M.D. UNIVERSITY, ROHTAK
SCHEME OF STUDIES AND EXAMINATION

B.TECH (TEXTILE TECHNOLOGY)
SEMESTER 7TH AND 8TH

SCHEME EFFECTIVE FROM 2021-22

M.D. UNIVERSITY, ROHTAK
SCHEME OF STUDIES AND EXAMINATION effective from 2021-22
Bachelor of Technology (Textile Technology)
Seventh Semester

Sr No.	Course Code	Course Title	Hours per week			Total Contact hrs/week	Credit	Examination Schedule (Marks)				Duration of Exam (Hours)
			L	T	P			Class work	Theory	Practical	Total	
1	PEC-IV	Elective-IV	3	0	0	3	3	25	75	-	100	3
2	PEC-V	Elective-V	3	0	0	3	3	25	75	-	100	3
3	OEC-IV	Open Elective-IV	3	0	0	3	3	25	75	-	100	3
4	PEC-VI	Elective-VI	0	0	2	2	1	25	-	25	50	3
5	PROJ-TT-401G	Mill Practice	0	0	0	0	5	100	-	100	200	Viva
6	PROJ-TT-402G	Seminar	0	0	2	2	0	-	-	-	-	-
7	PROJ-TT-403G	Project Work (Mid Term Evaluation)	0	0	4	4	2	100	-	-	100	Viva
Total							17				650	

ELECTIVE-IV

Sr. No.	Course Category	Course Code	Course Title
1	Professional Elective Course (PEC-IV)	PEC-TT-401G	Process Control in Spinning
2	Professional Elective Course (PEC-IV)	PEC-TT-402G	Process Control in Weaving
3	Professional Elective Course (PEC-IV)	PEC-TT-403G	Soft Computing in Textiles

ELECTIVE-V

Sr. No.	Course Category	Course Code	Course Title
1	Professional Elective Course (PEC-V)	PEC-TT-404G	Multi Fibre Spinning
2	Professional Elective Course (PEC-V)	PEC-TT/TC-405G	Nonwoven Technology
3	Professional Elective Course (PEC-V)	PEC-TT-406G	Clothing Science

OPEN ELECTIVE-IV

Sr. No.	Course Category	Course Code	Course Title
1	Open Elective Course (OEC-IV)	OEC-TT/TC-401G	Production and Operation Management in Textile
2	Open Elective Course (OEC-IV)	OEC-TT/TC-402G	Finance, Material and Human Resource Management
3	Open Elective Course (OEC-IV)	OEC-TT/TC/FAE-403G	Fashion Retailing and Promotion

ELECTIVE-VI

Sr. No.	Course Category	Course Code	Course Title
1	Professional Elective Course (PEC-VI)	LE-TT-401G	Spinning Practical – V
2	Professional Elective Course (PEC-VI)	LE-TT-402G	Weaving Practical – V
3	Professional Elective Course (PEC-VI)	LE-TT-403G	Soft Computing Practical

M.D. UNIVERSITY, ROHTAK
SCHEME OF STUDIES AND EXAMINATION effective from 2021-22
Bachelor of Technology (Textile Technology)
Eighth Semester

Sr No.	Course Code	Course Title	Hours per week			Total Contact hrs/week	Credit	Examination Schedule (Marks)				Duration of Exam (Hours)
			L	T	P			Class work	Theory	Practical	Total	
1	PEC-VII	Elective-VII	3	0	0	3	3	25	75	-	100	3
2	OEC-V	Open Elective-V	3	0	0	3	3	25	75	-	100	3
3	OEC-VI	Open Elective-VI	3	0	0	3	3	25	75	-	100	3
4	PROJ-TT-402G	Seminar	0	0	2	2	2	200	-	-	200	-
5	PROJ-TT-404G	Project Work	0	0	12	12	6	100	-	100	200	Viva
Total							17				700	

ELECTIVE-VII

Sr. No.	Course Category	Course Code	Course Title
1	Professional Elective Course (PEC-VII)	PEC-TT-407G	Textile Costing
2	Professional Elective Course (PEC-VII)	PEC-TT-408G	Textile Composites
3	Professional Elective Course (PEC-VII)	PEC-TT-409G	Mill Organization and Economics of Textile Processes

OPEN ELECTIVE-V

Sr. No.	Course Category	Course Code	Course Title
1	Open Elective Course (OEC-V)	OEC-TT/TC/FAE-404G	High Performance Fibres
2	Open Elective Course (OEC-V)	OEC-TT-405G	Protective Clothing
3	Open Elective Course (OEC-V)	OEC-TT-406G	Smart and Functional Clothing

OPEN ELECTIVE-VI

Sr. No.	Course Category	Course Code	Course Title
1	Open Elective Course (OEC-VI)	OEC-TT/TC-407G	Technical Textiles
2	Open Elective Course (OEC-VI)	OEC-TT-408G	Industrial Textiles
3	Open Elective Course (OEC-VI)	OEC-TT-409G	Medical and Geo Textiles

DETAIL SYLLABUS

SEMESTER 7TH

PEC-TT-401G Process Control in Spinning

Course code	**PEC-TT-401G**				
Category	Professional Elective Course (PEC-IV)				
Course Title	Process Control in Spinning				
Scheme and Credits	L	T	P	Credits	Semester–VII
	3	0	0	3	
Branch	Textile Technology				
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Pre-requisites: Yarn Manufacture-I, Yarn Manufacture-II, Yarn Manufacture-III,

Course Objectives:

The course is designed to impart the following:

- To familiarize the students about drafting process and its variable that affect yarn quality.
- Understanding the constituents of process control at spinning preparatory.
- Understanding the constituents of process control at ring spinning machine and maintenance of spinning machineries.
- Understanding different yarn quality parameters and their control.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 10 parts of 2.5 marks from all units and remaining eight questions of 12.5 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

Irregularity of drafted material: random, periodic and quasi-periodic irregularities; Index of irregularity, Cause and control of drafting wave, roller nip movement, roller speed variation, roller slippage and their effect on yarn irregularities, Effect of warp and weft yarn irregularity on cloth appearance, Interpretation and analysis of diagrams like Spectrogram, V-L curve, Histogram.

UNIT-II

Scope of process control in spinning, Control of mixing quality and cost through cotton fibre selection and bale management, Yarn realization and its control. Control of waste and cleaning in blow room, carding and combing; Various aspects of process control in spinning preparatory.

UNIT-III

Measurement and analysis of productivity of a spinning mill, Means to improve productivity of a spinning industry through control of end breakage rate and machine efficiency, Control of fly generation and twist variations in ring spinning, Machinery audit and its implementation, Maintenance of yarn spinning machineries.

UNIT-IV

Control of yarn quality: Count and its variation (within and between bobbin), Strength and their variability, Yarn Elongation, Yarn evenness and Imperfection, Yarn Hairiness, Control of neps and fibre rupture, Yarn fault and their control, Different types of package defects and their control.

Suggested Reading List:

Title	**Author**
Process Control in Spinning	AR Garde and T A Subramanian
Process Control in Textile Manufacturing	Abhijit Majumdar, Apurva Das, R Alagirusamy and V K Kothari
Process Control and Yarn Quality in Spinning	G Thilagavathi and T Karthik
Manual of Cotton Spinning	GAR Foster

Course Outcomes:

The students will learn,

- the concept of yarn irregularity and how different drafting parameter affect yarn irregularity
- the process control at various stage of spinning preparatory.
- the process control at various stage of ring spinning and maintenance of spinning machineries.
- how to control different yarn quality parameters.

PEC-TT-402G Process Control in Weaving

Course code	**PEC-TT-402G**				
Category	Professional Elective Course (PEC-IV)				
Course Title	Process Control in Weaving				
Scheme and Credits	L	T	P	Credits	Semester–VII
	3	0	0	3	
Branch	Textile Technology				
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Pre-requisites: Weaving Preparation, Fabric Manufacture-I, Fabric Manufacture-II, Advanced Weaving Technology-I & II

Course Objectives:

• This course is useful for the students to understand the controlling parameters of weaving preparatory and weaving processes.

• This course will help students to learn about the control strategies & techniques used for ensuring fabric quality, process efficiency, and minimizing process waste.

• This course will help to study the maintenance schedule of different machines engaged for weaving preparatory and weaving department.

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

Process control in winding and warping: Controls for quality, machine stoppage and productivity in winding, warping, and pirn winding, process control program in winding and warping, Controls in the process of high twist yarns, blended yarns, filament yarns in warp and weft. Controls in the winding for processing yarns for dyeing & knitting, Controlling sloughing off during winding, warping, Control of yarn tension and clearer setting in winding, evaluation of knots and splice, control of hairiness, Calculations pertaining to production, efficiency and machine allocation in winding, warping, pirn, assessment of package and beam quality.

Process control in sizing: Selection of size material, control of size add-on, Optimization of machine speed, squeeze pressure, drying temperature, size concentration and viscosity, size paste preparation, evaluation of size material and sized yarn, control of waste in sizing, Control of migration in sizing, size droppings, typical size mix for common fabric styles, preparation of filament yarns for weaving.

UNIT-II

Process control in loom shed: Control of machine stop and yarn breakage, Controls for yarn quality, machine and energy audit, housekeeping and material handling, Care, selection and consumption norms of accessories. formulation of maintenance schedule, Loom allocation, Temperature and humidity control, Statistical interpretation of data on waste and quality.

Process control in shuttleless weaving systems: Weft loading in shuttleless weaving, control of air quality and water quality in jet weaving. Automation of functions, weft entry angle, troubleshooting message analysis and suggestion of action, various machine adjustments, electronic weft insertion control, automatic pick finder, auto-setting and opening of valve in air-jet loom, settings of weave colour & colour pattern, electronic let-off & take-up, automatic stop-mark preventer, weft selection, automatic control of weft density and warp tension, material handling and QSC system, warp tension control, control of weft waste.

UNIT-III

Fabric defects and value loss: Fabric defects and their control, automatic fabric inspection, estimation of value loss, Control of value loss in fabrics through evaluation & grading of fabric defects, Fabric defect analysis based on minor, major and point system grading. Remedial measures to control weaving defects, Control and norms for waste.

UNIT-IV

Yarn quality requirement and assessment for weaving: Warp breakage phenomena in weaving, warp breakage mechanism, factors affecting warp breakage rate, Estimation of warp breakage rate, empirical, statistical and instrumental approach, Concept of weavability, Yarn quality and weavability, CSP as a measure of weavability, Classimat analysis, role of classimat faults in assessing weaving performance of warp.

Suggested Reading List:

Title	**Author**
Process control in textile manufacturing	A Majumdar
Online quality control in spinning and weaving	A Barella
Weaving: Technology & Operations	A Ormerod
Weaving: Machines, Mechanisms, Management	Talukdar, Sriramulu, Ajgaonkar
Principles of Weaving	R Marks & A T C Robinson
Woven Fabric Production – I & II	NCUTE Publications

Course Outcomes:

After successful completion of this course, student will be able to

- Understand the controlling parameters to attain maximum process efficiency of Weaving and Weaving Preparatory department.
- Understand the methods adopted to reduce the waste and to increase the product value.
- The students will understand the maintenance procedure followed for weaving preparatory and weaving department.

PEC-TT-403G Soft Computing in Textiles

Course code	**PEC-TT-403G**				
Category	Professional Elective Course (PEC-IV)				
Course Title	Soft Computing in Textiles				
Scheme and Credits	L	T	P	Credits	Semester–VII
	3	0	0	3	
Branch	Textile Technology				
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Pre-requisites: Applied Statistics & Operation Research, Mathematics-I, Textile raw Materials

Course Objectives:

• Introduce students to soft computing concepts and techniques and foster their abilities in designing and implementing soft computing-based solutions for textile problems.
• Introduce students to image processing systems and its applications for textiles.
• Introduce students to fuzzy systems, fuzzy logic, and its applications.
• Explain the students about Artificial Neural Networks and various categories of ANN.

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

Concept of soft computing., Basic tools of soft Computing, Methods for building empirical models: linear statistical methods, neural networks and nonlinear multivariate statistical methods. Approximations of Multivariate functions, Non – linear Error surface and optimization.

UNIT-II

Principles of Image Processing: Image fundamentals, Image types, Image-processing tools, Morphological image processing, Edge detection, Boundary tracing, Concept of Fast Fourier Transform, Image acquisition system, Limitations of the image processing

UNIT-III

Fuzzy Logic Systems: Basics of fuzzy logic theory, Crisp and fuzzy sets; Basic set operations; Fuzzy relations, Composition of Fuzzy relations, Fuzzy inference, Zadeh's compositional rule of inference.

Defuzzificaiton, Fuzzy logic control, Mamdani and Takagi and Sugeno architectures. Applications to pattern recognition.

UNIT-IV

Neural networks: Concept of neural network, Single layer networks, Perceptron; Activation functions; Adalinc- its training and capabilities, weights learning, Multilayer perceptrons; error back propagation, generalized delta rule; Radial basis function networks and least square training algorithm, Kohenen self – organizing map and learning vector quantization networks; Recurrent neural networks, Simulated annealing neural networks; Adaptive neuro-fuzzy information systems (ANFIS).

Suggested Reading List:

Title	**Author**
Soft Computing in Textile Engineering	A Majumdar
Neuro-fuzzy and soft-computing	J. S. R. Jang. C. T. SUN and E. Mizutani
Principle of Neuro Computing for Science and Engineering	Fredric M. Ham and Ivica Kostanic
Digital Image Processing	Rafael C. Gonzalez

Course outcomes:

After successful completion of this course, student will be able to

- Understand soft computing techniques and their role in problem solving.
- Conceptualize and parameterize various problems to be solved through basic soft computing techniques.
- Analyse and integrate various soft computing techniques in order to solve problems effectively and efficiently.

PEC-TT-404G Multi Fibre Spinning

Course code	**PEC-TT-404G**				
Category	Professional Elective Course (PEC-V)				
Course Title	Multi Fibre Spinning				
Scheme and Credits	L	T	P	Credits	Semester–VII
	3	0	0	3	
Branch	Textile Technology				
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Pre-requisites: Yarn Manufacture-I, Yarn Manufacture-II, Yarn Manufacture-III, Textile Raw Material

Course Objectives:

The course is designed to impart the following:

- To familiarize the students about spinning of manmade fibre on cotton spinning system.
- To familiarize the students about spinning of long and dyed manmade fibre on cotton spinning system.
- To familiarize the students about woolen and worsted spinning system.
- To familiarize the students about spinning of jute, flax, silk and cotton waste

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 10 parts of 2.5 marks from all units and remaining eight questions of 12.5 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

Brief idea about characteristics of man-made fibres their importance during spinning, Blending and its objective, Different indices of blending, selection of blend constituents, different technique of blending, Processing of man-made fibres and blends in blowroom, carding, drawframe and simplex in cotton spinning system.

UNIT-II

Processing of man-made fibres and blends on ringframe in cotton spinning system, Spinning of long staple fibres, spinning of dyed fibres, Structure and properties of ring spun blended yarns, spinning of man-made fibres on woollen and worsted system,

UNIT-III

Woollen, Semi-worsted and worsted systems of spinning: Brief idea of scouring, carbonizing, carding, combing, gilling, flyframe and ring spinning.

UNIT-IV

Jute and flax spinning: understanding of various processes like batching, carding, drawing, roving and spinning of hessian and sacked yarn.

Manufacturing of spun silk yarn

Cotton Waste: Types, classification and end-uses, study of machines and methods employed in the production of waste yarn (coiler system and condenser system).

Suggested Reading List:

Title	**Author**
Spinning of man-mades and blends on Cotton system	KR Salhotra
Wool Hand Bookm Vol.II	Werner Von Bergei
British Wool Manual	H Spibey
Shoddy & Mungo Manufacture	NC Gee
Worsted	Alan Brearley
Jute-Fibre to Yarn	RR Atkinson

Course Outcomes:

The students will learn about,

- the spinning of manmade fibre on cotton spinning system.
- the spinning of long and dyed manmade fibre on cotton spinning system.
- the woollen and worsted yarn manufacturing.
- the spinning of jute, flax, silk and cotton waste yarns.

PEC-TT/TC-405G Nonwoven Technology

Course code	**PEC-TT/TC-405G**				
Category	Professional Elective Course (PEC-V)				
Course Title	Nonwoven Technology				
Scheme and Credits	L	T	P	Credits	Semester–VII
	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: Concepts of textile raw materials (TRM), fundamentals of yarn and fabric formation

Course Objectives:

- To familiarize the students about nonwovens, technology, and classification
- To familiarize the students about different nonwoven web preparation techniques
- To familiarize the students about different web bonding techniques
- To familiarize the students about nonwoven fabric structure-properties and common test methods

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

Non-woven fabrics: Characterization, classification, uses.

Web preparation: requirements, orientations, types – their technology and machineries.

UNIT-II

Needle Punching: technology, machineries, needling parameters, felting needle, needle parameters, and applications.

Spun-lacing: principle, machineries, and applications.

Stitch bonding – principle, and applications.

UNIT-III

Chemical bonding: principle, binders – their types and properties, binder application techniques, and applications.

Spun Bonding and melt blown techniques: principle, machineries, and applications.

UNIT-IV

Thermal bonding: technology, binders – their types and properties, machineries (hot calendaring, hot-air systems), and applications.

Nonwoven fabric structure-properties, factors affecting structure-properties.

Some common standard tests of nonwoven fabrics.

Suggested Reading List:

Title	**Author**
Handbook of nonwovens	S J Russell
Nonwoven Fabrics	W Albrecht, H Fuchs, W Kittelmann

Course Outcomes:

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

- understand the technology of nonwovens, classification and application areas.
- understand the types and machineries of different web formation techniques.
- understand the technology and machineries of different web bonding techniques.
- understand the structure-property of nonwoven fabrics.
- know the common test methods of nonwovens.

PEC-TT-406G Clothing Science

Course code	**PEC-TT-406G**				
Category	Professional Elective Course (PEC-V)				
Course Title	Clothing Science				
Scheme and Credits	L	T	P	Credits	Semester–VII
	3	0	0	3	
Branch	Textile Technology				
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Pre-requisites: Textile Testing; Garment Manufacturing

Course Objectives:

• To enable the students to understand specific characteristics of human clothing.
• To gain knowledge about the fabric handle and aesthetic properties of fabric required for human clothing.
• To understand the comfort characteristics of fabric for clothing purposes.
• To understand the safety aspects of garments.

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

Concept of selection of fabrics for clothing purpose – Types of fabric required for apparel use for different age group, occasions, purpose, Fabric properties and performance for apparel use.

Fabric properties for serviceability of fabrics, Concept of tailorability of woven and knitted garments

UNIT-II

Aesthetic properties of garments, fabric parameters affecting fabric texture, Significance of dimensional Stability of Fabrics; Hygral expansion, Relaxation shrinkage, Swelling shrinkage, Felting shrinkage. Mechanism of fabric shrinkage - Relationship between Hygral Expansion, Relaxation shrinkage and extensibility - Knitting Process Parameters and fabric stability. Methods of measuring dimensional stability to dry cleaning and dry heat. Concept of Fabric Hand, subjective hand judgment, objective evaluation of fabric hand and its applications.

UNIT-III

Definition of comfort - Human clothing system - Physical, Physiological, and psychological aspects of comfort – Tactile and pressure sensation aspects. Concept of Thermal Comfort, Thermal transfer processes – Dry heat transfer and Rapid heat transfer. Function of Textiles in enhancing thermal comfort. Comparison of thermal comfort properties for different textile structures.

UNIT-IV

Concept of Functional Properties of garments, Elasticity: elastic recovery, residual strain; Thermal insulation; Water repellence, water resistance and waterproof; Wicking: vertical and horizontal transportation of liquid; Water absorbency; UV protection; Soil release. Safety norms for textiles: Toxicity - residual dye stuff and other finishing agent, Okeo-Tex norms; Flammability.

Suggested Reading List:

Title	**Author**
The Science of Clothing Comfort	Y Li
Physical Testing of Textiles	B P Saville
Clothing: Comfort & Functions	Lyman Fourt & Norman R S Hollies
Science in Clothing Comfort	A Das, R Alagirusamy

Course Outcomes

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

- Understand the fabric selection process for apparels.
- Understand the role of clothing for human comfort.
- Recognize the Principles of heat transfer to and away human body.
- Understand the environmental norms of garments.
- List the characteristics of cloth and made by an interchange property of fibre.

OEC-TT/TC-401G Production and Operation Management in Textile

Course code	OEC-TT/TC-401G				
Category	Open Elective Course (OEC-IV)				
Course Title	Production and Operation Management in Textile				
Scheme and Credits	L	T	P	Credits	Semester–VII
	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: Knowledge on textile processes

Course Objectives:

• To make the students aware of importance of planning and activities involved in production

• To enable the students enable to calculate productivity and factors affecting this.

• To enable the students to carry out time study and to determine standard time.

• To impart knowledge on quality control and quality management.

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

Scope and function of Production and operation. Functions involved in production and operation management. Macro & Micro level Production planning in textile mill. Objectives of production planning. Functions involved in planning and control. MIS in a textile mill. Classification of production system based on production method and market demand with example MIS in a textile organization.

UNIT-II

Concept of Productivity: Various measures of productivity and their relative merits and demerits. Factors affecting productivity of an organization with special reference to a textile mill. Concept of Business Process Reengineering.

Work study - scope and objective with special reference to textile industry. Steps involved in Method Study. Objectives of work measurement. Techniques of Work measurement. Various steps involved in Time Study and determination of standard time. Application of Snap Study in Textile Industry.

UNIT-III

Inspection process followed in a textile organization. Types of inspection. AQL level. Customer and producer risk involved in AQL. Single and double inspection plan. Limitation of inspection system. Quality control and application of statistics in quality and process control. Quality control chart and its importance. Construction of various types of control chart and their scope of application in a textile mill. Interpretation of quality control chart. Limitation of quality control.

UNIT-IV

Evolution of Concept of Quality & Quality Management System (Q.M.S). Overview of Quality Management System Standard - ISO 9000. Formulation of Quality Policy, Quality Objective & Quality plan. Implementation Procedure of Q.M.S with special reference to Textile industry. Documentation of quality management and preparation of Quality manual Quality Audit. Preparation of audit report. Types of audit.

Suggested Reading List:

Title	**Author**
Production and Operation management	S N Charry
Production and Operation management	N G Nair
Quality management	L Suganthi and Samuel
Fundamentals of quality control and improvement	A Mitra

Course Outcomes:

After completion of the course, students will:

- understand the job of a production manager.
- understand the importance of planning in production management.
- get a brief idea of MIS in textile industry.
- understand concept of productivity and various measures of productivity.
- get knowledge on quality management system and its implementation process.
- be able to conduct quality cicle and 5s

OEC-TT/TC-402G Finance, Material and Human Resource Management

Course code	**OEC-TT/TC-402G**				
Category	Open Elective Course (OEC-IV)				
Course Title	Finance, Material and Human Resource Management				
Scheme and Credits	L	T	P	Credits	Semester–VII
	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: Basic knowledge of economics and management

Course objectives:

- enable the student to understand the sources of finance for a business organization
- enable the student to understand the importance of budget and working capital
- enable the student to understand the basics of human resource management

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

Sources of Financing: Long-term and Short-term financial requirements. Sources of Finance. Need and importance of capital budgeting. Capital Budgeting Process, Methods of Capital Budgeting of Pay-back period, uneven cash inflows. Post pay-back profitability method. Accounting rate of return or, Average rate of return. Net present value Internal rate of return.

UNIT -II

Capital Structure: Meaning: Essentials of an ideal/optimum Capital Structure, Difference between capital, Capitalization and Capital Structure. Management of Working Capital: Definition; Nature Classification of Working Capital – (i) Permanent working Capital and (ii) Variable Working Capital; Factors affecting requirement of working capital, Presentation of cash flow statements and its benefits.

UNIT -III

Personal Management and HRD, Job Analysis: Meaning and Importance; Processes of Job Analysis, Job Description and Job Specification.

UNIT -IV

Materials Management: Definition and Objectives: Inventory Management. Inventory Control: Techniques of Inventory control - ROL, FOR Value Analysis, ABC Analysis, VED Analysis; Factors affecting Inventory Control, Ordering Costs, Carrying Costs, Stock-out costs, Buffer Stock, Stock Turnover & Lead.

Reading List

Title	**Author**
Accounting for Managers	Paresh Shah
Financial Accounting	D K Goyal
HRM	R S Dwivedi
Accounting Principles	Robert N Anthony & S James Reece
Financial Accounting	S M Shukla
Cost Mgt. Accounting & Control	Hansen & Mowen
Financial Accounting	P C Tulsiyan

Course Outcomes:

After studying the course, the student will:

- understand the various sources capitals.
- get idea on inventory control.
- understand different methods of Costing, their scope of application.

OEC-TT/TC/FAE-403G Fashion Retailing and Promotion

Course code	**OEC-TT/TC/FAE-403G**				
Category	Open Elective Course (OEC-IV)				
Course Title	Fashion Retailing and Promotion				
Scheme and Credits	L	T	P	Credits	Semester–VII
	3	0	0	3	
Branch	TT, TC, FAE				
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Pre–requisites: Textile Raw Materials, Yarn formation, Fabric formation, Coloration techniques, Accessory designing

Course Objectives:

To impart knowledge of fashion retail formats and services being offered by them.

- To understand the role of Wholesalers and to differentiate with that of a retailer.
- To introduce various aspects of retail marketing mix and its elements.
- To familiarize the students with the changing dimensions of fashion Retailing.
- To introduce the basics of retail in an apparel supply chain.
- To learn the retail decisions with emphasis on site selection and retail pricing.
- To learn the fashion promotion, advertising and communication to the other retailers and consumers.

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

Retailing Environment: Introduction to Retailing, Types of Retailers/retailing. Multi-channel retailing.

Retail strategy: Retiling decisions- Decisions related to target market, pricing, store positioning, retail site selection etc.

Store Organization, Retail communication, Retail audit.

UNIT – II

Wholesalers-difference between retailers and wholesalers, types of wholesalers, major functions and services provided by wholesalers, product line of wholesalers.

Retail store management: Store layout, Store design, Visual merchandising, Retail services. Retail

Arithmetic- product price setting, price change, Numerics of different types of mark ups, mark downs, price settlement at retail level.

Retail Inventory planning, Inventory control and management.

UNIT - III

Fashion communication: Fashion shows, Portfolio presentation, Moodboards, Storyboards. Fashion advertising, Fashion photography. Planning and Direction of Fashion advertising and different kinds of Advertising, Scheduling and planning (Public Media, Newspaper, Magazine, radio, Television, Direct mailing etc.), Advertising department in a retail store, Advertising agencies, Publicity, Special events.

UNIT - IV

Changing dimensions of fashion retailing - growth of private labels: retailers into manufacturing, concentration of retail power, globalization of retailing.

Fashion communication: Fashion shows, Portfolio presentation, Moodboards, Storyboards. Fashion advertising, Fashion photography. Planning and Direction of Fashion advertising and different kinds of Advertising, Scheduling and planning (Public Media, Newspaper, Magazine, radio, Television, Direct mailing etc.), Advertising department in a retail store, Advertising agencies, Publicity, Special events.

Suggested Reading List:

Title	**Author**
Inside Fashion Design	Sharon Lee Tate
Inside the Fashion Business	Kitty G Dickerson
Marketing Management, 13th Ed, Prentice Hall Higher Education, 2008	Philip Kotler, Kevin Keller
Marketing Management, 13th Ed, Prentice Hall Higher Education, 2008	Philip Kotler, Gary Armstrong
Fashion Marketing, Blackwell Publishers, 2008	Mike Easey

Course Outcomes:

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

- analyze the fashion retail, various formats and levels of services offered by retailers.
- develop the skills of differentiate fashion retailers and Wholesalers and their operations.
- analyze the retail Marketing process and modes of Fashion sales Promotion.
- implement the changes in dimensions of Fashion Retail and Globalization.

LE-TT-401G Spinning Practical–V

Course code	**LE-TT-401G**				
Category	Professional Elective Course (PEC-VI) (Laboratory Course)				
Course Title	Spinning Practical–V				
Scheme and Credits	L	T	P	Credits	Semester–VII
	0	0	2	1	
Branch	Textile Technology				
Class work	25 Marks				
Exam	25 Marks				
Total	50 Marks				
Duration of Exam	03 Hours				

Pre-requisite: Yarn Manufacture, Spinning Practical-IV

Course Objectives:
This practical is designed to impart first-hand experience of change places/features of the latest machineries. This course will also enable to make spin plan, determine workloads of workers in respective sections. The course is also designed to make students know the causes of various package faults and their remedies.

Contents: Study to find the draft constant, twist constant of ring frame of different makes. Familiarity with process parameters to spin single and plied yarns.

Case studies pertaining to charge sheet, snap study, workload of workers at different sections, total productivity and actual efficiency.

Study of USTER STASTICS; Oiling and maintenance schedules; Idea of time and motion study; Workload measurements

List of experiments:

1. To set the ring-frame to produce a particular yarn count from the given material.
2. To set the ring doubler to produce a plied yarn from the given material.
3. To find the end-breakage% of a ring frame.
4. To find out the workload of a ring-frame tenter employed in a spinning mill for a particular yarn count.
5. To find out the production and efficiency of ring-frame and ring-doubler department as a whole for a particular day and summarize your result count wise, shift wise, machine wise for the day and to find the average count of ring frame department.

6. To find out the work-load of a doffer gaiter.
7. To make a spin plan for a given count for a given production per day.
8. To find the cost per kg of a particular yarn count and also find contribution, profit per kg and per spindle of a mill.
9. To get acquainted with USTER STATISTICS.
10. To carry out snap study in a spinning mill to out end-breakage% and idle spindle % in a spinning department.
11. To acquaint yourself with latest developments of ring-frame, rotor-spinner, air-jet spinning machine.
12. To analyze the causes of package defects occurring in a spinning mill.
13. To get apprised of different types of workers employed in a spinning mill and list the designation and duties of each type of worker.
14. To know under what conditions a worker is charge sheeted and the further proceeding.
15. To acquaint yourself with some labour laws and factory act
16. To get acquainted with the duties of shift officer.
17. To get acquainted with the maintenance schedule and oiling schedule of ring frame, ring-doubler and winding machine

LE-TT-402G Weaving Practical-V

Course code	**LE-TT-402G**				
Category	Professional Elective Course (PEC-VI) (Laboratory Course)				
Course Title	Weaving Practical-V				
Scheme and Credits	L	T	P	Credits	Semester–VII
	0	0	2	1	
Branch	Textile Technology				
Class work	25 Marks				
Exam	25 Marks				
Total	50 Marks				
Duration of Exam	03 Hours				

Pre-requisites: Fabric Manufacture-I; Fabric Manufacture-II, Advanced Weaving Technology-I & II, Weaving Practical-I to IV.

Course Objectives:
This practical is designed to impart knowledge on colours and their use in textile design. It also gives a first-hand experience of product design and development in weaving and knitting as well as practice in time and motion studies. It serves as a bridge between theory and practice.

Contents: Theory of colour; primary, secondary and tertiary colours, Complementary colours, Colours in combination, Colour and weave effect, Proportion, rhythm and decorative qualities in textile design. Contrast and harmony in textile and colour.

Product design and development in weaving and knitting, Design preparation through CAD.

Practice in motion study, time study and work-load measurement.

List of Experiments:

1. Study of theory of colour - primary, secondary and tertiary colours.

2. Study of complementary colours and colours in combination.

3. Study of colour and weave effect.

4. Study of proportion, rhythm and decorative qualities in textile design.

5. Study of contrast and harmony in textile and colour.

6. Design preparation through CAD.

7. Design and development of woven fabric sample.

8. Design and development of knitted fabric sample.

9. Motion study, time study and work-load measurement in loom shed.

Course Outcomes:

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

- comprehend the theory and practice of colours, their combination and their use in textile design.
- prepare textile designs using CAD.
- design and develop woven as well as knitted fabric samples.
- know how to conduct motion study, time study and work-load measurement.
- Develop practical skills relevant to industrial practice.

LE-TT-403G Soft Computing Practical

Course code	**LE-TT-403G**				
Category	Professional Elective Course (PEC-VI) (Laboratory Course)				
Course Title	Soft Computing Practical				
Scheme and Credits	L	T	P	Credits	Semester–VII
	0	0	2	1	
Branch	Textile Technology				
Class work	25 Marks				
Exam	25 Marks				
Total	50 Marks				
Duration of Exam	03 Hours				

Pre-requisites: Applied Statistics & Operation Research,

Course Objectives:

• Introduce students to problem solving using Matlab
• Introduce students to image processing using Matlab.
• Introduce students to fuzzy systems in Matlab
• Introducing formation of Artificial Neural Networks in Matlab.

Contents: Basic operation of Matlab. Basic concept of Images, Types of Imges, Image transformation in Matlab platform. Morphological operations of Images in Matlab platform. Measurement and estimation of parameters of Images in Matlab platform. Concept of fuzzy logic and its applications in Textiles. Building of basic systems with fuzzy logic toolbox in Matlab. Applications of neural network in Textiles. Building up neural network models for prediction of yarn and fabric parameters.

List of Experiments:

1. Basic operation guidance in Matlab.
2. Importing and exporting of images in Matlab.
3. Plotting images in Matlab.
4. Solving non-linear equations in Matlab.
5. Image format conversions using Image Processing Toolbox in Matlab.
6. Edge detection, boundary tracing using Image Processing Toolbox in Matlab.
7. Measurement of yarn diameter, fabric cover with the help of image processing.
8. Building basic systems with fuzzy logic toolbox in Matlab.

9. Construction of feed-forward neural network using Matlab.
10. Construction of radial biased neural network using Matlab.
11. Construction of an ANN model for the prediction of fabric tensile strength using fiber parameters, yarn linear density, fabric constructional parameters.

Course outcomes:

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

- understand soft computing techniques and their role in problem solving using Matlab.
- conceptualize and parameterize various problems to be solved through basic soft computing techniques.
- analyse and integrate various soft computing techniques to solve problems effectively and efficiently.

PROJ-TT-401G Mill Practice

Course code	**PROJ-TT-401G**				
Category	Industry Internship				
Course Title	Mill Practice				
Scheme and Credits	L	T	P	Credits	Semester–VII
	0	0	0	5	
Branch	Textile Technology				
Class work	100 Marks				
Exam	100 Marks				
Total	200 Marks				
Duration of Exam	Viva				

At the end of 6th semester, each student, individual or in association with some other students has to undergo Practical Training of 6 weeks in an Industry/Mill/ Professional Organization with the approval of the Director, TIT&S and submit a typed report along with a certificate from the organization to the Head of the Department.

PROJ-TT-403G Project Work (Mid Term Evaluation)

Course code	**PROJ-TT-403G**				
Category	Project work				
Course Title	Project Work (Mid Term Evaluation)				
Scheme and Credits	L	T	P	Credits	Semester–VII
	0	0	4	2	
Branch	Textile Technology				
Class work	100 Marks				
Exam	-				
Total	100 Marks				
Duration of Exam	Viva				

Each student individually, or an association with some other students will carry out project of an experimental and/or theoretical nature in one of the main branches of textile technology and present his findings in a systematic manner in a typed report form duly approved and signed by his Supervisor/Guide (to be nominated by the Head of Department/Institution). The report is to normally include:

1. Survey of published literature on the assigned topic.

2. Preliminary Approach to the problem relating to the assigned topic/Plan of further work.

3. Preliminary Analysis/ Modelling/ Simulation/ Experiment/Testing/Design/ Feasibility.

DETAIL SYLLABUS

SEMESTER 8TH

PEC-TT-407G Textile Costing

Course code	**PEC-TT-407G**				
Category	Professional Elective Course (PEC-VII)				
Course Title	Textile Costing				
Scheme and Credits	L	T	P	Credits	Semester–VIII
	3	0	0	3	
Branch	Textile Technology				
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Pre-requisites: Knowledge on textile processes

Course objectives:

- Enable the student to understand cost and its classification
- Enable the student to understand how to control cost using standard cost concept
- Enable the student to identify the various sources of waste and control them
- Enable the student to understand various cost components and their contribution in total cost in manufacturing
- Enable the student to prepare cost sheet for various textile 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 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 concept of Cost. Purpose of costing. Classification of cost based on i) cost volume relationship ii) functions involved example, Manufacturing cost, R&D cost, selling and distribution cost etc. iii) cost element. Overhead Cost and its classification.

Concept of depreciation cost. Various ways of determination of depreciation cost with simple example in textile machineries.

UNIT-II

Different methods of Costing, their scope of application and principles involved, example, Job order costing, batch costing, Output costing, Process Costing, Operating Cost. Principle of determining standard cost, and their scope of application.

Essential criteria of Standard Cost. Types of standard cost and their scope of application Steps involved in controlling cost using standard costing. Variance analysis. Limitation of standard costing.

UNIT-III

Determination of Yarn Realization %, Cost of clean cotton. Factors influencing the waste extraction in blow room, carding and comber. Contribution of various factors in cost of yarn manufacturing. Power consumption in different section in a textile plant. Factors determining the optimum package size. Preparation of cost sheet in yarn costing.

UNIT-IV

Control of hard waste in spinning, winding, warping, sizing and loom Calculation of cost per meter of the fabric woven in conventional and modern loom and Value loss in selling price of fabric. Costing of garment. Control of fabric loss in garment manufacturing. Preparation of garment cost sheet.

Idea on inco terms, advantage and limitations inco terms. Containerization and its advantage and limitations. Type of containers and their uses.

Suggested Reading List:

Title	**Author**
Cost and Management Accounting	M N Arora
Cost Accounting, Principles and practice	B M Lall Nigam, I C Jain
Cost Accounting in Textile Mills	P V Bhave, V Srinivasan

Course Outcomes:

After studying the course, the students will:

- understand the various type of cost and able to classify costs.
- get idea of depreciation cost and various ways of determination of depreciation cost within textile machineries.
- understand different methods of costing, their scope of applications.
- know how to control waste at various stages of production of yarn and fabric.
- know the calculation of cost of production of textile products.

PEC-TT-408G Textile Composites

Course code	**PEC-TT-408G**				
Category	Professional Elective Course (PEC-VII)				
Course Title	Textile Composites				
Scheme and Credits	L	T	P	Credits	Semester-VIII
	3	0	0	3	
Branch	Textile Technology				
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Pre-requisites: Fabric Manufacture-I & II; Yarn Manufacturing

Course Objectives:

- To familiarize the students about the modern composite materials.
- To familiarize the students about growing application of light weight composite materials.
- Understanding about the raw materials used to manufacture the textile composite.
- Understanding about the manufacturing techniques and principle of the textiles composites.
- To orient the students towards high end research with modern textile 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

Definition of Composites, Fibrous Composites and Fibrous Structural Composites, Fibrous Materials for Composites, Matrix and Reinforcements, Classification of Fibre Reinforced Structures According to Axis and Dimension; Non-Axial, Mono-Axial, Biaxial, Triaxial and Multiaxial Structures, UD, 2D, 3D Structures.

UNIT-II

Structural Anisotropy of Composites, Parallel Arrangement, and Series Arrangement of Components Chopped Strand and Milled Fibres, Hybrid Fabrics, Non-Crimp Fabrics, Laminates, Stitched Structure, Composite Rope, Design, Manufacture, and Applications of Reinforcements.

UNIT-III

Manufacture and Characterization of Light Weight 3D Hollow Fibrous Structure for Composites, Methods of Composite Processing, Manufacturing Techniques of Complex Structural Composites,

Characterization of Structural Composites, Theory of Composites, Composite Concepts and Theory, Rule of Mixture, The Synergy Effect.

UNIT-IV

Particular, Granular, Fibrillar, Lamellar, Properties of Components, Properties of Interface, Mechanism of Adhesion, Applications of Fibrous Structural Composites, Reinforced Concretes, Fibre Concrete Bonding, Fibrous Structure Reinforcement Concrete Architecture, Characterization and Applications of Reinforced Concretes.

Suggested Reading List:

Title	**Author**
Textile structural composites	Tsu Wei Chou and Frank K. Ko
3D Fibrous assemblies	Jinlian Hu
High performance fibre composites	J G Morley, Harcourt Brace Jovanovinch

Course Outcomes:

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

- understand the concept of fibrous composite materials and the classification of different types of composite.
- understand the design and manufacturing of light-weight materials for the use of different high-end applications.
- understand the growing importance of light-weight textile materials to build and protect the modern world.

PEC-TT-409G Mill Organization and Economics of Textile Processes

Course code	**PEC-TT-409G**				
Category	Professional Elective Course (PEC-VII)				
Course Title	Mill Organization and Economics of Textile Processes				
Scheme and Credits	L	T	P	Credits	Semester–VIII
	3	0	0	3	
Branch	Textile Technology				
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Pre-requisites: Knowledge of textile processes

Course Objectives:

• To make the students understand the factors need to be considered for selection of site and layout and their importance
• To enable the students to carry out break even analysis and determination of contribution
• To impart knowledge on inventory management in textile organization
• To make the students understand the importance of maintenance and utility services
• To make the students understand environment management system

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 planning in the context of a textile mill. Site selection of a textile mill. Plant layout and its importance in a textile industry. Types of layout applicable to a textile industry. Principle of designing material handling system. Type of material handling in a textile industry. Automation in material handling. Manpower planning in a textile mill and determination of wage and incentives.

UNIT-II

Inventory management. Categorization of inventories with example applicable in a textile plant. Cost associated with industry. Break even analysis and its importance. and limitation. Application of breakeven analysis in a textile organization. Determination of contribution and its importance.

UNIT-III

Maintenance and its importance. Type of maintenance preventive and corrective. Different types of maintenance in a textile plant and their impact on quality, productivity and safety. Total productive maintenance and its importance in today's context. Implementation of T.P.M.

Role of different utility services in a textile plan. Brief idea on working of humidification plant and its working principle.

UNIT-IV

Pollution in a textile plant. Identification of environ aspect and impact. Initial environment review and Implementation of environment management system in textile mill. Environment action plan. Brief idea on working of ETP. Noise pollution and control. Occupational Health hazard and its prevention in a textile mill. Concept and implementation of OSHA 18000.

Suggested Reading List:

Title	**Author**
Management of Textile Industry	V D Dudeja
Management of Textile Production	A Ormerod
Industrial Organization & Engg. Economics	T R Banga & S.C. Sharma
Environmental Pollution and Waste Management	H D Kumar

Course Outcomes:

After completion of the course, the students will

- understand the site selection process and lay out in textile industry.
- get a brief idea on maintenance activities and their importance.
- get a brief idea on environment management and its implementation process.
- understand the process of implementation of OSHA 18000.

OEC-TT/TC/FAE-404G High Performance Fibres

Course code	**OEC-TT/TC/FAE-404G**				
Category	Open Elective Course (OEC-V)				
Course Title	High Performance Fibres				
Scheme and Credits	L	T	P	Credits	Semester–VIII
	3	0	0	3	
Branch	TT/TC/FAE				
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Pre–requisites: Man-made fibre production, Drawing and Heat setting

Course Objectives:

The course is designed to impart the following:
- Polymers for high performance fibres
- Various fibre spinning systems
- Manufacturing of inorganic 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

Introduction to high performance fibres: fully aromatic polyamide or aramid fibres; Liquid crystals. Kevlar: manufacture, structure, properties and applications. Dry-jet wet spinning, Polyarylate fibres viz. Vectran - manufacture, properties and applications.

UNIT-II

Ordered polymeric fibres; Aromatic heterocyclic rigid rod polymeric fibres like PBO – their production, structure properties and applications.

Flexible chain high performance fibres: Ultra high molecular weight polyethylene; gel spinning and melt spinning / drawing. Routes for fibre manufacture. Manufacturing, structure, properties and applications these fibres.

UNIT-III

Carbon fibres: Different precursors for carbon fibres like viscose rayon, PAN and pitch; Pre-oxidation, carbonization and graphitization. Chemical and physical changes in structure during these processes: Structure, properties and applications of carbon fibre.

Brief introduction to the manufacturing methods, properties and applications of nano fibres.

UNIT-IV

Manufacturing of glass fibre, types of glass fibres; Manufacturing of PEEK fibre, Ceramic fibre; Manufacturing process of optical fibres, classification of optical fibres, applications of optical fibre

Suggested Reading List:

Title	**Author**
High Performance Fibres	P Bajaj & A K Sengupta
High Technology Fibres (Part A, B, C, D)	M. Lewin & J. Preston
High Performance Fibres	J. W. S. Hearle

Course Outcomes:

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

- know the type of polymers for manufacturing high performance fibres.
- know variants of fibre spinning systems.
- get familiarised with manufacturing techniques of inorganic fibres.

OEC-TT-405G Protective Clothing

Course code	**OEC-TT-405G**				
Category	Open Elective Course (OEC-V)				
Course Title	Protective Clothing				
Scheme and Credits	L	T	P	Credits	Semester-VIII
	3	0	0	3	
Branch	Textile Technology				
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Pre-requisites: Concepts of textile raw materials (TRM), structure and production of yarn and fabric

Course Objectives:

- To familiarize the students about the various high end of application of modern textile material.
- To familiarize the students about growing sectors of textiles rather than conventional clothing.
- Understanding about the raw materials used to manufacture the protective textiles.
- Understanding about the manufacturing techniques and principle of the protective textiles.
- To orient the students towards high end research with modern textile 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

Overview of Protective Clothing: Market Prospects, Classification, Materials and Technologies, Future of Personal Protection.

Factors Affecting the Design and Use of Protective Clothing: Factors Influencing the Design Development Process, Clothing Systems and Functionality.

UNIT-II

Steps in The Selection of Protective Clothing Materials: Assess Hazards, Identify Relevant Standards, Specifications or Guidelines, Screen Materials Based on Protection Performance, Selection of Materials Based on Other Major Factors.

Fibres and Fabrics for Protective Textiles: More Extensible Fibres, Carbon Fibres, Aramid and Related Fibres, High-Modulus Polyethylene, PBO and M5, Inorganic Fibres, Resistant Polymer Fibres, Nano-Fibres, Fibres to Fabrics.

UNIT-III

Textiles for Protection Against Cold: The Cold Environment Metabolism, Heat Production and Physical Work, The Human Heat Balance Equation, Requirements for Protection, Measurements of Clothing Performance, Performance of Clothing for Cold Protection, Specific Materials, and Textiles for Cold Protection,

Thermal (Heat and Fire) Protection: Fire Science Factors, Flame Retardant Fibres and Textiles, Heat and Fire Resistant Fibres and Textiles, Design Issues, Testing and Performance.

UNIT-IV

Ballistic Protection: History of Body Armours, Ballistic Protective Materials, Fabric Structures used for Body Armour, Working Mechanism of Body Armour, United States NIJ Test Methods for Bullet Resistant Armours, Design and Manufacture of Ballistic Body Armour, Ballistic Helmets.

Suggested Reading List:

Title	**Author**
Textiles for protection	Richard A. Scott
Wellington Sears Handbook of Industrial Textiles	S Adanur
Smart textiles for protection	Roger Chapman
Polymeric Protective Technical Textiles	McCarthy, Brian J.

Course Outcomes:

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

- Understand the concept of Protective Textiles and the classification of different Protective Textile applications.
- Understand the design and manufacturing of materials for the use of different high-end applications.
- Understand the growing importance of textile materials in the modern world.

OEC-TT-406G Smart and Functional Clothing

Course code	**OEC-TT-406G**				
Category	Open Elective Course (OEC-V)				
Course Title	Smart and Functional Clothing				
Scheme and Credits	L	T	P	Credits	Semester–VIII
	3	0	0	3	
Branch	Textile Technology				
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Pre-requisites: Concepts of textile raw materials (TRM), structure and production of yarn and fabric

Course Objectives:

- To familiarize the students about smart textiles systems and their application areas
- To familiarize the students about smart polymers and their applications
- To familiarize the students about e-textiles and photonic textiles
- To familiarize the students about use of smart textiles in medical field
- To familiarize the students about use of smart textiles in protection.
- To familiarize the students about cold weather clothing and use of smart materials in such clothing.

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

Smart textile systems/clothing – definitions and types, application areas.

Smart polymers – shape memory polymers (SMPs), phase change materials (PCMs), different types of stimuli sensitive polymers such as temperature-responsive, pH-responsive, photo-responsive, magnetically responsive and enzyme-responsive polymers, smart polymer hydrogels, etc.; their application in textiles.

UNIT-II

Electronic Textiles - Different types of electro-conductive and semiconducting materials for smart textiles; formation of electrical circuits in textile structures; joining technologies; textile-based sensors; wearable electronics and wearable computers.

Energy harvesting technologies for smart textiles like solar, kinetic.

UNIT-III

Introduction to chromic materials. Photonic textiles and optical fibres.

Smart textiles for medical purposes – health monitoring, textile sensors used for health care; smart wound-care materials; textile-based drug release systems.

UNIT-IV

Smart textiles for protection – application of smart clothing in personal protective equipment (PPE) for different types of protection.

Cold weather clothing – Construction and use of smart materials.

Suggested Reading List:

Title	**Author**
Intelligent textiles and clothing	H R Mattila
Wearable electronics and photonics	Xiaoming Tao
Smart textiles for protection	R A Chapman
Smart textiles for medicine and healthcare	L Van Langenhove

Course Outcomes:

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

- understand the concept of smart clothing and its application areas.
- know the types of smart polymers and their uses.
- understand the concept of e-textiles, their construction and applications.
- understand the applications of smart textiles in areas like medical and protection.
- understand the structure of cold weather clothing and the possible uses of smart materials in such clothing.

OEC-TT/TC-407G Technical Textiles

Course code	**OEC-TT/TC-407G**				
Category	Open Elective Course (OEC-VI)				
Course Title	Technical Textiles				
Scheme and Credits	L	T	P	Credits	Semester–VIII
	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: Concepts of textile raw materials (TRM), fundamentals of yarn and fabric formation

Course Objectives:

- To familiarize the students about technical applications of textile materials; fibres suitable for technical applications and their properties
- To familiarize the students about Geotextiles, medical textiles and automotive textiles and their types and applications
- To familiarize the students about protective clothing and their different types
- To familiarize the students about composites, their construction, properties and applications
- To familiarize the students about the concept of filtration and filters
- To familiarize the students about the structure and production of ropes and cordage

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: Definition, Textile materials in technical applications.

Fibres: Natural and Man-made fibres suitable for technical applications and their relevant properties.

UNIT-II

Geotextile: Mechanics of reinforcement, Separation, filtration and drainage of soils by geotextile. Types: woven, nonwoven, Geonets, Geogrids, etc. Fiber and fabric construction details of Geotextile in typical applications like road construction, river embankment, earth quake proof building.

Medical textiles: Textiles in various medical applications; Medical fibers and their properties, Hygiene and non-implantable medical textile, Biotextiles, application-oriented design of typical medical textile (e.g. porous graft or trashed tube). Materials used and design procedure for wounds dressing, scaffolds, Sutures, etc.

UNIT-III

Automotive Textiles: Fibres used for automotive applications - upholstery, carpets, preformed parts, tires, safety devices, filters and engine compartment items. Brief description for the manufacture and application of these devices or parts.

Protective clothing: Thermal protection. Ballistic protection, Protection from electromagnetic radiations and hazards, Protection against micro-organisms, chemicals and pesticides.

UNIT-IV

Composites: Type of fibers and resins used, Methods of construction, Type of preforms and their properties, typical applications, 3 dimensional fabrics and triaxially braided materials for composites.

Filtration: Principles and some mathematical models of wet and dry filtrations. Characteristics properties of fibers and fabrics in selective examples of filtration.

Ropes and Cordage: Method of production. Application oriented structure and production of ropes, cordages and twines.

Suggested Reading List:

Title	**Author**
Handbook of Technical Textiles	A. Richard Horrocks, Subhash C. Anand
Technical Textile yarns: Industrial and medical applications;	R. Alagirusamy, A. Das
Progress in Textiles: Science & Technology Volume 2 – Textile Fibres: Developments & Innovations	V K Kothari
Progress in Textiles: Science & Technology Volume 3 – Technical Textiles: Technology, Development and Applications	V K Kothari
Technical Textile	NCUTE series

Course Outcomes:

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

- understand the technical applications of textiles and different fibres used in such applications
- understand the types and applications of geotextiles, medical textiles, automotive textiles and protective clothing.
- comprehend the concept of filtration and filters.
- understand the types and production of composites, ropes and cordages.

OEC-TT-408G Industrial Textiles

Course code	**OEC-TT-408G**				
Category	Open Elective Course (OEC-VI)				
Course Title	Industrial Textiles				
Scheme and Credits	L	T	P	Credits	Semester-VIII
	3	0	0	3	
Branch	Textile Technology				
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Pre-requisites: Concepts of textile raw materials (TRM), fundamentals of yarn and fabric formation

Course Objectives:

- To familiarize the students about the wide range of application of textile material.
- To familiarize the students about growing sectors of textiles rather than conventional clothing.
- Understanding about the raw materials used to manufacture the industrial textile.
- Understanding about the manufacturing techniques and principle of the industrial textile.
- To orient the students towards high end research with textile 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

Definition, history and significance of Industrial Textiles. Principles of Industrial Textiles, Polymers, Fibre Type and Structure, Yarn Type and Structure, Fabric Type and Structure, Manufacturing Parameters, Differences between Industrial and Non-Industrial Textiles, Classification of Industrial Textiles, The Future of Industrial Textiles.

UNIT-II

Architectural and Construction Textiles - Fabrics for Architecture and Construction, Base Fabrics, Coating and Laminating, Properties of Coated Fabrics for Architecture and Construction, Applications of Coated Fabrics in Building Structures, Awnings and Canopies, Textiles as Roofing Materials, Storage Vessels, Fibre Reinforced Concrete and Cement.

UNIT-III

Filtration Textiles - Principles of Filtration, Filtration Equipment, Textiles in Dry Filtration, Textiles in Liquid Filtration, Designing for Filtration, Testing.

Geotextiles - Geotextile Materials and Manufacturing, Geotextile Properties, Geotextile Functions, Application of Geotextiles, Geotextiles Market, Geosynthetics.

UNIT-IV

Medical Textiles - Classification of Medical Textiles, Materials used in Medical Textiles, Textiles for Implantation, Non-Implantable Textiles, Textiles for Extracorporeal (Biomedical) Devices, Healthcare and Hygiene Products (Diapers, Sanitary Pads, Bandages).

Military and Défense Textiles - Protective Clothing and Individual Equipment, Textiles used in Defense Systems and Weapons, Other applications.

Suggested Reading List:

Title	**Author**
Wellington Sears Handbook of Industrial Textiles	S Adanur
Handbook of Technical Textiles	A Richard Horrocks, Subhash C Anand
Industrial Textiles - Products, Applications and Prospects	G Thilagavathi, S Periyasamy

Course Outcomes:

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

- Understand the concept of Industrial Textiles and the classification of different Industrial Textile applications.
- Understand the design and manufacturing of materials for the use of different high-end applications.
- Understand the wide range of technical application rather than apparel.

OEC-TT-409G Medical and Geo Textiles

Course code	**OEC-TT-409G**				
Category	Open Elective Course (OEC-VI)				
Course Title	Medical and Geo Textiles				
Scheme and Credits	L	T	P	Credits	Semester–VIII
	3	0	0	3	
Branch	Textile Technology				
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Pre-requisites: Concepts of textile raw materials (TRM), fundamentals of yarn and fabric formation

Course Objectives:

- To familiarize the students about medical textiles.
- To familiarize the students about materials used in medical textiles.
- To familiarize the students about medical textile products like, implantable, non-implantable, health care hygiene and extracorporeal devices.
- To familiarize the students about geotextiles, their functions, properties and applications.

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

Medical textiles: Introduction to medical textiles, requirement and classification of medical textiles. Natural and synthetic polymers and textile-based techniques used for medical applications. Health care and hygiene textiles: Definition and products like surgical mask, surgical gown, wipes, surgical caps, blankets, bedsheets, surgical drape, diapers, antibacterial textiles and superabsorbent polymers.

UNIT-II

Non-Implantable textiles: Definition, requirement for non-implantable textiles. Functions of non-implantable textile and applications; surgical dressing, gauze, lint. Bandages- types of bandages, fibers used for bandages; alginate, chitin, chitosan, hydrogels and other fibres. Compression garments, recent developments in non-implantable textiles.

UNIT-III

Implantable and extracorporeal devices: Introduction to implantable and extracorporeal devices. Implantable textiles; Applications of implantable textiles; sutures, required properties and fibres used for sutures, types of sutures; recent developments in sutures, vascular grafts, heart valves.

Extracorporeal devices: Definition, principle and properties required; Artificial heart, artificial liver, artificial lung and artificial kidney.

UNIT-IV

Geotextiles: Introduction to geotextiles, definition. Key functions of geotextiles like reinforcement, separation, filtration, drainage. Key properties of geotextiles. Different types of geotextiles like woven, non-woven, knitted, composite, geonets, geogrids, etc. Natural and synthetic fibres used for geotextiles. Typical applications of geotextiles like road construction and railroad track construction, river embankment, sediment and erosion control, reinforced walls, waste containment, marine engineering applications.

Suggested Reading List:

Title	**Author**
Handbook of Technical Textiles	A Richard Horrocks, Subhash C Anand
Handbook of medical textiles	V T Bartels
Geotextiles: From Design to Applications	R M Koerner

Course Outcomes:

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

- understand the concept of medical textiles, their different types and applications.
- understand the concept of geotextiles, their functions, key properties, and applications.

PROJ-TT-402G Seminar

Course code	**PROJ-TT-402G**				
Category	Seminar				
Course Title	Seminar				
Scheme and Credits	L	T	P	Credits	Semester–VIII
	0	0	2	2	
Branch	Textile Technology				
Class work	200				
Exam	-				
Total	200				
Duration of Exam	-				

Each student will have to deliver a presentation and submit a typed report on a topic related to the broad field of textile technology in the weekly periods allotted to this subject. The performance of the speaker would be judged in the class by faculty in charge of this subject.

PROJ-TT-404G Project Work

Course code	**PROJ-TT-404G**				
Category	Project work				
Course Title	Project Work				
Scheme and Credits	L	T	P	Credits	Semester–VIII
	0	0	12	6	
Branch	Textile Technology				
Class work	100 Marks				
Exam	100 Marks				
Total	200 Marks				
Duration of Exam	Viva				

The object of Project Work is to enable the student to extend further the investigative study taken up under PROJ-TT-403G. Each student individually, or an association with some other students will carry out project of an experimental and/or theoretical nature in one of the main branches of textile technology and present his findings in a systematic manner in the report form duly approved and signed by his Supervisor/Guide (to be nominated by the Head of Department/Institution). Each candidate would submit 3 typed copies of Project Report to the Head of the Department/Institution at least 15 days before the commencement of Second Semester Examination. One copy of the project report will be returned to the candidate after viva-voce examination. The original Report and a copy of the same will be retained by the concerned Department/Institution and the Supervisor respectively.