

M.D. UNIVERSITY, ROHTAK

(NAAC Accredited 'A+' Grade)

SCHEME OF STUDIES AND EXAMINATION

B.TECH (Textile Chemistry)

SEMESTER 5th AND 6th

Scheme effective from 2020-21

COURSE CODE AND DEFINITIONS:

Course Code	Definitions
L	Lecture
T	Tutorial
P	Practical
BSC	Basic Science Courses
ESC	Engineering Science Courses
HSMC	Humanities and Social Sciences including Management courses
PCC	Professional Core Courses
LC	Laboratory Courses
MC	Mandatory Courses
PT	Practical Training
S	Seminar
TH	Theory
Pr	Practical

General Notes:

1. Mandatory courses are non credit courses in which students will be required passing marks in internal assessments.
2. Students will be allowed to use non programmable scientific calculator. However, sharing of calculator will not be permitted in the examination.
3. Students will be permitted to opt for any elective course run by the department. However, the department shall offer those electives for which they have expertise. The choice of the students for any elective shall not be binding for the department to offer, if the department does not have expertise. To run the elective course a minimum of 1/3rd students of the class should opt for it.

Scheme of Studies and Examination
B.TECH (Textile Chemistry) – 5th Semester
w.e.f. 2020-21

S N	Category	Course Code	Course Title	Hours per week			Total Contact hrs /week	Credit	Examination Schedule (Marks)				Duration of Exam (Hours)
				L	T	P			Internal Assessment	External Examination	Practical	Total	
1	Professional Core Course	PCC-TC-301G	Technology of Dyeing	3	0	0	3	3	25	75		100	3
2	Professional Core Course	PCC-TC-302G	Textile Printing	3	0	0	3	3	25	75		100	3
3	Professional Core Course	PCC-TT/TC/FAE-303G	Textile Testing	3	0	0	3	3	25	75		100	3
4	Professional Elective Courses	PEC-I	Elective-I	3	0	0	3	3	25	75		100	3
5	Open Elective Courses	OEC-I	Open Elective-I	3	0	0	3	3	25	75		100	3
6	Open Elective Courses	OEC-II	Open Elective-II	3	0	0	3	3	25	75		100	3
7	Professional Core Course	LC-TC-301G	Dyeing Lab-I	0	0	2	2	1	25		25	50	3
8	Professional Core Course	LC-TC-302G	Textile Printing Lab	0	0	2	2	1	25		25	50	3
9	Professional Core Course	LC-TT/TC/FAE-303G	Textile Testing Practical	0	0	2	2	1	25		25	50	3
TOTAL CREDITS								21				750	

Note:

1. Choose any one from Elective-I
2. Choose any one from Open Elective-I
3. Choose any one from Open Elective-II

S.No.	Category	Course Code	Name of the Course	Preferred Semester
Elective-I				
1.	PEC-I	PEC-TC-302G	Chemical Processing of Unconventional Textile Materials	V
2.		PEC-TC-303G	Chemical Processing of Woollen Textiles	V
3.		PEC-TT/TC-301G	Post Extrusion Operations	V
Open Elective-I				
1.	OEC-I	OEC-TC-301G	Textile Design	V
2.		OEC-TC-302G	Textile Colour and Design Concept	V
3.		PEC-TT-303G	Waste Management & Pollution Control	V
Open Elective-II				
1.	OEC-II	OEC-TT/TC-303G	Garment Manufacturing Technology	V
2.		OEC-TT/TC-304G	Apparel Quality Evaluation and Standards	V
3.		OEC-TT/TC/FAE-305G	Introduction to Fashion and Apparel Industries	V

Scheme of Studies and Examination
B.TECH (Textile Chemistry) – 6th Semester
w.e.f. 2020-21

S N ·	Category	Course Code	Course Title	Hours per week			Total Contact hrs/week	Credit	Examination Schedule (Marks)				Duration of Exam (Hours)
				L	T	P			Internal Assessment	External Examination	Practical	Total	
1	Humanities and Social science including Management courses	HSMC-TT/TC/FAE-301G	Merchandising & Export Management	3	0	0	3	3	25	75		100	3
2	Professional Core Course	PCC-TC-304G	Processing of Synthetics & Blends	3	0	0	3	3	25	75		100	3
3	Professional Core Course	PCC-TC-305G	Textile Finishing	3	0	0	3	3	25	75		100	3
4	Professional Core Course	PCC-TC-306G	Textile Processing Machinery	3	0	0	3	3	25	75		100	3
5	Professional Elective Course	PEC-II	Elective-II	3	0	0	3	3	25	75		100	3
6	Open Elective Courses	OEC-III	Open Elective-III	3	0	0	3	3	25	75		100	3
7	Professional Core Course	LC-TC -304G	Dyeing Lab-II	0	0	2	2	1	25		25	50	3
8	Professional Core Course	LC-TC-305G	Characterisation and Evaluation of Dyed & Finished Textiles	0	0	2	2	1	25		25	50	3
9	Professional Core Course	LC-TC-306G	Technical Analysis Lab	0	0	2	2	1	25		25	50	3
TOTAL CREDITS								21				750	

Note: 1. At the end of 6th semester each student has to undergo Practical Training of 6 weeks in a Mill/Industry and submit typed report along with a certificate from the organization & its evaluation shall be carried out through viva in the 7th Semester.

2. Choose any one from Elective-II
3. Choose any one from Open Elective-III

S.No.	Category	Course Code	Name of the Course	Preferred Semester
Elective-II				
1.	PEC-II	PEC-TC-304G	Textile Chemical Testing	VI
2.		PEC-TC-305G	Textile Auxiliaries	VI
3.		PEC-TC-306G	Chemistry of Dyes	VI
Open Elective-III				
1.	OEC-III	OEC-TC-306G	Garment Processing & Quality Control	VI
2.		PEC-TT-305G	Structure and Properties of Fibres	VI
3.		OEC-TC-307G	Coating & Laminating of Textiles	VI

PCC–TC–301G Technology of Dyeing

Course code	PCC–TC–301G				
Category	Professional Core Course				
Course title	Technology of Dyeing				
Scheme and Credits	L	T	P	Credits	Semester–V
	3	0	0	3	
Branch	Textile Chemistry				
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Pre–requisites: Basic knowledge the chemistry of fibres and their properties Also some fundamental knowledge of organic chemistry

Course Objectives:

1. To provide basic knowledge of different types of colourants used for textile colouration.
2. To familiarize students with the basic concept of dyeing with various terms used in dyeing.
3. To familiarize students with the different types of machineries involved in natural fibre dyeing.
4. To make students learn about dyeing of cellulosic and protein fibres with different classes of colouring materials.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 06 parts of 2.5 marks from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each Unit.

UNIT-I

Introduction to coloring materials and their classifications. Nomenclature of dyes: Colour Index and Commercial names. Basic concept of dyeing with various terms used in dyeing: Concept of percentage shade, MLR, exhaustion, etc. Introduction to various methods of dyeing: Batch, Semi-continuous and Continuous dyeing. Different types of dye-fiber interactions.

Dyeing machineries: Loose fibre, yarn and package dyeing machines. Jigger, Winch dyeing machines and Padding mangles.

UNIT-II

Direct dyes- Mechanism of direct dyeing, factors affecting the dyeing process: electrolytes, temperature and liquor ratio. Application process for direct dye on cellulosic textiles and after treatments to improve wash fastness.

Reactive dyes – Introduction and types of reactive dyes. Dyeing mechanism and Application methods for Chlorotriazine and Vinylsulphone based reactive dyes. Reactivity & Affinity of reactive dyes and the concept of hydrolysis. Study the influence of process parameters. Batch and continuous application techniques for reactive dyeing. Concept of bi and multi functional dyes. Reactive dyes for non-cellulosic substrates.

UNIT-III

Vat dyes - Introduction, commercial vat dyes and forms, concept of vatting and particle size. Classification of vat dyes, principles and application of vat dyes. Leuco-vat, Pigment padding, Semi pigmentation and Vat-acid processes. Concept of Indigo dyeing of Denim & its continuous range.

Indigosols (Solubilized vat) dyes: Principle and technology of dyeing with solubilized vat dyes. Sulphur dyes - General considerations of sulphur colours, classification based on dissolution and application techniques. Reduction and oxidation process of sulphur dyes. Bronziness of shades and sulphur black tendering- causes and remedies.

UNIT-IV

Principles and technology of dyeing with Pigments, Oxidation colours (Aniline Black) and Mineral colours (Mineral Khaki).

Azoic colours – Introduction to Azoic colours, methods of dissolution for naphthols, concept and process of diazotization, coupling reaction.

Dyeing of protein fibres: Wool and Silk with Acid, Metal-complex (1:1 and 1:2) and Mordant dyes. Classification of these dyes, their mechanisms of action and effect of process parameters.

Reading List

Title	Author
Fundamentals and Practices in Coloration of Textiles	J N
Chakraborty Technology of Dyeing	V A
Shenai	
Dyeing and Chemical Technology of Textile Fibres	E
R Trotman Silk Dyeing, Printing and Finishing	
M L Gulrajni	
Denim-A Fabric for All	Parmar

Course Outcomes:

At the end of the course, the students will be:

1. familiar with types of colouring materials for textiles and suitability of dyes for different fibres
2. having the basic idea of dyeing and also different techniques of dyeing
3. familiar with the different types of machineries involved in natural fibre dyeing
4. Able to explore the applications of different class of dyes on natural (cellulosic and protein) fibres.

PCC-TC-302G Textile Printing

Course code	PCC-TC-302G				
Category	Professional Core Course				
Course title	Textile Printing				
Scheme and Credits	L	T	P	Credits	Semester-V
	3	0	0	3	
Branch	Textile Chemistry				
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Pre-requisites: Knowledge of Introduction to Textile Processes

Course Objectives:

1. Concept of printing and various styles of printing.
2. Various ingredients of printing paste and recipes involved in printing.
3. Overview of various machines involved in printing of textiles.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 06 parts of 2.5 marks from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each Unit.

UNIT-I

Definition of Printing. Composition of printing paste. Printing ingredients and their function. Methods of printing viz block, roller, screen and transfer printing. Design making and screen exposing. Table, flatbed and rotary screen printing.

UNIT-II

Styles of printing, i.e. direct, discharge and resist. Various discharging and resisting agents. Special effects like Batik, Tie and dye etc. Printing of cellulose with Direct and Azoic colours.

UNIT-III

Printing with vat, solubilised vat, aniline black, reactive, acid and metal complex dyes in different styles.

UNIT-IV

Pigment printing. Transfer printing: advantages, disadvantages, machinery, paper printing, dyes in context to cotton and polyester. Methods of print fixation. Machines used in print drying, print-fixation and washing.

Reading List

Title	Author
Technology of Printing	V A Shenai
Textile Printing	LWC Miles

Course Outcomes:

At the end of course students are able to:

1. Understand textile printing process and its various styles.
2. Use of various printing paste ingredients and recipes for printing.
3. Understand machine involved in textile printing.

PCC-TT/TC/FAE-303G Textile Testing

Course code	PCC-TT/TC/FAE-303G				
Category	Professional Core Course				
Course title	Textile Testing				
Scheme and Credits	L	T	P	Credits	Semester–V
	3	0	0	3	
Branch	Textile Technology/Textile Chemistry/Fashion & Apparel Engineering				
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Pre–requisites: Basic knowledge of textile fibres, yarns and fabrics.

Course Objectives:

1. To familiarize the students about the importance, concept and techniques of sampling
2. To familiarize the students about important fibre, yarn and fabric dimensions and characteristics and their measurement techniques
3. Comprehending the mechanical behavior of textile materials and its evaluation methods
4. To familiarize the students about the evaluation methods of colour fastness
5. To familiarize the students about common types of garment testing

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 06 parts of 2.5 marks from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each Unit.

UNIT-I

Introduction to textile testing - aim and scope. Sampling and Sampling techniques: General requirements; fibre, yarn and fabric sampling techniques.

Measurement of fibre dimensions and characteristics, viz. length, fineness, cotton maturity, neps and trash including principle and operation of equipment in common use.

Relation between R.H. and moisture regain of textile materials; equilibrium regain, hysteresis. Measurement of moisture regains. Official regain and concept of correct invoice weight.

UNIT-II

Measurement of yarn dimensions and characteristics: yarn count/diameter, twist and hairiness including principle and operation of equipment in common use.

Yarn evenness: Terms and definitions, nature of irregularities. Principles and methods of evenness testing, variance-length curves and their interpretation.

Test methods for fabric dimensional and other physical properties like, thickness, weight, crimp, bending and drape including principle and operation of equipment in common use.

UNIT-III

Mechanical behaviour of textiles: Terms and definitions, expression of results, quantities and units. Experimental methods: Principle of CRL, CRT and CRE type tensile testing machines. Fibre strength testing – single fibre strength and bundle strength. Yarn strength testing – single yarn strength and lea strength. Fabric strength testing - tensile, tearing and bursting strength tests. Principle and operation of equipment in common use.

Measurement of fabric abrasion resistance and evaluation of results; measurement of fabric pilling and crease recovery.

UNIT-IV

Measurement of fabric air permeability and water vapour permeability. Introduction to fabric handle.

Introduction to fastness properties of dyed and printed textiles - evaluation methods of colour fastness to Laundering, Crocking, Sunlight, Perspiration, Dry-cleaning and Hot Pressing.

Garment Testing: Testing of Seam Strength, Seam Slippage, Seam Puckering, Button Strength and Zipper or Closer Strength.

Suggested Reading List:

Title	Author
Principles of Textile Testing	J E Booth
Physical Testing of Textiles	B P Saville
Fabric Testing	Jinlian Hu
Physical Properties of Textile Fibres	W E Morton & J W S Hearle
Textile Fibres, Yarns and Fabrics	E R Kaswell

Course Outcomes:

After completion of the course, students will be:

1. Able to understand the concept of sampling and sampling techniques for testing of textile materials.
2. Familiar with the important fibre, yarn and fabric dimensions and characteristics and their measurement techniques.
3. Familiar with the mechanical behavior of textile materials, different related terms and principles, and its evaluation methods.
4. familiar with the evaluation methods of colour fastness
5. familiar with the common types of garment testing

LC-TC-301G Dyeing Lab-I

Course code	LC-TC-301G				
Category	Laboratory Course (Professional Core Course)				
Course title	Dyeing Lab-I				
Scheme and Credits	L	T	P	Credits	Semester-V
	0	0	2	1	
Branch	Textile Chemistry				
Class work	25 Marks				
Exam	25 Marks				
Total	50 Marks				
Duration of Exam	03 Hours				

Pre-requisites: Basic knowledge of fibres chemistry and their properties

Course Objectives:

This Lab course is designed to impart first-hand experience of cellulosic fabric dyeing with different types of colorants thus serving as a bridge between theory and practice.

Contents

Introduction to experimental dyeing, commercial dye nomenclature and colour Index. Effect of salt concentration and M/L ratio on exhaustion of direct dyes. Effect of after treatments on wash fastness of direct dyes. Dyeing of cotton and rayon with various dyes - direct, azoic, reactive, sulphur, vat and indigosol. Effect of various fixation methods for reactive dyeing. Pigment dyeing. Dyeing of wool and silk with acid, metal complex and mordant dyes.

List of Experiments

1. Dyeing of the cotton fabric with direct dyes in open bath beaker dyeing machine.
2. Different after treatments on Direct dyed fabric.
3. Dyeing of cotton yarn with hot brand reactive dyes.
4. Dyeing of the cotton fabric with cold brand reactive dyes.
5. Dyeing of cotton fabric with different padding methods like cold pad batch, pad bake and pad steam.
6. Dyeing of cotton with Vat Dyes.
7. Dyeing of cotton with Solublized vat Dyes.
8. Dyeing of cotton with Azoic colours
9. Dyeing of cotton fabric with Sulphur Dye.

10. Dyeing of wool and silk with Basic Dye.
11. Dyeing of wool and silk with Acid Dye.
12. Dyeing of wool and silk with Metal-complex Dye.
13. Dyeing of cotton with Mineral Khaki.
14. Application of pigment colour to textile materials.

Course Outcomes:

1. To understand basic concept of dyeing of cotton fabric direct dye and it's after treatment.
2. Different methods of dyeing cotton fabric with reactive dyes.
3. Dyeing of cotton fabric with vat and sulphur dyes.
4. Dyeing of wool and silk fabrics with different class of dyes.
5. To understand the application of pigments over textiles.

LC–TC–302G Textile Printing Lab

Course code	LC–TC–302G				
Category	Lab Course (Professional Core Course)				
Course title	Textile Printing Lab				
Scheme and Credits	L	T	P	Credits	Semester–V
	0	0	2	1	
Branch	Textile Chemistry				
Class work	25 Marks				
Exam	25 Marks				
Total	50 Marks				
Duration of Exam	03 Hours				

Pre–requisites: Basic knowledge of textile printing process.

Course Objectives:

This Lab course is designed to impart knowledge of printing processes as a bridge between theory and practice.

List of Experiments

1. Direct style of printing of Direct Dyes on cotton
2. Direct style of printing of Reactive Dyes on cotton
3. Direct style of printing of Reactive Dyes on cotton with various types of thickeners
4. Direct style of printing of Vat Dyes cotton
5. Direct style of printing of Azoic colours on cotton
6. Direct style printing on Polyester with Disperse dyes
7. Direct style printing on Wool with Acid and Direct dyes
8. Direct style of printing of Pigments on cotton and polyester
9. Discharge style of printing – white discharge under direct dyed ground
10. Discharge style of printing – white discharge under Reactive dyed ground
11. Discharge style of printing – Vat discharge under direct dyed ground
12. Discharge style of printing – pigment under reactive dyed ground
13. Resist style of printing – White resist under reactive dyed ground
14. Special print effect – Tie and Dye style of printing
15. Special print effect – Batik style of printing
16. Special print effect – burnt out/brasso style of printing

Course Outcomes:

1. To familiarize the students with various machinery and process involve in printing process.
2. To understand the function of different chemicals in printing process.
3. To learn preparation of various recipes for printing.

LC–TT/TC/FAE–303G Textile Testing Practical

Course code	LC–TT/TC/FAE–303G				
Category	Laboratory Course (Professional Core Course)				
Course title	Textile Testing Practical				
Scheme and Credits	L	T	P	Credits	Semester–V
	0	0	2	1	
Branch	Textile Technology/Textile Chemistry/Fashion & Apparel Engineering				
Class work	25 Marks				
Exam	25 Marks				
Total	50 Marks				
Duration of Exam	03 Hours				

Pre–requisites: Basic knowledge of textile fibres, yarns and fabrics, Textile Testing.

Course Objectives:

1. To impart first-hand experience of the procedures of basic testing of fiber, yarn, fabric and garment.
2. To learn presentation of test results in a suitable manner.
3. To impart first-hand experience of test result analysis.
4. It serves as a bridge between theory and practice.

List of Experiments:

1. Measurement of trash content in raw cotton
2. Measurement of fiber fineness by whole fiber method
3. Measurement of fiber fineness by airflow method
4. Measurement of fiber length parameters by Baer Sorter
5. Determination of fiber bundle strength using Pressley fiber bundle strength tester
6. Determination of fiber bundle strength using Stelometer
7. Measurement of yarn twist
8. Measurement of linear density of sliver, roving and yarn
9. Measurement of C.S.P value of yarn
10. Measurement of fabric tensile properties
11. Measurement of fabric tearing strength
12. Evaluation of washing and rubbing fastness properties of dyed fabrics
13. Evaluation of seam properties (Seam strength and Seam Slippage)

Course Outcomes:

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

1. Correlate between theory and practice of the concept of textile testing.
2. Conduct basic testing of fiber, yarn, fabric and garment.
3. Present the results in graphical and tabular manner.
4. Analyze the results from the tests.
5. Develop practical skills relevant to industrial practice.

PEC–TC–302G Chemical Processing of Unconventional Textile Materials

Course code	PEC-TC–302G				
Category	Professional Elective Course				
Course title	Chemical Processing of Unconventional Textile Materials				
Scheme and Credits	L	T	P	Credits	Semester–V
	3	0	0	3	
Branch	Textile Chemistry				
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Pre–requisites: Basic knowledge of textile raw materials and elementary idea of textile chemical processing

Course Objectives:

1. To discuss the chemical processing of Knit goods with technical details of machinery.
2. To explain the chemical processing Denim fabric including dyeing and finishing.
3. To explain process and machines used for terry towel and carpet products.
4. To discuss processing of Jute and Linen fabrics.
5. To discuss the processing route of spandex containing materials.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 06 parts of 2.5 marks from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each Unit.

UNIT-I

Knit Goods Processing

Basic concept of knitting: warp knits, weft knits, courses, wales, stitch and loop density. Factors to be considered in knit processing. Process sequences in tubular and open width form processing. Pre-treatment like singeing, scouring, bleaching and mercerization. Dyeing with direct, reactive, vat and sulphur using winch and soft flow dyeing machines. Finishing of knit goods: Hydro-extraction and slitting, drying and compacting. Faults in knit goods.

UNIT-II

Processing of Denim

Introduction to denim, types of Denim fabrics, chemistry and process of warp dyeing with indigo. Indigo dyeing equipments. Dyeing with mixture of indigo and other dyes. Finishing of Denim Fabrics and Garments. Quality and process control in wet processing.

UNIT-III

Terry Towel Processing

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

UNIT-IV

Jute and Linen Processing

General properties and uses of jute and linen fibres. Their pre-treatment and dyeing processes. Woollenisation of jute.

Processing of Fabric containing spandex

Brief introduction of properties and uses of spandex fibres and blends. Wet processing of Cotton/ Spandex, Viscose/Spandex, Nylon/Spandex, Polyester/Spandex fabrics. Finishing of warp knits containing spandex fibres.

Reading List

Title

Processing of cotton knitted fabrics
M L Gulrajni Denim a Fabric for All
Manufacturing of Terry Towel
Interior Furnishing
No. 1
Textile Printing

Author

M. Chakraborty, Amit Dayal and
Parmar
Subhash J. Patil
Mortimer O'shea, Textile Progress, Vol. 11,
L W C Miles

Course Outcomes:

At the end of the course, the students will be:

1. Explain processing, precaution and details of Knit goods
2. Explain processing and finishing of Denim fabric and garments
3. Explain the processing of terry towel and carpet product
4. Explain the complete chemical processing of jute and linen fabrics
5. Able to understand the chemical processing of Spandex containing textile materials.

PEC–TC–303G Chemical Processing of Woollen Textiles

Course code	PEC-TC–303G				
Category	Professional Elective Course				
Course title	Chemical Processing of Woollen Textiles				
Scheme and Credits	L	T	P	Credits	Semester–V
	3	0	0	3	
Branch	Textile Chemistry				
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Pre–requisites: Knowledge of physical and chemical properties of wool fibre and elementary idea of textile chemical processing

Course Objectives:

1. To discuss the different varieties of wool and the impurities present in them.
2. To explain pre-treatments associated with woollen textiles.
3. To discuss dyeing of woollen materials with different class of dyes.
4. To discuss the finishing processes involved in woollen textiles.
5. To explain the chemical processing of woollen and their blended textiles.
6. To make students learn about new and innovative product with wool and their application.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 06 parts of 2.5 marks from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each Unit.

UNIT-I

Different varieties and quality of wool fiber, impurities in wool. Scouring and bleaching of wool fibers, machines for wool scouring, bleaching. Processing of woollens and worsted. Milling, crabbing and super contraction.

UNIT-II

Dyeing of woollen materials in loose fiber form, tops, hanks and fabric. Dyeing with various classes of dyes viz. acid, metal complex, chrome dyes, reactive dyes, natural dyes.

UNIT-III

Finishing of woollen materials, application of various finishes viz. blowing, KD process, rotary press, paper press, London shrinkage. Shrink proofing of wool. Flame retardant finish on woollen materials. Processing of wool blends e.g. wool cotton, polyester wool.

UNIT-IV

New wool products and applications, Improving the whiteness and photostability of wool, Enhancing wool products using nanotechnology, Wool performance apparel for sport, High- performance wool blends; Intelligent wool apparel, Application of wool keratins ranging from industrial materials to medical devices.

Reading List

Title	Author
Dyeing and Chemical Technology of Textile Fibers R. Trotman Textile Processing and Properties	E. Vi
go Finishing of woollen material	A. R. Brady
Textile fibers and their uses	K. P. Hess
Chemical Processing of Polyester and its Blends	R.M. Mittal & Trivedi
Advances in Wool Technology Russell	N.A.G. Johnson and I.M.

Course Outcomes:

At the end of the course, the students will be:

1. Able to understand the different varieties of wool with their chemical composition.
2. Able to explain the pre-treatments associated with woollen textiles.
3. Able to understand the dyeing of woollen textiles materials with different class of dyes.
4. Able to explain the finishing processes involved in the woollen textiles.
5. Able to understand the chemical processing of woollen and their blended textiles.
6. Aware about innovations in wool and how these can be used to design different products made from wool.

PEC–TT/TC–301G Post Extrusion Operations

Course code	PEC-TT/TC–301G				
Category	Professional Elective Course				
Course title	Post Extrusion Operations				
Scheme and Credits	L	T	P	Credits	Semester–V
	3	0	0	3	
Branch	Textile Technology, Textile Chemistry				
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Pre–requisites: Man-made fibre production

Course Objectives:

The course is designed to impart the following:

1. Basic concepts of drawing of filaments.
2. Basic concept of setting.
3. Basic concept of texturizing.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 06 parts of 2.5 marks from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each Unit.

UNIT-I

Drawing: Objectives, neck drawing of filaments, NDR, MDR and LDR; Drawing of polyester and nylon; Spin-draw process; Various parameters of drawing and their effects on structure and properties of filaments.

Heat setting process: Nature of set, mechanism of setting; Various parameters of heat-setting and their influence on structure and properties of filaments; Thermal healing; Settability and measurement of degree of set.

UNIT-II

Texturing process: Principle of texturing; Types of texturing processes; Principle and brief description of stuffer box crimping, Edge crimping, Knit-de-knit texturing; Manufacturing of BCF and Hi-bulk yarns.

UNIT-III

Twist texturing principle; Material, machine and process variables affecting structure and properties of twist textured yarns; Faults in twist textured yarns and their remedies; Evaluation of twist textured yarns.

UNIT-IV

Air-jet texturing: Principles and mechanism of air-jet texturing; Material, machine and process variables affecting structure and properties of the air-jet textured yarn; Different types of jets, baffle elements and their description; Properties of air-jet textured yarns and their importance; Evaluation of air-jet textured yarns.

Suggested Reading List:

Title

Manufactured Fibre Technology
Modern Yarn Production
Yarn Texturing Technology

Author

Gupta & Kothari
G R Wray
Hearle, Hollick & Wilson

Course Outcomes:

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

1. understand the essential requirements for drawing of filaments.
2. comprehend the basics of temporary and permanent setting.
3. get familiarised with manufacturing techniques of texturizing.

OEC-TC-301G Textile Design

Course code	OEC-TC-301G				
Category	Open Elective Course				
Course title	Textile Design				
Scheme and Credits	L	T	P	Credits	Semester-V
	3	0	0	3	
Branch	Textile Chemistry				
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Pre-requisites: Basics of woven fabric formation.

Course Objectives:

1. To understand the basic concepts of textile design.
2. To impart knowledge of different types of basic weave designs and their derivatives.
3. To impart knowledge of different types of decorative weave designs.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 06 parts of 2.5 marks from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each Unit.

UNIT-I

Importance of textile design: Identification of warp and weft in the fabric, classification of woven fabrics. Methods of fabric representation. Basic elements of woven design: Weaving Plan, Drafting Plan & Lifting Plan. Different types of drafting plans. Construction of plain weave and its derivatives, ornamentation of plain weave.

UNIT-II

Twill weave and its derivatives. Sateen /satin weaves. Stripe and check effects by combination of two weaves.

UNIT-III

Diamond weaves, Crepe weaves, Cork screw weaves, Bedford cord, Warp pile and weft pile fabrics.

UNIT-IV

WELTS and Pique structures, Mock leno, Huckaback, Honeycomb structures and Double cloth.

Suggested Reading List:

Title

Watson's Textile Design & Colour
Fabric Structure and design
Watson's Advanced Textile Design
Structural Fabric Design

Author

Z J Grosicki
N Gokarneshan.
Z J Grosicki
J W Klibbe

Course Outcomes:

After completion of the course, students will:

1. Have the knowledge of fabric structure and weave designs.
2. Be able to identify and design different types of weave designs along with drafting, denting and lifting plans.

OEC-TC-302G Textile Colour & Design Concept

Course code	OEC-TC-302G				
Category	Open Elective Course				
Course title	Textile Colour & Design Concept				
Scheme and Credits	L	T	P	Credits	Semester-V
	3	0	0	3	
Branch	Textile Chemistry				
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Pre-requisites: Textile raw materials, yarn formation, woven & knitted fabrics

Course Objectives:

1. To familiarize the students with the role of colour theories in Textile and Apparels.
2. To understand the Colour combination techniques in fabric and garments.
3. To familiarize with the contribution of composition of designs and Geometric ornamentation in Textile and Apparel production.
4. To understand the patterns, symmetry procedure followed in Textile and Garment products.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 06 parts of 2.5 marks from all units and remaining eight questions of 15 marks each to be set up by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

UNIT – I

Concept and specifications of colour, Light and colour phenomenon, Additive and Subtractive combinations, Colour theories as light theory, pigment/ Brewster colour theory. Colour wheel – primary, secondary, sub-secondary and tertiary colours, Rainbow colours. Colour combination techniques in fabric and garments. Psychological effects of colour, Warm and Cool colours. Colour harmony. Definition of Colour as per C.I.E., Tristimulus value, Hue and Chroma; Color gamut

UNIT – II

Colour combination techniques in fabric and garments. Colour contrast in fabric and garments. Application of colour combination and harmony in designing of clothing/fabric. Modification of

colours as formation of tint, shades and coloured grays etc. Colour intensity charts. Outline for the movement of colours in fashion with the factors affecting the choice of colour. Elements of design of a motif: line, dot, curve, colour and texture. Different Types and their applications.

UNIT – III

Composition of designs Geometric ornamentation, conventional treatment of natural and artificial forms, adoption and reproduction of earlier designs. Construction of symmetrical figures, reversing inclined figures. Arrangement of figures - unit-repeating design, the drop device, drops reverse designs, sateen system of distribution (with reference to half drop, diamond base, ogee base, rectangular base lines). Construction of designs from incomplete repeat.

UNIT – IV

Study of Pattern: – historical precedents. Symmetry – principle concepts, perspectives and its application, classification of motifs, border patterns, all over patterns, Counterchange motifs, border patterns and all over patterns.

Suggested Reading List:

Title	Author
Watson's Textile Design and colour	Watson
Colour mixing Bible	Watson
Colour: right from the start	Watson
Textile Science	Gohl E P G and Vilensky LD
Fashion from Concept to Consumer	Emilio Puc

Course Objectives:

After completion of the course, students will be able to

1. Relate colour and colour theory in designing Textile and Apparel products.
2. Develop colour combination techniques in fabric and garments.
3. Analyze composition of designs and Geometric ornamentation in Textile and Apparel production.
4. Design patterns and symmetry in Textile and Garment products.

PEC-TT-303G Waste Management and Pollution Control

Course code	PEC-TT-303G				
Category	Open Elective Course				
Course title	Waste Management and Pollution Control				
Scheme and Credits	L	T	P	Credits	Semester-V
	3	0	0	3	
Branch	Textile Chemistry				
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Pre-requisites: Basic concepts of textile production.

Course Objectives:

1. To familiarize the students about various wastes and pollutants from textile production.
2. To familiarize the students about the importance of waste management and pollution control.
3. To familiarize the students different textile effluents and their recovery/recycling.
4. To give an overview on toxicity of bleaching, dyeing, printing and finishing auxiliaries and their analysis and minimization.
5. To give an overview on water, air and noise pollution due to textile production, their control, standards and acts.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 06 parts of 2.5 marks from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each Unit.

UNIT-I

Definition of Waste and Pollutant: Classification of wastes and pollutants; Importance of waste management and pollution control. Environmental impact assessment, definition & need, introduction to environmental impact assessment methodology, unit processes.

UNIT-II

Textile effluents and their characterization, methods of effluent treatment, disposal of effluents, reuse of water in a process house, fiber and polymer waste, recovery and recycling of monomer. Modifications of polymer waste. Recovery and recycling of monomers, Modifications of

polymer waste and its utilization, Waste Management approaches, Statistical interpretation of data on waste of different sections of textile industry.

UNIT-III

Toxicity of intermediates dyes, processing aids-bleaching, dyeing, printing and finishing auxiliaries etc. Analytical methods for various pollutants. Formaldehyde, Pentachlorophenol, Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Minimization, Optimization and Standardization of waste in textile industry.

UNIT-IV

Source of water pollution: Factors contributing water pollution and their effect, water pollution parameters, physical, biological, chemical standards for quality of treated water. Effluent treatment methods and control, basic principles - Unit operations (sedimentation, precipitation, filtration, and incineration), specific pollutants. Pollution of air, causes, effect, monitoring and control. Source of noise pollution, its effect and control. Legislation- salient provisions of water act, Air act, Environment protection act, Environment Impact Assessment: Basic principles, purpose, components, methodology and constraints.

Suggested Reading List:

Title	Author
Basic course in environmental studies	S Deswal & Anupama Deswal.
Environment impact Assessment	L W Caeter
Environment Pollution & Control	H S Bhatia
Textile management	V D Dudeja
Water and effluent in textile mills	P B Jhala

Course Outcomes:

After completion of the course, students will be:

1. familiarized with various wastes and pollutants from textile production.
2. able to comprehend the importance of waste management and pollution control.
3. familiarized with different textile effluents and their scope of recovery/recycling.
4. have an idea on toxicity of bleaching, dyeing, printing and finishing auxiliaries and their analysis and scope of its minimization/optimisation.
5. have an idea on water, air and noise pollution due to textile production, their control, standards and acts.

OEC–TT/TC–303G Garment Manufacturing Technology

Course code	OEC-TT/TC–303G				
Category	Open Elective Course				
Course title	Garment Manufacturing Technology				
Scheme and Credits	L	T	P	Credits	Semester–V
	3	0	0	3	
Branch	Textile Technology/Textile Chemistry				
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Pre–requisites: Textile raw materials, yarn formation, woven & knitted fabric formation

Course Objectives:

1. To familiarize the students with the role of Fashion in Apparels.
2. To understand the marker planning, spreading and cutting processes in Garment Industries.
3. To familiarize with the contribution of various entities of sewing in Apparel production.
4. To understand the pressing procedure followed in Garment industries.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 06 parts of 2.5 marks from all units and remaining eight questions of 15 marks each to be set up by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

UNIT – I

Concepts of Fashion: various terms used- fashion cycle, fad, style etc. Fashion Theories, Consumer identification with different phases of Fashion Cycle. Introduction to Garment Manufacturing process. Introduction of merchandising and retail concepts. Future prospects for engineers in garment sector.

UNIT – II

Planning, drawing and reproduction of the marker, requirements of marker-planning, marker efficiency, methods of marker planning and marker use – normal marker, planning and computerized marker planning, requirement of spreading process, nature of fabric packages, Objectives and methods of cutting straight knife, band knife, notches, drills, computer controlled

knives, Die cutting, Laser cutting, Plasma cutting, Microprocessor based machinery in pattern construction and planning, marking and cutting processes.

UNIT – III

Sewing: Properties of seams, seam types, stitch types, sewing machine feed mechanism, sewing machine needles, sewing threads, sewing problems. Introduction to Sewing Machinery: Basic sewing machines and associated work aids. Automation in Garment Industry, Information Technology in Garment Industry

UNIT – IV

Pressing: Purpose of pressing, pressing equipment and methods general description to alternative methods of joining materials and the use of components, trimmings to care labelling in garment manufacturing.

Suggested Reading List:

Title	Author
Fashion from Concept to Consumer	Emilio Puc
The Technology of Clothing Manufacture	Harold Carr & B. Latham
The Apparel Industry in India	I. L. A. Kanti
Garment Manufacturing Technology	Nayak & Padhey
Apparel Manufacturing Analysis	Jacob Solinger
Apparel Manufacturing Handbook	Jacob Solinger
Apparel Manufacturing Technology	Karthik, Ganeshan,
Goplakrishnan	

Course Outcomes:

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

1. Relate fashion concepts in garment industries.
2. Analyze marker planning and efficiency, spreading and cutting processes in Garment Industries.
3. Work and relate sewing parameters in Apparel products.
4. Develop pressing procedure in Garment industries.

OEC–TT/TC–304G Apparel Quality Evaluation and Standards

Course code	OEC-TT/TC–304G				
Category	Open Elective Course				
Course title	Apparel Quality Evaluation and Standards				
Scheme and Credits	L	T	P	Credits	Semester–V
	3	0	0	3	
Branch	Textile Technology/Textile Chemistry				
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Pre–requisites: Textile raw materials, yarn formation, woven & Knitted Fabrics, GMT, Apparel Merchandising

Course Objectives:

1. To familiarize the students with the role of Quality in Apparels and its categorization.
2. To create clarity regarding the Inspection systems and tools of Quality Control.
3. To familiarize with the contribution of various entities in Apparel organizations towards Quality.
4. To understand the sampling procedure followed in Garment industries.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 06 parts of 2.5 marks from all units and remaining eight questions of 15 marks each to be set up by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

UNIT – I

Meaning of quality, testing and standard and their importance in apparel industry – Quality terminologies- Sources of international standards. Quality Parameters of fabric and garment.

Quality –definition, classification of defects, Quality loop, inspection loop, stages of inspection, how much to inspect-arbitrary, statistical sampling, AQL, zones in garment evaluation, Quality function. Evaluation of quality cost, categorisation of quality costs, objectives of quality cost evaluation.

UNIT –II

Role of quality management for Fashion Buyer - Role of fashion Buyer, Buying team, buying cycle - comparative shopping, directional shopping. Principles of TQM – Deming’s PGDCA

Cycle - KAIZAN concepts – 5 S applications in apparel industry. Application of seven QC tools in apparel industry.

UNIT – III

Inspection- purpose, inspection manuals, how much to inspect, random sampling etc. Quality standards- ISO-9000 series of standards, Quality assurance, Six Sigma. various care labelling symbols, different stages at which inspection is carried out and its effect on overall garment quality like raw material inspection- Fabric Inspection system : 4 point,10 point system and in process inspection.

UNIT – IV

Understanding procedures in sampling and sample development, different stages of samples and their requirements from Proto to Shipment sample Proto, fit, size set, pre production, TOP, sealer etc. Inspection: Incoming and raw material inspection: Fabric inspection – 4-point system. In process/ online inspection: Advantages – On line inspection during spreading, pattern making, cutting, sewing and ironing. Final inspection: Sampling plans and AQL charts – Level of final inspection. Packing & packaging quality tests. Care labeling and international care symbols.

Suggested Reading List:

Title	Author
Hand book of Quality Control	Jo
seph Juran Total Quality Management: A pictorial guide for manager	Jo
hn Oakland Statistical Quality Control	Grant Eugene & L
Richard Managing Productivity in Apparel Industry	Rajesh Bheda
Productivity Through Quality	Rajesh Bheda
Fashion Buying	Halen Goworek
Evaluating Apparel Quality	Stamper
ISO 9000 Quality Management System	D.L.Shah
Managing the Quality in Apparel Industries	Pradeep V Mehta
Principles of Textile Testing	J E Booth
Testing and Quality Management	V K Kothari

Course Outcome:

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

1. Implement the Quality parameter in Apparel industry.
2. Utilize the various tools of Quality control and Inspection systems.
3. Evaluate the sampling procedure being followed in Garment Industries.
4. Analyze the contribution of different entities towards Quality control.

OEC–TT/TC–305G Introduction to Fashion and Apparel Industries

Course code	OEC-TT/TC–305G				
Category	Open Elective Course				
Course title	Introduction to Fashion and Apparel Industries				
Scheme and Credits	L	T	P	Credits	Semester–V
	3	0	0	3	
Branch	Textile Technology/Textile Chemistry				
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Pre–requisites: Textile Raw Materials, Yarn and Fabric Formation, Apparel Production, Colour & Design Concepts

Course Objectives:

1. To understand the elementary knowledge of Indian and global apparel industries.
2. To learn the concept of fashion, components of fashion, fashion cycle, fashion theories.
3. To gain knowledge of fashion centres fashion brands.
4. To develop skills for application of fashion promotion, information services and communications.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 06 parts of 2.5 marks from all units and remaining eight questions of 15 marks each to be set up by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

UNIT – I

Introduction to Apparel Industry, Indian Apparel industry scenario and its SWOT Analysis, Status of Structure and working flowchart of various departments of a garment production house. Apparel manufacturing countries: their features, level of technology, product mix. Indian apparel industry- challenges & global scenario.

UNIT – II

Fashion terminology, components of fashion, fashion cycle – its phases, Style classification based on fashion cycle - fad/classic, recurring & interrupted cycles, Consumer identification with fashion cycles- leaders, innovators, followers, victims & laggards. Motives of consumer buying & factors affecting fashion growth & declination. Fashion adaptation theories.

UNIT – III

Major fashion centres of the world: Brief introduction to world fashion centers – Milan, Italy, Paris, Rome, American, European, and Japanese. Who's who of fashion world- national & international designers, their private labels, Luxury brands of apparels & accessories.

General introduction to careers & future opportunities in fashion & apparel sector- export & buying houses, design houses etc.

UNIT – IV

Fashion information services, trend forecasting and auxiliary services. Importance of fashion seasons & fashion calendar in apparel industry.

Introduction to fashion forecasting – significance, purpose of forecasting trends, forecasting tools & techniques and role of fashion forecasters. Fashion promotion and communications- Trade fairs, Fashion shows, exhibitions & promotional events

Suggested Reading List:

Title	Author
The theory of Fashion	John Wiley & Sons, 1965.
Fundamentals of Men's Fashion Design	Kawashima, Masazki
The clothing Factory	H C Carr
Inside the Fashion Business	J A Jarnow, B Judelle
Advertising Handbook	Barton Roger
Merchandising of Fashion	John B
Garment Manufacturing Technology	Nayak & Padhey
The Technology of Clothing Manufacture	Carr & Latham
Apparel manufacturing analysis	Jacob Solinger
Apparel manufacturing Handbook:	Jacob Solinger
Apparel Manufacturing Technology	Karthik, Ganeshan &
Goplakrishnan	

Course Outcomes:

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

1. Understand the fundamentals of fashion and apparel industries.
2. Analyze the fashion cycles, fad and different styles and fashion theories.
3. Apply the work of fashion leaders and brands into practice
4. Develop fashion promotion and communication skills.

HSMC-TT/TC/FAE-301G Merchandising and Export Management

Course code	HSMC-TT/TC/FAE-301G				
Category	Humanities and Social Sciences including Management Courses				
Course Title	Merchandising and Export Management				
Scheme and Credits	L	T	P	Credits	Semester-VI
	3	0	0	3	
Branch	Textile Technology/Textile Chemistry/Fashion and Apparel Engg.				
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Pre-requisites: Basic concept of management

Course Objectives:

1. To make the students acquainted with various concepts of marketing and different aspects pertaining to marketing which include market segmentation, product life cycle, various stages involved in new product development.
2. To make them understand the various pricing strategy and functions of distribution channel.
3. To make them understand the importance of export.
4. To familiarize them on export procedure, export terms of payment and final assistance provided by government.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 06 parts of 2.5 marks from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each Unit.

UNIT-I

Fundamental idea and basic terms and definition in marketing. Definition of marketing. Explanation of various concept of marketing with examples. Types of Marketing: Target marketing and Mass Marketing. Market segmentation. Classification of market based on size. Various stages of new product development and product life cycle.

UNIT-II

Concept and definition of Marketing mix. Variables of market mix: 4Ps Product, Price, Promotion and Place. Distribution channels and various functions performed by the distribution channel. Logistics and its relevance. Promotion mix: various kinds of promotion mix; their scope

of applications and their relative merits and demerits. Various factors need to be considered while deciding the price. Pricing decision and strategy.

UNIT-III

Export Management—importance of export. Risk involved in export and remedial measures. Various kind of terms of payment and their relative merits and demerits. Various kinds of document to be prepared and maintained for export. Various steps involved in Export Assistance given for export. Pre shipment and post shipment finance. Common incoterms.

UNIT-IV

Concept and definition of Merchandising. Utility and obsolescence factors in merchandising. Essential qualification criteria of a merchandiser. Types of merchandising. Roles of a merchandiser in an apparel industry. Various activities involved in merchandising: Line Planning, Line Development and Line presentation. Different types of sampling and their importance. Visual Merchandising. Elements of interior, exterior window display, store planning and layout-fixtures, location. Different types of sampling and their importance in merchandising. Brand building: Introduction, strategies, brand expansion, global trends. Introduction to customer relationship.

Suggested Reading List:

Title

Marketing Management
Nabhi's Publication on Export
International Marketing
Export Management

Author

Phillip Kotlar
Govt. Handbook
Hess and Cateora
B S Rathore

Course Outcomes:

After completion of the course, students will understand:

1. The concept of marketing and marketing mix
2. The importance and functions of distribution channel
3. The use of different promotional tools and their scope of applications
4. The various documents required for commercial and legal purpose
5. Financial assistance provided by government to the exporters and different modes of terms of payment in export business.

PCC-TC-304G Processing of Synthetics & Blends

Course code	PCC-TC-304G				
Category	Professional Core Course				
Course title	Processing of Synthetics & Blends				
Scheme and Credits	L	T	P	Credits	Semester-VI
	3	0	0	3	
Branch	Textile Chemistry				
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Pre-requisites: Knowledge of Introduction to Textile Processes

Course Objectives:

The course is designed to impart the following:

1. Sufficient knowledge and skills in synthetic dyeing
2. Must be aware of principle of dyeing operations, Material, equipment, process
3. Overview of various machines involved in processing of Synthetics & Blends.
4. Concept of Synthetics printing.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 06 parts of 2.5 marks from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each Unit.

UNIT-I

Chemistry and Technology of chemical processing of polyester, nylon and acrylics.

UNIT-II

Dyeing of important blends of natural and synthetic fibre fabrics. Analysis and remedy of barre effect. Developments of synthetic fibre dyeing and other chemical processing.

UNIT-III

Dyeing of microfibre fabrics. Dyeing machines for dyeing fibre, yarn and fabric. Mass colouration. Weight reduction treatment of polyester.

UNIT-IV

Styles and techniques of printing synthetics and blended textiles. Heat setting and other finishing (Antisoiling, antistatic, antipilling etc.) techniques.

Reference books

Chemical Processing of Synthetics
Vaidya

Author

K C Datye & A A

Course Outcomes:

Student will learn

1. Effective use of dyeing and printing knowledge for synthetic fibre, yarn and fabric in industries.
2. Use of various recipes for synthetic dyeing and printing.
3. Effective use of various machines for synthetic dyeing and printing.

PCC–TC–305G Textile Finishing

Course code	PCC-TC-305G				
Category	Professional Core Course				
Course title	Textile Finishing				
Scheme and Credits	L	T	P	Credits	Semester–VI
	3	0	0	3	
Branch	Textile Chemistry				
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Pre–requisites: Basic knowledge of different fiber properties and elementary idea of textile chemical processing

Course Objectives:

1. To enunciate the objects, classes and types of finishing & select the finishing process sequence according to the type of fabric and end use.
2. To describe working of finishing machinery used for application of various types of finishes to fabric.
3. To elucidate the importance, chemistry, mechanism, different types of finishes applied to various substrates and choose the ingredients for the same.
4. To describe the various problems faced during finishing of fabric with their remedies and choose proper method for evaluation of the performance of finishes applied on various substrates.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 06 parts of 2.5 marks from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each Unit.

UNIT-I

Objects of Textile finishing, Classification of finishing processes viz. Mechanical and Chemical Finishes, Temporary and Permanent Finishes. Finishing Process Sequences for different types of fabric like cotton, silk, wool, man-made etc.

Brief outline of Mechanical Finishes e.g. Calendaring, Raising, Sueding, Sanforising, Heat- Setting, Decatising & Milling of Wool and Aero finishing. Drying of textiles, concept and various type of drying machines used in textile industry.

UNIT-II

Chemical finishing process: Anti-crease finish: Mechanism of creasing, chemistry and technology used for improving wrinkle resistance, wash & wear and durable press properties of fabrics; Non-formaldehyde finishes Technologies eg: application of BTCA, CA, etc. Evaluation of these finishes.

Concept and mechanism of Flame retardancy. Flame retardant and proof finishes on natural fibres, synthetics and blends; temporary and durable finishes. Methods of evaluation of these finishes.

UNIT-III

Water repellent finishes, Chemistry and application of water repellents. Soil release finish – mechanism of soiling, steps of soil release and theory, different soil release finishes, soil repellency, fluorocarbons and Teflon finishes. Introduction to Antimicrobial finishing, chemistry of various antimicrobial finishes and their application. Methods of evaluation of these finishes.

UNIT-IV

Classification and chemistry of softeners, their application on textiles, merits and demerits. Detail on Silicone softeners and their chemistry. Application of Macro, micro and nano emulsion softeners. Brief introduction Optical brighteners. Introduction to Rot and Mildew proof finishing of Wool.

Reading List

Title	Author
Principles of Textile Finishing	A K R Chaudhary
Chemical Finishing of Textiles	W D Schindler & P J Hauser
An Introduction to Textile Finishing	J T Marsh
The Technology of Textile Finishing, Vol-X	V A Shenai
Encyclopedia of Textile Finishing	H K Rouette

Course Outcomes:

At the end of the course, the students will be:

1. Understand the objects of finishing & select the finishing process sequence according to the type of fabric and end use.
2. Understand working of finishing machinery used for application of various types of finishes to fabric.
3. Explain the importance, chemistry, mechanism, different types of finishes applied to various substrate and choose the ingredients for the same.
4. Analyze problems with their remedies in finishing of textiles and evaluate the performance of finishes applied on various substrates.

PCC–TC–306G Textile Processing Machinery

Course code	PCC-TC-306G				
Category	Professional Core Course				
Course title	Textile Processing Machinery				
Scheme and Credits	L	T	P	Credits	Semester–VI
	3	0	0	3	
Branch	Textile Chemistry				
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Pre-requisites: Basic knowledge of the various processes involved in the textile chemical processing like pre-treatments, dyeing, printing and finishing.

Course Objectives:

1. To describe the functions and working of various machinery used in pre-treatment of textiles.
2. To explain working of different dyeing and printing machines.
3. To explain working of various finishing machines

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 06 parts of 2.5 marks from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each Unit.

UNIT-I

Shearing and Cropping - Various types of shearing machines for woven fabric, surface shearing for terry towels, carpets, etc. Singeing machine- Various types of gas singeing machines for woven and knit goods. Construction and working of singeing machines. Open width and Rope form washing machines. Water extraction equipments of different mechanism like centrifuging, mangling, suction.

UNIT-II

Scouring and Bleaching Machine - Various types of kiers. J-box for continuous scouring, pad- roll system of scouring. Equipments for conventional bleaching. Continuous Pre-treatment range. Mercerizing, Washing, Relaxing Machines and Machinery for knit goods- Yarn mercerization

machines, fabric mercerization machines like pad chain, pad chainless and padless – chainless. Caustic recovery plant.

UNIT-III

Dyeing Machineries - Batch and continuous fibre dyeing machine, Hank dyeing machine, Package dyeing machine, different types of packages. Jigger, different types of Jiggers, winch dyeing machine, Horizontal beam dyeing machine. Pad batch and continuous open width fabric dyeing range. Different types of padding mangles. Different types of Jet dyeing machines, Soft flow, over flow & air flow dyeing machine.

UNIT-IV

General aspects of Textile Printing machinery: Study of roller printing machine. Study of construction & working of rotary printing machine & flat bed printing machine. Continuous & cut panel thermo transfer printing. Developments in printing machines. Study of agers, steamers & polymeriser. Finishing machinery - Drying equipments like Vertical Drying Range, Stenter for drying & finishing.

Reading List

Title

Textile Wet Processing Machinery
Engineering in Textile Colouration
Handbook of Textile processing machinery
Encyclopaedia of Textile Finishing

Author

N B Peefel
C Duckworth
R S Bhagwat
H K Rouette

Course Outcomes:

At the end of the course, the students will be:

1. Describe the functions and working of various machinery used in pre-treatment of textiles.
2. Explain working of different dyeing and printing machines.
3. Explain working of various finishing machines.

LC-TC-304G Dyeing Lab-II

Course code	LC-TC-304G				
Category	Lab Course (Professional Core Course)				
Course title	Dyeing Lab-II				
Scheme and Credits	L	T	P	Credits	Semester-VI
	0	0	2	1	
Branch	Textile Chemistry				
Class work	25 Marks				
Exam	25 Marks				
Total	50 Marks				
Duration of Exam	03 Hours				

Pre-requisites: Basic knowledge of processing of synthetics and their blends.

Course Objectives:

This Lab course is designed to impart knowledge of dyeing processes of synthetic fibers and their blends as a bridge between theory and practice.

List of Experiments:

1. Dyeing of polyester with disperse dye by carrier
2. Dyeing of polyester with disperse dye by high temperature & high pressure
3. Dyeing of polyester with disperse dye by thermosol dyeing
4. To study the Effect of carrier concentration on dye uptake of polyester
5. Dyeing of Acrylic
6. To study the effect of retardants
7. Dyeing of nylon with acid dyes
8. Dyeing of Nylon with metal complex dyes
9. To study the effect of dye fixing agents
10. Dyeing of polyester/cotton blended fabric
11. Dyeing of polyester/viscose blended fabric
12. Dyeing of polyester/wool blended fabric
13. Dyeing of cotton/wool blended fabric
14. Dyeing of acrylic/wool blended fabric

Course Outcomes:

1. To familiarize the students with various machinery and process involve in dyeing of synthetic fibres and their blends.
2. To understand the function of different chemicals in dyeing process of synthetic fibres.
3. To learn preparation of various recipes for Dyeing of synthetic fibres.

LC–TC–305G Characterization and Evaluation of Dyed & Finished Textiles

Course code	LC–TC–305 G				
Category	Laboratory Course (Professional Core Course)				
Course title	Characterization and Evaluation of Dyed & Finished Textiles				
Scheme and Credits	L	T	P	Credits	Semester–VI
	0	0	2	1	
Branch	Textile Chemistry				
Class work	25 Marks				
Exam	25 Marks				
Total	50 Marks				
Duration of Exam	03 Hours				

Pre–requisites: Basic knowledge of dyeing, printing and finishing of textile materials

Course Objectives:

This Lab course is designed to understand the various methods of evaluating the performance of dyed/printed and finished textile materials.

List of Experiments

1. Evaluation of colour fastness to Washing using standard test methods.
2. Evaluation of colour fastness to Rubbing using standard test methods.
3. Evaluation of colour fastness to Sublimation.
4. Evaluation of colour fastness to Perspiration.
5. Evaluation of colour fastness to Light.
6. Evaluation of colour fastness to Bleach with hypochlorite and peroxide.
7. Evaluation of colour fastness to Hot pressing.
8. Evaluation of colour fastness to Dry cleaning.
9. Evaluation of dimensional stability to washing, dry heat relaxation shrinkage.
10. Application and the evaluation of Anti-crease finish on cotton fabric.
11. Application of water repellent finish and determination of water repellency using Spray test.
12. Application of flame retardant finish and evaluation of flame retardency using flammability tester.
13. Application of Anionic softener and evaluation of softener application.
14. Application of Cationic softener and evaluation of softener application.
15. Application of Silicone softener and evaluation of softener application.

Course Outcomes:

At the end of the course, the students will:

1. Demonstrate testing of colour fastness of dyed and printed textiles.
2. Demonstrate the evaluation of various finish application to textiles.
3. Demonstrate the evaluation of various softeners applied to textiles.

LC-TC-306G Technical Analysis Lab

Course code	LC-TC-306G				
Category	Laboratory Course (Professional Core Course)				
Course title	Technical Analysis Lab				
Scheme and Credits	L	T	P	Credits	Semester-VI
	0	0	2	1	
Branch	Textile Chemistry				
Class work	25 Marks				
Exam	25 Marks				
Total	50 Marks				
Duration of Exam	03 Hours				

Pre-requisites: Basic knowledge of analytical chemistry and chemistry of textile auxiliaries

Course Objectives:

This Lab course is designed to impart experience of testing and analysis of various raw materials (dyes, chemicals & raw materials) used in textile chemical processing.

List of Experiments

1. Identification of class and the sub-class of dyes from given dye power eg: Basic, Direct, Reactive, Vat, Sulphur, Acid etc.
2. Identification of the class of dyes from the given dyed substrate eg: Direct, Reactive, Vat, Sulphur etc.
3. Estimation of the strength of NaOH volumetrically.
4. Volumetrically analyze the strength of given Hypochlorite solution.
5. Estimation of strength of Hydrogen Peroxide solution volumetrically.
6. Estimation of dye powder strength.
7. Cuprammonium Fluidity test to determine.
8. Methylene Blue Exhaustion to determine.
9. Barium Activity Number test.
10. Demonstration of UV-Visible Spectrophotometer
11. Demonstration of FTIR (Fourier Transformation Infra-red Spectroscopy)
12. Evaluation of the Wetting agents.
13. Evaluation of the Detergents.
14. Evaluation of the dye powder purity.
15. Evaluation of Reducing agents (Sodium hydrosulphide, Sodium sulphite).

Course Outcomes:

1. Demonstrate testing of dye powder with their class and sub-class.
2. Identification of dye from the dyed substrate.
3. Estimation strength of common chemicals used in textile industries.
4. Demonstration of instruments used in the technical analysis.
5. Evaluation of degradation of cellulosic textiles.

PEC–TC–304G Textile Chemical Testing

Course code	PEC-TC-304G				
Category	Professional Elective Course				
Course title	Textile Chemical Testing				
Scheme and Credits	L	T	P	Credits	Semester–VI
	3	0	0	3	
Branch	Textile Chemistry				
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Pre–requisites: Basic knowledge of the various processes involved in the textile chemical processing like pre-treatments, dyeing, printing and finishing.

Course Objectives:

1. Describe concepts and importance of chemical testing in textiles and standards.
2. Describe testing of textile products such as colour fastness, performance of auxiliaries used in processing.
3. Describe testing of material performance properties and chemical residue, its impact on and related environmental concern and standards on hazardous chemicals.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 06 parts of 2.5 marks from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each Unit.

UNIT-I

Introduction to textile chemical testing with their objective and scope. Introduction to the standards like ISO, ASTM, AATCC and BIS; Certifications like Okö-tex, Organic cotton, GOTS and restricted chemicals (Azo Ban, Formaldehyde).

Analysis of common chemicals used in wet processing: Acids, Bases, Salts, Oxidizing agents, Reducing agents (estimation of bleaching agents like hypochlorite, chlorite and peroxide).

UNIT-II

Estimation of chemical degradation of cotton, wool, silk and polyester (aldehyde and carboxyl group estimation in cellulose, amino group estimation of protein fibres, fluidity/viscosity measurement, critical dissolution time, etc).

UNIT-III

Identification and evaluation of dyes used for textile chemical processing. Colour Fastness of Dyed and Printed Goods General Principle of fastness testing, sample preparation, multifibres strip and their evaluation with grey scale. Evaluation of Colour fastness to washing, home laundering and various reference detergents; Colour Fastness to Rubbing, Perspiration, Water, Sea water, Chlorinated pool water, Light, Sublimation, Bleaching with hypochlorite and Peroxide, Hot pressing and Dry-cleaning using International Standards (ISO, AATCC, BIS).

UNIT-IV

Testing and Analysis of Auxiliaries: Surfactants, Wetting Agents, Leveling Agents, Detergents, Dispersing agents, Defoamers, Sequestering Agents, Softeners etc. Analysis of fresh water and effluent.

Reading List

Title

Chemical Testing of Textiles
Textile Auxiliaries
Analytical Methods for a Textile laboratory
Colorants and Auxiliaries Vol-I &II

Author

Qinguo Fan
VA Shanai
JW Weaver

John Shore AATCC Technical Manual

Course Outcomes:

At the end of the course, the students will:

1. Explain concepts and importance of testing, test standards and quality matter.
2. Demonstrate testing of textile products such as colour fastness, dyes and auxiliaries used in processing.
3. Explain the testing of chemical damages occur during wet processing.
4. Explain testing of material performance properties and chemical residue, its impact on and related environmental concern; standards on hazards and restricted chemicals.

PEC-TC-305G Textile Auxiliaries

Course code	PEC-TC-305G				
Category	Professional Elective Course				
Course title	Textile Auxiliaries				
Scheme and Credits	L	T	P	Credits	Semester-VI
	3	0	0	3	
Branch	Textile Chemistry				
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Pre-requisites: Basic knowledge of the various processes involved in the textile chemical processing like pre-treatments, dyeing, printing and finishing.

Course Objectives:

1. Describe the various auxiliaries used in textile chemical processing.
2. Describe the chemistry involved in the various auxiliaries used in the wet processing of textiles.
3. Demonstrate testing and evaluation of various chemicals and auxiliaries used in the textile processing.
4. Describe the working principle of some important instruments used in chemical testing.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 06 parts of 2.5 marks from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each Unit.

UNIT-I

General Consideration and classification of textile auxiliaries. Essential requirements of surfactants, mechanism of surface activity and surface active agents. Physical principles involved in detergency conditions for efficient detergency and Preparation of detergents. Scouring auxiliaries, mercerizing auxiliaries and various bleaching agents.

UNIT-II

Dyeing auxiliaries- wetting agents, dispersing agents, leveling agents, sequestering, stripping agents and dye fixing agents.

Printing auxiliaries: thickeners, classification of thickeners, thickeners for reactive dyes, emulsion thickeners, wetting agents, hygroscopic agents, antifoaming agent, pigment binders, reducing agents, oxidizing agents and miscellaneous auxiliaries.

UNIT-III

Finishing agents: Cross linking agents, urea formaldehyde derivatives and melamine formaldehyde. Synthetic resin emulsion used in textile industry like PV alcohol, PVC acrylic polymer, silicon emulsion etc.

Determination of strength of hypochlorite, hydrogen peroxide and hydrosulphite. Estimation of strength of NaOH containing sodium carbonate volumetrically and by Tw meter.

UNIT-IV

Performance evaluation of textile auxiliaries- Testing of wetting agents, detergents, foaming characteristics, soil release agents, leveling agents, flame retarding agents, water repellants. Softeners –different types of softeners.

Reading List

Title	Author
Textile Auxiliaries	VA Shenai
Textile Auxiliaries and Finishing Chemicals	AA Vaidaya &
S S Trivedi Textile Scouring and Bleaching	VA Shenai
Hand book of Specialties Chemicals	John E. Nettles
Chemistry of Organic Textile Chemicals	VA Shenai

Course Outcomes:

At the end of the course, the students will be:

1. Explain the various auxiliaries used in textile chemical processing.
2. Explain concepts and importance of testing, test standards and quality matter.
3. Demonstrate testing of chemicals, dyes and auxiliaries used in textile processing.
4. Explain the working principle of instruments used in chemical testing.

PEC–TC-306G Chemistry of Dyes

Course code	PEC–TC–306G				
Category	Professional Elective Course				
Course title	Chemistry of Dyes				
Scheme and Credits	L	T	P	Credits	Semester–VI
	3	0	0	3	
Branch	Textile Chemistry				
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Pre–requisites: Basic Knowledge of Chemistry

Course Objectives:

The course is designed to impart the following:

1. Sufficient knowledge regarding chemistry of synthetic dyes and its synthesis
2. Classify dyes according to their chemical structure
3. Use of dyes-stuff depending on their class and subclass

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 06 parts of 2.5 marks from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each Unit.

UNIT-I

Spectral properties of colorants, classification of dyes according to application and constitution, Dye intermediates and its chemistry. Colour & Constitution, Different types of chromophores and auxochromes. Fluorescence and phosphorescence. Isomers (stereoisomerism of Azo dyes and tautomerism).

UNIT-II

Chemistry including the synthesis of a few members of direct, acid, basic dyes. Developments of acid and basic dyes.

UNIT-III

Chemistry of vat dyes (Indigoid, anthraquinonoid and polycyclic quinonoid dyes; solubilised vat dyes), Sulphur dyes and sulphurised vat dyes, Chemistry of azoic colours.

UNIT-IV

Chemistry of Disperse & Reactive dyes. Chemistry and classes of pigments. Developments of colourants (ink for printing, fluorescent colour and other industrial application).

Reading List

Title

Colour Chemistry

Chemistry of Synthetic Dyes

Venkatraman Colour Chemistry – Synthesis, Properties and Applications
of

Dyes and Pigments

Industrial Dyes

Chemistry of Synthetic Dyes and Pigments

Author

R L M Allen

K

Zollinger H

Klaus Hunger

Lubs H. A

Course Outcomes:

1. Understand the chemistry involved in manufacturing of dyes and pigments.
2. Use of dyestuff on their class and subclass on textile substrate.
3. Effective use of dyestuff on their fastness properties.
4. Prepare novel dyestuff for textile substrate.

OEC-TC-306G Garment Processing & Quality Control

Course code	OEC-TC-306G				
Category	Open Elective Course				
Course title	Garment Processing & Quality Control				
Scheme and Credits	L	T	P	Credits	Semester-VI
	3	0	0	3	
Branch	Textile Chemistry				
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Pre-requisites: Basic knowledge of garment manufacturing and textile chemical processing

Course Objectives:

1. To discuss the process & machinery used for garment dyeing and printing.
2. To understand the role of special print effects in garment industry.
3. To discuss the various specialty Finishes used in garment industry and to understand the role of various parameters.
4. To discuss the process of wash down effects on denim garments & to understand the principle & features of machinery used for laundering & dry cleaning.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 06 parts of 2.5 marks from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each Unit.

UNIT-I

Introduction to Garment Processing: Importance of garment processing - advantages and limitations. Characteristics of various fibers used in garment manufacturing with respect to garment processing. Major issues in garment processing.

Garment Dyeing: Concepts of garment stage and pre garment stage dyeing- General precautions for garment dyeing –Various machineries used for Garment dyeing like paddle dyeing machine, drum dyeing machine. Drying of garment dyed goods – Various drying machinery like Hydroextractor, Tumble, dryer, RF dryer. Problems in Garment dyeing and its remedies.

UNIT-II

Garment Printing: Special print recipes for garments – Khadi – Metallic – Flock – Plastizol – Reflective – Pearl – Fluorescent – High density printing – Puff Printing – Foil Printing – Plastic,

Printing – Printing of Garments with Photochromatic and Thermo chromatic dyes. Garment Printing Machineries -Multi arm flat bed printing machine, Digital printing introduction and Transfer printing. Garment Finishing: Classification – Flow chart, Fragrance finish – UV protection finish - Cool finish - thermo cat finish – water resistant breathable finishes.

UNIT-III

Garment Washing: Introduction – Various wash down effects – Stone washing – Various stone- less washing effects like enzyme wash, Mud wash, Ion wash, Monkey wash etc. Other novel wash down effects like Acid wash, Antique wash, Denim Hand Sand /Scraping- Sand Blasting – Ball Blasting - Ozone Fading. Back Staining- causes and remedies. Laundering: Objective – Laundering procedure for garments made up of various fibers like cotton, linen, wool, silk and manmade textiles – various laundering equipments. Care labeling and Stain removal of garments.

UNIT-IV

Quality Control: Production technology in garment manufacturing – Manual and Mechanical systems. Inspection systems – Raw material inspection, In-process inspection and Final inspection. Quality Control and tools of quality control; Production planning in garment manufacturing. Introduction to cost structure in garment manufacturing.

Reading List

Title	Author
Fundamentals and Practices in Coloration of Textiles	J N
Chakraborty Dyeing and Chemical Technology of Textile Fibres	E R
Trotman Textile Finishing	A J
Hall	
Denim A Fabric for all	M S Parmar
An Introduction to Quality Control for Apparel Industry	P V Mehta
Managing Quality for Apparel Industry	P V Mehta & S K Bhardawaj

Course Outcomes:

At the end of the course, the students will be:

1. Explain the working principle of various machineries used for garment processing.
2. Describe the process of garment dyeing and suggest suitable process sequence.
3. Summarize the various special print effects and specialty finishes used in garment industry & to compare the effects given by various wash down processes to analyze problems & suggest possible remedies in denim processing.
4. Describe the quality control aspects of garment manufacturing.

PEC–TT–305G Structure and Properties of Fibres

Course code	PEC-TT-305G				
Category	Open Elective Course				
Course title	Structure and Properties of Fibres				
Scheme and Credits	L	T	P	Credits	Semester–VI
	3	0	0	3	
Branch	Textile Chemistry				
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Pre-requisites: Basic knowledge of fibres

Course Objectives:

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

1. familiarize the students with the morphological structure
2. get familiarized with the properties of the fibre to suit their applications
3. appreciate mechanism of absorption of moisture in fibres and their effects
4. understand thermal and optical properties of fibre

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 06 parts of 2.5 marks from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each Unit.

UNIT-I

Theories of fine structure of fibres; Methods of determination of molecular structures (crystallinity and orientation, crystal size etc.) by X-Ray methods; Stress-strain, creep and stress-relaxation of fibres, Simple spring and dashpot models simulating fibres.

UNIT-II

Absorption of moisture in fibres, hysteresis. Quantitative analysis of moisture absorption, Pierce's theory, Fick's laws of moisture diffusion, Swelling, Heat of sorption

UNIT-III

Optical properties: Polarization and refractive index, Birefringence and its measurement.

Thermal properties: Molecular motions and transition phenomenon, First order and second order transition phenomenon, Concept of heat setting and pleating, Measurement of specific heat of fibres

UNIT-IV

Electrical properties: Di-electric properties and its measurement, Effect of frequency and temperature on dielectric constant, Electrical resistance of fibres and its measurement, Static electricity and measurement of static charge in fibres.

Frictional properties of fibres – nature and measurement.

Suggested Reading List:

Title	Author
Physical properties of fibres	Morton and Hearle

Course Outcomes:

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

1. understand the fine structure of the fibres which is an essential tool to predict properties of fibres
2. assess various aspects of structure of fibre
3. blend different fibres to suit for various uses
4. understand the scope and limitations to improve structure and properties of synthetic fibres

OEC-TC-307G Coating and Laminating of Textiles

Course code	OEC-TC-307G				
Category	Open Elective Course				
Course title	Coating and Laminating of Textiles				
Scheme and Credits	L	T	P	Credits	Semester-VI
	3	0	0	3	
Branch	Textile Chemistry				
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Pre-requisites: Basic knowledge of polymer chemistry and fundamentals of textile finishing.

Course Objectives:

1. To explain concept of coating and chemistry of base material.
2. To discuss coating and lamination technology.
3. To discuss water proof and breathable coating, and various applications of coated and laminated products.
4. To discuss functional material involved in coating and environmental issue in coating and lamination technology.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 06 parts of 2.5 marks from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each Unit.

UNIT-I

Introduction

Advantages & Disadvantages of conventional finishing, Concept of Coating & Lamination, Merits & Demerits of Coating & Lamination, Production, Structure & Properties of Rubbers like- Natural Rubber, Styrene- Butadiene rubber, Isoprene-Isobutylene Rubber, Butyl Rubber, EPM & EPDM, Polychloroprene Rubber, Nitrile Butadiene Rubber & Silicone Rubber, Polymeric materials like Polyvinyl Chloride, Polyurethane, Acrylic Polymers, Foams For Laminates, Radiation-Cured Coating. Test methods of coated materials.

UNIT-II

Coating Methods

Knife Coating- Different types of Knives, Knife coating with premetering & postmetering, Roll Coating- Mayer rod coating, Direct-roll coating, Kiss roll coating, Gravure coating, Reverse roll coating, Dip Coating, Transfer Coating, Rotary screen Printing, Calendering- Zimmer coating,

Hot-Melt Coating, Scatter Coating, Foam Coating, Lamination by Adhesives, Flame Lamination, Hot melt. Lamination Merits & Demerits of each coating methods.

UNIT-III

Waterproof Breathable Fabrics

Mechanism of Water Proof Breathability, Parameters of Water Proof Breathability, Designing of Water Proof Breathability Fabric, Types of Water Proof Breathability Fabric. Application & Evaluation of Water Proof Breathability Fabrics.

Products from Coated & Lamination Fabrics

Protective clothing-Sports & Industrial, Industrial & Functional Products, Automotive applications in Interiors & Air bag fabrics, Marine applications, Building & Architecture, Medical & Military Use, Synthetic leather – Compact coated fabrics, Promeeries, Porous Vinyls, PTFE Laminate, Architectural Textiles- material & structure, Fluid Containers, Tarpaulins, Carpet backing, Flocking, Fusible Interlining.

UNIT-IV

Coating with Functional Materials

Microencapsulation, Thermochromic Fabrics, Temperature – Adaptable Fabrics, Fragrance Release Fabric, Fabrics for Chemical Protection, Camouflage Nets, High Visibility Garments, Intumescent Coating, Metal & Conductive-polymer coated fabrics, Coating of Smart Polymers & Nanomaterials.

Coating and Lamination Effects on the Environment

The effect of pollution, Environmental legislation, Manufacturing concerns, Sustainable developments. Future developments of coating & lamination with eco-friendly concern.

Reading List

Title	Author
Coated Textiles	A K Sen, CRC Press
Handbook of Technical Textile	Horrocks and Anand
Handbook of Industrial Textiles	S Adanur
Coated & Laminated Textiles	Walter Fung

Course Outcomes:

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

1. Explain concept of coating and chemistry of base material.
2. Illustrate coating and lamination technology.
3. Explain water proof and breathable coating and various applications of coated and laminated products.
4. Explain functional material involved in coating and predict environmental issue in coating and lamination technology.