

VEERMATA JIJABAI TECHNOLOGICAL INSTITUTE
(VJTI)

MATUNGA, MUMBAI 400 019

(Autonomous Institute affiliated to University of Mumbai)



Curriculum

(Scheme of Instruction & Evaluation and Course contents)

(Revision 2014)

For

Final Year

of

Four Year Undergraduate Programmes Leading to
Bachelor of Technology (B Tech) Degree in Textile Technology

Implemented from the batch admitted in Academic Year 2014-15

VEERMATA JIJABAI TECHNOLOGICAL INSTITUTE

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Bachelor of Technology (B Tech) In Textile Technology

VEERMATA JIJABAI TECHNOLOGICAL INSTITUTE

Textile Manufactures Department

VISION

To develop competent professionals and leaders for the global textile community, through quality education, innovation and research.

MISSION

- To provide comprehensive knowledge of textile technology through structured course delivery and active participation in innovative and collaborative research work.
- To foster stronger interface with industry, alumni and research organizations in India and abroad.
- To kindle a sense of social and environmental responsibility and inculcate the ability to perform well in team based projects in the professional sphere.

Bachelor of Technology in Textiles

Program Educational Objectives (PEOs)

The undergraduate programme of textile technology is designed:

1. To impart in-depth knowledge in the field of textile products, processes and quality assurance aspects.
2. To impart leadership and problem solving skills to enable the graduates excel in challenging work environments in textile domain and assume positions of higher responsibility in their professional career.
3. To motivate the graduates towards continuous learning of new products and processes in the field of textile manufacturing.
4. To instil the spirit of professionalism, ethical conduct, effective communication and team work within the individual.

Program Outcomes (POs)- As specified by NBA

On successful completion of the programme, graduates will be able to:

1. Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems (**Engineering knowledge**).
2. Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences (**Problem analysis**).
3. Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations (**Design/development of solutions**).
4. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions (**Conduct investigations of complex problems**).
5. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations (**Modern tool usage**).
6. Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice (**The engineer and society**).
7. Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development (**Environment and sustainability**).
8. Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice (**Ethics**).
9. Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings (**Individual and team work**).
10. Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions (**Communication**).
11. Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments (**Project management and finance**).
12. Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change (**Life-long learning**).

Program Specific Outcomes (PSOs)

On successful completion of the programme, graduates will be able to:

1. Apply knowledge of textile products and processes, statistical, analytical and computational skills to investigate technical problems in textile and allied industries.
2. Demonstrate knowledge in textiles and management principles effectively in the workplace and manage projects in multidisciplinary environments.
3. Understand the impact of the textile processes in societal and environmental contexts and demonstrate the knowledge and need for sustainable development.

VEERMATA JIJABAI TECHNOLOGICAL INSTITUTE

Bachelor of Technology in Textiles

Scheme of Instruction and evaluation

SEMESTER VII

Scheme of Instruction				Scheme of Evaluation				
Sr. No	Course code	Course Title	L-T-P (Hours / week)	Credits	T A	IST	ESE	ESE hours
1.	TT4001S	Non-Woven & Industrial Textiles	3-1-0=4	4	10	30	60	3
2.	TT4002S	Long Staple Spinning and Weaving	3-1-0=4	4	10	30	60	3
3.	TT4003T	Textile composites	3-0-0=3	3	10	30	60	3
4.	TT4003P	Textile composites Lab	0-0-2=2	1	100 % CIE			-
5.	TT4101T/TT4102T/T4103T/TT4104T	Elective-II	4-0-0=4	4	10	30	60	3
6.	TT4101P/TT4102P/T4103P/TT4104P	Elective-II Lab	0-0-2=2	1	100 % CIE			-
7.	TT4601T	Open Elective - Textiles in Field of Engineering Applications	4-0-0=4	4	10	30	60	3
8.	TT4904D	Project I	0-0-4=4	2	100 % CIE			-
9.	TT4005A	Entrepreneurship in Textiles	3	100 % CIE				
Total			30	23				

Abbreviations: **L**: Lecture, **T**: Tutorial, **P**: Practical, **TA**: Teacher Assessment / Term work Assessment, **IST**: In Semester Tests (comprise of average of two In semester tests), **ESE**: End Semester Written Examination, **CIE**: Continuous In-semester Evaluation

List of electives: Elective II

Sr. No.	Course Code	Course Title
1.	TT4101T	Advanced Finishing
	TT4101P	Advanced Finishing Lab
2.	TT4102T	Fashion Designing
	TT4102P	Fashion Designing Lab

3.	TT4103T	Production and Performance of Home Textiles
	TT4103P	Production and Performance of Home Textiles Lab
4.	TT4104T	High Tech Fibres
	TT4104P	High Tech Fibres Lab

VEERMATA JIJABAI TECHNOLOGICAL INSTITUTE

Bachelor of Technology in Textiles

Scheme of Instruction and evaluation

SEMESTER VIII

Scheme of Instruction				Scheme of Evaluation				
Sr. No	Course code	Course Title	L-T-P (Hours / week)	Credits	TA	IST	ESE	ESE hours
1.	TT4006S	Textile Management	3-1-0=4	4	10	30	60	3
2.	TT4007S	Sustainable Textile Material	3-1-0=4	4	10	30	60	3
3.	TT4008T	Process Control in Textile Manufacturing	3-1-0=4	4	10	30	60	3
4.	TT4008P	Process Control in Textile Manufacturing Lab	0-0-2=2	1	100 % CIE			-
5.	TT4106T/TT4107T/TT4108T	Elective-III	3-0-0=3	3	10	30	60	3
6.	TT4106P/TT4107P/TT4108P	Elective-III lab	0-0-2=2	1	100 % CIE			-
7.	TT4109S/TT4110S/TT4111S/TT4112S	Elective-IV	4-0-0=4	4	10	30	60	3
8.	TT4909D	Project-II	0-0-8=8	4	100 % CIE			-
		Total	31	25				

Abbreviations: **L**: Lecture, **T**: Tutorial, **P**: Practical, **TA**: Teacher Assessment / Term work Assessment, **IST**: In Semester Tests (comprise of average of two In semester tests), **ESE**: End Semester Written Examination, **CIE**: Continuous In-semester Evaluation

Semester VIII List of Electives:

Elective III

S. No	Course Code	Course Title
1.	TT4105T	Coated & Laminated Textiles
	TT4105P	Coated & Laminated Textiles Lab
2.	TT4106T	CAD/CAM application for Clothing
	TT4106P	CAD/CAM application for Clothing Lab
3.	TT4107T	Advances in Textile Testing

	TT4107P	Advances in Textile Testing Lab
4	TT4108T	Green Composites
	TT4108P	Green Composites Lab

Elective IV

S. No	Course Code	Course Title
1.	TT4109S	Retail & Supply chain Management
2.	TT4110S	Nano Technology in Textiles
3.	TT4111S	Functional and Smart Textiles
4.	TT4112S	Project formulation & Appraisal in Textile Sector

Program Name	Bachelor of Technology in Textiles	Semester-VII
Course Code:	TT4001S	
Course Title:	Nonwoven and Industrial Textiles	
Course Objectives	To expose the students to get knowledge about the technology of nonwovens and its industrial applications.	
Course Outcomes:	<p>After completing this course, students will able to:</p> <ol style="list-style-type: none"> 1. Learn the properties and structure of various fibers and chemicals used for the production of nonwoven fabric 2. State the various methods used for the production of nonwoven fabric 3. Comprehend the structure of nonwoven fabric for industrial applications 4. Apply the concept of hybridization technology for value added nonwoven products 5. Describe the effect of various process parameters on the structural properties of nonwoven fabrics 	
Prerequisites:	To learn the fundamental principles of manufacturing of nonwoven fabrics	

Course Content:

Module	Description	Hr.
Module 1	Introduction to Nonwoven fabrics : Concept and Definition of nonwoven fabric, raw material used for the production of nonwoven fabrics. Study of properties of various fibers for the production of nonwoven fabrics	2
Module 2	Classification of Nonwovens: Classification on the basis of use, on the basis of manufacturing process, on the basis of web formation, on the basis of bonding. Web forming technologies	4
Module 3	Dry Laid and Wet Laid Webs : fibre selection, fibre preparation, web formation, layering, Wet laid nonwoven – Raw materials, production process, special features of the wet laid process and its product. Spun laced webs, process parameters in dry and wet laid structure, fiber orientation in parallel and cross laid webs	6
Module 4	Mechanical bonded Nonwovens: Principle involved, basic information of machine parts and its function, single board and double board needle punching process, understanding machine driving mechanism, study of design of needles, classifications of needles, dimensions of needles, process parameters in needle punching operation , Applications of needle punch nonwovens	8
Module 5	Chemically bonded Nonwovens: Study of binders used in the chemical bonded nonwoven, bonding methods, classifications of chemically bonded nonwovens: concept of saturation and foam bonding with its merits and demerits, formulation recipe, study of process parameters and applications of chemically bonded nonwovens	8
Module 6	Hydroentangled Nonwovens : Bonding mechanism, water quality requirements, technical specifications of machines,	4

	structural properties of hydroentangled nonwoven, process parameters and application	
Module 7	Thermally bonded Nonwovens: binder, binding fibers, binding powder, binding webs, methods of thermal bonding , Hot calendaring, belt calendaring, oven bonding, ultrasonic bonding, radiant heat bonding. Process parameters and applications.	6
Module 8	Specialty Nonwoven Structures: Concept of hybrid nonwovens, SMS fabric and its applications, finishing technology for nonwovens	4
Module 9	Spun bonded and Melt Bonded Nonwovens : Manufacturing process, flow diagram, design aspects of various machine parts, structure and properties of nonwovens, process parameters and applications	4
Module 9	Industrial applications of nonwovens : Applications in technical textile sectors, Electrical insulation Battery separators synthetic turf and sports application , sound insulation	2

Text Books

1. Non-woven bonded fabrics by J. Lunescclloss& W.Albrecht
2. Non-woven fabrics by P K Banarjee.
3. Nonwovens by Madhavamoorthy & J.P, Shetty

Reference Books:

1. The Nonwovens by Giovanni Tachis, 2008
2. Hand Book of Nonwoven by S. J. Russell
3. Non-woven fabrics – production and applications by M.L. Gulrajani.

Programme Name:	Bachelor of Technology in Textiles	Semester – VII
Course Code	TT4002S	
Course Title	Long staple spinning and weaving	
Course Objective	To impart knowledge of mechanical processing of long staple fibres	
Course Outcomes	<p>After completing this course, students will be able to:</p> <ol style="list-style-type: none"> 1. Highlight the specific features of long staple fibres influencing the performance at various stages of spinning and weaving. 2. Describe the process flow in mechanical processing of bast fibres 3. Describe the process flow in mechanical processing of leaf and fruit fibres. 4. Get exposure to production and processing of woollen and worsted yarns and fabrics 5. Get exposure to production and processing of silk yarn and fabrics. 6. Get exposure to production and processing of other animal hair fibres. 	
Prerequisites	Knowledge of spinning and weaving of short staple fibres	

Course Content

Modules	Description
Module 1	Long staple fibres: Varieties, origin, extraction method, grading, physical and chemical properties
Module 2	Processing of bast fibres like jute, flax, hemp, ramie: Preparation, batching, carding, drawing, roving, spinning, winding, weaving
Module 3	Processing of leaf and fruit based fibres like Sisal, coir etc.: Fibre extraction, preparation,
Module 4	Processing of wool fibre: Woolen yarn vs. worsted yarn; Manufacturing of woolen yarn- preliminary processes, blending or mixing, woolen carding, woolen spinning, woolen yarn numbering; Manufacturing of worsted yarn – worsted carding, back washing, oiling, gilling and combing, tow to top conversion, worsted drawing, worsted yarn spinning, worsted yarn numbering, norms and modern developments; Manufacturing of worsted and woolen fabrics by weaving, knitting and nonwoven routes; Utility of FAST system in worsted garment manufacturing.
Module 5	Processing of silk fibre: Raw silk reeling: various devices, methods, quality control during reeling; Raw silk testing and quality control; Production of spun silk; Manufacturing of silk fabrics with special emphasis on silk satin, velvets, brocades, crepe de chin and georgette structures; Evaluation of silk fabric handle.
Module 6	Processing of other animal hair fibres like Cashmere, Mohair, Angora, Alpaca etc.

Recommended References:

1. Corbman, B.P. - Textiles:Fibre to Fabric, McGraw Hill International Edition, 1983
2. R.R.Atkinson – Jute Fibre to yarn, B.I. Publication, Bombay, India, 1965.

3. Richards, RTD, Sykes, A.B. – Wollen Yarn Manufacture, The Textile Institute, 1994
4. Tomar, R.S. – Hand Book of Wool and Blended Suiting Process, Woodhead Publishing, ISBN: 978-1-84569-954-3.
5. Lee, Y.W. – Silk reeling and testing manual, FAO Agricultural Services Buiietin 136.
6. Matsudaira, M., Kawabata, S. – A Study of The Mechanical properties of Woven Silk Fabrics (Part I, II, III), Journal of The Textile Institute, 1988, 79 (3), pp. 490-503.

Programme Name:	Bachelor of Technology in Textiles	Semester – VII
Course Code	TT4003T	
Course Title	Textile Composites	
Course Objective	To present knowledge of composite, its structure and use of various forms and textiles in the field of composites.	
Course Outcomes :	<ol style="list-style-type: none"> 1. Describe the difference between monolithic and composite materials. 2. Describe the classification of composites based on reinforcing and matrix materials. 3. Express the importance of interfacial bond between reinforcing material and matrix. Its importance in deciding the end use of composites in applications. 4. Demonstrate skills in the product development of textile composites. 5. Outline the different mechanical properties of textile composites. 6. Formulate application of textile composites in various field of engineering. 	
Prerequisites	Knowledge of polymers, fibres and various forms of fabrics.	

Course Contents

Modules	Description	No of contact hours
Module 1	Importance of composites over other materials. Advantages and characteristics of composite materials, General requirements of composite materials.	04
Module 2	Classification of composites on the basis of reinforcement and matrix, Form and functions of reinforcement, Functions of matrices. Dispersion strengthened, particle strengthened and fiber-reinforced composites. Fibres and resin materials.	08
Module 3	Strengthening mechanisms, Aspect Ratio, Rule of Mixture, discontinuous and continuous fiber composites. Comparison of above composites. Characteristics and materials of reinforcements and matrices. Critical Fiber Length, Short and Continuous Fibers, Fiber Orientation. Matrix and Reinforcement Materials.	08
Module 4	Major composite classes: polymer matrix, metal matrix, ceramic matrix, carbon/carbon, and intermetallic composites. Hybrid composites, Laminated composites. Examples of each class of composites. Particulates, Flakes, Whiskers, Fibers.	08
Module 5	Role of interfaces in composites, Toughening mechanisms in PMCs, MMCs, and CMCs.	04
Module 6	Fabrication of fiber reinforced plastic matrix composites: Fiber Forms, Prepregs, Molding Compounds-Processes, Lay-Ups, Filament Winding, Pultrusion, and Recycling. ; Matrix – Reinforcement Interface, Wettability	06
Module 7	Applications of advanced composite materials. Environmental effects in Composites, Green composites. ; Synthesis and Properties of Nanocomposites.	02

Text Books:

1. Mathews F L and Rawlings R D, "Composite Materials Engineering Science", 1994.
2. Long A C, "Design and Manufacture of Textile Composites", Woodhead Publishing Ltd., UK, 2005.

Recommended Readings:

1. Gupta L, "Advanced Composite Materials", Himalayam Books, 1998.
2. Bogdanovich A and Pastore C, "Mechanics of Textile and Laminated Composites", Chapman & Hall Due, 1997.
3. Hearle J W S, "High Performance Fibres Composites and Engineering Textile Structures", Journal of the Textile Institute, Special issues, The Textile Institute, 1990

Programme Name:	Bachelor of Technology in Textiles	Semester – VII
Course Code	TT4003P	
Course Title	Textile Composites Lab	
Course Objective	To present knowledge of making of textile composite and its analysis.	
Course Outcomes	<ol style="list-style-type: none"> 1. Demonstrate skills in the product development of textile fibre reinforced composites. 2. Express the effect of various physical and mechanical properties of textile fibres on mechanical properties of textile fibre reinforced composites. 	
Prerequisites	Knowledge of polymers, fibres and various forms of fabrics.	

Course Contents

Modules	Description	No of contact hours
Module 1	The General study of Hot Compression Moulding machine.	02
Module 2	The calculations related to volume fraction and weight fraction of reinforcement in composite.	02
Module 3	Thermoplastic composite manufacturing with glass fibre as reinforcement.	04
Module 4	Thermoplastic composite manufacturing with natural fibre as reinforcement.	04
Module 5	Thermoset composite Manufacturing with glass fibre as reinforcement.	04
Module 6	Thermoset composite Manufacturing with natural fibres as reinforcement.	04
Module 7	Mechanical Testing of Composites.	08
Module 8	Analysis of Composite structures.	04

Text Books:

1. Mathews F L and Rawlings R D, "Composite Materials Engineering Science", 1994.
2. Long A C, "Design and Manufacture of Textile Composites", Woodhead Publishing Ltd., UK, 2005.

Recommended Readings:

1. Gupta L, "Advanced Composite Materials", Himalayam Books, 1998.
2. Bogdanovich A and Pastore C, "Mechanics of Textile and Laminated Composites", Chapman & Hall Due, 1997.
3. Hearle J W S, "High Performance Fibres Composites and Engineering Textile Structures", Journal of the Textile Institute, Special issues, The Textile Institute, 1990

Program Name	Bachelor of Technology in Textiles	Semester-VII
Course Code	TT4101T	
Course Title	Advance Finishing	
Course Objectives	To make students aware about the basics and advances in the field of textile finishing technology	
Course Outcomes	<p>After completing this course, students will able to:</p> <ol style="list-style-type: none"> 1. Learn the basics and advances in the field of finishing of textile products for various appeal and industrial applications 2. Develop the alternative formulations and methods for value addition of textile materials 3. Apply innovative methodology to resolve environmental issues in various textile finishing processes 4. Learn various modern characterization techniques for evaluation of finishing of textile material 	
Prerequisites	To learn the basic concept of advance textile finishing, Production of value added textile materials for various applications using advance textile finishing	

Course Content

Module	Description	Hr.
Module 1	Introduction to Textile Finishing: Object of finishing, Importance of textile finishing, classification of finishing, process sequence of finishing of 100% cellulose, regenerated and synthetic material, concept and working of machinery like Calendaring, felting, Sanforising, Stentor, Aero finishing technology	6
Module 2	Advances in Crease Resistant Finishing: Mechanism of creasing, concept of antcrease, wash-n-wear and Durable Press, Methods for developing crease resistant textiles. Mechanism of formaldehyde release, various methods to reduce formaldehyde release. Ecofriendly cross linking agents, Low and ultra-low formaldehyde resins. Resin finishing formulations for 100% Cotton garments and evaluation of crease resistant finishing.	6
Module 3	Advances in Flame Retardant finishing: Concept of flame retardant, Role of LOI of various textile fibers in flame retardant finishing. Chemicals used for flame retardant finishing of textiles. Impact assignment of various chemicals such as antimony oxide and phosphorous base compounds Resin finishing formulations for 100% Cotton garments and evaluation of crease resistant finishing.	6
Module 4	Advances in Therapeutical (Antimicrobial) Finishing: Concept of therapeutical textile finishing Mechanism and methods of antimicrobial finishing various antimicrobial finishes for cotton, wool, silk, PET, Nylon and Acrylic, Mildew-proof and rot proof finishing, Evaluation of antimicrobial finishes.	6
Module 5	Specialty Finishing Methods: Chiffon finishing for PET, Nano-finishing technology for various applications (sport textiles, self-cleaning textiles etc.), Finishing of technical textile products.	6
Module 6	Advances in finishing of Coated and Laminated Textiles: Water proof and water repellent finishes, UV protective finishing, Evaluation of water proof, water repellent and UV protective finishing.	6

Module 7	Best Available Techniques for finishing of Textiles: Plasma Finishing Technology, Diamond finishing technology for deniums and other products, Biopolishig of denims,	6
Module 8	Ecological Aspects in Modern Finishing Technology: Foam finishing technology, Concept of foam and blow ratio. Properties of foam, Factors affecting the stability of foam. Methods to determine the stability of foam. Various approaches for Energy Conservation and cost reduction in finishing.	6

Text Books:

1. WD Schindler and PJ Hauser, Chemical Finishing of Textiles, CRC Press, 2004.
2. R.S.Prayag, Textile Finishing, 1994.
3. Dr. V.A. Shenai, Technology of Printing, Sevak Publications, Mumbai, 1990

Reference Books:

1. Derek Heywood, Textile Finishing, Society of Dyers and Colourists. 2003.
2. Technology of Finishing – Dr. V.A. Shenai, Sevak Pub. ,1999 , Mumbai
3. Textile Printing – Edited by L.W.C. Miles, SDC Pub., U.K., 1981
4. An Introduction to Textile Finishing – J.T. Marsh, Asia Pub. House, 1959, Mumbai.

Program Name:	Bachelor of Technology in Textiles	Semester-VII
Course Code:	TT4101P	
Course Title:	Advance Finishing Lab	
Course Objective	To expose the students to emerging techniques and challenges in the textile finishing	
Prerequisites:	Students should learn and develop the products based on the knowledge of advance finishing technology.	
Course Outcomes:	After completing this course, students will able to, 1. Describe the mechanism involved in the various finishing techniques 2. Grasp the knowledge of various finishing and axillary chemicals used in the field of textile finishing 3. Develop new finishing formulations for various applications 4. Appraise the advance characterization techniques for evaluation of products	
Prerequisites:	To learn the advances in the field of textile finishing	

Contents:

Module	Description	
Module 1	Antimicrobial finishing for 100% cotton fabric using natural antimicrobial agent	2
Module 2	Antimicrobial finishing for 100% cotton fabric using synthetic antimicrobial agent	2
Module 3	Finishing of cotton and cotton/polyester blend fabric for flame retardant applications	4
Module 4	Finishing of cotton, nylon and polyester fabric for water repellent applications	4
Module 5	Finishing of cotton, nylon and polyester fabric for water proof applications	3
Module 6	Study of Durable press finishing for cotton and cotton/viscose fabric	2
Module 7	Study of Fragrance finishing for various fabrics	2
Module 8	Finishing of PET and Wool for soil resistant applications	4
Module 9	Development and evaluation of silk like polyester	
Module 10	Finishing of silk and wool fabrics for moth proof applications	

Programme Name	Bachelor of Technology in Textiles	Semester VII
Course Code	TT4102T	
Course Title	Fashion Designing	

Course Objective	To equip the students with holistic knowledge and well balanced prospective of designing and its process.
Course outcome	<ol style="list-style-type: none"> 1. Student would learn the history of fashion and basic theories of fashion designing (colour, line, shape, texture, scale and proportion). 2. Analyze and use various accessories effectively in their design process. 3. Students will be illustrating the use of social, political, economic, geographic and religious factors to understand and forecasting of fashion designing. 4. Student will be recognizing impact of fashion history in current fashion characteristics and trends. 5. Identifying concept related to the management, marketing and consumption of apparel product. 6. Develop an appropriate career path and understand the need of for continued learning.
Prerequisite	Basic knowledge of spinning, weaving, chemical processing and fashion designing.

Course Content

Modules	Description	Hr.
Module 1	Introduction and History of fashion Fashion Terminology - Fashion, fad, trend, haute couture, prêt a porter, classic, fashion cycle, Fashion- Effect of World War I and World War II on fashion, and fashion in late 20th century	3
Module 2	Fashion Design Process: Flowchart, Analyzing, Innovational opportunities, Research Inspirations, Research direction, Designing process, Prototyping and Collections, Promotion, Portfolio	6
Module 3	Elements and principle of Fashion Design Elements of design: Point, Line, Shape, Space, Color and texture, Principles of design proportion, balance, rhythm, emphasis and harmony, Implementation of elements and principle in design process, Source of inspiration.	6
Module 4	Fashion accessories & Styling: Fashion accessories- Introduction, Classification, Accessory types- Head gears, Foot wear, Bows, ties and belts, Hand bags, Gloves, Scarves, Stoles, Shawls, Elements of Style- Accessing styles and trends, Achieve Visual balance, Making trends	5
Module 5	The Fashion Forecasting Process: Objectives, Fashion curves, Forecasting specialties, Long term and short term forecasting, Consumer research / scan, Consumer segmentation, Study of Consumer Behavior in fashion forecasting process, Consumer adoption process, Fashion movement -forecasting in textile and apparel industries, Avoiding forecasting traps, Colour and Fabric Forecasting, Trend Forecasting, Sales Forecasting	8
Module 6	Fashion Marketing	

	Size and structure of fashion market, Marketing environment, Marketing research, Marketing objectives and Strategies, Marketing mix, Fashion marketing planning, Fashion market sourcing- domestic, export manufacturing, retailers/wholesalers/cooperative, buying agencies/offices, direct exporting	8
Module 7	Advances in fashion – Modern fashion ideas & Recycling fashion ideas.	8
Module 8	Careers in fashion industry – Fabric designer, Fabric agent, Fashion designer, Fashion predictors, Fashion illustrator, Product developer, Visual merchandiser, Accessory Designer, Men’s wear stylist, Ladies wear stylist, Children’s wear stylist	4

Text Books

1. McKelvey Kathryn and Munslow Janine, “Fashion Design: Process, Innovation and Practice”, Blackwell Science Ltd, 2003.
2. Jay Calderin, Fashion Design Essentials, 100 Principles of fashion designing”, Rockport Publisher, 2011.

Recommended Reading:

1. Tate, Sharon and Lee, “Inside Fashion Design”, Pearson Education Asia, 5th Edition, 2005
2. Waddell Gavin, “How to Fashion Works Couture, Ready to Wear and Mass Production”, Om Books Services, 2005
3. Frings and Stephens Gini, “Fashion: From Concepts to Consumer”, Prentice-Hall of India, 7th Edition.1997
4. Fashion Marketing, Mike Easey
5. John Peacock, “Fashion Accessories- Men”, Thames and Hudson, London, 1996

Programme Name	Bachelor of Technology in Textiles	Semester VII
Course Code	TT4102P	
Course Title	Fashion Designing Lab	

Course Objective	To give hands on experience on development of design using different boards and themes.
Course outcome	1. To develop the skills and ability to make different boards to start their design. 2. To develop the skills and ability to use colors to make attractive design. 3. To develop skills in handling different fabrics & embellishments to finishing of garments.
Prerequisite	Basic knowledge of spinning, weaving, chemical processing and fashion designing.

Course Content

Modules	Description	No. of Contact Hours
Module 1	Study of basic sketches	2
Module 2	Study of different themes and there incorporation in designing	2
Module 3	Create a Mood board by using different themes.	2
Module 4	Preparation of Story Board	2
Module 5	Design development by using different colors – Colour Board	2
Module 6	Create swatch board for various Indian Outfit.	2
Module 7	Study of fashion accessory to emphasize various designs.	2
Module 8	Preparation of designs by using of recycled material.	2

Text Books

1. McKelvey Kathryn and Munslow Janine, “Fashion Design: Process, Innovation and Practice”, Blackwell Science Ltd, 2003.
2. Jay Calderin, Fashion Design Essentials, 100 Principles of fashion designing”, Rockport Publisher, 2011.

Programme Name	Bachelor of Technology in Textiles	Semester	VII
Course Code	TT4103T		
Course Title	Production and Performance of Home Textiles		

Course Objective	To enrich the students with sound knowledge of home textiles so as to implement the same in the concern industry.
Course outcome:	Students will be able to <ol style="list-style-type: none"> 1. Differentiate various types of home textiles and its significance. 2. Implement their knowledge in evaluation of home textiles. 3. Different types of testing taken place for home textile and its importance. 4. Develop the knowledge of different finishes employed in home textiles and the advances in the field.
Prerequisite	Students must have knowledge of basic textiles and technical textiles.

Course Content

Module	Description	Hr.
Module 1	Introduction of Home Textiles Different types of Fibres and Fabrics used in Home Textiles, required properties.	4
Module 2	Textile for Seating Upholstery fabrics for domestic applications – scope, fixed upholstery, non-stretch loose covers, stretch covers. Upholstery fabrics for contract use – general, automotive applications, commercial applications. Textile Floor Coverings Introduction, pile fibres, backing fibres & fabrics – Tufted carpets, woven carpet. Woven Carpet Manufacture, Tufted Carpet Manufacture – Needling machinery textured & patterned needle felts, thermo-bonded products. Unconventional methods for making carpets – Bonding, knitted carpet, stitch bonding, flocking.	10
Module 3	Window Textiles Sun filters (sheers and nets), semi-sheers, reflective textiles, curtain fabrics & drapes, blinds. Bed Textiles Sheets & pillow cases, quilted textile, blankets & rugs - Jacquard blankets, printed blankets, fire proof blankets, baby blankets, bed spreads, mattress covers (Ticking). Bathroom Textiles General shower curtains, terry toweling, Types of towels, bath robes, beach towels, terry towels, napkins - Construction, weave, pile height, patterning, production, dyeing, finishing, etc.	10

Module 4	Velour - Types of velvets – Jacquard, Dobby, Plain, Printed – Manufacture & construction. Methods of velour making by cutting and shearing.	6
Module 5	Kitchen Textiles Aprons, dish cloth, teacosy, bread bag, mittens, pot holders, kitchen towels table mats – Construction & manufacturing details.	4
Module 6	Performance specifications of different home textiles Importance, requirements of the US market, UK Market, Canada market.	4
Module 7	Evaluation of Home Textiles Introduction, Test Method for towels, rug and home textiles	4
Module 8	Finishes used in home textiles Introduction, protection against unpleasant odour, temperature regulated beddings, Antimicrobial finish, Moisture management finish, Towel finishing, Nanotechnology based home textiles enhancements. Ecofriendly aspects of home textiles and advances in the field.	4

Text Book

1. Performance of Home Textiles, Subrata Das, Woodhead Publications India Pvt Ltd.

Recommended Readings

1. Textile Floor coverings by G.H. Crawshaw, Textile Progress, Vol.9, No.2, The Textile Inst. Publisher.
2. Interior Furnishings', Textile Progress, Vol.11, No.1, By Mortimer O.Shea, The Textile Inst. Publication
3. Carpets: Back to Front, Textile Progress, Vol.19, No.3 by – L Cegielka MA, The Textile Inst. Publication.

Programme Name	Bachelor of Technology in Textiles	Semester	VII
Course Code	TT4103P		
Course Title	Production and Performance of Home Textiles (LAB)		
Course Objective	To expose the students to fundamental and practical knowledge of home textiles.		
Course Outcome	Students will be able to - 1. Differentiate various types of home textiles 2. Describe types of testing taken place for home textile and its importance. 3. Define different properties required for production and performance of home textiles. 4. Apply methodology to resolve various issues in home textile industry		
Prerequisite	Students must have knowledge of the basic knowledge of textile testing and technical textiles.		

Course Content

Module	Description	No. of contact hours
Module 1	To study the tensile properties of home textile fabric.	2
Module 2	To study drapability of upholstery and window textile fabric.	2
Module 3	To study pilling property of home textile fabric.	2
Module 4	To study abrasion resistance of seating fabric.	2
Module 5	To study flammability of home textile fabric.	2
Module 6	To study surface water absorption of home textiles.	2
Module 7	To study fastness properties of home textiles.	2
Module 8	To find out the construction of terry fabric.	2
Module 9	To study shrinkage property of home textile fabric.	2
Module 10	To study wicking property of home textile fabric.	2
Module 11	To study antimicrobial property of kitchen and bathroom textile fabric.	2

Text Books

1. Performance of Home Textiles, Subrata Das, Woodhead Publications India Pvt Ltd
2. Principles of Textile Testing, J. E. Booth, Third Edition, Butterworths, 1986

Program Name:	Bachelor of Technology in Textiles	Semester-VII
Course Code:	TT4104T	
Course Title:	High Tech Fibers	
Course Objectives	To encourage the students about the significance of high tech fibers in the various emerging applications in the field textile and allied area	
Course Outcomes:	After completing this course, students will able to: 1. Learn the properties and structure of new fiber over the conventional fiber 2. Explain the use of high performance fibers for various applications 3. Develop the new innovative product using fibers from unused resources 4. Describe the physiochemical properties of new fibers and explain their possible end use	
Prerequisites:	Production and Application of specialty fibers from various natural and synthetic resources	

Course Content:

Module	Description	Hr.
Module 1	Introduction to High Tech and High Performance fibers : Drawbacks of conventional fibers, Concept and definition of high tech fibers, Need and requirements of high tech, high performance and high touch fibers	2
Module 2	Cellulose base high tech fibers: Concept of new solvent spinning techniques, Manufacturing process and application of Tencel and lyocell fiber, ecological aspects and economical aspects in recent cellulose base high tech fibers.	6
Module 3	High Performance fibers: Concept of high performance fiber, production and application of liquid crystalline polymers, Structure and applications aliphatic and aromatic polyamides, high tech. Super fibers: Carbon, fibers and its applications.	8
Module 4	High Touch fibers: Silk like fibres, challenge of ultra-fine fibres, skin-like fibres (Exceltech), Chameleonic fibres, Phototropism-controlled fibres, Perfumed fibres, Power fibres storing solar energy, Protein plastics with feel of human skin, Iridescent textiles.	8
Module 5	High Tech fibers based on Polyolefin Structures: Manufacturing technology of High density polyethylene fiber, structural properties and applications, Technology of ultrahigh modulus polyethylene fiber	6

	such as Dyneema and spectra etc.	
Module 6	High Tech fibers from various unused resources: Fibres and biotechnology, fibers used in electronics, cars, space, nuclear power, sports and geo- textiles. Various types of high tech fibres, development of shingosen, specialist fibres, dietary and soya fiber and its applications	8
Module 7	Super fibers: Concept of Vectron fiber, polyacetyl fiber and vinyl fiber, Properties and applications of Basalt, Glass and PEEK fibers.	6
Module 8	Fibers in Next Millennium: Manufacturing of PLA fiber its applications, Production of ultrafine fibers biomimetic, super functional fibre material and super-biomimetic fibre material, fibres for health.	4

Text Books:

1. Hongu Tatsuya & Philips G.O. – ‘New Fibres’. Woodhead pub.Ltd., Cambridge, U.K. 1997
2. Lawrence C. A., Advances in Yarn Spinning Technology, Woodhead Publishing, 2010
3. High Performance Fibres, J. Hearle, Woodhead Publishing.
4. New millennium fibres, Tatsuya Hongu, Glyn O. Phillips and Machigo Takigami.

Program Name:	Bachelor of Technology in Textiles	Semester-VII
Course Code:	TT4104P	
Course Title:	High Tech Fibers Lab	
Prerequisites:	Students should analyze the properties of high tech fibers for various applications	
Course Objectives	To make the students familiar about the concept and advances in the field of high tech and high performance fibers for various applications	
Course Outcomes:	After completing this course, students will able to: 1. Explain the manufacturing technology of various high tech fibers 2. Learn structural properties of new fibers 3. Develop the new alternative fiber to replace the existing fibers using unused resources 4. Summarize the technical parameters and evaluation techniques for new fibers	
Prerequisites:	To learn the various properties and possible applications of new emerging fibers	

Contents:

Module	Description	Hr.
Module 1	Study of properties of conventional fibers	2
Module 2	Development of silk like PET and its Evaluation	4
Module 3	Comparative study of conventional and new solvent spinning technology	2
Module 4	Study the structural and mechanical properties of carbon fibers	2
Module 5	Study of structural and mechanical properties of Kevlar fiber	2
Module 6	Development and evaluation of cement based composites using new fibers from various unused resource	4
Module 7	Study of physiochemical properties of PLA fiber	2
Module 8	Study and evaluation of thermal, chemical and mechanical properties of HDPE and Dyneema fiber	4

Program Name:	Bachelor of Technology in Textiles	Semester-VII
Course Code:	TT4601T	
Course Title:	Textiles in Field of Engineering Applications	
Course Objectives	To give hands on exposure to the students about the engineering applications of textile materials.	
Course Outcomes:	After completing this course, students will able to: <ol style="list-style-type: none"> 1. Learn the properties and structure of various fibers for high end engineering applications 2. Explain the fundamental principles of textile materials for engineering applications 3. Develop the engineering concept in the textile production 4. Associate and interpret the relation between the textile and engineering material 5. Select the quality control and characterization techniques for evaluation of textile materials for industrial applications 	
Prerequisites:	Knowledge of basic sciences and engineering/ technology	

Course Content:

Module	Description	Hr.
Module 1	Introduction to Textile Materials and Production : Study of various textile materials such as fiber, yarn and fabrics, Production process of various textile products, Production of innovative fibers, yarns and fabric	2
Module 2	Textiles in Civil Engineering Applications: Study of various fibers used in civil engineering area, Requirements and structural properties of fibers such as length, diameter and aspect ratio, Concept and design of fiber reinforced concrete, evolution and analysis of FRC products	4
Module 3	Textiles in Geotechnical Applications : Study of various fibers used in geotechnical engineering, Requirements of geotextiles and Geosynthetics materials, Materials for PVD, geo-separator, geo-cell and road embankment, tunnel lining, Testing and evaluation of geotextile products etc.	4
Module 4	Textiles in Mechanical Engineering Applications: Study of material used for production of belts, polymeric gears, polymeric zig and fixtures and thermal insulators for refrigeration and air condition operations, Concept of creep and relaxation in the fiber for analysis of belts, Principles of polymer base composites and its microstructural analysis such as tensile, fatigue failure, impact, tribological characteristics etc.	6
Module 5	Textiles in Automobile Engineering Applications: Study of various fibers used for automotive applications, Polymer matrix composites for automotive applications, manufacturing technique of roof lining material. Comparative analysis of metal matrix composite materials and polymer matrix composites in the designing of vehicle with respect to strength the weight ratio, fatigue failure and fuel efficiency. Designing of air bags, types of air bags, simulation of air bags etc.	6
Module 6	Intelligent Textiles for Defense Applications : Properties of various textile materials for the production of bullet and ballistic (NBC) protection, Production and performance evaluation of bullet proof materials, Concept	6

	of soft and hard armor materials. Textiles used for high altitude applications (extreme cold and extreme hot area), Materials for parachute applications	
Module 7	Smart Textiles for Electrical and Electronics Engineering Applications: Study of various textile fibers in the specific application area. Concept of clean room garment in electronic industries, Use of carbon and carbon nanotubes in electrical applications such as conductive materials and EMI shielding. E-textiles for sensors, digital signal processing and microcontroller applications, flexible solar cells using textiles.	6
Module 8	Textiles for Agriculture Applications : Material used in the production of agricultural products, Requirement of agrotech products, Design of weed control fabric, Design of shed net for green house applications, Concept of shade factor in shade net, Materials for crop protection: UV protection textiles.	8
Module 9	Nano fibers and Nano-embedded textiles for chemical engineering applications: Fibers used and its properties for development of filters for chemical engineering applications, Production of Nano fibers, Concept of micro and nono-filtration, design aspects of filter fabric. Mechanism and types of filtration, evaluation of filter fabric	6

List of Books:

1. Seyam A M, "Structural Design of Woven Fabrics", Textile Progress Vol.31, No: 3. Wood Head Publishing Ltd, 2002.
2. Jones F.R. – 'Hand Book of Polymer Fibre Composites, Polymer Science & Tech. Series Longman House, Harlow, 1994.
3. Horrocks A R and Anand S C, "Handbook of Technical Textiles", Woodhead Publishers and Textile Institute, 2000
4. Tao X., "Smart Fibres, Fabric and Clothing", Textile Institute, 2001.

Reference Books:

1. Hearle J W S, Grosberg P and Backer S, "Structural Mechanics of Fibres Yarn and Fabrics", Wiley Interscience Pub., 1999.
2. Sabit Adanur, "Wellington Sears Handbook of Industrial Textiles ", Technomic Publishing Co., Inc, 1995.
3. Russel.S, "Handbook of Nonwovens", The Textile Institute Publication, 2004..
4. Mattilla H.R. "Intelligent textiles and clothing", Textile Institute, 2006.

Programme Name	Bachelor of Technology in Textiles	Semester	VII
Course Code	TT4005A		
Course Title	Entrepreneurship in Textiles		
Course Objective	1. Create an interactive learning experience that addresses the challenges, issues, and reward faced by entrepreneurs in starting and growing a venture. 2. Study the entrepreneurship development and Finance management. 3. Recognize the critical importance of values and ethics when engaged in entrepreneurial activities. 4. Develop a strong knowledge base and set of tools that enables them to act on creative and innovative ideas.		
Course outcome	1. Students develop their startup company in both pre and post revenue stages. 2. Focusing on the team, funding, product development, business models, internal processes. This simulation combines academic concepts and practical experience. 3. The players can see how the concepts integrate within the simulation.		
Prerequisite	Student should have background of engineering Knowledge and Textile Industry.		

Tao X., "Smart Fibres, Fabric and Clothing", Textile Institute, 2001.

Course Content

Modules	Description	Hr.
Module 1	Entrepreneur, Creativity and innovation, and their Commercialization: What is creativity? What is innovation? Example of creativity that leads to innovation. The commercialization of creative and innovative ideas. Trends in technology development. Entrepreneur: Their Characteristics, Role of an entrepreneur in Industrial development. Entrepreneurship: Entrepreneurship Management And Ownership, Contrast entrepreneurship with management, theories of entrepreneurship (Max Weber, Schumpeter ,Hegan, Peter Drucker). Starting A New Business: Business Planning/ Strategic Planning And Strategic Management, Site Selection And Layout	6
Module 2	Establishing New Venture: Opportunities for Entrepreneurship, Meaning and Definition of SSI, Ancillary industry, Importance of SSI, Government policies for SSI. Basic criteria for final selection of a business opportunity, Amount of investment, Nature of technology. Input requirement for setting up SSI, Institutional support to SSI at State & National level. Products Identification in various fields, Causes of industrial disputes , Machinery for settlement of disputes, Idea of risk management.	8
Module 3	The Business Plan Development: What is a Business Plan? The Need for a Business Plan, Define the structure of a business plan, Discuss the critical elements of an effective business plan, Preparing a Business Plan: a) Forecasting Developments and Charting an Action Plan b) Identifying the Product/Service c) Evaluating the Business Venture d) Market Research and Feasibility Study;	6

	Differentiate the feasibility study and the business plan, Identify requirements for venture feasibility.	
Module 4	Enterprise Management: Identify mechanisms of and requirements for growth of a venture, Describe effective organizational structures, Discuss the operational challenges for entrepreneurships, Review alternative operations strategies for adapting an organization to changes in the marketplace, Differentiate entrepreneurial and traditional corporate career paths, Organizational structure relevant to small organization, Procedures involved in the management of man, machine, material and methods of production and operation.	8
Module 5	Financing Business: Type of capital, importance of financial management in context to small scale industry, Sources of Debt Financing, Sources of Equity Financing ,Financial Controls.	4
Module 6	Marketing Products: Creating the Marketing Plan, Pricing for Profit, Creative Advertising and Promotion. Forecasting Market Conditions, Assessing Alternative strategic plans	4
Module 7	Promoting Entrepreneurship in Textiles: Scope in Textile Entrepreneurship, Problems in textile entrepreneurship, Govt schemes in promoting textile entrepreneurs. Overview of Incentives and Subsidies given by governments. Financial Assistance for Small Enterprise: Institutional: a)Bank Loan b) Angel Funding c) Venture Funding d) Self Employment Schemes of Government of Maharashtra e) Government Financial Institutions: Khadi and Village Industries Board(KVIB),Rajiv Gandhi Udyami Mitra Yojana (RUGMY) f) Prime Minister Employment Generation Programme (PMEGP)	8
Module 8	Indian Entrepreneurship and Case Studies : Overview and analysis of successful entrepreneurs (such as Jamshedji Tata,G.D. Birla, Aditya Birla, Dirubhai Ambani, Azim Premji etc.) ,Discussion of Indian business environment.	4

Text Books:

1. **Vasant Desai**, “Dynamics of Entrepreneurship Development”.
2. **Dr.P.C.Shejwalkar**, "Entrepreneurship Development”.

Recommended Readings:

1. **David H. Holt**, “Entrepreneurship”– New Venture Creations.
2. **Hisrich Peters**, “Entrepreneurship”.
3. **Shrinivas Pandit**, “Thought Leaders”.
4. **Brigitte Berger**, “The culture of Entrepreneurship”.

Programme Name	Bachelor of Technology in Textiles	Semester	VIII
Course Code	TT4006S		
Course Title	Textile Management		
Course Objective	To impart knowledge of various management concepts.		
Course outcome	<ol style="list-style-type: none"> 1. Describe the principle of requirement of site and other requirements for textile industry 2. Outline spinning and weaving production planning and control 3. Describe management principles 4. Describe the marketing and financial management importance in textile industry 5. Describe management information system 6. Evaluate the various acts of textile industry. 		
Prerequisite	Textile Manufacturing process knowledge		

Course Content

Module	Description	Hr.
Module 1	Management Principles Planning, Organizing, Staffing, Leading, Directing and Control.	06
Module 2	Financial Management- Sources of funds for textile industry, Introduction to working capital, Balance sheet, Profit & Loss Account, Budget, Budgeting, Auditing. Analysis & interpretation of Balance sheet, Ratio analysis, fund-flow statement. pay-back period. Reconciliation of financial & cost accounts.	08
Module 3	Marketing management Concept, marketing function, pricing practice, advertising & sales promotion, market research.	08
Module-4	Objective, Factors governing of site selection for textile mill, kinds of layout their advantages & disadvantages, effect of automation on plant layout, advantages of a good layout, symptoms of bad layout. Safety provisions in textile industry.	06
Module-5	Textile industry scenario, Textile Industry growth, problems & government policy. Make in India concept, start up policy of government its utilization for textile industry.	06
Module-6	Export-Import policies & Documentations for Textile industry	06
Module-7	Industry laws like labor laws, factory acts and its study.	08

Text Books:

1. Kulkarni M.G. – ‘Textile Manufacturing’, Current literature Co. Pvt. Ltd., Malhotra House, Mumbai.
2. Textile Project Management – A. Ormerod.
3. Industrial Organization and Engg. Economics by T.R. Banga and S.C.Sharma, Khanna Publishers, Delhi.

4. Industrial Engg. and Management - O.P.Khanna

Reference Books :

- Varma D.S. – ‘Textile Mill Planning & Organization’, Metropolitan Book Co. Ltd. Publ., Delhi – 110006, 1964
- Project Planning, Analysis, Selection, Implementation and Review, Prasanna Chandra, Tata McGraw Hill Publishing Co. Ltd
- Management of textile industry - Dudeja
- Practical cotton mills management - Benjamin

Program Name:	Bachler of Technology in Textiles	Semester-VIII
Course Code:	TT4007S	
Course Title:	Sustainable Textile Materials	
Course Objective	To impart sound and comprehensive knowledge about the environmental and ecological aspects of textile materials and processing.	
Course Outcomes:	After completing this course, students will able to: 1. Learn the emerging trends in the field of textile and allied area to resolve the environmental issues of textile industry 2. Analyze the impact and assessment of various textile processes on environment 3. Learn and apply innovative methodology to resolve environmental issues in various textile processes 4. Analyze the implications of various textiles process to maintain sustainability	
Prerequisites:	Knowledge of manufacturing, processing and finishing of textile materials	

Course Content:

Module	Description	Hr.
Module 1	Introduction to Sustainable Textile Materials and Production : Concept, Definition, Need and requirements of sustainable textile materials	4
Module 2	Ecological Aspects in Fiber production: Eco-Fiber and their production with reference to organic cotton and its comparison with conventional cotton, Ecological aspects in the production of bamboo, hemp and other allied fibers, The genetic modification of cotton and its impact on environment and naturally coloured cotton production and its benefits	6
Module 3	Ecological Consideration in Spinning and Weaving Area: Fluff and noise generation and its impact, Plant design considerations to minimize the noise, Role of humidification for minimizing fluff generation and maintain the heat balance. Design aspects for controlling the noise, Comparison of old and modern plants with respect to noise and fluff generation	6
Module 4	Ecological Aspects in Wet Processing: Comparison between old and modern pre and post wet processing techniques, Banned dyes, Banned Auxiliaries, Substitute chemicals and their norms.	8
Module 5	Ecological Consideration in Coated and Laminated Textiles: Water and Polymeric base compounds in coating and laminating operations, Assessment of VOC and toxic fume gases, Process parameters and safety requirement	6
Module 6	Energy Saving aspects in Utility Engineering: Selection of proper size of motors in spinning and weaving operations, Humidification parameters to maintain the heat load, Boiler house operations- Air to Fuel ratio, role of heat exchangers in boiler etc., Counter flow technique for wet	8

	processing operations and its merits, salt, size and dye recovery technique.	
Module 7	Best Available Techniques for Textiles Wet Processing: Waterless dyeing technology, Ultrasonic assisted dyeing for various fibers with its merits and demerits, Plasma processing of textiles etc.	6
Module 8	Environmental Legislations in Textile Production : Environmental protection, International and National policy regarding environmental protection, Protective applications, Legislation, Pollution measurement problems, Environmental auditing, eco-labeling-Oeko Tex Standards, Concept of COTP etc.	4

Text Books

1. Indian Journal of fibre and textile research, Special issue on environmental issues:- Technology options for textile industry' 2001, June, edited by Prof. R.B.Chavan , IIT, Delhi.
2. Shastree N.K., 'Environmental resource management, noise pollution: standards and control', Anmol Publication Pvt. Ltd., New Delhi.(1997).
3. Environmental impact of textiles, Keith Slater, Woodhead Publishers, June 2003.
4. Textile Preparation and Dyeing, Asim Kumar Roy Chaudhary, Oxford IBHP Publishing house, New Delhi 2006.
5. Das S. & Ghosh A., National conference on environmentally conscious design and manufacturing –Issues and challenges, KCT, Coimbatore, (2004).
6. Wagle N.P., NCUTE programme on ecofriendly textile wet processing, SSM College of Engg., Komarapalayam, T.N.(2001).
7. Y.S.Asolekar, (Co-ordinator) 2002, Environmental problems in the chemical processing of textiles, NCUTE, IIT Delhi.
8. 'Ecofriendly textile processing' symposium proceeding-IIT Delhi, Nov 1995.
9. E.Zippel, 1998, Oeko-tex labeling of textiles, In: Proceedings of ecotextile'98- Sustainable development, Bolton, UK, 1998, PP 197-210.
10. Handbook of Technical textiles, Edited by Subhash Chandra Anand, A. R. Harrocks and S. C. Anand. (2000)

Program Name:	Bachelor of Technology in Textiles	Semester-VIII
Course Title	Process control in textile manufacturing	
Course Code	TT4008T	
Course Objective	To impart knowledge of process control for achieving desired quality and efficiency in spinning and weaving	
Course outcomes	After completing the course, student will be able to: 1. Depict the approach and methodology of process control. 2. Identify various performance parameters for controlling spinning process. 3. Identify various performance parameters for controlling weaving process. 4. Calculate the machine productivity index, efficiency, labour and machine allocation in spinning and weaving.	
Prerequisite	Knowledge of Textile manufacturing & processing	

Course Contents

Module	Description	Hr
Module-1	Introduction, importance of process control in spinning, key variables, establishing norms, Collection & interpretation of data for process control, Maximizing quality & Cost evaluation of fibre quality, Linear programming for cotton mixing. Yarn realization, estimation & control of yarn realization, Waste & their norms.	6
Module-2	Process control in preparatory -Control of cotton contamination. Control of cleaning efficiency and waste in blow room and card, comber. Control of neps in sliver at card drawframe and comber stage.	6
Module-3	Process control at yarn stage -Control of yarn imperfections and faults in yarns. Control of yarn count and count CV%. Control of strength, and strength CV%. Control of periodic mass variations, package faults. Calculations pertaining to production, Productivity indices and evaluation of indices in spinning efficiency and machine allocation in preparatory and ring spinning.	8
Module-4	Weaving: Approach, methodology and scope for process control in weaving. Process control in winding- Knot quality, efficient removal of yarn faults and the control of productivity. Process control in warping- Control of end breaks, tension levels, quality and the productivity in warping.	8
Module-5	Process control in sizing- Choice and the control of size pick-up, yarn stretch and moisture in sized yarns. Improving weavability of the sized yarn and the control of	8

	productivity and size losses. Process control in pirn winding- Minimizing end breaks and stoppages. Improving the build of the pirn and the productivity. Process control in Loomshed.	
Module-6	Productivity Definition, Idea of productivity calculations of weaving mill and factors affecting productivity, Productivity Indices used in weaving. Relation between machine allocation and machine efficiency. Calculations pertaining to production, efficiency and machine allocation in winding, warping, pirn winding, sizing and loom shed.	6
Module-7	Material handling in spinning / weaving department. Humidification and air-conditioning provisions, ventilation & air changes	6

Text BOOKS:

- 1) Process control in Spinning by ATIRA.
- 2) Process control in Weaving by ATIRA.
- 3) Process control and yarn quality in spinning by Dr G.Thilagvathy & Dr.T.Kartik.

Reference Book:

- 1) Testing and quality management by V.K.Kothari.

Program Name:	Bachelor of Technology in Textiles	Semester-VIII
Course Title	Process control in textile manufacturing Lab	
Course Code	TT4008P	
Course Objective	To impart knowledge of process control for achieving desired quality and efficiency in spinning and weaving	
Course outcomes	After completing the course, student will be able to: 1. Depict the approach and methodology of process control. 2. Identify various performance parameters for controlling spinning process. 3. Identify various performance parameters for controlling weaving process. 4. Calculate the machine productivity index, efficiency, labour and machine allocation in spinning and weaving.	
Prerequisite	Knowledge of Textile manufacturing & processing	

Content:

Module	Description	Hr.
Module 1	Spinning of carded yarn sample & testing of yarn properties	6
Module 2	Study of effect of break draft in Ring frame on yarn properties	4
Module 3	Study of effect of twist multiplier on yarn properties.	4
Module 4	Study of effect of traveller weight on yarn properties	4
Module 5	Sizing of the carded yarn sample	4
Module 6	Weaving of sized carded yarn sample	4

Program Name:	Bachelor of Technology in Textiles	Semester-VIII
Course Code:	TT4105T	
Course Title:	Coated and Laminated Textiles	
Course Objective	To provide knowledge to the students about the basic concept of coated and laminated textiles.	
Course Outcomes:	After completing this course, students will able to: 1. Describe the basic concept of coated and laminated textiles 2. Explain the various polymeric materials used for coated and laminated textiles 3. Outline the methods for the production of coated and laminated textile products 4. Learn and develop the ecofriendly processes for the production of coated and laminated textiles to maintain sustainability	
Prerequisites:	Knowledge of textile manufacturing & polymer	

Course Content:

Module	Description	Hr.
Module 1	Introduction to Coating and Lamination : Concept, Definition, Need and market potential of coating and lamination textiles	4
Module 2	Materials for coating and lamination: Study of various natural and synthetic textile substrate used in the production of coated and laminated textiles, Auxillary and functional chemicals such as silicon, antimony tri oxides and PVC and CMC base binders	6
Module 3	Methods of Coating and Lamination: Basic chemistry involved in coating and lamination, formulation recipe, Methods of coating and lamination: Transfer coating, hotmelt coating, dry and wet lamination, direct and flame lamination etc. Paste preparation and evaluation techniques.	6

Module 4	Machines for Coating and Laminations: Brief Study of Roller coating, Knife coating and knife over roller coating, Process parameters: temperature, pressure, thickness of coating and curing etc, Effect of weave pattern, fill yarn size, effect of coating thickness and penetration on shear behavior study	8
Module 5	Product from Coated and Laminated fabric Protective clothing-sports and industrial, functional clothing, automotive application, Marine application, Building , construction and Architecture application, Household product, Medical use, Defense textiles, Conductive coating for textiles, Breathable textiles from coated and laminated process,	6
Module 6	Characterization of Coated and Laminated Textiles: Basic test standards and methods for evaluation of products, GSM, permeability criteria, , degree of adhesion etc, Performance test: Water repellency and water proofing, Flammability and launderability etc.	6
Module 7	Best Available Techniques for Coating and Lamination: Foam coating technique with its merits and demerits, coating of specialty textiles: conductive and breathable textiles, Nano and plasma coating technology for industrial applications	6
Module 8	Environmental consideration in Coating and Lamination : Environmental protection, VOC, Green house emission, Machine and Human safety norms: Temperature, Material storage and handling consideration, pollution control norms in coating and lamination technology	6

Text Books:

1. Sen A.K., Coated Textiles: Principle and Application, 2nd Edition, CRC Press, 2007
2. Walter Fung; Coated and Laminated Textiles, Woodhead Publication Ltd, 2002,
3. Smith W.C., Smart Textiles Coating and laminating Woodhead Publication, 2010

Recommended reading:

1. Carr C.M.” Chemistry of Textile Industry, Chapt 07, Chapman and Hall India, 1995
2. Giesmann Andreas, Coating Substrate and Textiles: A Practical guide to coating and laminating Technologists, By Springer, 2012

Program Name	Bachelor of Technology in Textiles	Semester-VII
Course Code:	TT4106P	
Course Title:	Coating and Lamination Textiles Lab	
Course Objective	To expose the students to practical aspects in the field of coating and lamination	
Course Outcomes:	After completing this course, students will able to, 1. Learn the mechanism involved in the coating and lamination operation 2. Grasp the paste formulation technique for production of coated and laminated textiles 3. Explain various process parameters in coating and lamination process 4. Appraise the advance characterization techniques for evaluation of products	
Prerequisites:	Knowledge of coated and laminated structures for various applications	

Contents:

Module	Description	Hr.
Module 1	Study of properties and preparation of textile substrate for coating	2
Module 2	Study of knife coating machine	2
Module 3	Coating of cotton and cotton/polyester blend fabric for flame retardant applications	4
Module 4	Development of water repellent textiles using coating technology	4
Module 5	Development of water proofing textiles using coating technology	3
Module 6	Development of flame retardant textiles using coating technology	2
Module 7	Development of combined fragrance and antimicrobial textiles using coating technology	2
Module 8	Study of various characterization techniques in coating and lamination technology	4

Programme Name	Bachelor of Technology in Textiles	Semester VIII
Course Code	TT4106T	
Course Title	CAD/CAM Application for Clothing	

Course Objective	To learn about the elements of solid modeling, creation of parts of increasing complexity and the assembly of parts to form a final design, along with mechanism simulation.
Course outcome	<ol style="list-style-type: none"> 1. To describe the fundamental theory and concepts of the CAD/CAM. 2. Describe computerized grading, Marker Planning and cutting. 3. Apply analytical decision making techniques in a fashion and textiles environment. 4. Aware the different 2D and 3D software for process of garment manufacturing. 5. Develop the concepts and underlying theory of modeling and the usage of models in different clothing manufacturing applications.
Prerequisite	Basic knowledge of spinning, weaving, chemical processing and garment designing.

Course Content

Modules	Description	No. of Contact Hours
Module 1	Introduction to computer – concepts of CAD CAD definition, fundamentals of CAD – Introduction, general process of design, abbreviations and Symbols used in CAD systems, application of computers for design, Benefits of CAD, Computers & the Fashion Industry, Quick response technology, CAD in Today’s Fashion Industry	5
Module 2	Introduction to computer - concepts of CAM Usage of CAM in Garment Manufacturing. Principles of computer graphics, CAM - Computer controlled machinery for garment manufacturing - automated layout planning by various techniques - Algorithm for computer Production garment parts, Development of robotics for CAM, Creating marker plan and plotting markers.	5
Module 3	Computerized production pattern making Comparison of manual and CAD systems, Computerized production pattern Making – Hardware and software selection for CAD systems, How to produce a sample production pattern, Computer aided manipulation of pattern pieces to create individual styles, Operation of garment CAD software, Computer aided color matching- Computer used for purchase, inventory control and sales, computerization in quality control and production control.	9

Module 4	Computer aided production planning in Garment Manufacturing Introduction to finite scheduling concept and fast react software, Creating Product and order planning, updating. Eliminate late deliveries - General set up, allowances and matrices, Critical path and time tables. Reports generated by production planning software – production output reports by Customer/location/delivery date. Use of microcomputers for production control in garment industry	9
Module 5	Overview of 2D &3D CAD software Auto CAD for sketching, modeling, Overview of 3D CAD/CAM software like NX, CATIA, Pro-E for sketching, modeling, assembly, drafting, analysis and manufacturing, Overview of Textile-CAD software.	6
Module 6	Basic maintenance of operations Preference, setting up a document, what is resolution, saving files, files formats, zooming in & out, view options, CAD approach to design, vector graphics object Vs Raster design.	6
Module 7	Recent Developments in CAD/CAM 3D pattern making systems, WIP control using CAD software, 3D virtual clothing and simulation software	4
Module 8	CAD/CAM applications in fashion field – garment designing, weaving, knitting and embroidery, textile dyeing and printing	4

Text Book:

1. Garment Manufacturing Technology, Edited by R K Nayak and Rajiv Padhye, 1st Edition, Woodhead Publishing 2015
2. Stephen Gray “CAD / CAM in clothing and Textiles ”, Gower Publishing Limited, 1998,

Recommended Readings:

1. CAD for Fashion Design by Renee Weiss Chase, Prentice hall Pub.
2. CAD/CAM Computer Aided Design & Manufacturing by Mikell P Groover&Mory W Zimmers. Jr, Pearson Education Pub.2000
3. CAD/CAM/CIM by R.Radhakrishnan, S.subramanyan, V.Raju, New Age International Pub.
4. Fashion Design on Computers By M.kathleenColursy, Prentice Hall.2004.
5. Winfred Aldrich, CAD in Clothing & Textiles, Blackwell Science, 1994.
6. Patric Taylor, “Computer in the Fashion Technology”, Om Book Service, 1997.

Programme Name	Bachelor of Technology in Textiles	Semester VIII
Course Code	TT4106P	
Course Title	CAD/CAM Application for Clothing Lab	

Course Objective	To help students to understand the fundamentals and principles of CAD/CAM
Course outcome	Student will be able to: <ol style="list-style-type: none"> 1. Use different tools for pattern making using Rich Peace software. 2. Develop the skills and ability to use grading tools using Rich Peace 3. Create a marker plan for the same and mixed sizes.
Prerequisite	Basic knowledge of spinning, weaving, chemical processing and garment designing.

Course Content

Modules	Description	No. of Contact Hours
Module 1	To understand the usage of the basic tools available for pattern making in any of the CAD software.	4
Module 2	Draft the basic block using the tools available in the CAD software	2
Module 3	Grade the basic block using grading tools available in CAD software	2
Module 4	To add darts/pleats/notches/folds in the patterns	2
Module 5	Create marker plan for a set of patterns drafted in CAD	4
Module 6	Create a mixed marker plan for all the sizes drafted/graded and plot the pattern with the plotter	4

Programme Name:	Bachelor of Technology in Textiles	Semester – VIII
Course Code	TT4107T	
Course Title	Advances in Textile testing (Elective III)	
Course Objective	To impart knowledge of advanced testing techniques for textile materials	
Course Outcomes	<p>After completing this course, students will be able to:</p> <ol style="list-style-type: none"> 1. Explain the need and commercial importance of advanced textile testing 2. Describe the Sampling procedure and importance of statistical methods in textile testing. 3. Describe the process flow in mechanical processing of leaf and fruit fibres. 4. Apply the knowledge of advanced testing of textile yarns. 5. Apply the knowledge of advanced testing of fabrics 6. Get exposure to the evaluation methods of damaged textile samples 	
Prerequisites	Knowledge of basic testing of textile fibres, yarns and fabrics	

Course Content

Modules	Description
Module 1	Testing for innovation and commercial needs: cope of advanced testing, Current status of textile testing, Future trends.
Module 2	Sampling and statistical analysis in textile testing: Requirement for sampling and statistics in textile testing, tools used, sources of error, applications.
Module 3	Advances in testing of fibres: Traditional methods vs. new techniques, AFIS, HVI, Identification of new fibres, Fourier Transform Infra Red (FT-IR) and Thermal analysis of animal fibres and their contribution towards “Wool Mark”
Module 4	Advances in testing of yarns: Effect of previous history-dimension-rate of loading and time to break on the mechanical properties of yarn and its commercial implications, Evenness testing of yarns, Measurement of hairiness of yarns, Yarn to yarn and yarn to metal friction measurement, Yarn imperfection- Classimat faults and its importance, Testing of hosiery- fancy and textured yarns, Advanced testing of cordage and ropes.
Module 5	Fabric composition testing: Scope- Traditional methods vs. new methods, burning behavior of fibres, Identification of new fibres, Testing of High visibility fabrics
Module 6	Chemical testing of textiles: Practical significance – Identification of sizing agents, surfactants, OBAs, Finishing chemicals, Degradation testing of textiles, Future trends.
Module 7	Flammability testing of textiles: Key issues, Measurement techniques, Textile flammability standards with special emphasis on Kid’s wear and home furnishing materials.
Module 8	Appearance and comfort testing of textiles: Pilling-Wrinkling-Seam puckering-

	Light reflectance testing, Evaluation of “Ease of movement”, Evaluation of thermal-moisture and sensory comfort- their importance, application and future trends,
Module 9	Special testing for technical textiles: Estimation of cut resistance, filtration efficiency, UV resistance, creep and stress relaxation properties.
Module 10	Testing of damaged textile samples: Practical significance of damage analysis, causes types and stages of damage occurrence, Methods of damage analysis, Application in forensic investigation, future trends.

Text Books:

1. Saville B P, “Physical Testing of Textiles”, Woodhead Publishing Ltd, Cambridge, 2004, ISBN 1 85573 367 6.

Recommended References:

- Fabric Testing: Edt. Jinlian Hu, The Textile Institute and Woodhead Publishing, 2008, ISBN: 978-1-84569-297-1
- Chemical testing of textiles: Edt. Qinguo Fan, The Textile Institute and Woodhead Publishing, 2005, ISBN13: 978-1-85573-917-8

Programme Name:	Bachelor of Technology in Textiles	Semester – VIII
Course Code	TT4107P	
Course Title	Advances in Textile Testing Lab (Elective)	
Course Objective	To impart practical experience of advanced textile testing methods.	
Course Outcomes :	After completing of this course student will be able to - 1. Perform various physical and chemical tests for fibres, yarns and fabrics. 2. Determine the mechanical properties of fibres, yarn & fabrics by new methods 3. Perform some advanced tests involving KAWABATA and FAST systems	
Prerequisite	.Knowledge of basic testing of fibre, yarn and fabrics.	

Course content

Module	Description
Module-1	Testing of fibres on AFIS
Module-2	Testing of fibres on HVI
Module-3	Testing of yarn imperfection and classmate faults of yarn on USTER Tester (Demonstration practical)
Module-4	Measurement of Yarn to yarn and yarn to metal friction
Module-5	Testing and structural study of textured filaments
Module-6	Measurement of cut resistance of fabrics
Module-7	Study of rupture damage of yarn by Scanning Electron Microscope
Module-8	Estimation of crystallinity of textile fibres by X-Ray Diffraction technique (Demonstration practical)
Module-9	Identification of finishing chemicals present on fabrics by FT-IR spectroscopy. (Demonstration practical)
Module-10	Testing of fabrics by KAWABATA and FAST system (Demonstration practical)

Program Name:	Bachelor of Technology in Textiles	Semester-VIII
Course Code:	TT4108T	
Course Title:	Green Composites	
Course Objectives	To make students aware about the basics and advances in the field of green composites	
Course Outcomes:	After completing this course, students will able to: <ol style="list-style-type: none"> 1. Learn the basics and advances in the field of green composites for various industrial applications 2. Compare the structure of green composites with synthetic composite 3. Describe the method for preparation of green composite 4. Learn various modern characterization techniques and life cycle analysis for evaluation of green composites 	
Prerequisites:	Knowledge about the basic concept of green composite	

Course Content

Module	Description	No. of contact hours
Module 1	Introduction to green composites Concept of green composites, Need and requirement. Role of green composite in reduction of overall environmental footprint.	6
Module 2	Materials for green composites Natural reinforced and matrix materials such as cellulose and protein base fibers and matrix material, properties of different green fibrous and matrix materials.	6
Module 3	Biopolymers Different types of natural thermoset biopolymers and natural thermoplastic biopolymers used in making of green composites.	6
Module 4	Treatment to natural fibres Various Physical and chemical treatment to natural fibres to improve mechanical and to reduce hydrophobicity of natural fibres	6
Module 5	Methods for making of Green Composites Overview of basic manufacturing technology of green composites, Initial preparation for making green composites: Fiber opening and cutting, Concept of hand laying technique. Process parameters and its effect on the properties of green composites. Use of nanoparticles in composites.	6
Module 6	Characterization and Evaluation of green reinforcement and matrix materials Length and Diameter measurement for determination of aspect ratio of various fibers, Evolution of fiber-matrix compatibility, measurement of viscosity of matrix material etc. Evolution of fiber cross section and its effect on the properties of composites.	6

Module 7	Applications of green composites Applications in medical, packing, automotive industries supported with case studies	6
Module 8	Instrumentation techniques for evaluation of green composite products Techniques for evaluation of surface characteristics: SEM and TEM etc XRD, SAX techniques for evaluation of crystallinity, Study of Tensile, Impact, Flexural strength for evolution of mechanical characteristics	6

Text Books:

1. Green composites from natural resources by Vijay Thakur
2. Green composites, polymer composite and environment by Baillie

Reference Books:

1. Recent articles from journal of bioprocessing and bio-techniques based on green composites

Program Name:	Bachelor of Technology in Textiles	Semester-VII
Course Code:	TT4108P	
Course Title:	Green Composites	
Course Objective	To expose the students about the concept and application of green composites	
Course Outcomes:	After completing this course, students will able to, 1. Outline the basic manufacturing techniques for making green composites 2. Grasp the knowledge of various green reinforced and matrix materials used for making green composites 3. Learn the properties of raw materials for used for development of green composites 4. Appraise the advance characterization techniques for evaluation of products	
Prerequisites:	knowledge about the basic manufacturing techniques development of green composites	

Contents:

Module	Description	No of contact hours
Module 1	Study of basic manufacturing techniques for development of	2
Module 2	Development and evolution of green composite using sunhemp fiber	2
Module 3	Development and evolution of green composite using jute/coir as reinforcement material	4
Module 4	Development and evolution of green composite using soya fiber as a matrix and lignin as a binder	4
Module 5	Development and evolution of green composite using enzyme treated natural fiber	3
Module 6	Effect of process parameters on the mechanical properties of green composites	2
Module 7	Comparative study of jute-soya and glass-epoxy composites	2

Text Books:

1. Green composites from natural resources by Vijay Thakur
2. Green composites, polymer composite and environment by Baillie

Programme Name	Bachelor of Technology in Textiles	Semester	VIII
Course Code	TT4109S		
Course Title	Retail & Supply chain Management		
Course Objective	<ol style="list-style-type: none"> 1. Provide insights into all functional areas of retailing. 2. Identify the paradigm shifts in retailing business with increasing scope of technology and e-business. 3. Give a perspective of the Indian retail scenario. 4. Understand importance of goods supply, chain design ,planning, and operation in Textile 5. Know the supply chain drives used on a conceptual level during supply chain design, planning and operation to improve the performance. 		
Course outcome	<ol style="list-style-type: none"> 1. Demonstrate an understanding of key concept and issue pertaining to retail environment of firm and their retail marketing strategies including store consumption, location, image, target costumer, merchandise management and pricing, human resources and distribution channel. 2. Develop alternative strategies for integrated retail marketing plans and explain suggestions for implementing such ideas. 3. Illustrate the concept of supply chain management. 4. Adopt different marking channels for developing business. 		
Prerequisite	Student should have Marketing Knowledge and Product Knowledge.		

Course Content

Modules	Description	
Module 1	Introduction to Retailing: Concept of retailing, Functions of retailing, Terms & Definition, Retail formats and types, Retailing Channels, Retail Industry in India, Importance of retailing, Changing trends in retailing.	6
Module 2	Understanding the Retail Consumer: Retail consumer behavior, Factors influencing the Retail consumer, Customer decision making process, Types of decision making, Market research for understanding retail consumer. Market Segmentation and its benefits, Kinds of markets, Definition of Retail strategy, Strategy for effective market segmentation, Strategies for penetration of new markets, Growth strategies, Retail value chain.	10
Module 3	Retail Location Selection: Importance of Retail locations, Types of retail locations, Factors determining the location decision, Steps involved in choosing a retail locations, Measurement of success of location	6
Module 4	<p>Merchandise Management: Meaning of merchandising , Factors influencing Merchandising, Functions of Merchandising Manager, Merchandise Planning, Merchandise buying, Analysing Merchandise Performance.</p> <p>Retail Operation and Retail Pricing: Store administration, Premises management, Inventory Management, Store Management, Receipt Management, Customer Service, Retail Pricing, Factor influencing retail prices, Pricing strategies, Controlling costs.</p> <p>Retail Space Management and Marketing: Definition of Space Management, Store layout and Design, Visual Merchandising, Promotions Strategy, Relationship Marketing Strategies, CRM, Retail Marketing Mix, Retail Communication Mix, POP Displays</p>	10

Module 5	Emerging trends in retailing: Changing nature of retailing, Organized retailing, Modern retail formats, E-Retailing, Challenges faced by the retail sector	6
Module 6	Supply Chain Management (SCM): Introduction, Concept, Objectives, Meaning of supply chain process, Push and Pull View of Supply Chain Process. Current scenario of SCM in Textile industry. Drivers and issues in value chain, Value Chain Management in Textile. Supply Chain networks for apparel products. Apparel Sourcing: - Domestic, Foreign Sourcing. Resident Buying Office (RBO).Supply Chain Decisions, Location, Production, Inventory and Transportation. Strategies and planning in SCM, Difficulties in implementation of SCM.	10
Module 7	Marketing Channels : Definition and Importance ,Different forms of channels , Unconventional channels ,Channels for Consumer goods, Industrial Goods & Services , Integrated Marketing Channels ,Horizontal, Vertical, Multi channel , Functions of Marketing Channels ,Channel Management, Channel Selection Process & criteria, Performance appraisal of Channel Members ,Channel Conflicts & Techniques to resolve channel conflicts	8
Module 8	Current Trends in Supply chain Management – Green Supply Chain Management, Customer Relationship Management ,Supplier Relationship Management , E-Business and the Supply Chain; E-Business in Practice Strategic Cost Management in Supply Chain: The financial impacts, Volume leveraging and cross docking, global logistics and material positioning, global supplier development, target pricing, cost management enablers, Measuring service levels in supply chains, Customer Satisfaction/Value/Profitability/Differential Advantage.	8

Text Book:

1. Supply Chain Management by Sunil Chopra, Peter Meindl & D.V. Kalra
2. Inventory Management by L.C. Jhamb
3. Principles and Practices of Costing by Sunita Pokharna, Success Publications, Pune

Recommended Readings:

1. Sales and Distribution Management by Krishna K. Havaldar & Vasant M Cavale
2. Purchasing and Supply Management by Dobler and Burt
3. Supply Chain Management Best Practices by David Blanchard
4. Channel Management & Retail Management by Meenal Dhotre

Program Name:	Bachelor of Technology in Textiles	Semester-VIII
Course Code:	TT4110S	
Course Title:	Nanotechnology in Textile Applications	
Course Objective:	To motivate the students about the important of the nanotechnology and its various application.	
Course Outcomes:	After completing this course, students will able to: 1. Learn the advances in the field of nanomaterial's used in the textile and allied area 2. Develop the innovative methodology to meet the emerging challenges and opportunity both at national and international level relating to nanotechnology and its potential application in the advance textile area 3. Design the methodology to resolve societal and environmental implications of nanoscience and technology 4. Describe various modern instrumentation techniques for characterization and evaluation of nano textile material	
Prerequisites:	To learn the concept of nanoscience and nanotechnology, Production of nanomaterial and its application in textiles	

Course Content

Module	Description	Hr.
Module 1	Introduction to Nanotechnology: Fundamental of Nanoscience Nanotechnology, Introduction to nanomaterial: Definition, Concept, Requirement,	4
Module 2	Production of Nanomaterials: Principle and production of nanomaterials, nanoparticles, nanospheres etc, Top down and bottom down approaches for production of nanomaterials. Electrospinning technique	6
Module 3	Nanoparticles and potential applications in Textiles: Carbon Black nanoparticle, carbon nanotubes, classification and, application, Formulations of Titanium Nano particles, Metal Nano Particle, Clay Nano Particle and study of their properties	6
Module 4	Nanofibers for Textile Applications: Production of nanofibers, Applications of Nanofibers in Air and water filtration, Controlled drug delivery, Tissue reconstruction, Barrier materials, Anti-microbial fabric other advanced technique in field of various engineering	6

Module 5	Nano-Enhanced Finishing Treatments: Nano formulations for dyes ,Nano coatings and nano finishing, Nano Emulsion to get value addition on Textiles	6
Module 6	Nano-Textile Products and their utility: <ul style="list-style-type: none"> • Sports fabrics : improved mechanical properties, and odour-reducing antibacterial properties • Therapeutic textiles : antimicrobial wound dressings, clothing and bedding • PPE (personal protective equipment) : improved chemical or heat resistance • Military textiles: flexible body armor, radio shielding and camouflage • Wearable electronics: computers made from nanofibers and flexible circuit board. • Nanocomposites and their applications .	6
Module 7	Societal implications of nanoscience: Ethical, legal and environmental implications, Concept of bionanotechnology and its merits	6
Module 8	Analysis of Nano Scale Textile Material: Principles and Instrumental Technique (SEM, XRD, AFM, TEM, Particle size and Particle size distribution, Stability etc).	6

Text Books:

1. Nanoparticles: From Theory to Application, Ed.: G. Schmid, Chichester, John Wiley, 2004
2. Nanofibers and nanotechnology in textiles, Edited by P Brown and K Stevens, Clemson University, USA Woodhead Publishing Series in Textiles No. 67

Reference Books:

1. "Polymer-Clay Nanocomposites", Pinnavaia, T. J., and Beall, G. W., Wiley and Sons, NY, 2000
2. Adanur, S., and Ascioğlu, B., "Processing Characterization of PVA Nanofibers in Electrospinning", Proc. of ICCE/11, Hilton Head, SC, August 8-14, 2004

Programme Name:	Bachelor of Technology in Textiles	Semester – VIII
Course Code	TT4111S	
Course Title	Functional and Smart Textiles (Elective IV)	
Course Objective	To impart knowledge about Functional and smart textile materials	
Course Outcomes	After completing this course, students will be able to: <ol style="list-style-type: none"> 1. Explain the role of functional and smart textiles 2. Describe the design and development of thermo-regulate textiles 3. Explain the utility of hollow fibre membranes 4. Apply the knowledge of intelligent polymer for specific applications 5. Explain the usefulness of Smart medical textiles 6. Get exposure to the design-development and application of conductive textiles 	
Prerequisites	Knowledge of technical textiles	

Course Content

Modules	Description
Module 1	Development of functional and smart textiles and clothing: Understanding existing materials and technologies, Research and development in new products-niche application
Module 2	Heat storage and thermo-regulated textiles: Basic concepts of heat storage materials, manufacturing of thermo-regulated textiles, Application and future trends.
Module 3	Stimuli responsive textiles: Fundamental concepts, Current status, Textiles working on mechanical stimulus- permeation stimulus-optical stimulus, Application, Future trends.
Module 4	Hollow fibre membranes for fluid separation: Importance, Historical over view, Theories of permeation process, Development of phase inversion and hollow fibre membranes, Future trends.
Module 5	Tailor made intelligent polymers for specific applications: Concept of Shape memory materials, Textile scaffolds in tissue engineering.
Module 6	Smart medical textiles: Smart wound care materials, Textile based drug release systems, Textile based sensors for health care.
Module 7	Adaptive Responsive Textile Structures (ARTS): Textiles in computing, energy harvesting, Concept of wearable electronics, application, Future trends.
Module 8	Conductive textiles as flexible substrates: Method of manufacturing conductive textiles, Techno-economic aspects of various technologies, Application of conductive textiles as EM shielding screen- Clean room curtain and flooring- Wearable antenna- Embedded electrodes in soft ground improvement.
Module 9	Testing of smart textiles: Role of smart textile testing, Testing of shape memory effect Fabrics- phase change materials- Self cleaning materials-Electronic responsiveness-EM shielding, Future trends.

Recommended References:

1. Smart fibres, fabrics and clothing: Edt.Xiaoming Tao, The Textile Institute and Woodhead Publishing, 2001, ISBN 1 85573 546 6

2. Smart textiles for medicine and health care: Materials, Systems and Applications, Edtd. L.Van Langenhove, The Textile Institute and Woodhead Publishing, 2007, ISBN 13: 978-1-84569-027-4.
3. Fabric Testing: Edt. Jinlian Hu, The Textile Institute and Woodhead Publishing, 2008, ISBN: 978-1-84569-297-1
4. Relevant research papers.

Program Name:	Bachler of Technology in Textiles	Semester-VIII
Course Code:	TT4112S	
Course Title:	Project formulation and Appraisal in Textile Sector	
Course Objectives	To provide the sound knowledge to the students about the concept and principles of project formulation in textile sector	
Course Outcomes:	After completing this course, students will able to: 1. Learn the fundamental concepts of project formulation in textile 2. Determine the basic constraints for project formulation 3. Outline the various government laws and legislations prior to project formulations 4. Summarize the concept of cash flow statements and profitability in the project formulation of textiles	
Prerequisites:	Knowledge of Textile Manufacturing, processing & process control aspects	

Course Content:

Module	Description	Hr.
Module 1	Introduction to Project Planning : Concept of project planning, Phases involved in budget planning,	2
Module 2	Formulation of project for various textile process: Assumptions, Requirement of Miscellaneous Fixed Assets & Machinery Stores & Spares, Requirement & Calculations related to Electrical Power, Lighting, Water, Steam, Compressed Air and Captive power generation etc. Calculations of cost of project, Estimates of sales & production – cost of production – working Capital requirement – Profitability Projection – Break Even point – Projected cash flow statements.	6
Module 3	Financial Aspects in Project Formulation: Concept of taxation, types of tax, depreciation provision for building and machineries, types of depreciations, concept of DSCR ratio in project formulation.	6
Module 4	Site Selection Aspects: Selection of site for textile mill, Criteria for site selection: Transportation facilities, Laws and regulations in industrial estate, climatic requirements etc. selection of actual site locations: Electricity requirements, soil criteria for building construction etc.	4
Module 5	Plant Construction Management : Structural Design aspects of textile mill building: height, ventilation aspects etc. General principles of building construction & building functions, Types of factory buildings: Saw tooth and arched structure, Types of building construction. Supportive construction materials for designing of floors, false ceilings, ducts, fire resistance, sound proof, etc. concept of contracts and tenders etc.	8

Module 6	Machinery Selection and Calculation of Capacity Constraints: Selection of machines & machinery specifications required for the product in spinning, weaving, knitting etc. Calculation of spin and weave plan. Waste, crimp, ideal spindle/machine consideration in the calculation of spin and weave plan, selection criteria for humidification, boiler, compressor, transformer etc.	8
Module 7	Plant Layout: Concept, objectives and principles of layouts, study of layouts and their comparisons, flow pattern, work station design, concept of line balancing, storage space requirements, plant layout procedure, factors influencing layouts, selection of layout, symptoms of bad layout. Utility and administrative consideration in plat layout	6
Module 8	Material Handling and Labor complements : Requirement of material handling systems, ergonomics aspects in designing of material handling systems, understanding the functions of various material handling systems, inventory management, calculation of no. of labor required for spinning, weaving and knitting mills, cost of labor, concept of fringe benefits to the staff and workers	6

List of Books:

1. Textile Project Management by A. Ormerod, The Textile Institute Publication.
2. Charles T Horngren, George Foster and Srikant M Datar, “Cost Accounting, A Managerial Approach”, 2003 Varma H K, “Costing in Textile Industry”, Prentice Hall Inc, 1992
3. Goal Directed Project Management by E.S. Andersen, K.V. Grude & Tor Hang, Coopers & Cybranl Publication.
4. Project, Planning Analysis, Selection Implementation & Review by Prasanna Chandra, Tata McGraw Hill Publishing Co. Ltd.
5. Management of Textile Production, A. Ormorod. Newnes – Butter Wortrs Publication.