.C., “Technical Textiles”, Textile Institute, 1999, ISBN: 185573317X
3. Adanur S., “Wellington Sears Handbook of Industrial Textiles”, Technomic Publishing Co. Inc., Lancaster Pennsylvania, 1995, ISBN 1-56676-340-1
4. Michael Szycher and Steven James Lee, “Modern Wound Dressing: A Systematic Approach to Wound Healing”, Journal of Biomaterials Applications, 1992.

**GE8074**

**HUMAN RIGHTS**

**L T P C**  
**3 0 0 3**

**OBJECTIVE:**

- To sensitize the Engineering students to various aspects of Human Rights.

**UNIT I**

**9**

Human Rights – Meaning, origin and Development. Notion and classification of Rights – Natural, Moral and Legal Rights. Civil and Political Rights, Economic, Social and Cultural Rights; collective / Solidarity Rights.

**UNIT II**

**9**

Evolution of the concept of Human Rights Magana carta – Geneva convention of 1864. Universal Declaration of Human Rights, 1948. Theories of Human Rights.

**UNIT III**

**9**

Theories and perspectives of UN Laws – UN Agencies to monitor and compliance.

**UNIT IV**

**9**

Human Rights in India – Constitutional Provisions / Guarantees.

**UNIT V**

**9**

Human Rights of Disadvantaged People – Women, Children, Displaced persons and Disabled persons, including Aged and HIV Infected People. Implementation of Human Rights – National and State Human Rights Commission – Judiciary – Role of NGO’s, Media, Educational Institutions, Social Movements.

**TOTAL: 45 PERIODS**



**OUTCOME:**

- Engineering students will acquire the basic knowledge of human rights.

**REFERENCES:**

1. Kapoor S.K., "Human Rights under International law and Indian Laws", Central Law Agency, Allahabad, 2014.
2. Chandra U., "Human Rights", Allahabad Law Agency, Allahabad, 2014.
3. Upendra Baxi, The Future of Human Rights, Oxford University Press, New Delhi.

**GE8077**

**TOTAL QUALITY MANAGEMENT**

**L T P C**  
**3 0 0 3**

**OBJECTIVE:**

- To facilitate the understanding of Quality Management principles and process.

**UNIT I INTRODUCTION 9**

Introduction - Need for quality - Evolution of quality - Definitions of quality - Dimensions of product and service quality - Basic concepts of TQM - TQM Framework - Contributions of Deming, Juran and Crosby - Barriers to TQM - Customer focus - Customer orientation, Customer satisfaction, Customer complaints, Customer retention.

**UNIT II TQM PRINCIPLES 9**

Leadership - Quality Statements, Strategic quality planning, Quality Councils - Employee involvement - Motivation, Empowerment, Team and Teamwork, Recognition and Reward, Performance appraisal - Continuous process improvement - PDCA cycle, 5S, Kaizen - Supplier partnership - Partnering, Supplier selection, Supplier Rating.

**UNIT III TQM TOOLS AND TECHNIQUES I 9**

The seven traditional tools of quality - New management tools - Six sigma: Concepts, Methodology, applications to manufacturing, service sector including IT - Bench marking - Reason to bench mark, Bench marking process - FMEA - Stages, Types.

**UNIT IV TQM TOOLS AND TECHNIQUES II 9**

Quality Circles - Cost of Quality - Quality Function Deployment (QFD) - Taguchi quality loss function - TPM - Concepts, improvement needs - Performance measures.

**UNIT V QUALITY MANAGEMENT SYSTEM 9**

Introduction—Benefits of ISO Registration—ISO 9000 Series of Standards—Sector-Specific Standards—AS 9100, TS16949 and TL 9000-- ISO 9001 Requirements—Implementation—Documentation—Internal Audits—Registration--**ENVIRONMENTAL MANAGEMENT SYSTEM:** Introduction—ISO 14000 Series Standards—Concepts of ISO 14001—Requirements of ISO 14001—Benefits of EMS.

**TOTAL: 45 PERIODS**

**OUTCOME:**

- The student would be able to apply the tools and techniques of quality management to manufacturing and services processes.

**TEXT BOOK:**

1. Dale H.Besterfield, Carol B.Michna,Glen H. Besterfield,Mary B.Sacre,Hemant Urdhwareshe and Rashmi Urdhwareshe, "Total Quality Management", Pearson Education Asia, Revised Third Edition, Indian Reprint, Sixth Impression, 2013.

**REFERENCES:**

1. James R. Evans and William M. Lindsay, "The Management and Control of Quality", 8<sup>th</sup> Edition, First Indian Edition, Cengage Learning, 2012.
2. Janakiraman. B and Gopal .R.K., "Total Quality Management - Text and Cases", Prentice Hall (India) Pvt. Ltd., 2006.
3. Suganthi.L and Anand Samuel, "Total Quality Management", Prentice Hall (India) Pvt. Ltd., 2006.
4. ISO9001-2015 standards

<b>GE8072</b>	<b>FOUNDATION SKILLS IN INTEGRATED PRODUCT DEVELOPMENT</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**OBJECTIVES:**

- To understand the global trends and development methodologies of various types of products and services
- To conceptualize, prototype and develop product management plan for a new product based on the type of the new product and development methodology integrating the hardware, software, controls, electronics and mechanical systems
- To understand requirement engineering and know how to collect, analyze and arrive at requirements for new product development and convert them in to design specification
- To understand system modeling for system, sub-system and their interfaces and arrive at the optimum system specification and characteristics
- To develop documentation, test specifications and coordinate with various teams to validate and sustain up to the EoL (End of Life) support activities for engineering customer

**UNIT I FUNDAMENTALS OF PRODUCT DEVELOPMENT 9**

**Global Trends Analysis and Product decision** - Social Trends - Technical Trends- Economical Trends - Environmental Trends - Political/Policy Trends - **Introduction to Product Development Methodologies and Management** - Overview of Products and Services - Types of Product Development - Overview of Product Development methodologies - Product Life Cycle – Product Development Planning and Management.

**UNIT II REQUIREMENTS AND SYSTEM DESIGN 9**

**Requirement Engineering** - Types of Requirements - Requirement Engineering - traceability Matrix and Analysis - Requirement Management - **System Design & Modeling** - Introduction to System Modeling - System Optimization - System Specification - Sub-System Design - Interface Design.

**UNIT III DESIGN AND TESTING 9**

**Conceptualization** - Industrial Design and User Interface Design - Introduction to Concept generation Techniques – **Challenges in Integration of Engineering Disciplines** - Concept Screening & Evaluation - **Detailed Design** - Component Design and Verification – **Mechanical, Electronics and Software Subsystems** - High Level Design/Low Level Design of S/W Program - Types of Prototypes, S/W Testing- Hardware Schematic, Component design, Layout and Hardware Testing – **Prototyping** - Introduction to Rapid Prototyping and Rapid Manufacturing - **System Integration, Testing, Certification and Documentation**

**UNIT IV SUSTENANCE ENGINEERING AND END-OF-LIFE (EOL) SUPPORT 9**

Introduction to Product verification processes and stages - Introduction to Product Validation processes and stages - Product Testing Standards and Certification - Product Documentation - **Sustenance** -Maintenance and Repair – Enhancements - **Product EoL** - Obsolescence Management – Configuration Management - EoL Disposal

**UNIT V BUSINESS DYNAMICS – ENGINEERING SERVICES INDUSTRY 9**

**The Industry** - Engineering Services Industry - Product Development in Industry versus Academia –**The IPD Essentials** - Introduction to Vertical Specific Product Development processes -Manufacturing/Purchase and Assembly of Systems - Integration of Mechanical, Embedded and Software Systems – Product Development Trade-offs - Intellectual Property Rights and Confidentiality – Security and Configuration Management.

**TOTAL: 45 PERIODS**

**OUTCOMES:**

**Upon completion of the course, the students will be able to:**

- Define, formulate and analyze a problem
- Solve specific problems independently or as part of a team
- Gain knowledge of the Innovation & Product Development process in the Business Context
- Work independently as well as in teams
- Manage a project from start to finish

**TEXTBOOKS:**

1. Book specially prepared by NASSCOM as per the MoU.
2. Karl T Ulrich and Stephen D Eppinger, "Product Design and Development", Tata McGraw Hill, Fifth Edition, 2011.
3. John W Newstorn and Keith Davis, "Organizational Behavior", Tata McGraw Hill, Eleventh Edition, 2005.

**REFERENCES:**

1. Hiriappa B, "Corporate Strategy – Managing the Business", Author House, 2013.
2. Peter F Drucker, "People and Performance", Butterworth – Heinemann [Elsevier], Oxford, 2004.
3. Vinod Kumar Garg and Venkita Krishnan N K, "Enterprise Resource Planning – Concepts", Second Edition, Prentice Hall, 2003.
4. Mark S Sanders and Ernest J McCormick, "Human Factors in Engineering and Design", McGraw Hill Education, Seventh Edition, 2013

**TC8006 NANO TECHNOLOGY IN TEXTILE PROCESSING L T P C  
3 0 0 3**

**OBJECTIVES:**

- To understand the concepts of nanotechnology.
- To know the applications of nanotechnology in textiles.
- To gain knowledge on the characterization of nano textiles.

**UNIT I INTRODUCTION 9**

Nano Technology: definition and basic concepts, particle size, nano particles; Different types of process: Top down approach, bottom up approach; Synthesis of nano materials used in textiles.

**UNIT II NANO FIBRES AND NANO PARTICLES 9**

Nano fibres: Definition, properties and applications such as filtration, tissue engineering; Electro spinning of nano fibres: capillary method, charge injection method; Production of noncontinuous

or short yarns: Rotating collector method, Gap alignment method; carbon nano fibres, metal and metal oxide nano particles such as nano silver, nano silica, nano titanium, nano zinc oxide, nano magnesium oxide.

**UNIT III APPLICATIONS AND NANO FINISHING 9**

Applications of nano technology in textile materials and polymers; Nano finishing through water and oil repellent, self cleaning, anti microbial, UV protective, nano architecture, nanopel, nano care, nano touch, nano feel, lotus effect.

**UNIT IV CHARACTERIZATION OF NANO TEXTILES 9**

Characterization methods: Optical microscopy, Scanning Electron Microscopy, Transmission electron microscopy, Atomic force microscopy, Energy dispersion X-ray and Raman spectroscopy. Testing of nano functional Textiles: Anti-microbial testing, UV protection testing and self cleaning testing.

**UNIT V CNT, NANOCOMPOSITES AND NANO COATING 9**

Synthesis of carbon nanotubes: principle methods, arc discharge, laser ablation, chemical vapour deposition (CVD); Polymeric Nano Composites: definition, types, characterization, applications; Nanotechnologies for coating and structuring of textiles: Anti-adhesive nano coating of fibres and textiles, water and oil repellent coatings by plasma treatment, self cleaning super hydrophobic surfaces, layer by layer self assembly, sol-gel coating.

**TOTAL: 45 PERIODS**

**OUTCOME:**

- Knowledge on concepts of Material science and material handling aspects of nanomaterials and polymers learned

**TEXT BOOKS:**

1. Ashutosh Sharma, Jayesh Bellare and Archana Sharma, "Advances in Nanosciences and Nanotechnology", NISCAIR, First Edition, 2004.
2. Brown P and Stevens K., "Nano fibres and Nanotechnology in Textiles", Woodhead Publishing Limited, 2007.

**REFERENCES:**

1. Jurgan Schulte, "Nanotechnology: Global strategies, industry trends and applications", Wiley Publications, 2005.
2. Bhushan Bharat, "Springer Handbook of Nanotechnology", Springer, 2007.
3. Brown P and Stevens K, "Nano fibres and Nanotechnology in Textiles", Woodhead Publishing Limited, 2007.
4. "Industry insight Indian nanotechnology", Cygnus Business Consulting and Research, 2006.
5. Lynn E.Foster, "Nanotechnology: Science, Innovation and Opportunity", Prentice Hall Professional Technical Reference, 2005.
6. Mark Ratner & Daniel Ratner, "Nanotechnology: A Gentle Introduction to Next Big Idea", Prentice Hall Professional Technical Reference, 2002.

**TT8491**

**KNITTING TECHNOLOGY**

**L T P C**

**3 0 0 3**

**OBJECTIVES:**

To make the students to understand

- Fundamentals of knitting

- Types of knitting processes in detail
- Functioning of components of knitting machine

**UNIT I INTRODUCTION TO KNITTING 9**

Reasons for the growth of the knitting industry. Comparison of fabric properties - wovens, knits and bonded fabrics; classification of knitting processes – weft knit & warp knit; yarn quality requirements for knitting. Preparation of staple yarns for weft and warp knitting.

**UNIT II FUNDAMENTALS OF KNITTING 9**

General definitions and principles of knitting; Types of knitting needles – Bearded, Latch & Compound Needle. Elements of knitted loop structure.

**UNIT III WEFT KNIT STRUCTURES 9**

Basic weft knitted structures and their production - plain, rib, interlock and purl; Fundamentals of formation of knit, tuck and float stitches; factors affecting the formation of loop; effect of loop length and shape on fabric properties; Analysis of various types of weft knitted structure. Weft knitted fabric geometry.

**UNIT IV WEFT KNITTING MACHINES 9**

Construction, Characteristics and working of circular knitting machines used for the production of basic structures; production of derivatives of weft knitted structures; needle control in circular knitting machines; quality control in knitted fabric production; production calculation. Basic principles and elements of flat knitting machines; different types of flat knitting machines - manual, mechanical and computer controlled; production of various weft knitted structures using flat knitting machines.

**UNIT V WARP KNITTING 9**

Basic principles; elements of warp knitted loop – open loop, closed loop; warp knitting elements chain link, chain links for simple patterns, guide bar movement mechanism,. Tricot and Rachel warp knitting machines. Principles of double needle bar patterning, Terry pile fabric production. Let off system; run in value based on the lapping diagram; take up system; theoretical concepts of warp knitted loop configuration.; Uses of warp knitted fabrics in technical applications.

**TOTAL: 45 PERIODS**

**OUTCOMES:**

Upon completion of this course, the student shall be able to understand the

- Principle of knitting by different types of knitting machines
- Structure and properties of fabric produced by different knitting machines

**TEXT BOOKS:**

1. Spencer D.J., “Knitting Technology”, III Ed., Textile Institute, Manchester, 2001, ISBN: 1 85573 333 1
2. Ajgaonkar D.B., “Knitting Technology”, Universal Publishing Corporation, Mumbai, 1998, ISBN: 81-85027-34-X
3. Gajjap B.J., “Handbook of warp Knitting Technology”, Textile Institute, Manchester, 2004, ISBN: 1 85573 7701

**REFERENCES:**

1. Chandrasekhar Iyer, Bernd Mammel and Wolfgang Schach., “Circular Knitting”, Meisenbach GmbH, Bamberg, 1995, ISBN: 3-87525-066-4
2. Samuel Raz., “Flat Knitting: The new generation”, Meisenbach GmbH, Bamberg, 1997, ISBN: 3- 87525-054-0

3. Samuel Raz., "Warp Knitting production", Melliand Textilberichte, GmbH, Rohrbacher, 1987, ISBN: 3-87529-022-4
4. Thomas D.G.B., "An Introduction to Warp Knitting", Merrow Publishing Company, UK., 1971, ISBN-13: 9780900541070
5. Sam Raz, "Warp Knitting Production", Melliand Textilberichte GmbH, Heidelberg, Germany, 1987, ISBN:3-87529-022-4
6. Die Maschenbindungen der Kettenwirkerai, "An Introduction to the Stitch Formations in Warp Knitting", Published Employee's Association, Karl Mayere.V., Germany, 1966
7. Paling D.F., "Warp Knitting Technology", Columbine Press, U.K, 1966
8. Charles Reichman, "Wool and Synthetic Knitwear Handbook", National Knitted Outerwear Association, U.S.A, 1967
9. Charles Reichman, "Knitted Stretch Technology", National Knitted Outerwear Association, U.S.A, 1965.

**GE8073**                                  **FUNDAMENTALS OF NANOSCIENCE**                                  **L T P C**  
**3 0 0 3**

**OBJECTIVE:**

- To learn about basis of nanomaterial science, preparation method, types and application

**UNIT I**                                  **INTRODUCTION**                                  **8**

Nanoscale Science and Technology- Implications for Physics, Chemistry, Biology and Engineering-Classifications of nanostructured materials- nano particles- quantum dots, nanowires-ultra-thinfilms-multilayered materials. Length Scales involved and effect on properties: Mechanical, Electronic, Optical, Magnetic and Thermal properties. Introduction to properties and motivation for study (qualitative only).

**UNIT II**                                  **GENERAL METHODS OF PREPARATION**                                  **9**

Bottom-up Synthesis-Top-down Approach: Co-Precipitation, Ultrasonication, Mechanical Milling, Colloidal routes, Self-assembly, Vapour phase deposition, MOCVD, Sputtering, Evaporation, Molecular Beam Epitaxy, Atomic Layer Epitaxy, MOMBE.

**UNIT III**                                  **NANOMATERIALS**                                  **12**

Nanoforms of Carbon - Buckminster fullerene- graphene and carbon nanotube, Single wall carbon Nanotubes (SWCNT) and Multi wall carbon nanotubes (MWCNT)- methods of synthesis(arc-growth, laser ablation, CVD routes, Plasma CVD), structure-property Relationships applications- Nanometal oxides-ZnO, TiO<sub>2</sub>,MgO, ZrO<sub>2</sub>, NiO, nanoalumina, CaO, AgTiO<sub>2</sub>, Ferrites, Nanoclays-functionalization and applications-Quantum wires, Quantum dots-preparation, properties and applications.

**UNIT IV**                                  **CHARACTERIZATION TECHNIQUES**                                  **9**

X-ray diffraction technique, Scanning Electron Microscopy - environmental techniques, Transmission Electron Microscopy including high-resolution imaging, Surface Analysis techniques- AFM, SPM, STM, SNOM, ESCA, SIMS-Nanoindentation.

**UNIT V**                                  **APPLICATIONS**                                  **7**

NanoInfoTech: Information storage- nanocomputer, molecular switch, super chip, nanocrystal, Nanobiotechnology: nanoprobes in medical diagnostics and biotechnology, Nano medicines, Targetted drug delivery, Bioimaging - Micro Electro Mechanical Systems (MEMS), Nano

Electro Mechanical Systems (NEMS)- Nanosensors, nano crystalline silver for bacterial inhibition, Nanoparticles for sunbarrier products - In Photostat, printing, solar cell, battery.

**TOTAL: 45 PERIODS**

**OUTCOMES:**

- Will familiarize about the science of nanomaterials
- Will demonstrate the preparation of nanomaterials
- Will develop knowledge in characteristic nanomaterial

**TEXT BOOKS:**

1. A.S. Edelstein and R.C. Cammearata, eds., "Nanomaterials: Synthesis, Properties and Applications", Institute of Physics Publishing, Bristol and Philadelphia, 1996.
2. N John Dinardo, "Nanoscale Charecterisation of surfaces & Interfaces", 2nd edition, Weinheim Cambridge, Wiley-VCH, 2000.

**REFERENCES:**

1. G Timp, "Nanotechnology", AIP press/Springer, 1999.
2. Akhlesh Lakhtakia, "The Hand Book of Nano Technology, Nanometer Structure, Theory, Modeling and Simulations". Prentice-Hall of India (P) Ltd, New Delhi, 2007.

**TT8092**

**DENIM MANUFACTURING**

**L T P C  
3 0 0 3**

**OBJECTIVES:**

To enable the students to learn about

- Requirement of fibre, yarn
- Production of fabric, dyeing and finishing
- Stitching for denim garments

**UNIT I**

**5**

An overview on denim and jeans; fiber qualities for denim yarn production; yarns for denim production and their characteristics

**UNIT II**

**9**

Indigo dye and its reduction; dyeing technology of denim yarns; non-indigo dyes for denims; weaving and finishing of denim fabrics.

**UNIT III**

**13**

Denim garment manufacture -types of garments and production sequence, seams and stitches, sewing threads and needles, sewing machines, fastenings, trims, pressing and Inspection.

**UNIT IV**

**9**

Dry and wet finishes to produce effects and colours on denim garments; novel denims

**UNIT V**

**9**

Dyeing of denim garments; digital printing of denim garments; comfort aspects of denim

**TOTAL: 45 PERIODS**

**OUTCOMES:**

Upon completion of this course, the students shall know about

- Fibres and yarns used for production of denim garments
- Weaving and chemical processing of denim fabrics
- Stitching and finishing of denim garments

**TEXT BOOKS:**

1. Parmar M. S., Satsangi S. S., and Jai Prakash, "Denim – A fabric for ALL (Dyeing, Weaving, Finishing)", NITRA, Ghaziabad, India, 1996.
2. Roshan Paul (Ed.), "Denim – Manufacture, Finishing and Applications", Woodhead Publishing, 2015, ISBN: 0857098438 | ISBN-13: 9780857098436

**REFERENCES:**

1. Denim: Manufacture, Finishing & Applications, Ed. by Roshan Paul, The Textile Institute, Manchester, 2016
2. Denim: A Fabric for all Dyeing, Weaving & Finishing by M.S. Parmar, S.S. Satsangi, Dr. Jai Prakash, NITRA, 1996

**TT8851****BONDED FABRICS****L T P C  
3 0 0 3****OBJECTIVES:**

To enable the students to learn about the

- Fundamentals of bonded fabrics
- Different method of web formation and bonding

**UNIT I            FUNDAMENTALS OF BONDED FABRICS            5**

Definitions and classification of bonded fabrics; fibres, fibre preparations and their characteristics for the production of bonded fabrics, uses; methods of bonded fabric production

**UNIT II            WEB FORMATION WITH STAPLE FIBRES            9**

Production of staple-fibre web by dry and wet methods; influence of web laying methods on fabric properties; quality control of web

**UNIT III            MECHANICAL, CHEMICAL AND THERMAL BONDING            13**

Bonded fabric production by mechanical bonding - needling, stitching, water jet consolidation; Thermal Bonding technologies; Chemical bonding – Binder polymers and bonding technologies

**UNIT IV            POLYMER – LAID WEB AND FABRIC FORMATION            9**

Manufacture of Spun bonded fabrics, fibre orientation in spun bonded fabrics and characterization of filament arrangement; Manufacture of Melt blown fabrics – fibre formation and its attenuation; Effect of processing parameters on fabric characteristics

**UNIT V            FINISHING AND APPLICATION OF BONDED FABRICS            9**

Dry and Wet finishing; Characterization, structure - property relationship in bonded fabrics; End uses of bonded fabrics

**TOTAL: 45 PERIODS****OUTCOMES:**

Upon completion of the course the student will be able to

- Explain different types of nonwovens and their method of production
- Explain different type of finishes applied on the fabric and their end uses
- Choose appropriate bonded technique for getting desired properties in fabric.

**TEXT BOOKS:**

1. Lunenschloss J., Albrecht W. and David Sharp., "Nonwoven Bonded Fabrics", Ellis Horwood Ltd., New York, 1985.
2. Russell S., "Hand Book of Nonwovens", Textile Institute, Manchester, 2004.



3. Chapman R., "Applications of Nonwovens in Technical Textiles", Textile Institute, Manchester, 2010.

**REFERENCES:**

1. Mrstina V. and Feigl F., "Needle Punching Textile Technology", Elsevier, New York, 1990.
2. Dharmadhikary R. K., Gilmore T. F., Davis H. A. and Batra S. K., "Thermal Bonding of Nonwoven Fabrics", Textile Progress, Vol.26, No.2, Textile Institute Manchester, 1995.
3. Jirsak O. and Wadsworth L. C., "Nonwoven Textiles", Textile Institute, Manchester, 1999.

**MG8791**

**SUPPLY CHAIN MANAGEMENT**

**L T P C**

**3 0 0 3**

**OBJECTIVE:**

- To provide an insight on the fundamentals of supply chain networks, tools and techniques.

**UNIT I INTRODUCTION**

**9**

Role of Logistics and Supply chain Management: Scope and Importance- Evolution of Supply Chain -Decision Phases in Supply Chain - Competitive and Supply chain Strategies – Drivers of Supply Chain Performance and Obstacles.

**UNIT II SUPPLY CHAIN NETWORK DESIGN**

**9**

Role of Distribution in Supply Chain – Factors influencing Distribution network design – Design options for Distribution Network Distribution Network in Practice-Role of network Design in Supply Chain – Framework for network Decisions.

**UNIT III LOGISTICS IN SUPPLY CHAIN**

**9**

Role of transportation in supply chain – factors affecting transportations decision – Design option for transportation network – Tailored transportation – Routing and scheduling in transportation.

**UNIT IV SOURCING AND COORDINATION IN SUPPLY CHAIN**

**9**

Role of sourcing supply chain supplier selection assessment and contracts- Design collaboration - sourcing planning and analysis - supply chain co-ordination - Bull whip effect – Effect of lack of co-ordination in supply chain and obstacles – Building strategic partnerships and trust within a supply chain.

**UNIT V SUPPLY CHAIN AND INFORMATION TECHNOLOGY**

**9**

The role IT in supply chain- The supply chain IT frame work Customer Relationship Management – Internal supply chain management – supplier relationship management – future of IT in supply chain –E-Business in supply chain.

**TOTAL: 45 PERIODS**

**OUTCOME:**

- The student would understand the framework and scope of supply chain networks and functions.

**TEXT BOOK:**

1. Sunil Chopra, Peter Meindl and Kalra, "Supply Chain Management, Strategy, Planning,

and operation”, Pearson Education, 2010.

**REFERENCES:**

1. David J.Bloomberg , Stephen Lemay and Joe B.Hanna, “Logistics”, PHI 2002.
2. James B.Ayers, “Handbook of Supply chain management”, St.Lucle press, 2000.
3. Jeremy F.Shapiro, “Modeling the supply chain”, Thomson Duxbury, 2002.
4. Srinivasan G.S, “Quantitative models in Operations and Supply Chain Management”, PHI, 2010.