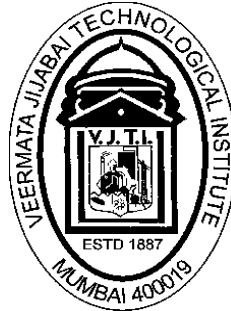


VEERMATA JIJABAI TECHNOLOGICAL INSTITUTE
(VJTI)
MATUNGA, MUMBAI 400 019

(Autonomous Institute affiliated to University of Mumbai)



Curriculum
(Scheme of Instruction & Evaluation and Course contents)
(Revision 2018)
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, 2018-19

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 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
SEM – III**

	Course Code	Course Name	Hr/Week			Credits
			L	T	P	
1	R4MA2005S	Mathematics for Textiles	3	1	0	4
2	R4TT2001S	Textile Fibres	3	1	0	4
3	R4TT2002T	Fundamentals of Yarn Manufacturing Technology	3	0	0	3
4	R4TT2002P	Spinning Preparatory Laboratory	0	0	2	1
5	R4TT2003T	Fundamentals of Fabric Manufacturing Technology	3	0	0	3
6	R4TT2003P	Weaving Preparatory Laboratory	0	0	2	1
7	R4TT2004T	Technology of Textile Pretreatment & Dyeing	3	0	0	3
8	R4TT2004P	Textile Pretreatment & Dyeing Laboratory	0	0	2	1
9	R4TT2005A	Traditional Textiles of India	3	0	0	MNC
	Total		18	2	6	20

SEM – IV

	Course Code	Course Name	Hr/Week			Credits
			L	T	P	
1	R4TT2006S	Statistics for Textile Technology	3	1	0	4
2	R4TT2007T	Yarn Manufacturing Technology	3	0	0	3
3	R4TT2007P	Yarn Manufacturing Laboratory	0	0	2	1
4	R4TT2008T	Fabric Manufacturing Technology	3	0	0	3
5	R4TT2008P	Fabric Manufacturing Laboratory	0	0	2	1
6	R4TT2009T	Testing of Fibre & Yarn	3	0	0	3
7	R4TT2009P	Testing of Fibre & Yarn Laboratory	0	0	2	1
8	R4TT2010S	Technology of Textile Printing & Finishing	3	1	0	4
9	R4TT2011A	History of Textile and clothing around the globe	3	0	0	MNC
10	RACH200A	Environmental Studies	2	0	0	MNC
	Total		20	2	6	20

Programme Name	Bachelor of Technology in Textiles	Semester – III
Course Code	R4MA2005S	
Course Title	Mathematics For Textile Technology	
Course objective	To provide knowledge of mathematical tools useful in Textile Technology	
Course Outcomes	<p>After completing this course students will be able to:</p> <ol style="list-style-type: none"> 1. Use matrix calculations in connection with the eigen values, eigen vectors, Cayley Hamilton Theorem, function of square matrix, quadratic form and find its rank, index, signature and class. 2. Evaluate Laplace as well as Inverse Laplace Transform of function, solve ordinary differential equations and linear time invariant system. 3. Find approximate solution of a system of linear equations & ordinary differential equations using numerical methods; also compare the approximate solution of ordinary differential equations with its exact solution. 4. Develop basic knowledge of calculus involving limits, derivatives and integrations. 	
Prerequisites	Basic high school level mathematics	

Course Contents

Module 1	<p>Matrices: Eigen values Eigen vectors of square matrix. Cayley Hamilton's theorem and function of square matrix. Similarity Matrices, Modal Matrix. Function of Square a Matrix, Minimal Polynomial and Minimal Equation of a Matrix, Derogatory and Non-Derogatory Matrices. Quadratic forms : Linear Transformation, Linear Transformation of Quadratic forms , Congruence of a square Matrix , Reduction to Canonical form under Congruent and Orthogonal Transformation of Quadratic form , rank , index ,signature and class value of Quadratic form.</p>
Module 2	<p>Laplace Transforms: Functions of bounded variation. Linear property of Laplace transforms. Laplace transforms of standard functions such as $1, e^{at}, \sin at, \cos at, \sinh at, \cosh at, \operatorname{erf} x$. Change of scale property, First shifting theorem, Second shifting theorem $\int_0^\infty e^{-st} f(t) dt = F(s)$, $\int_0^\infty e^{-st} f'(t) dt = sF(s) - f(0)$, $\int_0^\infty e^{-st} f''(t) dt = s^2 F(s) - sf'(0) - f(0)$, $\int_0^\infty e^{-st} f'''(t) dt = s^3 F(s) - s^2 f'(0) - sf''(0) - f(0)$ Inverse Laplace transform using linear property, theorems, partial fractions and convolution theorem. Unit step functions, Heaviside, Dirac delta functions, Periodic functions and their Laplace transforms. Application to solve ordinary differential equations with one dependent variable.</p>

Module 3	Numerical Methods : Solutions of systems of linear equations. Gauss elimination, Gauss Jordan, Crout's (LU) method. Gauss Seidal and Jacobi iteration. Differential equation, Taylor series method, Euler's Modified , Runga-kutta Method.
Module 4	Basic skills in Calculus: Concept of limit of a function, Limits of algebraic, trigonometric functions, Standard limits. Logarithmic Exponential Derivatives- Derivatives of standard function by first Principal , Rules of differentiation , derivatives of composite function , derivatives of implicit function and parametric function . Second order derivative and applications of derivatives. Integration-Integration of standard function , Method of integration , Definition of definite integral , Properties of definite integrals with simple problems , Application of definite integrals. Solving of quadratic equation, synthetic division, Indices rule, Finding equation of line, plane and circle. Basic curve fitting equations (Ellipse, Parabola, Hyperbola), 2D, 3D curve.
Module 5	Statistics & Probability Theory: Review of measures of central tendency, measures of variation and probability, Discrete and continuous Random variable, Binomial- Poisson and Normal distribution.

Text Books:

1. Advanced Engineering Mathematics, H K Dass, S Chand & Co. Ltd, 3rd Edition, 2006
2. Higher Engineering Mathematics, Dr B S Grewal, Khanna Publications, 39th Edition, 2005
3. A Text Book of Engineering Mathematics, N.P.Bali & Dr.Manish Goyal, 8th Edition , Laxmi Publication.

Programme Name	Bachelor of Technology in Textiles	Semester III
Course Code	R4TT2001S	
Course Title	Textile Fibres	
Course objective	To apprise students about the classification and basic properties of textile fibres.	
Course Outcomes	After completing this course, students will be able to : 1. Identify and Classify the various textile fibres. 2. Discuss the structure and properties of various textile fibres. 3. Relate the properties of fibres to the applications for which fibres can be used. 4. Comprehend the structure and properties of man-made fibres and compare them with natural fibres. 5. Assess the properties and applications of hi- tech fibres in textiles.	
Prerequisite	Applied Chemistry, Applied Physics	

Course Content

Module	Description
Module 1	Definition of terms – Fibre, textile fibre. Classification of textile fibre according to their origin and constitution, structural requirement of fibre forming polymer, concept of molecular weight, Degree of polymerization, orientation, crystallinity.
Module 2	Structure and properties of Natural fibres- 1) Cotton 2)Wool 3) Silk 4)Jute 4)Flax 5)Banana Fiber 6) Bamboo fiber 7)Coir fiber. Various applications of these fibers.
Module 3	Structure and properties of manmade fibres- Physical, Chemical and Biological properties of Manmade Fibres - Polyester, Viscose rayon, Acetate Rayon, Lyocell, Polyamide, Acrylic & Modacrylic, Polyolefin fibres, Elastomeric fibres, Eco-friendly fibres like PLA, Soy etc.- Various applications of these fibers.
Module 4	Physical, Chemical and biological properties of high-tech fibres-Aromatic polyamides, Super-absorbent fibres, High Density Polyolefin, Polyvinyl fibres, Carbon fibre, PPS fibre, PBO fibre, Glass fibre and their applications.

Text Books :

1. E.P.G.Gohl, L.D.Vilensky, Textile Science, an Explanation of Fibre Properties, Second Edition, 1987, CBS Publishers & Distributors Pvt. Ltd.
2. H.V.S. Murthy, Introduction to Textile Fibres (Revised edition- 2015), Wood Head Publication, ISBN 9789385059094 .
3. S. P.Mishra, Science & Technology of Man-Made Fibres, Suraj publications, 2007,
4. Tatsuya Hongu, Glyn O. Phillips, MachikoTakigam, New Millennium Fibers, Woodhead Publishing Ltd., CRC Press LLC, 2005, ISBN 0-8493-2598-6.

VJTI- S.Y.B.Tech- Textile Technology. Revised Syllabus:

Programme Name	Bachelor of Technology in Textiles	Semester	III
Course Code	R4TT2002T		
Course Title	Fundamentals of Yarn Manufacturing Technology		
Course Objectives	To introduce the fundamentals of spinning technology.		
Course outcome	After completing this course, students will be able to : 1. Describe the fundamentals of staple spinning technology. 2. Explain the steps involved in the production of spun yarn. 3. Explain the functions of blow room, card and draw frame. 4. Analyze the effect of material and process parameters at blow room, carding and draw frame.		
Prerequisite	Fibres and basic Physics.		

Course Content

Modules	Description
Module 1	Fundamentals of Spinning : Steps involved in conversion of fibre to continuous knot free yarn, Difference between fiber and yarn etc.
Module 2	Steps involved in the production of Staple Yarn : Concept of Mixing and Blending, Methods of Mixing and Blending , Opening and Cleaning operations in blow room and cards, Drawing operation, Roving and Yarn formation, Significance of evenness and its control in spinning.
Module 3	Blow room : Objectives, Sequence of machines in conventional and modern blow room line, Conventional and Modern openers and cleaners along with their features. Feeding techniques in blow room. Role of condenser cage, metal and contaminator detector in blow room. Important setting and its effect on the yarn property.
Module 4	Carding : Objectives, Working of carding machine. Detail Study of different zones of carding from feed to coiling zone and its setting, Card clothing , Forces acting on fibers at various stages of carding, Calculation of speed, draft and production, Latest development in carding., Autolevellers at Card – Need and Objectives, working of Autolevellers and Setting of Autolevellers
Module 6	Drawing : Objectives, Construction and working of a draw frame. Concept of roller drafting, Basic requirements of drafting, Study of various drafting systems with its merits and demerits. Concept and types of roller weighting systems. Introduction to Shirley drafting, concept of ideal drafting, draft and drafting force. law of doubling, law of addition of irregularity, causes and control of irregularity of a drafted textile strand. Autolevellers in draw frame – Objectives, working of Autolevellers and Setting of Autolevellers.

Text Books :

1. W. Klein, The Technology of Short staple spinning (Vol. 1), The Textile Institute Publication, 1998.
2. W. Klein, A practical guide to opening and carding (Vol. 2), The Textile Institute Publication, 1987.

3. W. Klein, A Manual of Textile Technology: A practical guide to Spinning Preparation (Vol 3), The Textile Institute Publication, 1987.
4. K.R. Salhotra, Spinning of Manmade & Blends on Cotton System, Textile Association (India), 2004.

Recommended Readings:

1. Khare A.R, Elements of Raw cottons & Blow room, Sai book publication, 1999.
2. Khare A.R, Elements of Carding & Drawing, Sai book publication, 1999.
3. Merrill G.R, Cotton Drawing & Roving and Cotton Combing 364-Vernum Ave. Lowell, Mass. 1992

Programme Name	Bachelor of Technology in Textiles	Semester	III
Course Code	R4TT2002P		
Course Title	Spinning Preparatory Laboratory		
Course outcome	After completing this course, students will be able to : 1. Understand the technological aspect of ginning, opening, cleaning and carding action. 2. Analyze transfer efficiency, web stripping mechanism, coiling mechanism in carding 3. Compile technical details, process and settings of draw frame		
Prerequisite	Basics operations of spinning industry.		

Course Content

Modules	Description
Module 1	Study of Roller & Saw Gin, Different drives for types of cotton.
Module 2	Study of working mechanism of a bale breaker / bale opener- To calculate the rotational speed of evener roller and linear speed of the inclined lattice, number of rows of evener spikes passing per linear meter movement of spiked lattice.
Module 3	Study of Step Cleaner/Axi Flow - Construction, flow of material, gearing, settings, speed and production calculations.
Module 4	Study the working mechanism of a bladed beater- To determine the intensity of beating (beats/cm) of a bladed beater, the beater speed and feed rate.
Module 5	Determine the position of the belt on the cone drums due to step change in thickness of the material passing in between the pedals and pedal rollers.
Module 6	Study of Single scutcher and chute feed system - Construction, flow of material gearing, settings, speed and production calculations, different cages in blow room.
Module 7	Study of general passage of cotton through Carding machine- importance of various parts involved and their importance in the process, calculations of speed(s), draft(s) and production.
Module 8 Module 8	Study of main carding action, construction of flats, and their bearing surface, importance of cylinder-flat setting, actual setting procedure, influence of this setting on the quality of the material processed, importance of „Stripping & Grinding“.
Module 9	Study of transfer mechanism of fibres in card- from cylinder, cylinder-doffer region, setting procedure, factors influencing the transfer of fibres on to doffer, Condensation of card web and its subsequent coiling in the form of web. Influence of tension drafts involved between doffer and final coiling. Card waste and its effect on actual and calculated draft, methods for controlling waste at card.
Module 10	Passage of material through draw fame, gearing diagram, settings and production calculations.

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	R4TT2003T		
Course Title	Fundamentals of Fabric Manufacturing Technology		
Course Objectives	To apprise the students about basics of weaving technology.		
Course outcome	After completing this course, students will be able to : <ol style="list-style-type: none"> 1. Understand the fundamental techniques of winding, warping and sizing. 2. Explain problems occurring during the passage of yarn on winding, warping and sizing machines and their remedial measures. 3. Describe the role of primary loom mechanisms and their importance. 4. Explain the secondary mechanisms involved in making of fabric on weaving machine. 		
Prerequisite	Engineering Physics, Chemistry, Mathematics and Mechanics.		

Course Content

Modules	Description
Module 1	Introduction to the methods of manufacturing different types of fabrics. Outline of weaving and preparatory processes and Textile Industry.
Module 2	<p>Winding: Objectives of winding, Types of winding machines, Various features and parts of winding machines and their functions. Yarn tension in winding, end breaks, classimat yarn faults, package faults.</p> <p>Pirn winding: Objectives, systems of weft preparation, and different types of pirn winding machines.</p>
Module 3	Warping: Objects, classification, Beam warping, Sectional warping, creels, headstock, stop motions, modern developments, and comparison of various types of warping machines.
Module 4	<p>Sizing: Objects 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.</p> <p>Study of modern sizing machine with reference to various zones of sizing machines, it's advantages and disadvantages and beam drives.</p> <p>Different control systems used in sizing such as - level controller, stretch controller, temperature controller and moisture controller.</p>
Module 6	<p>Drawing-in and Knotting: Manual, Automatic type</p> <p>Plain Looms: Classification of weaving machines; Primary, Secondary and Auxiliary motions of loom.</p> <p>Shedding: Objectives and Introduction to different Shedding Devices, Tappet shedding mechanism, negative and positive shedding tappets, Heald reversing motions.</p> <p>Picking & checking mechanisms. Over-pick & Under-pick mechanisms, Picking Cams.</p>

	Beat-up mechanism. Eccentricity of sley. Take-up and let-off mechanism. Side weft fork motion, warp protector mechanism, loose reed, fast reed, brake motion, temple devices, oscillating back-rest. anti-crack motion.
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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 Readings:

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. K. T. Aswani, Fancy Weaving Mechanisms –Mahajan Book publishers, 1990.

Programme Name	Bachelor of Technology in Textiles	Semester	III
Course Code	R4TT2003P		
Course Title	Weaving Preparatory Laboratory		
Course outcome	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

Modules	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 IV
Course Code	R4TT2004T	
Course Title	Textile Pretreatments and Dyeing	
Course objective	To apprise students about the principles of Textile Pretreatments and Dyeing	
Course Outcomes	After completing this course, students will be able to: <ol style="list-style-type: none"> 1. Explain the importance and fundamental techniques of preparing fabrics for dyeing. 2. Analyze the changes in the properties of fabrics after pretreatments 3. Describe the colour theory and concepts behind colour measurement systems. 4. Demonstrate the methods of dyeing various fibres. 5. Discuss the various machineries used for pretreatment & dyeing with respect to specific applications 	
Prerequisite	Applied Chemistry – I and Applied Chemistry – II	

Course content

Modules	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 labcolour 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. Dyeing machinery such as package dyeing, jigger, padding mangle and jet dyeing machine. Working principle and various dyeing cycle used for coloration of natural and synthetic fibre fabric. Evaluation of colour fastness to various agencies such as light, wash, rubbing and sublimation.
Module 6	Eco-friendly textile pretreatment and dyeing of various fibers.

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	R4TT2004P	
Course Title	Textile Pretreatments and dyeing Lab	
Course objective	To teach students actual methods followed in pretreatments and dyeing of textile substrates.	
Course Outcome	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 Contents

Modules	Description
Module 1	Removal of size in Textile Fabric/Yarn through enzymatic, Acid & chlorite desizing and its evaluation
Module 2	Cotton scouring & scouring efficiency determination.
Module 3	Bleaching of cotton yarn/cloth with sodium hypochlorite and hydrogen peroxide
Module 4	Combined scouring and bleaching of cotton
Module 5	Dyeing of cotton fabric with Direct Dyes.
Module 6	Dyeing of cotton fabric with different classes of reactive dyes
Module 7	Dyeing of cotton fabric with Azoic colours.
Module 8	Dyeing of cotton fabric with Vat Dyes.
Module 9	Dyeing of cotton fabric with Solubilised 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

Text Books :

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	R4TT2005A		
Course Title	Traditional Textiles of India		
Course Objective	To introduce various cultural and regional diversity of traditional Indian textiles and their adaptation by contemporary Brands/Designers/Industry.		
Course outcome	<p>After completing this course, students will be able to:</p> <ol style="list-style-type: none"> 1. Discuss the origin, motifs, colors, equipment and technology used for natural dyed/painted/printed/woven textiles of India 2. Appreciate the Indian traditional textile crafts and the uniqueness of their various manufacturing methods. 3. Distinguish various artistic textile materials. 		
Prerequisite	Various regions of India, cultural history and traditional rituals.		

Course content

Modules	Description
Module 1	<p>Dyes and textiles: Classification of natural dyes according to the sources- plant, Animal and minerals. Comparison of natural dyes & synthetic dyes. Substantive (turmeric saffron etc.), Mordant (myrobalan tannin, alum, source of natural alizarin), Vat (Indigo fera and vat process). Communities who specialized in dyeing craft in India -rangrez, neelgar, khatris</p>
Module 2	<p>Ritualistic textiles: Ritualistic Textiles with regards to historical perspective, origin, significance, technique(s) of making and evolution Pichwai: Pigment painted, temple hanging of Vallabhacharya sect, Pushtimarg, Haveli, Srinathji, Nathdwara, moods of festivals & important events, format of the hanging, mural painting in Rajasthan. Patachitra: Place of practice, distinct features, community, themes depicted, format, the materials& processes. Pabuji ki phad & Devnaraynji ki Phad : Origin, Joshi chippa, bhopa of nayak, itinerant story teller, ravana hatha, story of Pabuji Rathore, size of the phad.</p>
Module 3	<p>Indian Woven textiles and saris Looms in India, material, techniques and identifying characteristic features such as motif, colour and layout, historic perspective and evolution and weaving communities. woven materials: Shawls of Kashmir , Varanasi brocades, asavali, Baluchari, Kancheepuram, Jamavar, Jamdani, Chanderi, Maheshwari, Kanjivaram, Kota, Paithani, Gadwall, Venkatagiri, Mangalagiri, Bomkai, Khandua, Kasavu etc. Coloured Textiles: Bandhani, Patola, Ikat, Pocchampalli etc. Printed and Painted Textiles – Sanganeri. Kalamkari., block printing, Ajrakh, Dabu Prints, Roghan / khadi / Tinsel printing, Warak Printing etc</p>
Module 4	Traditional floor covering

	<p>Carpets, Durries and Namdahs - Looms, technique, material, colour and motifs, layout and evolution</p> <p>Carpets from Kashmir and UP Bhadohi / Mirzapur-Sultan Zain – ulabidin, Hand Knotted, Senna Knot, Abrash, Talim Durries from Warangal, Punjab, U.P. Namdah - Felted floor covering.</p>
Module 5	<p>Textile articles from north east</p> <p>Weaving on back strap loom</p> <p>Mekhala chadder & gamocha from Assam</p> <p>Moirangphee sari, Innaphi Phanek</p> <p>Shawls of Manipur and Naga shawl</p>

Recommended Readings:

1. Ancient Textiles: The Art of Production, Processing and Preservation- Dr. B. J. Agarwal, 2017, WPI, ISBN 9789385059032
2. Bhandari, V., 2004. Costumes, Textiles, Jewellery of India: Traditions in Rajasthan. Prakash Books.
3. S. Bhowmick, 1982. The Master Weavers – Festival of India in Britain, Royal College of Arts.
4. Gillow, J. & Barnard, N., 1991. Traditional Indian Textiles. Thames & Hudson, London.
5. Irwin, John & Margaret Hall, M., 1971. Indian Painted & Printed fabrics: volume I – Historic textiles of India at the Calico Museum.
6. Jain, J., 1998. Picture show men – Insights into narrative tradition in Indian Art. Marg Publishers.
7. Ranjan, A. & Ranjan, M., 2007. Handmade in India. Mapin publishers.
8. Singh, M., Chisti, R. & Jain, R., 2008. Hand Crafted Indian Textiles. Roli Books.
9. 1982. The master weavers – Festival of India in Britain, Royal college of Arts.
10. Das, S., 1992. Fabric Art Heritage of India. Abhinav Publisher.
11. Guy, J., 1998. Woven Cargoes: Indian textiles in the East. Thames & Hudson.
12. Barnard, N., 1993. Arts & Crafts of India. Conron Octopus.
13. Mohanty, B.C. & Mohanty J.P., 1983. Block printing and dyeing of Bagru, Rajasthan. Calico Museum of Textiles.
14. Dhamija, J. & Jain, J., 1989. Hand woven Fabrics of India. Mapin Publishing.
15. Dhamija, J., 1995. Woven silks of India.
16. Katiyar, V., 2009. Indian saris – Traditional perspectives – design. Wisdom Tree.
17. Singh, M., 2010. Saris of Bihar & W. Bengal. Wiley Eastern ltd.
18. Singh, M. & Chishti, R., 2010. Saris of India traditional and beyond. Lustre press.
19. Prabhas, S., 1994. Crafts of west Bengal. Mapin Publishing ltd.
20. Lynton, L., 1995. The sari – styles, patterns, history, techniques. Thames and Hudson.
21. Jaitley, J., 1990. Crafts of Kashmir, Jammu & Ladakh. Abbeville Press.
22. Textiles & crafts of India Arunachal Pradesh, Assam , Manipur. Prakash Books.

SEM – IV

Programme Name	Bachelor of Technology in Textiles	Semester – IV
Course Code	R4TT2006S	
Course Title	Statistics For Textile Technology	
Course objective	To introduce the statistical tools useful for solving textile engineering problems.	
Course Outcomes	After completing this course, students will be able to apply: <ol style="list-style-type: none"> 1. Concepts of statistics, probability theory, probability distribution to engineering problems. 2. Sampling theory to engineering problems. 3. The concepts of correlation as well as regression analysis to engineering problems. 4. Knowledge of SQC, control chart and ANOVA one-way and two-way professional field. 	
Prerequisites	Mathematics	

Course Content

Modules	Description
1	Introduction and need for statistics in Textiles Introduction to statistics, Methods of data collection, need for SQC techniques, Classification and graphical representation of data.
2	The elements of statistics Measures of central tendency -concept of Mean, Median & Mode, Partition values- concept of quartiles , percentile; Measures of dispersion- quartile deviation, S.D, C.V.; Frequency distribution, sampling distribution.
3	Correlation & Regression Analysis Introduction to bi-variate data, Correlation analysis, Coefficient of correlation and Rank correlation, Regression analysis, curve fitting, method of least square, Multi variate data analysis.
4	Sampling Theory Types of sampling- Discrete & continuous sampling, large sample and small sample, Testing of Hypothesis, „t“ test „F“ test and Chi-square test; confidence interval; Sampling distribution, standard error, Central Limit Theorem, Estimation of parameters- point estimation & interval estimation.
5	ANOVA- Introduction, one way analysis and two way analysis.
6	SQC- Introduction to Statistical quality control techniques and control charts- Mean chart, R chart, n-p chart, p chart, C chart and lot control.
7	Design of experiments- Introduction, complete randomize design, latin square design, factorial experiments.

Text Books:

1. Statistics for Textile Engineers, Edited by J.R.Nagla, Woodhead Publishing India Pvt. Ltd., 2014, ISBN 978-93-80308-37-1.

Recommended Reading

1. Principles of Textile Testing, J. E. Booth, Heywood Books, London, 1961.

Programme Name	Bachelor of Technology in Textiles	Semester	IV
Course Code	R4TT2007T		
Course Title	Yarn Manufacturing Technology		
Course Objectives	To apprise students about the in the yarn spinning technology.		
Course outcome	After completing this course, students will be able to : 1. Explain method of twist insertion in the formation of ring spun yarn. 2. Describe the different types of unconventional spinning techniques and comparison with ring spinning. 3. Discuss merits and demerits of open-end spinning techniques over other spinning techniques. 4. Recognize modern developments in yarn manufacturing technologies.		
Prerequisite	Engineering mechanics and fundamentals of yarn manufacturing technology.		

Course content

Modules	Description
Module 1	Combing: Shortcomings of short fibers, Short, Short to Medium and long Staple combing mills, Objectives of combing, Preparation of stock for combing, Conventional and Modern stock preparation techniques , Need for preparatory process for combing, hook direction, pre-comb draft & doublings.
Module 2	Modern concept of lap preparation: Construction and working of Sliver Lap, Ribbon Lap, Super Lap & Lap Former.
Module 3	Construction and working of Nasmith Comber: Drive to different parts – cylinder, nippers, lap & feed rollers, detaching rollers, cradle, top comb and drafting rollers in draw box
Module 4	Setting and timing of different parts in Comber – time diagram. Various setting involved in changing waste (noil) percentage on comber. Level of waste for different end uses. Different faults & their remedies. Difference in yarn quality of a carded and combed yarn.
Module 5	Speed Frame: Objectives of speed frame passages. Construction and working of a speed frame. Introduction to top arm drafting. Construction of Spindles & Flyers for twisting and winding. Flyer & bobbin leading principles. suspended flyer technology, auto-doffing techniques. Roving bobbin transportation technologies. Contour of cone drum and its construction. Roller settings. Principles of differential motion & building motion. Swing motion and Change Places Faults & Remedies. Calculations related to speeds, drafts and production in combing and speed frame, calculation of noil percentage in combing, calculations of twist, differential speeds in speed frame. Importance and calculations of various constants and corresponding change wheels.

Module 6	<p>Ring Frame: Objectives of ring frame. Construction and working of a ring frame. Details of creel, lappet, traveller (c-shape, elliptical, spiv, and clip). Ring (conventional, antiwedge, SU rings etc.) and spindle on ring frame. Pneumafil (bonda) collection</p> <p>Building mechanism on ring frame - chain building chainless, modern package building. Roving / Cop / Combination build.</p> <p>Winding and binding coils. Setting a frame for a particular count. Twist factors for different counts, strength of the yarn and twist factor, strength for different counts. Change Places, wrapping procedure. Forces acting on the traveller and yarn balloon in ring spinning. Different types of drives to ring frame. Ring frame auto doffing techniques and ring-data type online measurement and monitoring systems</p> <p>Improvements in various parts and features of modern ring frame for high speed spinning. Twist flow in ring spinning, Effect of various parameters on twist flow. Yarn and Package faults. Linking ring frame to winding (requirements for winding).</p>
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Text Books:

1. W. Klein, "Technology of Short Staple Spinning(Vol.3 &4)", The Textile Institute, Manual of Textile Technology, All volumes.
2. Carl A. Lawrence "Fundamentals of Spun Yarn Technology", CRC Publications, 2003.
3. 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	R4TT2007P		
Course Title	Yarn Manufacturing 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. Describe the flow of material through comber. 2. Demonstrate drive to various parts, settings and production calculations on comber machine. 3. Explain speed frame mechanism, building mechanism, differential motion. 4. Describe the flow of material through Ring frame, chain building mechanism and production calculations 		
Prerequisite	Spinning preparatory process		

Course content

Modules	Description
Module 1	A General Study of Sliver Lap Machine – Construction, material flow through machine, gearing, setting and speed/production calculations. Stop motions, lap forming.
Module 2	General study of Ribbon Lap Machine - Construction, material flow through machine, gearing, setting and speed/production calculations. Stop motions, lap forming.
Module 3	A General study of a comber – name of the parts, flow of material, index cycle. Comber – gearing calculations – feed per nip, nips per min., draft, production, waste%, head to head variation.
Module 4	Comber settings – nipper crank, nipper pivot, step gauge, leaf gauge, feed roller, top comb, plain segment & quadrant setting.
Module 5	Study of combing mechanisms – driving of different parts. Construction of half lap, top comb, nippers & study of stop motions.
Module 6	General study of speed frame – Construction, material flow through machine, gearing, setting, speed calculation, twist per inch, production. Truing of rollers and roller stand alignment.
Module 7	Study of Swing motion, stop motions on speed frame, change places, dimensions of staff & gauge.
Module 8	Study of various types of differential motions on speed frame.
Module 9	Study of Building mechanism on speed frame and related important settings.
Module 10	General study of a ring frame – construction, material flow through machine, gearing, settings and speed calculation. Calculations of twist, spindle speed, front roller speed and production.
Module 11	Study of ring rail leveling, spindle gauging, thread wire setting, measurement of staff, gauge, ring dia. Study of spinning geometry of ring frame.
Module 12	Study of building mechanism on ring frame. Change Places. Procedure for count changing.

Recommended Readings:

VJTI- S.Y.B.Tech- Textile Technology. Revised Syllabus:

1. Carl A. Lawrence, Fundamentals of Spun Yarn Technology, CRC Press, 2003.
2. P.R. Lord, Hand Book of Yarn Production : Science, Technology and Economics, Tailor and Francis, 2003
3. W. Klein, A Practical Guide to Ring Spinning, Manual of Textile Technology –Vol- 3,4, The Textile Institute, Manchester, UK 1990.
4. NCUTE publications on Yarn Manufacturing, Indian Institute of Technology, Delhi.

Programme Name	Bachelor of Technology in Textiles	Semester	IV
Course Code	R4TT2008T		
Course Title	Fabric Manufacturing Technology		
Course Objectives	To apprise students about the fabric forming process.		
Course outcome	After completing this course, students will be able to : 1. Explain mechanism of various dobbies, knowledge of card punching, and pegging. 2. Recognize the features and working of jacquard mechanism. 3. Explain the concept of weft patterning. 4. Describe the working of automatic looms.		
Prerequisite	Fundamental operations of weaving technology.		

Course Content

Module	Description
Module 1	Dobby: Classification of doobby, Mechanisms of doobby. Working principle of various types of non-electronic doobby. Electronic doobby: Working principle, machine parameters, microelectronics design features, drive arrangement, systems for pattern data transfer and design development.
Module 2	Jacquard: Classification, mechanism and design developments. Electronic Jacquard: working principle, constructional variants, various electronic jacquard systems, selection system, pattern data, transfer and management. CAD for doobby, jacquard, label and carpet.
Module 3	Weft Patterning: Significance of weft patterning system. Advantages and disadvantages of Drop-box and Circular-box motion, Mechanisms of Pick- &- Pick and Pick –at- Will. Weft mixing motions.
Module 4	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, Centre weft fork, center selvedge 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. Talukdar, Sriramulu &Ajgaonkar, Weaving Machines Mechanism & Management, Mahajan Publishers, Ahmedabad- 4.

Recommended Reading:

1. A. Ormerod and W. S. Sondhelm, Weaving Technology and Operations ,The Textile Institute, Manchester, 1995
2. P.K. Banerjee ,Weaving Mechanism, Woodhead Publications, 2014

Programme Name	Bachelor of Technology in Textiles	Semester	IV
Course Code	R4TT2008P		
Course Title	Fabric Manufacturing Laboratory		
Course outcome	After completing this course, students will be able to: <ol style="list-style-type: none"> 1. Describe the working of basic components of shuttle looms, dobbie and jacquard looms. 2. Examine various mechanisms associated with these machines. 3. Get hands on of experience on running these machines. 		
Prerequisite	Basics operations of weaving industry.		

Course Content

Modules	Description
Module 1	General study of dobbie, Study of negative cam dobbie & Study of pick finding devices.
Module 2	Study, Timing and setting of dobbie, Pegging of dobbie lattice & weaving of dobbie 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 Pulishers Pvt. Ltd., Ahmadabad, 2005, ISBN 81-85401-26-8.

Programme Name	Bachelor of Technology in Textiles	Semester	IV
Course Code	R4TT2009T		
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 significance of textile testing. 2. Discover the importance of statistics in textile testing 3. Outline different types of testing used for assessing textile materials. 4. Recognize different terminologies used in textile testing. 		
Prerequisite	Applied mathematics & Applied physics.		

Course Content

Module	Description
Module 1	Objective of textile testing: Testing quality schemes like wool mark ISE mark. ASTM, ISO, 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 textiles. Principles of textile testing instruments - CRL, CRE, CRT & inclined plane, stelometer, pressley fibre strength tester. The working principle of - Electronic dynamometer-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	IV
Course Code	R4TT2009P		
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 & Measurement of 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 thread strength
Module 13	Measurement of Yarn Twist tester.

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- IV
Course code	R4TT2010S	
Course Title	Technology of Textile Printing and Finishing	
Course objective	To teach the principles and methods of printing and chemical finishing of textile products	
Course Outcomes	After completing this course, students will be able to: 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	Textile pretreatments and dyeing.	

Course content

Modules	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	Eco-friendly and Energy concepts in textile wet-processing: Printing and finishing of various fibres.
Module 7	Tutorials: Demonstrations of various advanced concepts 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	R4TT2011A		
Course Title	History of textiles and clothing around the globe		
Course Objective	Outline the history of various trends and clothing styles all over the world		
Course outcome	After completing this course, students will be: <ol style="list-style-type: none"> 1. Familiar with the origin of various textiles and regional practices to carry them. 2. Able to elaborate the history and historical developments in clothing styles and their effect of various civilizations 3. Able to explain the change in trends and styles over the period of time based on societal interest all over the world. 		
Prerequisite	Knowledge about various regions of world and their basic cultural aptitude.		

Course content

Modules	Description
Module 1	The Ancient World (3500B.C.-A.D.300) The Ancient middle east : Egypt ,Mesopotamia, Crete & Greece, Etruria & Rome The Middle age (early and late middle age) The Renaissance: The Italian Renaissance, The Northern Renaissance Baroque & Rococo:The Seventeenth century, The Eighteenth century The Nineteenth Century: The Directoire period & the Empire period, The Romantic period, The Crinoline period, The Bustle period
Module 2	Bell Epoque: (1900-1913) Edwardian “S” Look, Art Deco Movement, Gibson Girl Look. Designers: Paul Poiret, Mariano Fortuny etc
Module 3	World War I : Start of war (1914- 1919): Dropped waist, Shorter lengths of Garments. Between the Wars (1920-1939): Roaring twenties (1920-1929), androgynous, Flapper, Glamour Years (1930-1939): Slinky look, Bias cut dresses. War time Utility look (1940-1946): Make do Mend, Ready-to-Wear, compulsory minimalism New Look (1947 -1956): Pedal pushers, Teenager. Mini and Mod (1957 – 1966): Miniskirts, biker look, Mod look, Twiggy, Space Age, Op Art, Youth directed, A-Line Silhouette, Kennedy years, Swinging London.
Module 4	End of century: Anti-Fashion (1967 – 1978): Vietnam protest, Women’s liberation, Flower power, Psychedelia, Retro, Ethnic, Hot Pants, Maxi Coats, Disco, Unisex Clothing, Punk, Street Fashion, microminis. Power-Dressing (1979 – 2000): Shoulder pads, Yuppie Status symbols, Androgynous, Minimalism, Deconstruction, Ethnic, Techno, Mix of Styles, Grunge Look, Dressing down Fridays.
Module 5	New styles of century 21st Century: Designers of 21 st century styles, trends and fashion of new century Studying movie costumes based on history and events.

Recommended Readings:

1. Baker, J.O. 2007. *A Handbook of Costume Drawing*. India: Reed Elsevier India Private Limited. (Second Edition).
2. Callan, G.H. 2008. *The Thames and Hudson Dictionary of Fashion and Fashion Designers*. London: Thames and Hudson Ltd.
3. Leventon, M. 2008. *Costume Worldwide* London: Thames and Hudson.
4. Murray, M.P. 2005. *Changing Styles in Fashion-Who, What, Why*. New York: Fairchild Publications.
5. Norris, H. 1999. *Medieval Costume and Fashion* . New York: Dover Publications Inc.
6. Picken, M.B.1999. *A Dictionary of Costume and Fashion*, New York: Dover Publications Inc.
7. *The Collection of the Kyoto Costume Institute FASHION. A History from the 18th to the 20th Century*. Volume I and II. KOLN, London, Los Angeles, Madrid, Paris, Tokyo: TASCHEN.
8. Worsley, H. 2004. *Decades of Fashion*. Germany: Getty Images. KONEMANN

Programme Name	Bachelor of Technology in Textiles	Semester	IV
Course Code			
Course Title	Environmental Studies		
Course objective	To present the impact of technological development on the environment.		
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. Provide the student with an understanding of radioactive waste. 3. Interpret the impact of environmental problems on socio economic growth and human health. 4. Imply various strategies, technological improvement, and methods for sustainable management of environmental systems and for the remediation of degraded environment. 5. Apply different Science and Technology (S&T) based sustainability solutions and limitations as well as to identify impact of human population on the natural environment and human health. 		
Prerequisite	Basic Science and Social Science		

Course Content

Modules	Description
Module 1	<p>Significance of Environment Science:</p> <p>Definition, basic principles and scope of environment science. Earth Man and Environment inter-relationship. Need for awareness Industrialization & Urbanization; Modern Human Life, Basic Ecological Concepts Ecosystems, nature of environmental threats Current environmental problems, Importance of clean air.</p>
Module 2	<p>Ecosystems and Its conservation:</p> <p>Introduction, definition: genetic, species and ecosystem diversity.</p> <p>Concept of an ecosystem: Structure and function of an ecosystem, Producers, consumers and decomposers.</p> <p>Conservation of ecosystem: Natural Resources, Renewable and Non-renewable Resources, Natural resources and associated problems.</p> <p>Forest resources, Water resources, Mineral resources, Food resources, Energy resources, Land resources.</p> <p>Role of an individual in conservation of natural resources. Biodiversity and its significance, and conservation. Global, National and effects of biodiversity.</p>
Module 3	<p>Fundamentals of Environmental Chemistry:</p> <p>Definition, Causes, effects and control measures of (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards (h) Radioactive Waste (I) E-waste. Importance of Environmental Chemistry to access and manage environmental pollution.</p>

Module 4	<p>Pollution Monitoring and Control Methods: Methods of controlling air pollution: Pollution controlling methods, Principle, construction, working and application of Equipment for gaseous pollutants control: Method to control water pollution: Principle, construction, working. Concept of Sustainability and Green Chemistry as a tool for sustainable development.</p>
Module 5	<p>Environmental Assessment, Management and Legislation: Aims And Objectives Of Environmental Impact Assessment (EIA). Environmental Impact Statement (EIS) And Environmental Management Plan (EMP) Environmental Ethics: Issues And Possible Solutions: Environment Audit :Principle, Procedure And Benefits Case study can be submit by the students. <i>Projects and activities by students on Current Environmental Issues in India</i> <i>Global Environmental Issues:</i> Biodiversity loss ,Climate change, Ozone layer depletion, Sea level rise Global Warming <i>International efforts for environmental protection and contribution of India for same, National Action Plan on Climate Change</i></p>

Text Books

1. De., Environmental Chemistry, 6th Edition, New Age International.
2. P.K.Goel, Water Pollution, Causes, Effects and Control, New Age International
3. Erach Bharucha, Text Book of Environmental Studies for Undergraduate Courses, Universities Press, Second Edition
4. Dr. Jagdish Krishnaswamy and Dr. R. J. Ranjit Daniels, Environmental Studies, Wiley India Private Limited, New Delhi, First Edition, 2009.

Recommended Readings:

1. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad,
2. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T., Environmental Encyclopedia, Jaico Publ. House, Mumbai, 200
3. Jadhav, H &Bhosale, V.M., Environmental Protection and Laws. Himalaya Pub. House, Delhi, 1995
4. Wanger K.D., Environmental Management. W.B. Saunders Co. Philadelphia, USA, 1998
5. Jadhav, H &Bhosale, V.M., Environmental Protection and Laws. Himalaya Pub. House, Delhi, 1995
6. Wanger K.D., Environmental Management. W.B. Saunders Co. Philadelphia, USA, 1998

Programme Name	Bachelor of Technology in Textiles	Semester – III
Course Code	R4MA2005S	
Course Title	Mathematics For Textile Technology	
Course objective	To provide knowledge of mathematical tools useful in Textile Technology	
Course Outcomes	<p>After completing this course students will be able to:</p> <ol style="list-style-type: none"> 1. Use matrix calculations in connection with the eigen values, eigen vectors, Cayley Hamilton Theorem, function of square matrix, quadratic form and find its rank, index, signature and class. 2. Evaluate Laplace as well as Inverse Laplace Transform of function, solve ordinary differential equations and linear time invariant system. 3. Find approximate solution of a system of linear equations & ordinary differential equations using numerical methods; also compare the approximate solution of ordinary differential equations with its exact solution. 4. Develop basic knowledge of calculus involving limits, derivatives and integrations. 	
Prerequisites	Basic high school level mathematics	

CO ↓	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO 1	2	3	3	2	1	---	---	---	1	1	2	3	3	---	---
CO 2	2	3	3	2	1	---	---	---	1	1	2	3	3	---	---
CO 3	2	3	3	2	1	---	---	---	1	1	2	3	3	---	---
CO 4	2	3	3	2	1	---	---	---	1	1	2	3	3	---	---

Programme Name	Bachelor of Technology in Textiles	Semester III
Course Code	R4TT2001S	
Course Title	Textile Fibres	
Course objective	To apprise students about the classification and basic properties of textile fibres.	
Course Outcomes	After completing this course, students will be able to : 1. Identify and Classify the various textile fibres. 2. Discuss the structure and properties of various textile fibres. 3. Relate the properties of fibres to the applications for which fibres can be used. 4. Comprehend the structure and properties of man-made fibres and compare them with natural fibres. 5. Assess the properties and applications of hi- tech fibres in textiles.	
Prerequisite	Applied Chemistry, Applied Physics	

CO ↓	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO 1	3	3	2	2	1	---	---	---	---	---	---	3	2	2	2
CO 2	3	3	2	2	1	---	---	---	---	---	---	3	2	2	2
CO 3	3	3	2	2	---	---	3	3	---	1	2	3	3	3	3
CO 4	3	3	2	2	---	3	3	2	---	---	---	3	3	1	3
CO 5	3	3	3	3	1	2	---	1	1	1	---	3	3	2	2

Programme Name	Bachelor of Technology in Textiles	Semester	III
Course Code	R4TT2002T		
Course Title	Fundamentals of Yarn Manufacturing Technology		
Course Objectives	To introduce the fundamentals of spinning technology.		
Course outcome	After completing this course, students will be able to : 1. Describe the fundamentals of staple spinning technology. 2. Explain the steps involved in the production of spun yarn. 3. Explain the functions of blow room, card and draw frame. 4. Analyze the effect of material and process parameters at blow room, carding and draw frame.		
Prerequisite	Textile fiber and Basic Physics.		

CO ↓	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO 1	3	3	2	3	1	---	---	---	1	---	---	3	3	2	2
CO 2	3	3	3	2	1	---	---	---	---	---	---	3	3	3	3
CO 3	3	3	3	3	2	---	1	---	---	---	---	3	3	3	3
CO 4	3	3	3	3	2	1	---	---	---	---	---	3	3	1	3

Programme Name	Bachelor of Technology in Textiles	Semester III
Course Code	R4TT2002P	
Course Title	Spinning Preparatory Laboratory	
Course outcome	After completing this course, students will be able to : 1. Understand the technological aspect of ginning, opening, cleaning and carding action. 2. Analyze transfer efficiency, web stripping mechanism, coiling mechanism in carding 3. Compile technical details, process and settings of draw frame	
Prerequisite	Basics operations of spinning industry.	

CO ↓	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO 1	3	3	3	3	3	---	---	---	3	3	---	3	3	3	2
CO 2	3	3	3	3	3	---	---	---	3	3	---	3	3	3	2
CO 3	3	3	3	3	3	---	---	---	3	3	---	3	3	3	2

Programme Name	Bachelor of Technology in Textiles	Semester	III
Course Code	R4TT2003T		
Course Title	Fundamentals of Fabric Manufacturing Technology		
Course Objectives	To apprise the students about basics of weaving technology.		
Course outcome	After completing this course, students will be able to : <ol style="list-style-type: none"> 1. Understand the fundamental techniques of winding, warping and sizing. 2. Explain problems occurring during the passage of yarn on winding, warping and sizing machines and their remedial measures. 3. Describe the role of primary loom mechanisms and their importance. 4. Explain the secondary mechanisms involved in making of fabric on weaving machine. 		
Prerequisite	Student should have background of engineering Physics, Chemistry, Mathematics and Mechanics.		

CO ↓	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO 1	3	3	3	3	---	---	1	---	---	---	1	3	3	3	2
CO 2	3	3	3	3	---	---	1	---	---	---	1	3	3	3	2
CO 3	3	3	3	3	---	---	---	---	---	---	---	3	3	3	2
CO 4	3	3	3	3	---	---	---	---	---	---	---	3	3	3	2

Programme Name	Bachelor of Technology in Textiles	Semester III
Course Code	R4TT2003P	
Course Title	Weaving Preparatory Laboratory	
Course outcome	After completing this course, students will be able to : <ol style="list-style-type: none"> 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	

CO ↓	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO 1	3	3	3	3	1	---	---	2	3	2	1	3	3	3	2
CO 2	3	3	3	3	1	---	---	2	3	2	1	3	3	3	2
CO 3	3	3	3	3	1	---	---	2	3	2	1	3	3	3	2

Programme Name	Bachelor of Technology in Textiles	Semester III
Course Code	R4TT2004T	
Course Title	Textile Pretreatments 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. 2. Analyze the changes in the properties of fabrics after pretreatments 3. Describe the colour theory and concepts behind colour measurement systems. 4. Demonstrate the methods of dyeing various fibres. 5. Discuss the various machineries used for pretreatment & dyeing with respect to specific applications 	
Prerequisite	Applied Chemistry – I and Applied Chemistry – II	

CO ↓	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO 1	3	3	3	2	2	---	1	---	1	1	---	3	3	3	3
CO 2	3	3	3	2	---	---	---	---	1	1	---	3	3	2	---
CO 3	3	3	3	1	3	---	2	---	1	1	---	3	3	2	1
CO 4	3	2	3	2	2	---	2	---	1	1	---	3	3	2	2
CO 5	3	3	3	2	3	---	3	---	1	1	---	3	3	2	2

Programme Name	Bachelor of Technology in Textiles	Semester III
Course Code	R4TT2004P	
Course Title	Textile Pretreatments and dyeing Lab	
Course objective	To teach students actual methods followed in pretreatments and dyeing of textile substrates.	
Course Outcome	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	

CO ↓	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO 1	3	2	3	3	2	---	2	---	2	1	---	3	3	2	2
CO 2	3	3	3	3	3	---	2	---	2	1	---	3	3	2	2
CO 3	3	3	3	3	3	---	3	---	2	1	---	3	3	2	3

Programme Name	Bachelor of Technology in Textiles	Semester III
Course Code	R4TT2005A	
Course Title	Traditional Textiles of India	
Course Objective	To introduce various cultural and regional diversity of traditional Indian textiles and their adaptation by contemporary Brands/Designers/Industry.	
Course outcome	<p>After completing this course, students will be able to:</p> <ol style="list-style-type: none"> 1. Discuss the origin, motifs, colors, equipment and technology used for natural dyed/painted/printed/woven textiles of India 2. Appreciate the Indian traditional textile crafts and the uniqueness of their various manufacturing methods. 3. Distinguish various artistic textile materials. 	
Prerequisite	Knowledge about various regions of India, cultural history and traditional rituals.	

CO ↓	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO 1	1	1	1	---	1	3	3	2	2	2	---	3	1	3	3
CO 2	---	---	2	---	1	3	3	2	2	2	2	3	1	3	3
CO 3	---	---	2	---	---	3	3	2	2	2	---	3	1	3	2

SEM – IV

Programme Name	Bachelor of Technology in Textiles	Semester – IV
Course Code	R4TT2006S	
Course Title	Statistics For Textile Technology	
Course objective	To introduce the statistical tools useful for solving textile engineering problems.	
Course Outcomes	After completing this course, students will be able to apply: <ol style="list-style-type: none"> 1. Concepts of statistics, probability theory, probability distribution to engineering problems. 2. Sampling theory to engineering problems. 3. The concepts of correlation as well as regression analysis to engineering problems. 4. Knowledge of SQC, control chart and ANOVA one-way and two-way professional field. 	
Prerequisites	Mathematics	

CO ↓	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO 1	2	3	3	2	2	---	---	---	1	1	---	3	3	2	---
CO 2	1	3	3	3	2	---	---	---	1	1	---	3	3	2	---
CO 3	1	3	3	3	2	---	---	---	1	1	---	3	3	2	---
CO 4	2	3	3	3	3	---	---	---	1	1	---	3	3	2	---

Programme Name	Bachelor of Technology in Textiles	Semester	IV
Course Code	R4TT2007T		
Course Title	Yarn Manufacturing Technology		
Course Objectives	To apprise students about the in the yarn spinning technology.		
Course outcome	After completing this course, students will be able to : 1. Explain method of twist insertion in the formation of ring spun yarn. 2. Describe the different types of unconventional spinning techniques and comparison with ring spinning. 3. Discuss merits and demerits of open-end spinning techniques over other spinning techniques. 4. Recognize modern developments in yarn manufacturing technologies.		
Prerequisite	Knowledge of engineering mechanics and fundamentals of yarn manufacturing technology.		

CO ↓	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO 1	3	3	2	2	1	---	1	---	1	1	---	3	2	2	2
CO 2	3	3	2	2	1	---	---	---	1	1	---	3	3	2	1
CO 3	3	3	3	2	1	---	---	---	1	1	---	3	3	2	1
CO 4	3	3	3	3	3	---	---	---	1	1	1	3	3	3	1

Programme Name	Bachelor of Technology in Textiles	Semester IV
Course Code	R4TT2007P	
Course Title	Yarn Manufacturing 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. Describe the flow of material through comber. 2. Demonstrate drive to various parts, settings and production calculations on comber machine. 3. Explain speed frame mechanism, building mechanism, differential motion. 4. Describe the flow of material through Ring frame, chain building mechanism and production calculations 	
Prerequisite	Spinning preparatory processes	

CO ↓	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO 1	3	3	3	2	2	1	1	---	2	2	1	3	3	2	1
CO 2	3	3	2	2	2	1	---	---	2	2	1	3	3	2	1
CO 3	3	3	2	2	2	1	---	---	2	2	1	3	3	2	1
CO 4	3	3	3	2	2	1	1	---	2	2	1	3	3	2	1

Programme Name	Bachelor of Technology in Textiles	Semester	IV
Course Code	R4TT2008T		
Course Title	Fabric Manufacturing Technology		
Course Objectives	To apprise students about the fabric forming process.		
Course outcome	After completing this course, students will be able to : <ol style="list-style-type: none"> 1. Explain mechanism of various dobbies, knowledge of card punching, and pegging. 2. Recognize the features and working of jacquard mechanism. 3. Explain the concept of weft patterning. 4. Describe the working of automatic looms. 		
Prerequisite	Fundamental operations of weaving technology.		

CO ↓	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO 1	3	1	2	1	3	1	---	---	1	1	---	3	3	2	1
CO 2	3	1	2	1	3	1	---	---	1	1	---	3	3	2	1
CO 3	3	1	2	1	3	1	---	---	1	1	---	3	3	2	1
CO 4	3	1	2	1	3	1	---	---	1	1	---	3	3	2	1

Programme Name	Bachelor of Technology in Textiles	Semester IV
Course Code	R4TT2008P	
Course Title	Fabric Manufacturing Laboratory	
Course outcome	After completing this course, students will be able to: <ol style="list-style-type: none"> 1. Describe the working of basic components of shuttle looms, doobby and jacquard looms. 2. Examine various mechanisms associated with these machines. 3. Get hands on of experience on running these machines. 	
Prerequisite	Basics operations of weaving industry.	

CO ↓	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO 1	3	3	3	2	3	1	---	---	2	2	---	3	3	2	1
CO 2	3	3	3	2	3	1	---	---	2	2	---	3	3	2	1
CO 3	3	3	3	2	3	1	---	---	2	2	---	3	3	2	1

Programme Name	Bachelor of Technology in Textiles	Semester	IV
Course Code	R4TT2009T		
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 significance of textile testing. 2. Discover the importance of statistics in textile testing 3. Outline different types of testing used for assessing textile materials. 4. Recognize different terminologies used in textile testing. 		
Prerequisite	SApplied mathematics & Applied physics.		

CO ↓	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO 1	1	3	3	2	2	1	1	1	1	1	---	3	3	2	2
CO 2	1	3	3	2	2	1	---	1	1	1	---	3	3	2	1
CO 3	1	3	3	2	2	1	---	1	1	1	---	3	3	2	1
CO 4	1	3	3	2	2	1	---	1	1	1	---	3	3	2	1

Programme Name	Bachelor of Technology in Textiles	Semester	IV
Course Code	R4TT2009P		
Course Title	Testing of Fibre and Yarn Laboratory		
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.		

CO ↓	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO 1	1	3	3	1	1	1	1	1	2	2	---	3	3	3	1
CO 2	1	3	3	1	1	1	1	1	2	2	---	3	3	3	1
CO 3	1	3	3	1	1	1	1	1	2	2	---	3	3	3	1

Programme Name	Bachelor of Technology in Textiles	Semester- IV
Course code	R4TT2010S	
Course Title	Technology of Textile Printing and Finishing	
Course objective	To teach the principles and methods of printing and chemical finishing of textile products	
Course Outcomes	After completing this course, students will be able to: <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	Textile pretreatments and dyeing.	

CO ↓	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO 1	3	3	3	2	1	---	2	---	1	1	---	3	3	2	3
CO 2	3	3	3	2	3	---	2	---	1	1	---	3	3	2	2
CO 3	3	3	3	3	3	2	2	---	1	1	---	3	3	2	3

Programme Name	Bachelor of Technology in Textiles	Semester- IV
Course code	R4TT2011A	
Course Title	History of textiles and clothing around the globe	
Course objective	Outline the history of various trends and clothing styles all over the world	
Course Outcomes	After completing this course, students will be: <ol style="list-style-type: none"> 1. Familiar with the origin of various textiles and regional practices to carry them. 2. Able to elaborate the history and historical developments in clothing styles and their effect of various civilizations 3. Able to explain the change in trends and styles over the period of time based on societal interest all over the world. 	
Prerequisite	Knowledge about various regions of world and their basic cultural aptitude.	

CO ↓	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO 1	1	---	1	---	1	3	3	2	2	2	---	3	1	3	3
CO 2	---	---	---	---	---	3	3	2	2	2	---	3	1	3	3
CO 3	---	---	---	---	---	3	3	2	2	2	---	3	1	3	3

Programme Name	Bachelor of Technology in Textiles	Semester	IV
Course Code			
Course Title	Environmental Studies		
Course objective	To present the impact of technological development on the environment.		
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. Provide the student with an understanding of radioactive waste. 3. Interpret the impact of environmental problems on socio economic growth and human health. 4. Imply various strategies, technological improvement, and methods for sustainable management of environmental systems and for the remediation of degraded environment. 5. Apply different Science and Technology (S&T) based sustainability solutions and limitations as well as to identify impact of human population on the natural environment and human health. 		
Prerequisite	Basic Science and Social Science		

CO ↓	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO 1	1	3	2	2	---	3	3	3	1	1	2	3	---	---	3
CO 2	1	3	2	2	---	3	3	3	1	1	2	3	---	---	3
CO 3	1	3	2	2	---	3	3	3	1	1	2	3	---	---	3
CO 4	1	3	2	2	---	3	3	3	1	1	2	3	---	---	3
CO 5	1	3	2	2	---	3	3	3	1	1	2	3	---	---	3