

VEERMATA JIJABAI TECHNOLOGICAL INSTITUTE
(VJTI)
MATUNGA, MUMBAI 400 019

(Autonomous Institute affiliated to University of Mumbai)



Curriculum
(Scheme of Instruction & Evaluation and Course contents)
(NEP Revision 2023)
For
Second Year
of
Four Year Undergraduate Programme Leading to
Bachelor of Technology (B. Tech) Degree in Textile Technology
Implemented from the batch admitted in First Year, 2023-24

VEERMATA JIJABAI TECHNOLOGICAL INSTITUTE

(Autonomous Institute affiliated to University of Mumbai)

Curriculum

(Scheme of Instruction & Evaluation and Course contents)

For

Second Year

of

**Four Year Undergraduate Programmes Leading to
Bachelor of Technology (B Tech) In Textile Technology**

VEERMATA JIJABAI TECHNOLOGICAL INSTITUTE

Textile Engineering 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

UG Programme in Textile Technology (Level 5.0- UG Diploma) - Semester – III

Sr.	Course Code	Course Name	Hr/week			Cr	Examination Weightage in %		
			L	T	P		TA	MST	ESE
1	R5TT2001T	Yarn Manufacturing Technology I	3	1	0	4	20	30	50
2	R5TT2001L	Yarn manufacturing I Laboratory	0	0	2	1	ISCE :60		40
3	R5TT2002T	Weaving Technology I	3	0	0	3	20	30	50
4	R5TT2002L	Weaving Technology Laboratory I	0	0	2	1	ISCE :60		40
5	R5TT2003T	Technology of Pre-treatment and Dyeing	3	0	0	3	20	30	50
6	R5TT2003L	Textile Pre-treatment & dyeing Laboratory	0	0	2	1	ISCE :60		60
7	R5TT2004T	Testing of Fibres & Yarns	3	0	0	3	20	30	50
8	R5TT2004L	Testing of Fibres & yarns Laboratory	0	0	2	1	ISCE :60		40
9	R5TT2201T	Multi-disciplinary Minor-I	2	0	0	2	20	30	50
10	R5CH2401O	Environmental Science	2	0	0	2	ISCE :60		40
11	R5HS2501O	Modern Indian Language	2	0	0	2	ISCE :60		40
		Total	18	1	8	23			

UG Programme in Textile Technology (Level 5.0- UG Diploma) - Semester - IV

Sr.	Course Code	Course Name	Hr/week			Cr	Examination Weightage in %		
			L	T	P		TA	MST	ESE
1	R5TT2005T	Yarn Manufacturing Technology II	3	0	0	3	20	30	50
2	R5TT2006T	Weaving Technology II	3	0	0	3	20	30	50
3	R5TT2007T	Technology of Printing & Finishing of Textiles	3	0	0	3	20	30	50
4	R5TT2008T	Evaluation of fabrics	2	0	0	2	20	30	50
5	R5TT2202T	Multi-disciplinary Minor-II	2	0	0	2	20	30	50
6	R5TT2009T	Cloth structure analysis	2	0	2	3	20	30	50
7	R5HS2401T	Universal Human Values	2	0	0	2	20	30	50
8	R5TT2005L	Yarn Manufacturing Laboratory	0	0	2	1	ISCE :60		40
9	R5TT2006L	Weaving Technology II Laboratory	0	0	2	1	ISCE :60		40
10	R5TT2008L	Evaluation of fabrics laboratory	0	0	2	1	ISCE :60		40
11	R5TT2601P	Comm. Engg. Project / Field Project	0	0	4	2	ISCE :60		40
		Total	17	0	12	23			

SEMESTER III

Programme Name	Bachelor of Technology in Textiles	Semester III
Course Code	R5TT2001T	
Course Title	Yarn Manufacturing Technology I	
Course objective	To provide knowledge of yarn manufacturing process	
Course Outcomes	After completing this course, students will be able to : <ol style="list-style-type: none"> 1. Describe the fundamentals of conventional staple spinning technology 2. Discuss the modern development in various process of staple fibre spinning 3. Appraise the importance of combing process on the quality of ring spun yarns 4. Explain the twist insertion mechanism and bobbin building mechanism in ring yarn formation 5. Analyze the effect of material and process parameters at each stage of on quality of ring spun yarn 	
Prerequisite	Fundamental technology for textile manufacturing .	

Course Content

Module	Description
Module 1	Introduction to combing, objectives, preparation of stock for combing, hook direction pre and post combing drafting
Module 2	Construction and working of a comber, drive to various parts. Control of process parameters for producing combed yarns
Module 3	Comber settings, noil %, waste at comber and its reuse, comparison of carded and combed yarn quality. Modern developments in combing
Module 4	Objectives of speedframe, construction and working of a speedframe, design of spindle and flyers, principles of bobbin leading and fPlyer leading. Bobbin building mechanism on speedframe. Modern developments in speedframe.
Module 5	Objectives of ringframe, construction and working of ringframe. Design of ring and travelers and their impact on spun yarn quality, various cop building mechanism on ringframe, Various balloon breaking mechanisms and control on yarn tension
Module 6	Draft and twist setting on ringframe and its impact on yarn quality. improvement in modern ringframe and their impact on yarn properties. Linking of ringframe to winding

Module 7	Calculations related to speed, draft, production at each stage. Calculation of machine constant and change wheels, Calculation of comber noil, estimation of twist and twist multiplier in roving and yarn
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Text Books:

1. The Rieter Manual of Spinning - Volume 1: Technology of Short-staple Spinning by Werner Klein
2. The Rieter Manual of Spinning - Volume 2: Blowroom & Carding by Werner Klein
3. Introduction to Textile Fibres By H. V. Sreenivasa Murthy.
4. C. A. Lawrence, Fundamentals Of Spun Yarn Technology by Lawrence, T&F India, 2010, ISBN-10 : 1566768217
5. P.R.Lord, Handbook of Yarn Production: Technology, Science and Economics, 2010, CRC Press, ISBN-10 0849317819

Recommended reading:

1. Cotton: Science and technology, Edited by S. Gordon and Y-L. Hsieh, The Textile Institute.
2. A practical guide on quality management in spinning, B. Purushothama, WOODHEAD PUBLISHING INDIA PVT LTD

Programme Name	Bachelor of Technology in Textiles	Semester III
Course Code	R5TT2001L	
Course Title	Yarn manufacturing I Laboratory	
Course objective	To provide hands-on experience in working of comber, speed frame and ring frame.	
Course Outcomes	After completing this course, students will be able to : <ol style="list-style-type: none"> 1. Estimate the opening and cleaning intensity of blowroom and transfer efficiency at carding. 2. Calculate the draft of a machine 3. Understand the process parameters for combed yarn formation 4. Estimate the twist and draft settings on speedframe and ringframe. 5. Comprehend the package building mechanism on speedframe and ringframe. 	
Prerequisite	Fundamentals of basic raw materials in textiles, Basic mathematics, Mechanics of textile machines.	

Course Content

Module	Description
Module 1	Study the working of a bladed beater and determine its intensity of beating.
Module 2	Study of single scutcher and chute feed system- construction and flow of material, gearing and settings, production calculation and study of different cages in blowroom
Module 3	Study of fibre transfer mechanism on a cotton card, factors influencing transfer of fibres on to doffer, mechanism condensation of card web and its subsequent coiling. Draft and waste calculation on a card.
Module 4	Estimation of draft on a drawframe
Module 5	Study of comber preparatory process- Sliver lap and ribbon lap material passage, setting and speed calculations.
Module 6	General study of a combing machine, gearing calculation, determining feed/nip, nips/min, draft and waste % at comber
Module 7	Study of comber setting and their influence on comber noil
Module 8	Study of passage of material though speedframe and its differential motion
Module 9	Study of bobbin building mechanism on speedframe
Module 10	Calculate the twist, draft and production at ringframe. Determine the change places for various counts of ring spun yarns.

Module 11	Study of bobbin building mechanism on ringframe
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Recommended Readings:

1. Spinning Blowroom and Card, NCUTE Publication, 1998.
2. W. Klein, The Technology of Short Staple Spinning (Vol.1,2,3), The Textile Institute Publication, 1998.

Programme Name	Bachelor of Technology in Textiles	Semester III
Course Code	R5TT2002T	
Course Title	Weaving Technology I	
Course objective	To apprise students about the basics of weaving technology.	
Course Outcomes	<p>After completing this course, students will be able to :</p> <ol style="list-style-type: none"> 1. Understand the fundamentals of sizing, drawing-in and knotting-gaiting, problems and remedial measures related to sizing. 2. Describe the working of automatic looms and related mechanisms. 3. Explain mechanism of various dobbies, knowledge of card punching, and pegging. 4. Recognize the features and working of jacquard mechanism. 	
Prerequisite	Fundamental operations of initial preparatory and fabric formation technology	

Course Content

Module	Description
Module 1	<p>Sizing: Objective(s) of sizing, Sizing ingredients and their functions for cotton and synthetic yarns, passage of yarn through two cylinder and multi cylinder sizing machine. Single end sizing. Study of modern sizing machine with reference to various zones of sizing machines, its advantages and disadvantages and beam drives. Different control systems used in sizing such as - level controller, stretch controller, temperature controller and moisture controller</p> <p>Drawing-in and Knotting: Manual, Automatic type, Knotting, Gaiting related calculations.</p>
Module 2	<p>Automatic looms: Limitations of ordinary looms, Pre-requisites for successful installation of automatic looms, Essential features, types and their comparison. Weft feeler, electrical and electronic weft feeler, pirn changing looms with reference to automatic looms. Shuttle changing loom, non-stop shuttle change, Temple cutters and shuttle eye cutter. Mechanical and electrical warp stop motions, multi-shuttle weft replenishment, center weft fork, center selvage motion.</p> <p>Mechanisms of Pick- &- Pick and Pick –at- Will. Weft mixing motions.</p>
Module 3	<p>Dobby: Classification of doobby, Mechanisms of doobby. Working principle of various types of non-electronic doobby.</p>
Module 4	<p>Jacquard: Classification, mechanism and design developments. Mechanical Jacquard: working principle.</p>

Text Books:

1. Talukdar M.K. & Ajgaonkar D.B and Wadekar, Sizing- Materials, Methods and Machines, Textile Trade Press, Bombay,1982.
2. Winding, Warping & Sizing – BTRA Silver Jubilee monograph series.
3. Talukdar, Sriramulu & Ajgaonkar, Weaving Machines Mechanism & Management, Mahajan Publishers, Ahmedabad.
4. Marks R. & Robinson ATC, Principles of Weaving, Textile Institute Publication, 1986, Manchester (U.K.).
5. K. T. Aswani, Fancy Weaving Mechanisms –Mahajan Book publishers, 1990.

Recommended reading:

1. Sabit Adanur, Handbook of Weaving - CRC Press, 2000.
2. A Ormerod and W S Sondhelm, Weaving Technology and Operations, The Textile Institute, Manchester, 1995.
3. P.K. Banerjee, Weaving Mechanism, Woodhead Publications, 2014

Programme Name	Bachelor of Technology in Textiles	Semester III
Course Code	R5TT2002L	
Course Title	Weaving Technology Laboratory I	
Course objective	To apprise students about the basics of weaving technology.	
Course Outcomes	After completing this course, students will be able to : 1. Understand the technological aspect of weaving preparatory processes 2. Comprehend the various primary shuttle loom mechanisms 3. Compare between the various shedding mechanisms 4. Explain the shuttle loom timing and settings	
Prerequisite	Basics operations of weaving industry	

Course Content

Module	Description
Module 1	Study of cheese and cone winding machines. Passage of yarn. Calculations of winding machines. Productions of machines. Study of pirn winding machines
Module 2	Study of sectional warping machines and related calculations.
Module 3	Study of sizing – headstock, gearing, beam drive, leasing, tape marking, size box, creel leasing.
Module 4	Study of passage of warp yarn through a plain power loom and introduction to primary and secondary motions of loom.
Module 5	Study of warp stop motion on various looms and setting.
Module 6	Study of tappet shedding motion and related settings.
Module 7	Study and setting of beating motion and shuttle box.
Module 8	Study and setting of loose reed and fast reed motions, setting of duck bill heater, organ handle, bow-spring, knock off dagger.
Module 9	Study of weft fork motions, its settings and practice for running the loom (with warp & weft mending).

Recommended Readings:

1. Winding, Warping & Sizing – BTRA Silver Jubilee monograph series.
2. Gokarneshan N., Practical Guide to Fabric Manufacture & Cloth Analysis Laboratory, Mahajan Publishers Pvt. Ltd., Ahmadabad, 2005, ISBN 81-85401-26-8

Programme Name	Bachelor of Technology in Textiles	Semester III
Course Code	R5TT2003T	
Course Title	Technology of Pre-treatment and Dyeing	
Course objective	To apprise students about the principles of Textile Pretreatments and Dyeing	
Course Outcomes	<p>After completing this course, students will be able to:</p> <ol style="list-style-type: none"> 1. Explain the importance and fundamental techniques of preparing fabrics for dyeing and analyze the change in properties obtained 2. Describe the colour theory and concepts behind colour measurement systems. 3. Demonstrate the methods of dyeing various fibres. 4. Discuss the various machineries used for pretreatment & dyeing of textile substrates 	
Prerequisite	Applied Chemistry – I and Applied Chemistry – II	

Course Content

Module	Description
Module 1	Mechanical methods of Fabric Preparation & Desizing: Grey inspection, Shearing, Cropping, Singeing, Chemistry and technology of desizing viz. reductive, oxidative and novel techniques, Evaluation of desizing efficiency.
Module 2	Scouring and bleaching: Chemistry and technology of scouring cotton cloth in both batch and continuous process, Chemistry and technology of hypochlorite, peroxide and chlorite bleaching, Preparation processes for synthetic and blended fabric in brief, Bleaching performances, evaluation and norms for scoured and bleached cloth.
Module 3	Mercerisation: Technology of Mercerisation, Physical and chemical effects on fabric, Evaluation of efficacy of mercerisation
Module 4	Colour : Concept of light and colour, Primary, secondary and tertiary colour. Additive & subtractive colour mixing, auto dispersive systems, Munsell and CIE lab colour measurement systems, Principles of spectrophotometer for colour measurement, Chemical constitution responsible for colour
Module 5	Dyeing : Dyeing of Natural and other important fibres: Elements and mechanism of dyeing, Classification of dyes, Basics of chemistry behind dyeing, Concept of Dye-Fibre interaction. Principles of dyeing cotton with various classes of dyes such as direct, reactive, vat, sulphur, solubilized vat and azoic, Dyeing of protein fibers(Wool and Silk) with various classes of dyes. Principles of dyeing man-made fibers such as rayon(s), polyester(s), polyamines & modacrylics and their common blends. Evaluation of colour fastness to various agencies such as light, wash, rubbing and sublimation.
Module 6	Processing Machinery – Elements and working of Package dyeing, Jigger, Padding mangle, Jet dyeing, Soft flow machine for pretreatment and dyeing. Working principle and various dyeing cycle used for coloration of natural and synthetic fibre fabric.

Text Books :

1. A.K. Roy Chaudhary, Textile Preparation and dyeing, Science publisher, New Hampshire, 2006
2. R. S. Prayag, Bleaching, Mercerising and Dyeing of Cotton Materials 2000.
3. E.R. Trotman, Dyeing of Textile Fibres & Chemical Technology, B.I. Pub. New Delhi 1994.
4. Textile Scouring & Bleaching – Trotman E.R., B.I. Pub., 1993, New Delhi

Recommended Readings:

1. R.S.Prayag, Bleaching, Mercerising and Dyeing of Cotton Materials, 2000.
2. Dr. V.A. Shenai, Technology of Bleaching & Mercerising, Sevak Publication Mumbai, 1990
3. Dr. V.A. Shenai, Technology of Textile Processing, Sevak Pub. Mumbai, 1990.
4. R. R. Chakravarty & S.S. Trivedi, Technology of Bleaching & Dyeing of Textile Fibres Vol Part I & II, Mahajan Brothers, Ahmedabad 1979.

Programme Name	Bachelor of Technology in Textiles	Semester III
Course Code	R5TT2003L	
Course Title	Textile Pre-treatment & dyeing Laboratory	
Course objective	To teach students actual methods followed in pretreatments and dyeing of textile substrates.	
Course Outcomes	After completing this course, students will be able to: 1. Demonstrate desizing, scouring, bleaching, mercerization of textile materials by different methods. 2. Design experiments for dyeing of fibres with various dyes 3. Evaluate the fastness properties of the dyed fabrics.	
Prerequisite	Applied chemistry I and Applied chemistry II	

Course Content

Module	Description
Module 1	Identification of fibres
Module 2	Removal of size in Textile Fabric/Yarn through enzymatic, Acid & chlorite desizing and its evaluation
Module 3	Cotton scouring & scouring efficiency determination.
Module 4	Bleaching of cotton yarn/cloth with sodium hypochlorite and hydrogen peroxide
Module 5	Combined scouring and bleaching of cotton
Module 6	Dyeing of cotton fabric with Direct Dyes.
Module 7	Dyeing of cotton fabric with different classes of reactive dyes
Module 8	Dyeing of cotton fabric with Azoic colours.
Module 9	Dyeing of cotton fabric with Vat Dyes and solubilized vat dyes.
Module 10	Dyeing of cotton fabric with Sulphur dyes.
Module 11	Dyeing of Wool and Silk with Acid Dyes.
Module 12	Dyeing of Polyester with Disperse Dyes (Carrier & HTHP method)
Module 13	Demonstration of evaluation of Fastness properties

Programme Name	Bachelor of Technology in Textiles	Semester	III
Course Code	R5TT2004T		
Course Title	Testing of Fibre and Yarn		
Course Objective	To introduce processes involved in physical testing of textile fibres and yarns.		
Course Outcomes	After completing this course, students will be able to: <ol style="list-style-type: none"> 1. Summarize the importance of textile testing. 2. Recognize different terminologies used in Fibre Testing. 3. Recognize different terminologies used in Yarn Testing. 4. Outline different types of testing used for assessing Textile fibres. 5. Outline different types of testing used for assessing Textile yarns. 		
Prerequisite	Applied mathematics & Applied physics.		

Course Content

Module	Description
Module 1	Objective of textile testing: Testing quality schemes like Wool mark, Silk Mark, ASTM, ISO, EN, DIN, BS, and BIS standards. Role of statistics in testing of textiles.
Module 2	Selection of samples for testing: Types of sampling, Fibre sampling methods from combed slivers, roving and yarns, Yarn sampling techniques, Fabric Sampling techniques.
Module 3	Fibre dimension and quality testing: Fibre length measurement, Fibre Fineness measurement by various methods, measurement of fibre maturity-Trash % - single fibre strength and bundle strength of fibre. Moisture relations, concept of moisture regain and moisture content and its measurement. Measurement of atmospheric conditions, regain humidity relations & hysteresis, effect of moisture regain on fibre properties.
Module 4	Yarn structure and dimension testing: Yarn numbering system, yarn count measurement, yarn diameter moisture, relation between yarn diameter and count. Yarn twist: importance, effect of twist on various properties of yarn, twist measurement methods. Hairiness of yarn measurement. Concept of Yarn evenness -, U%, long term short term irregularity of yarn & its measurement, Uster Tester.
Module 5	Terminology and definitions used in measurement of tensile properties of fibres & yarns. Working principles of tensile testing instruments - CRL, CRE, CRT & inclined plane, The working principle of - strain gauge – transducer-UTM, Single yarn strength Testing, Yarn CSP measurement.

Text Books:

1. V. K. Kothari, Testing and Quality Management, IAFL Publications, New Delhi, 2005
2. B. P. Saville, Physical Testing of Textiles, Woodhead Publishing Ltd., U. K, 1999.
3. J. E. Booth, Principles of Textile Testing by, Heywood Books, London, 1961.

Recommended Readings :

1. E. B. Grover and D. S. Hamby, Handbook of Textile Testing and Quality Control, 1960.

Programme Name	Bachelor of Technology in Textiles	Semester	III
Course Code	R4TT2009L		
Course Title	Testing of Fibre and Yarn Lab		
Course Objective	To provide hands-on experience about the physical testing of textile fibres and yarns.		
Course Outcomes	After completing this course, students will be able to: <ol style="list-style-type: none"> 1. Demonstrate the methods of identifying textile fibres. 2. Explain the different methods of evaluating physical characteristics of textile fibres and yarns. 3. Get idea about the precautions to be taken during testing and sampling of textile materials. 		
Prerequisite	Applied Chemistry, Applied Physics.		

Course Content

Module	Description
Module 1	Observe and list physical characteristics of fibres and draw their cross-sectional/traverse microscopic structure
Module 2	Burning test & solubility test for identification of fibres
Module 3	Gravimetric method for identification of fibre blends
Module 4	Study of Convolutions and Ribbon width of cotton.
Module 5	Test method to evaluate the fineness of fibre
Module 6	Test method to evaluate the length of fibres & Crimp of fibre: by oiled plate method.
Module 7	Baer Sorter and fibre length measurement technique.
Module 8	Test method to evaluate fibre bundle strength
Module 9	Test method to evaluate single fibre strength
Module 10	Evaluation of Maturity of cotton by NaoH method, Maximum & minimum width of cotton fibre – microscopically.
Module 11	Measurement of yarn count by lea method and lea CSP, Tex number and work of rupture of yarn.
Module 12	Measurement of Single yarn strength

Module 13	Measurement of Yarn Twist.
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Recommended Readings:

1. V. K. Kothari , Testing and Quality Management , IAFL Publications, New Delhi, 2005
2. B. P. Saville, Physical Testing of Textiles, Woodhead Publishing Ltd., U. K, 1999.
3. J. E. Booth, Principles of Textile Testing by, Heywood Books, London, 1961.
4. E. B. Grover and D. S. Hamby, Handbook of Textile Testing and Quality Control, 1960.

Programme Name	Bachelor of Technology in Textiles	Semester	III
Course Code	R5CH2401T		
Course Title	Environmental Science		
Course Objective	To provide hands-on experience about the environmental science for sustainable development.		
Course Outcomes	<p>After completing this course, students will be able to:</p> <ol style="list-style-type: none"> 1. Imply the basic knowledge of environmental protection, sustainable development and improvement. 2. Categorize and scrutinize impact of human development on natural resources and its conservation. 3. Interpret the impact of environmental problems on socio economic growth. 4. Apply different Science and Technology (S&T) based sustainability solutions and technological improvement, and methods for the remediation of degraded environment. 5. Familiarize with the legislation, management and protocols existing for environmental protection. 		
Prerequisite	Applied Chemistry.		

Course Outline:

Sr. No.	Course Contents
Module 1	<p>Significance of Environment Science: Definition, basic principles and scope of environment science. Need for awareness Industrialization & Urbanization; Basic Ecological Concepts Ecosystems, nature of environmental threats, Current environmental problems, Importance of clean air.</p>
Module 2	<p>Natural Resources Management and Sustainability Concept of Ecosystem, Conservation of ecosystem: Natural Resources, Renewable and Non-renewable Resources, Natural resources and challenges with the conservation. Forest resources, Water resources, Energy resources Role of an individual in conservation of natural resources. Impact of energy use on Environment. Energy conservation and sustainability</p>

Module 3	Environment & Society Urbanization and environment, social movements, Community participation, JFM, participation by NGOs Impact of energy use on Environment, energy production on environment change, nuclear explosion, impact of dam construction, Energy conservation and sustainability
Module 4	Green Technologies Role of advancements in science and technology in developing environment friendly technologies 3 R's for Green Technology, Green technology towards sustainable future, Reduction of ecological footprint, Concept of Sustainability and Green Chemistry as a tool for sustainable development.

SEMESTER IV

Programme Name	Bachelor of Technology in Textiles	Semester IV
Course Code	R5TT2005T	
Course Title	Yarn Manufacturing Technology II	
Course objective	To impart knowledge on processing of blends and unconventional yarn forming techniques	
Course Outcomes	After completing this course, students will be able to : <ol style="list-style-type: none"> 1. Explain the pre-requisites of fibre blending and methods of blend yarn formation 2. Describe the various types of unconventional spinning techniques 3. Recognize merits and demerits of open-end spinning techniques 4. Describe the different techniques of yarn doubling and winding 5. Discuss the latest developments in yarn manufacturing 	
Prerequisite	Engineering mechanics and fundamentals of yarn manufacturing technology	

Course Content

Module	Description
Module 1	Spinning of Man-made fibres & blends, Fibre characteristics and their impact on yarn properties. Role of fibre crimp and spin finish in processing. Objectives of blending. Criteria for fibre selection for blending, blend intimacy estimation, fibre migration study.
Module 2	Introduction to unconventional spinning - fibre characteristics required for unconventional spinning, possibilities and limitations
Module 3	Rotor spinning - principle and operation, raw material preparation, working of rotor machine, Rotor process parameters and their impact on yarn quality, comparison of rotor and ring yarn properties, new developments in rotor spinning
Module 4	Airjet spinning -principle and operation, raw material preparation, working of rotor machine, airjet spinning process parameters and their impact on yarn quality, comparison of airjet spinning versus vortex spinning
Module 5	Friction Spinning principle and operation, raw material preparation, working of rotor machine, friction spinning process parameters and their impact on yarn quality, DREF II and DREFIII process.
Module 6	Other spinning technologies - SIRO spinning, Wrap spinning, Bobtex spinning, Core spinning, Compact spinning and new developments
Module 7	Doubling -objectives, preparation for doubling, dry and wet doubling, Two for One Twister, cabled yarns and fancy yarn developments

Text Books :

1. The Rieter Manual of Spinning - Volume 3: Technology of Short-staple Spinning by Werner Klein

2. The Rieter Manual of Spinning - Volume 4: Blowroom & Carding by Werner Klein
3. Carl A. Lawrence“ Fundamentals of Spun Yarn Technology”, CRC Publications, 2003.
4. P.R. Lord, Hand Book of Yarn Production : Science, Technology and Economics, Tailor and Francis, 2003.

Recommended Readings:

1. K.R. Salhotra, Spinning of Manmade & Blends on Cotton System, Textile Association (India), 2004.
2. Salhotra K R and Ishtiaque S M, Rotor Spinning : Its advantages, limitations and prospects in India, 1st Ed; National Information Centre for Textile and Allied Subjects, 1995.

Programme Name	Bachelor of Technology in Textiles	Semester IV
Course Code	R5TT2005L	
Course Title	Yarn Manufacturing Technology II Laboratory	
Course objective	To make the students aware of process of doubled yarn manufacturing and unconventional yarn processing	
Course Outcomes	After completing this course, students will be able to : <ol style="list-style-type: none"> 1. To comprehend technical entails, passage of materials on unconventional spinning 2. To recall the parameters for making doubled yarns and fancy yarns 3. To analyze blended yarns 4. To evaluate the properties of fancy yarns 	
Prerequisite	Yarn manufacturing Laboratory I	

Course Content

Modules	Description
Module 1	Microscopic study of fibre migration in blended yarns
Module 2	General study of yarn doubling, passage of yarn on doubling machine, package building, gearing calculations
Module 3	General study of fancy doubler machine
Module 4	Production of fancy yarns
Module 6	Production of SIRO yarn and study of its characteristics
Module 7	General study of rotor spinning machine
Module 8	General study of DREFspinning machine
Module 9	General study of Direct Twisting machine
Module 10	Evaluation of yarn evenness on Uster evenness tester

Programme Name	Bachelor of Technology in Textiles	Semester IV
Course Code	R5TT2006T	
Course Title	Weaving Technology II	
Course objective	To make the students aware of advances in the fabric manufacturing technology	
Course Outcomes	<p>After completing this course, students will be able to :</p> <ol style="list-style-type: none"> 1. Explain the need and concept of shuttleless weaving & electronic high-speed weaving. 2. Comprehend the principle and mechanics of weft insertions for various shuttleless weaving machines. 3. Appraise the energy conservation, fabric quality and techno-economics of shuttleless weaving. 4. Discuss the advanced weaving techniques like, multiphase, circular, etc. 	
Prerequisite	Students are expected to have knowledge of Engineering Physics, Mathematics. Mechanics and basics of Fabric Manufacturing.	

Course Content

Module	Description
Module 1	<p>High Speed Weaving Mechanisms: Limitations of Tappet shedding motion, positive cam shedding concept and need, Positive cam shedding motion: constructional and working details. Adjustments essential during weave change and timing. Limitations of lever and cam negative dobby, positive rotary cam concept, Rotary mechanical and electronically controlled dobby, various models available in the markets. Limitations of mechanical Jacquard, concept of electronic Jacquard, details of construction and working of electronic Jacquard, comparison between various Jacquard (Bonas, Staubli, Grosse) working principles, Jacquard capacity, suitability for various end uses, data transfer and management.</p> <p>Introduction to Shuttleless Weaving: Limitations of shuttle loom and comparison with shuttleless weaving, advantages of shuttleless weaving machines, classification of shuttleless weaving machines, weft storage units, etc.</p>
Module 2	<p>Projectile Loom: Weft insertion principle of projectile weaving machine, projectile picking motion, projectile acceleration & retardation, torsion rod details, picking phases, projectile preparation for picking, receiving unit, specifications of projectiles & grippers for various applications, power of picking, energy utilization, weaving performance and fabric quality. Technical applications with machine specifications.</p> <p>Rapier Loom: Study of weft velocity curves for looms with different methods of weft insertion. Classification of weft insertion systems and machines, Principle of weft</p>

	insertion with its sequence, Concept of Dewas & Gabler rapier systems, their comparison with other weft insertion systems. Auxiliary motions such as brake, cleaning, MIS, General electronic circuit, pick finding, multi color weft insertion, weft-stop, warp stop, etc. Weft waste during selvedge formation, etc.
Module 3	<p>Airjet Loom: Principle and sequence of weft insertion, machine parts with their role and significance, nozzles, methods of air-jet control, quality of air supply and energy consumption for air jet looms factors affecting pneumatic weft propulsion, motion of weft, nozzle design and technical features of modern air jet machine</p> <p>Waterjet Loom: Principle and sequence of weft insertion, machine parts with their role and significance, nozzles, methods of water-jet control and quality of water for waterjet looms & technical features with applications of modern waterjet weaving machines.</p> <p>Comparison with air jet, maintenance. Technical features of modern water jet weaving machines. Comparison of various shuttleless weaving technologies with respect to reed width, loom speed, WIR and capital cost.</p>
Module 4	Multiphase Weaving & Circular Weaving: Principles of weft insertion, sequence of weft insertion in multiphase looms, principles of fabric formation on two-phases, multiphases, circular and narrow fabric weaving, applications and technical features of modern looms.

Text Books:

1. Talukdar M.K. & Ajgaonkar D.B and Wadekar, Sizing- Materials, Methods and Machines, Textile Trade Press, Bombay,1982.
2. P.K. Banerjee, Weaving Mechanism, Woodhead Publications, 2014.
3. Winding, Warping & Sizing – BTRA Silver Jubilee monograph series.
4. Talukdar and Ajgaonkar, Weaving: Machines, Mechanisms, Management, Mahajan Publishers Ltd, 1996.
5. Marks R. & Robinson ATC, Principles of Weaving, Textile Institute Publication, 1986, Manchester (U.K.).

Recommended reading:

1. Sabit Adanur, Handbook of Weaving - CRC Press, 2000.
2. A Ormerod and W S Sondhelm, Weaving Technology and Operations, The Textile Institute, Manchester, 1995.

Programme Name	Bachelor of Technology in Textiles	Semester IV
Course Code	R5TT2006L	
Course Title	Weaving Technology II Laboratory	
Course objective	To make the students aware of electronic dobby, jacquard & provide hands-on experience over unconventional weaving systems	
Course Outcomes	After completing this course, students will be able to: 1. Explain the difference between mechanical and electronic dobby. 2. Explain the concept of shuttleless weaving 3. Discuss the principle and mechanism 4. Examine various mechanisms associated with these machines. 5. Get hands on of experience on running these machines.	
Prerequisite	Basics operations of weaving industry.	

Course Content

Module	Description
Module 1	General study of dobby, Study of negative cam dobby & Study of pick finding devices.
Module 2	Study, Timing and setting of dobby, Pegging of dobby lattice & weaving of dobby sample-pique.
Module 3	Study of pick and pick drop box timing & setting, Drop-box mechanism, pick- and-pick& pick- at- will.
Module 4	General study of Jacquard and its types.
Module 5	General study of auto loom, Study of feelers & three try motion, Battery setting on loom.
Module 6	Study of shuttle change loom & Study of multicolour cop-changing loom.
Module 7	Study of semi-positive & automatic let off motion

Text Books:

1. Talukdar M.K. & Ajgaonkar D.B and Wadekar, Sizing- Materials, Methods and Machines, Textile Trade Press, Bombay, 1982.
2. Winding, Warping & Sizing – BTRA Silver Jubilee monograph series.
3. Gokarneshan N., Practical Guide to Fabric Manufacture & Cloth Analysis Laboratory, Mahajan Publishers Pvt. Ltd., Ahmadabad, 2005, ISBN 81-85401-26-8.

Programme Name	Bachelor of Technology in Textiles	Semester IV
Course Code	R5TT2007T	
Course Title	Technology of Printing & Finishing of Textiles	
Course objective	To teach the principles and methods of printing and chemical finishing of textile products	
Course Outcomes	<p>After completing this course, students will be able to:</p> <ol style="list-style-type: none"> 1. Describe the under-lying principles of textile printing and print paste formulation. 2. Explain in detail the various methods of printing and styles of printing textile materials. 3. Outline the importance of finishing and identify various finishes used for enhancement of aesthetic as well as Functional properties of textile materials. 	
Prerequisite	Basics of Textile processing and dyeing.	

Course Content

Module	Description
Module 1	Printing: Study of printing paste ingredients and their role in printing of various textiles materials. Styles of printing and method of printing. Direct, Discharge and Resist style printing
Module 2	Printing Machinery: Principles of working of flat bed and rotary screen printing machines, roller printing, Transfer printing, mechanism, merits and demerits. Colour fixation equipment: Steamers, curing chambers, loop ager, thermo fixation units used in various processes.
Module 3	Digital Printing: Concept of inkjet & digital printing, various ink formulations, machineries involved. Fixation and fastness aspect.
Module 4	Finishing: Objects of process and study of various finishing agents. Classification of finishing process. Conventional finishing sequences used for cotton fabrics including starching, calendaring, Sanforising, heat setting etc. , Functional finishes for various fibre/fabrics including : softening finish, wrinkle free finishes, water repellency, flame retardancy, anti-static antipilling, soil release, anti-microbial finish etc
Module 5	Methods for evaluation of efficiency of various functional finishes
Module 6	Tutorials: Demonstrations of various advanced concepts of printing and learn to analyze samples of printing and finishing by using modern teaching tools

Text Books:

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

Recommended Readings:

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.

Programme Name	Bachelor of Technology in Textiles	Semester IV
Course Code	R5TT2008T	
Course Title	Evaluation of Fabrics	
Course objective	To provide comprehensive knowledge about evaluation of fabric properties.	
Course Outcomes	<p>After completing this course, students will be able to:</p> <ol style="list-style-type: none"> 1. Recognize the various parameters for evaluation of fabric properties 2. Associate the relationship between fabric structure and properties like permeability. 3. Estimate the fabric serviceability properties like abrasion, pilling, wrinkle etc. 4. Judge fabric functional properties like water repellency, flame retardancy, comfort, handle etc. 5. Determine mechanical properties of fabrics. 	
Prerequisite	Students should have knowledge of physics, mathematics, basic testing of yarns and fibres	

Course Content

Module	Description
Module 1	Testing of Fabric: Measurement of fabric dimensions and other physical properties such as thickness, weight, yarn crimp, fabric shrinkage.
Module 2	Relationship between fabric porosity and permeability. Air, water and water-vapour transmission through fabrics, thermal resistance of fabrics. Measurement of fabric porosity and permeability.
Module 3	Concept of serviceability of fabric. Testing of parameters such as abrasion resistance, pilling, crease and wrinkle recovery, fabric handle, bending length, assessment of barre and other form of fabric defects.
Module 4	Concept of Fabric wettability, Water repellency and waterproof and their measurement.
Module 5	Concept of Fabric Flammability, testing of flame retardancy and their measurement.
Module 6	Measurement of Fabric mechanical properties like strength, tear strength, bursting strength.
Module 7	Concept of Fabric low stress mechanical properties such as smoothness, stiffness, softness, shear, drape and their measurement- Introduction to Kawabata and FAST system.
Module 8	Chemical Testing of Textiles: Evaluation of Colour fastness, Rubbing fastness, Laundering fastness, sublimation fastness, blend composition.

Text Books:

1. Saville B P, “Physical Testing of Textiles”, Woodhead Publishing Ltd, 2004, ISBN 1 85573 367 6.
2. “Testing and Quality Management”, Ed. V. K. Kothari, IAFL Publications, New Delhi, 1999.
3. Booth J E, “Principles of Textile Testing”, CBS Publishers and Distributors, New Delhi, 1999.

Recommended Readings :

1. Angappan P & Gopalakrishnan R, “Textile Testing”, SSM Institute of Textile Technology, Komarapalayam, 2002

Programme Name	Bachelor of Technology in Textiles	Semester IV
Course Code	R5TT2008T	
Course Title	Evaluation of fabrics Laboratory	
Course objective	To provide practical training in testing of fabrics.	
Course Outcomes	After completing this course, students will be able to: <ol style="list-style-type: none"> 1. Perform various physical tests for fabrics. 2. Determine the mechanical properties of fabrics 3. Perform the serviceability test of fabrics 	
Prerequisite	Student must be aware of basic testings of fibres and yarns.	

Course Content

Module	Description
Module 1	Measurement of specific gravity of raw material for fabric formation
Module 2	Study of air permeability property of fabric
Module 3	Study of water permeability property of fabric
Module 4	Study of moisture vapour permeability property of fabrics
Module 5	Study of thermal insulation property of fabric
Module 6	Study of drapability of fabric
Module 7	Study of fabric assistance property
Module 8	Study of abrasion resistance property of fabric (both linear and Lissajous motion)
Module 9	Study of pilling propensity of fabric
Module 10	Study of crease recovery behavior of fabrics.

Module 11	Study of tearing strength measurement technique for fabric
Module 12	Study of bursting strength measurement technique for fabric

Recommended Readings:

1. B. P. Saville, Physical Testing of Textiles, Woodhead Publishing Ltd., U. K, 1999.
2. J. E. Booth, Principles of Textile Testing by, Heywood Books, London, 1961.
3. E. B. Grover and D. S. Hamby, Handbook of Textile Testing and Quality Control, 1960.

Programme Name	Bachelor of Technology in Textiles	Semester IV
Course Code	R5TT2009T	
Course Title	Cloth structure analysis	
Course objective	To impart knowledge of different woven cloth constructions and methodology of designing the same on a loom	
Course Outcomes	After completing this course, students will be able to: <ol style="list-style-type: none"> 1. Comprehend the concept and representation of woven fabric design. 2. Reproduce the basic weaves and their derivatives with draft and lifting plans. 3. Apply the concept of color and weave effect in ornamentation of fabrics 4. Identify and analyze the specialty woven designs for various classes of applications like apparel, home textiles, industrial textiles etc. 5. Estimate fabric parameters for producing particular weave. 	
Prerequisite	Basics of Fabric manufacturing and Yarn testing.	

Course Content

Module	Description
Module 1	Introduction: Different types of yarn such as spun, filament, textured and fancy yarns and their impact on textile design. Concept of fabric designing through fabric structure and textile printing. Fabric cover and crimp, importance of fabric structure and analysis, detection of directions of warp and weft, classification of woven fabrics, method of fabric presentation, weaving plans.
Module 2	Basic Weaves: Method of construction, features and uses of plain weave and its derivatives, twill weave and its derivatives, Satin and sateen weaves and their derivatives.
Module 3	Stripe and Check Weaves: Features, criteria for selection of weaves for combination, rules governing the joining of different weaves. Method of preparation and uses. Colour and Weave Effect: Weave and colour combinations, features, method of preparation of

	Continuous line effect, Hounds tooth, Birds eye, Crows foot, Hair lines and Step pattern.
Module 4	Absorbent Fabrics: Method of preparation, features and uses of Diamond and Diaper Weaves, Honey comb weaves, Huck-a-back and Mock-leno weaves. Crepe Weave: Special feature, construction of the weave, method of preparation of its derivatives and uses.
Module 5	Bedford Cord weaves: Method of construction, features, cross-sectional view, derivatives and uses.
Module 6	Double Cloth: Definition, features, classification and uses. Method of preparation of self-stitched and center-stitched double cloths, their salient feature and uses. Wadded double cloth.
Module 7	Terry Weaves: Definition, classification, process of formation of pile, graphical representation of terry weaves, loop sprouting, extra attachments. Backed fabrics: Definition, features, classification and usage. Graphical representation, warp backed and weft backed cloth, reversible backed fabric, wadded backed fabric, Extra warp and weft ornamentations
Module 8	Calculations: Raw material calculations to produce different weaves. Technical specification of important fabrics.

References:

1. Groszicki Z J, "Watsons Textile Design and Colour", NewnesButtersworth, 1988.
2. Groszicki Z J, "Watsons Advanced Textile Design", Newnes Buttersworth, 1989.
3. Klibbe J W, "Structural Fabric Design", Revised edition, 1965, North Carolina State University.

Recommended reading:

1. Gokarneshan N, "Fabric Structure and Design", New Age International, New Delhi, 2004.

Programme Name	Bachelor of Technology in Textiles	Semester IV
Course Code	R5HS2401T	
Course Title	Universal Human Values	
Course objective	<ol style="list-style-type: none"> 1. To help the student see the need for developing a holistic perspective of life. 2. To help sensitize the student about the scope of life – individual, family (inter-personal relationship), society and nature. 3. To strengthen self reflection 4. To develop more confidence and commitment to understand, learn and act accordingly 	

Course Outcomes	<p>After completing this course, students will be able to :</p> <ol style="list-style-type: none"> 1. Analyze the significance of value inputs provided in formal education along with skills and develop a broader perspective about life and education 2. Formulate their aspirations and concerns at different levels of living, and the way to fulfill them in a sustainable manner. 3. Evaluate their current state of understanding and living, and model a healthy lifestyle 4. Examine the issues of home sickness, interactions with seniors on the campus, peer pressure with better understanding and feel grateful towards parents, teachers and others 5. Develop more confidence and commitment for value-based living in family, society and nature
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Course Content

Module	Description
Module 1	<p>Aspirations and concerns – Understanding basic human aspirations, fixing one’s goals, and the need for a holistic perspective in form of Universal Human values Self management – self confidence, handling peer pressure, time management, anger, stress, personality development and self improvement which leads to harmony in the human being.</p>
Module 2	<p>Understanding Health – Health issues, healthy diet, healthy lifestyle which shall lead to Harmony of the self and body in forms of mental and physical health.</p>
Module 3	<p>Relationships – Learning to handle home sickness, gratitude towards parents, teachers and others, understanding impact of ragging and interaction, competition and cooperation to achieve harmony in relationships.</p>
Module 4	<p>Participation in society, participation in nature leading to harmony in the society and nature/existence, Role of education in developing holistic perspective</p>