

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

First 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

First 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

Credit Framework for UG Programme in Textile Engineering (Level 4.5- UG Certificate) -Semester - I

Sr.	Course Type	Course Code	Course Name	L	T	P	Hr	Cr	Examination Weightage in %			Ownership
									TA	MST	ESE	
1	BSC	R5PH1011T	Physics	2	1	0	3	3	20	30	50	Physics
2	BSC	R5PH1011L	Physics – Laboratory	0	0	2	2	1	ISCE :60		40	Physics
3	BSC	R5MA1001T	Mathematics-I	2	1	0	3	3	20	30	50	Mathematics
4	ESC	R5ME1001T	Engineering Graphics + Department Specific Drawings	2	0	0	2	2	20	30	50	Mechanical
5	ESC	R5ME1001L	Engineering Graphics Laboratory	0	0	2	2	1	ISCE: 60		40	Mechanical
6	ESC	R5TT1021T	Evolution of Textile Engineering & recent developments	3	0	0	3	3	20	30	50	Respective Department
7	ESC	R5TT1022T	Electrical & Electronic devices for Textile Manufacturing	3	0	0	3	3	20	30	50	Electrical Department
8	ESC	R5TT1023L	Electrical & Electronic devices for Textile Manufacturing Laboratory	0	0	2	2	1	ISCE :60		40	Electrical Department
9	VSEC	R5TT1024L	Skill Enhancement Course (Design Thinking and Idea Lab)	0	0	3	3	1.5	ISCE :60		40	Respective Department
10	AEC	R5HS1001L	Ability Enhancement Course (Communication Skill)	1	0	2	3	2	ISCE :60		40	Humanities
11	CC1	R5TT1025LA R5TT1025LB	Photography Art & Craft	0 0	0 0	3 3	3 3	1.5 1.5	ISCE:100			Respective Department
Total				14	0	16	30	22				

Abbreviations: L Lecture, T Tutorial, P Practical, TA Teacher Assessment / Term work Assessment, MST Mid Semester Test, ESE End Semester Written Examination, ISCE In-semester Continuous Evaluation, BSC Basic Science Course, ESC Engineering Science Course, VSEC Vocational and Skill Enhancement Course, IKS Indian Knowledge System, AEC Ability Enhancement Course , CC Co-curricular Course

Semester - I List of Co-Curricular and Extra-Curricular Courses

Sr.	Course Code	Course Name	L	T	P	Hr	Cr	
1	R5CE1030L B	Sports	0	0	3	3	1.5	ISCE:100
2	R5CE1030L C	NSS/NCC	0	0	3	3	1.5	ISCE:100
3	R5CE1030L D	Social Responsibility & Community Engagement	0	0	3	3	1.5	ISCE:100
4	R5CE1030L E	Digital storytelling and Environment	0	0	3	3	1.5	ISCE:100
5	R5CE1030L F	Graphic Design and Community	0	0	3	3	1.5	ISCE:100
6	R5CE1030LG	Indian Constitution and Laws for Civil Engineering	0	0	3	3	1.5	ISCE:100

VJTI- First Year B. Tech- Textile Technology. Revised Syllabus

f Dean-Academics
VJTI MUMBAI

N. Mehra
HEAD
DEPARTMENT OF TEXTILE ENGINEERING
VEERMATA JIJABAI TECHNOLOGICAL INSTITUTE
Matunga, Mumbai - 19.

VEERMATA JIJABAI TECHNOLOGICAL INSTITUTE

Bachelor of Technology in Textiles

Credit Framework for UG Programme in Textile Engineering (Level 4.5- UG Certificate) -Semester - II

Sr.	Course Type	Course Code	Course Name	L	T	P	Hr	Cr	Examination Weightage in %			Ownership
									TA	MST	ESE	
1	BSC	R5CH1011T	Chemistry	2	1	0	3	3	20	30	50	Chemistry
2	BSC	R5CH1011L	Chemistry Laboratory	0	0	2	2	1	ISCE :60		40	Chemistry
3	BSC	R5MA1015T	Mathematics-II	2	1	0	3	3	20	30	50	Mathematics
4	BSC	R5TT1026T	Raw materials for Textiles	2	0	0	2	2	20	30	50	Respective Dept.
5	ESC	R5SE1001T	Engineering Mechanics	2	0	0	2	2	20	30	50	Structural Engineering
6	ESC	R5SE1001L	Engineering Mechanics Laboratory	0	0	2	2	1	ISCE: 60		40	Structural Engineering
7	ESC	R5CO1001T	Programming for Problem Solving (Branch specific 2 Modules)	2	0	0	2	2	20	30	50	Computer and IT
8	ESC	R5CO1001L	Programming for Problem Solving Laboratory	0	0	2	2	1	ISCE :60		40	Computer and IT
9	PCC	R5TT1027T	Tech of Textile Manufacturing	2	0	0	2	2	20	30	50	Respective Department
10	VSEC	R5TT1028L	Textile Engg. Lab	0	0	4	4	2	ISCE: 60		40	Respective Department
11	IKS	R5TT1029T	Traditional Textiles	2	0	0	2	2	20	30	50	Respective Department
									Or Credit Transfer			Respective Department
12	CC2	R5TT1030L	Yoga / Music / Student Chapter Activities	0	0	4	4	2	ISCE:100			Respective Department
			Total	15	0	14	29	22				

Abbreviations: L Lecture, T Tutorial, P Practical, TA Teacher Assessment / Term work Assessment, MST Mid Semester Test, ESE End Semester Written Examination, ISCE In-semester Continuous Evaluation, BSC Basic Science Course, ESC Engineering Science Course, PCC Program Core Course, VSEC Vocational and Skill Enhancement Course, IKS Indian Knowledge System, CC Co-curricular Course

Semester - II List of Co-Curricular and Extra-Curricular Courses

Sr.	Course Code	Course Name	L	T	P	Hr	Cr	
1	R5CE1030L B	Sports	0	0	3	3	1.5	ISCE:100
2	R5CE1030L C	NSS/NCC	0	0	3	3	1.5	ISCE:100
3	R5CE1030L D	Social Responsibility & Community Engagement	0	0	3	3	1.5	ISCE:100
4	R5CE1030L E	Digital storytelling and Environment	0	0	3	3	1.5	ISCE:100
5	R5CE1030L F	Graphic Design and Community	0	0	3	3	1.5	ISCE:100
6	R5CE1030LG	Indian Constitution and Laws for Civil Engineering	0	0	3	3	1.5	ISCE:100

N. Mehra

VJTI- First Year B. Tech- Textile Technology. Revised Syllabus

DEPARTMENT OF TEXTILE ENGINEERING
VEERMATA JIJABAI TECHNOLOGICAL INSTITUTE
Matunga, Mumbai - 19.

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VEERMATA JIJABAI TECHNOLOGICAL INSTITUTE

Bachelor of Technology in Textiles

List of Exit Courses after completion of Semester I and II

1. Exit option is available for students those who have earned the total 44 credits at the End of Second Semester.
2. Student who wants to avail the exit option after first year have to **earn additional 6-8 credits** from the list of courses shown below.
3. These courses student have to complete **within summer vacation** after 1st Year.
4. After fulfilment as mentioned in 1 to 3 above, Students can earn U.G Certificate and same will be issued by the Institute.

List of Exit Courses after completion of Semester I and II: B.Tech. Textile Engineering										
Sr.	Course Type	Course Name	L	T	P	Hr	Cr	Examination Weightage in %		
								TA	MST	ESE
1	EC	Testing of Textile Laboratory	0	0	4	4	2	ISCE: 100%		
2	EC	Inplant training	0	0	4 weeks		6	ISCE: 100%		


HEAD
 DEPARTMENT OF TEXTILE ENGINEERING
 VEERMATA JIJABAI TECHNOLOGICAL INSTITUTE
 Mumbai, Mumbai - 40.


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SEM I

Program Name	Bachelor of Technology in Textiles	Semester	I
Course Code	R5PH1011T		
Course Title	Physics I		
Course Type	Basic Science Course		
Course Outcomes	<ol style="list-style-type: none"> 1. Classify, draw, describe, and distinguish crystal structures and crystallographic planes. 2. Analyze crystal structures by X-Ray diffraction. 3. Describe properties of light using interference, diffraction, polarization, and its applications. 4. Identify and summarize properties and applications of dielectric materials. 5. Classify and analyze magnetic materials. 		
Teaching Scheme	Examination Scheme		
L	T	P	Credit
2	1	0	3
TA%	MST%	ESE%	ESE (hr)
20	30	50	3

Course Contents

Modules	Description	Lectures
Module 1	Crystal Structure of solids: Single crystal, polycrystalline, amorphous solids; Concepts of space lattice, atomic basis, unit cell & its characteristics; Monoatomic and diatomic Crystal, ligancy, imperfection	04
Module 2	Crystallographic Planes and Direction: Concept of Miller indices and its determination for Crystallographic planes and their direction, examples, Interplanar spacing in terms of miller indices.	03
Module 3	Determination of crystal structure using X-rays: Bragg's law of X-ray diffraction, Bragg's spectrometer, X-ray diffraction methods: - Laue, Powder, Rotating Crystal	03
Module 4	Interference: Temporal and spatial coherence, interference in parallel thin films, wedge shaped film, Michelson interferometer, antireflection coating	04
Module 5	Diffraction: Fresnel and Fraunhofer diffraction, Fraunhofer diffraction at single slit, double slits and circular aperture, diffraction grating	04
Module 6	Polarization: Polarization types, theory of production of Plane, circularly and elliptically polarized light, double refraction, uniaxial and biaxial crystals, Nicole prism, Dichroism, retardation plates: quarter wave and half wave, polarimeter	05

Module 7	Dielectric properties: Capacitance, Permittivity & dielectric constant; Polarizability-polar and nonpolar, dielectric susceptibility, Polarizations: - electronics, ionic, orientation interface, internal fields in solids, Dielectrics in alternating fields, ferroelectricity, piezoelectricity	05
Module 8	Magnetic properties: Basic concepts, classification of magnetic materials, Domain theory of Ferromagnetism, Hysteresis Curve, Magnetostriction, magnetic materials.	02

Reference Books

1. Modern Physics, 3rd edition, R Serway, C Moses and C Moyer, Thomson Learning inc,
2. Material Science and Engineering: An Introduction, 6th Edn., Callister W.C. Jr., John Wiley & Sons
3. Applied Physics I for Science and Engineering, Dattatray Wavhal, ISBN 978-93-5267-180-9, 2016
4. Applied Physics II for Science and Engineering, Dattatray Wavhal, ISBN 978-93-5268-289-8, 2017
5. A textbook of Engineering Physics, M N Avadhanulu and P. G. Kshirsagar

Program Name	Bachelor of Technology in Textiles		Semester	I	
Course Code	R5PH1011L				
Course Title	Physics I Laboratory				
Course Type	Basic Science Course				
Course Outcomes	<ol style="list-style-type: none"> 1. Draw and analyze unit cells, Miller planes and Miller directions. 2. Calculate radius of curvature of lens, wavelength and small thickness, velocity of sound waves using Interference. 3. Finding energy of spectral lines and grating element using diffraction phenomena. 4. Determine optical activity by polarimeter and verification of Malus Law 5. Study of magnetic properties using hysteresis/curie temperature/ susceptibility 				
Teaching Scheme			Examination Scheme		
L	T	P	ICSE%	ESE%	Credit
0	0	2	60	40	1

Course Contents (Any 10)

1. Crystal Structure (Unit Cells)
2. Crystal Structure (Miller planes)
3. Newton's Ring Experiment
4. Wedge shape Method
5. Michelson Interferometer
6. Ultrasonic Interferometer
7. Wavelength and energy measurement of spectral lines using spectrometer.
8. Laser diffraction method
9. Specific rotation of Cane sugar solution using polarimeter.
10. Polarization of light and verification of Malus law
11. Hysteresis of a ferromagnetic material
12. Curie temperature by two probe method
13. Susceptibility of solids by Gouy's method

Program Name	Bachelor of Technology in Textiles	Semester	I
Course Code	R5MA1001T		
Course Title	Mathematics I		
Course Type	Basic Science Course		
Course Outcomes	<ol style="list-style-type: none"> 1. Characterize a linear system in terms of number of solutions, whether it is consistent or not. 2. Compute eigen values and eigenvectors of a square Matrix and determine if it is diagonalizable 3. Calculate functional value of some point in a neighborhood using Taylor's series expansion and find the limit of a function at a point or at infinity using L'Hospital's rule. 4. Determine if an infinite series is convergent or not using suitable test. 5. Be familiar with the theorems of differentiability such as mean value theorem and interpret it geometrically. 6. Evaluate partial derivatives and implement/ apply it to find minima and maxima of a multivariate function. Also Find directional derivatives and gradient and illustrate geometric meaning with the help of sketches. 7. Apply definite integration to evaluate surface areas and volumes of revolution and evaluate improper integrals. 8. Evaluate multiple integrals for regions in a plane and find volume, area bounded by the curves, mass, center of gravity of solid geometric figures. 9. Estimate the solution of non-linear equations using numerical methods. 10. Apply different techniques like interpolation, numerical integration to solve different engineering problems. 		
Teaching Scheme		Examination Scheme	
L	T	P	Credit
2	1	0	3
TA%	MST%	ESE%	ESE (hr)
20	30	50	3

Course Contents

Modules	Description	Lectures
Module 1	Linear Algebra: Rank of a matrix, System of linear equations- check for consistency, Eigenvalues & eigenvectors of a matrix, Diagonalization, Cayley-Hamilton theorem, Minimal polynomial, Finding Inverse and Powers of a matrix.	08
Module 2	Differential Calculus: Mean value theorem, Rolle's theorem, Indeterminate form, L'Hospital's rule, Taylor's theorem and Truncation error, Partial Derivatives, Chain rule, Total Derivative, Differentiation of an implicit function, Directional Derivative, Gradient, maxima, minima and saddle points of a multivariable function, Lagrange's multipliers method, tangent plane and normal line, Convergence of sequence and series, Tests for convergence -ratio test, root test, p-series test,	09

	comparison test, alternating series test, absolute convergence test.	
Module 3	Integral Calculus: Evaluation of definite integration to find surface areas and volumes of revolution, Introduction to Improper Integrals and Gamma functions and its properties, Multiple integrals, change of order of integration in double integrals, Change of variables (Cartesian to polar), Triple integrals (Cartesian, cylindrical and spherical co-ordinates). Applications: areas and volumes, Center of mass and Gravity (constant and variable densities).	09
Module 4	Numerical methods: Numerical solutions of non-linear equations, Interpolation by Newton's and Lagrange polynomials, Integration by trapezoidal and Simpson's rule.	06

Reference Books

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & sons, 2006.
3. Ramana B. V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
4. Veerarajan T., Engineering Mathematics for first year, Tata McGraw Hill, New Delhi 2008.
5. N.P.Bali and Manish Goyal, A textbook of Engineering Mathematics, Laxmi Publications, Reprint 2008.
6. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.
7. M.K.Jain, S.R.K. Iyengar, R.K.Jain, Numerical methods for scientific and engineering computation, Fourth Edition.

Program Name	Bachelor of Technology in Textiles		Semester	I			
Course Code	R5ME1001T						
Course Title	Engineering Graphics						
Course Type	Engineering Science Course						
Course Outcomes	1. Represent projections of lines and solids. 2. Draw projections of solids cut by section planes. 3. Convert the pictorial view into orthographic projections. 4. Convert the orthographic projections into isometric view.						
Teaching Scheme			Examination Scheme				
L	T	P	TA%	MST%	ESE%	ESE (hr)	Credit
2	0	0	20	30	50	2	2

Course Contents

Description
<p>Introduction to Drawing & Geometrical Contraction Introduction: Introduction and importance of engineering drawing, Drawing Instruments and their use, Drawing layout, types of lines, lettering and Dimensioning Engineering Curves: Cycloid, Epicycloid, and Hypocycloid; Involutes.</p>
<p>Projection of Points and Lines Introduction: Method of projections, Orthographic projection, Reference planes, Quadrants, Reference line etc. Projection of Points. Projections of lines: Line inclined to both the reference planes (excluding the traces), True/Apparent lengths & inclinations.</p>
<p>Projection Solids, Sections of Solids Projections of Solids: Solids (Prism, Pyramid, Cylinder, Tetrahedron, Hexahedron and cone only with their axis inclined to HP or VP only (Excluding Spheres, Composite and Hollow solids) Use change of position or Auxiliary Plane method. Section of Solids: Section of Prism, Pyramid, Cylinder, Tetrahedron, Hexahedron & cone cut by plane. Use change of Position or Auxiliary plane method.</p>
<p>Orthographic Projections Multi View Orthographic projections of simple machine parts by first angle method, Sectional views of simple machine parts (full & Half Section only)</p>
<p>Isomeric Projection Isomeric scale, isometric view/Drawing of simple blocks with plain and cylindrical surfaces. (excluding spherical surface)</p>
<p>Note: Only FIRST ANGLE Method of projections must be used throughout the course.</p>

Text books

1. N. D. Bhatt, Engineering Drawing, Charotar publishing house, 53rd Edition, 2014
2. N. H. Dubey, Engineering Drawing Nandu Publishers & printers, 15th Edition, 2015

Program Name	Bachelor of Technology in Textiles		Semester	I	
Course Code	R5ME1001L				
Course Title	Engineering Graphics Laboratory				
Course Type	Engineering Science Course				
Course Outcomes	<ol style="list-style-type: none"> 1. Draft various Geometrical Elements used in Engineering Practice using CAD software. 2. Draft projections of various objects and their representation and dimensioning using CAD software. 3. Represent objects through isometric projections. Interpret drawings of engineering parts and objects. 4. Acquire drawing skills pertaining to various topics like projection of points, lines and solids. 				
Teaching Scheme			Examination Scheme		
L	T	P	ICSE%	ESE%	Credit
0	0	2	60	40	1

Course Contents

Description
Part-I
<p>Introduction to Computer Aided sketching Computer screen, layout of the software, standard tool bar/menus and description of most commonly used tools bars, navigational tools. Co-ordinate system and reference planes. Definitions of HP, VP. Creation of 2D/3D environment. Selection of drawing size and scale. Commands and creation of co-ordinate points, lines, axes, polylines, square, rectangle, polygons, splines, circles, ellipse, text, move, copy, offset, mirror, rotate, trim, extend, break, chamfer, fillet, curves, constraints viz. tangency, parallelism, inclination and perpendicularity. Dimensioning, line conventions material conventions and lettering</p> <p>Minimum 10 Exercises based on above mentioned topics with minimum two problems in each Exercise.</p>
Part-II Drawing Practice
<ol style="list-style-type: none"> 1. Minimum 8 drawing sheets of A-3 size should be drawn based on each chapter mentioned in the syllabus for engineering graphics course

Programme Name	Bachelor of Technology in Textiles	Semester	I				
Course Code	R5TT1021T						
Course Title	Evolution of Textile Engineering and Recent Developments						
Course Type	Engineering Science Course						
Course Objectives	To inculcate the knowledge of entire gamut of textile sector encompassing the apparel and other technical applications						
Course outcome	<ol style="list-style-type: none"> 1. Appreciate the scope of growth in Indian/Global textile sector 2. Understand the various manufacturing methods for Textile products. 3. Understand the correlation of traditional and current textile manufacturing techniques. 4. Summarize various steps for establishment and modernization of textile industry 5. Outline various initiatives and recent developments for the growth of textiles in India. 						
Prerequisite	Knowledge of basic science and basic English Language.						
Teaching Scheme		Examination Scheme					
L	T	P	TA%	MST%	ESE%	ESE (hr)	Credit
3	0	0	20	30	50	3	3

Course Content

Modules	Description
Module 1	Basic introduction to the Textiles Industry Overview and evolution of Textiles and Industry, antique textiles of Indian Textile industry, early history and global scenario, growth of Indian textile industry post- independence and global perspective. Nature of textile industry, Opportunities in textile industry, Govt. initiatives, policies of ministry of textiles and industry, current players, investments and opportunities.
Module 2	Evolution and changing scenario of Textiles products Apparel and non-apparel applications of textiles: Textile for defense application: High altitude clothing, Bullet proof jackets etc. Textile for Automotives: Car interiors, tiers, filters and airbags etc. Textiles for geotechnical applications: Materials for slope stabilization, textiles for road separation etc. Textile for hygiene and healthcare: Protective clothing, mask, wound dressings and sutures etc, Textile for aerospace engineering: Fiber reinforced composites for aircraft design, interior for aircrafts and role of textile into it.
Module 3	Developments and innovations in textile manufacturing. Evolution and growth in natural and man-made fibres, high performance fibres, spinning, weaving, processing, finishing, garment technology. Comparison of fibre to fashion manufactured contemporarily and current trends. Sustainable initiatives in textile sector.

Module 4	Prospects and growth scenario in Indian and global textile industry Growth potential of textile industry, exports scenario, Role of Foreign Collaborations in the Textile and Clothing Sector, Role of AI in textile scenario, Prospects of Retail sector in textile industry, Case Studies of Indian Textile Industries such as Arvind Ltd., Alok Industries, Raymond Ltd, etc. India's Trade Scenario in the world,
Module 5	Traditional manufacturing and Recent Developments: Hand spinning and hand weaving of textile materials, Mechanization of textile machinery for spinning and weaving processes. Concept of mechatronics in textile machines and its merits over the conventional machines, Digital and additive manufacturing concept in textiles. Role of AI and machine learning in textile industries and its outcomes.

Text Books:

1. Dr. B. J. Agarwal - Ancient Textiles: The Art of Production, Processing and Preservation - 2017, WPI, ISBN 9789385059032
2. Mausumi Kaur - The Indian Textile and Clothing Industry: An Economic Analysis (Springer)
3. R. Shishoo - The global textile and clothing industry: Technological advances and future challenges
4. S. Bhowmick, 1982, The Master Weavers – Festival of India in Britain, Royal College of Arts.
5. Gillow, J. & Barnard, N., 1991. Traditional Indian Textiles. Thames & Hudson, London
6. Sarees of India – Dr. N. N. Mahapatra, WPI
7. J. N. Vora - Evolution of Modern Textiles, Low price production
8. Parul Bhatnagar - Traditional Indian Costumes and Textiles – Abhishek Publications

Recommended Readings:

1. https://en.wikipedia.org/wiki/Textile_industry_in_India
2. www.iiad.edu.in/the-circle/history-of-the-indian-textile-industry
3. <http://www.textileasart.com/weaving.html>

Programme Name	Bachelor of Technology in Textiles	Semester	I				
Course Code	R5TT1022T						
Course Title	Electrical & Electronic devices for Textile Manufacturing						
Course Type	Engineering Science Course						
Course Objectives	To introduce the working principles of electrical Electronic devices						
Course outcome	<ol style="list-style-type: none"> 1. Describe the fundamentals of D C Machines 2. Describe the fundamentals of A C Machines. 3. Explain the functions of Semi- conductor based circuits. 4. Explain the functions of oscillators. 5. Describe the fundamentals of special semi-conductor devices. 						
Prerequisite	Knowledge of physics & mathematics						
Teaching Scheme			Examination Scheme				
L	T	P	TA%	MST%	ESE%	ESE (hr)	Credit
3	0	0	20	30	50	3	3

Course Content

Modules	Description
Module 1	D.C.Network & Machines : Star-delta transformation, series-parallel combination of network, Kirchoff's law, Loop and nodal analysis, Superposition Theorem, Thevenin's & Norton's theorem, Maximum power transfer theorem. D.C.Generators - classification - working characteristics and uses. D.C.motors - classification - working - characteristics and uses.
Module 2	A.C.Circuits & Machines : Sinusoidal voltage and current waveforms, RMS and average value, R-L,R-C, R-L-C series- parallel circuits, phasor diagram, power factor, series and parallel resonance. A.C.Generator (Alternator)- Production of single phase & 3 phase A.C voltage. Principle and working of 3 phase induction motor, single phase A.C. motors, fractional horse power motors and synchronous motors, SERVO Motors.
Module 3	Semi-conductors, Transistor - Brief description of semi-conductors. Half wave, Full wave rectifiers and bridge rectifiers. Zener diode as regulator. Brief Theory of transistors – input / output characteristics, biasing methods of transistors, transistors as amplifier, oscillator, and crystal-controlled oscillators.
Module 4	Non-sinusoidal oscillators: Multi-vibrators – Bistable, Mono-stable and Astable. Timer circuits (Delayed ON, Delayed OFF, ON-OFF timer etc.), Special semi-conductor devices: Varactor, multi-element semi-conductor device – UJT, FET & MOSFET. Study of Circuits using these components. Electronic multimeter. Use of multimeter for various measurements.

Module 5	Microprocessor and Microcontrollers: Study of Microprocessor Architecture(s) & Micro Controller(s). Micro-processor application in the textile machines such as Blow room, spinning machines, winding machines, fabric forming machines, processing and finishing machines.
Module 6	Introduction to Control Systems: Basic ideas of process control, different types of controls, Control loop and its components. Study of simple open loop and closed loop control systems. Servo Mechanism. Error detectors. Characteristics of ON-OFF- proportional-Integral and derivative control systems.
Module 7	Working principle and application of special digital devices: Solenoid valves, Load cell, Thermo couple, Pressure/ capacitive transducers, photo electric sensors, Strain gauge(s), linear variable differential transformers (LVDTs), Data Loggers, Moisture measuring devices.

Text Books :

1. B.L. Theraja, "Text Book of Electrical Technology", Published by S.Chand & Co Ltd, India, ISBN-13. 978-8121924405.
2. Mittle. V.N., Mittle Arvind, "Basic Electrical and Electronics Engineering", Tata McGraw Hill, ISBN-13. 978-0074516324.
3. Digital Principles and Applications by Leach -Malvino & Saha (Author), published by McGraw Hill Education, ISBN-13. 978-0070141704 ;

Programme Name	Bachelor of Technology in Textiles	Semester	I		
Course Code	R5TT1023L				
Course Title	Electrical & Electronic devices for Textile Machines Lab				
Course Type	Engineering Science Course				
Course Objectives	To introduce the working principles of electrical Electronic devices				
Course outcome	<ol style="list-style-type: none"> 1. To understand fundamentals of DC circuits and apply knowledge for analyzing network theorems in DC circuits. 2. To learn the fundamentals and analyse single phase AC circuits. 3. To learn the Characteristics of semiconductor devices 4. To analyse the architecture of Microprocessor 5. To Describe the construction, operation, and characteristics of transducer 				
Prerequisite	Knowledge of physics & mathematics				
Teaching Scheme		Examination Scheme			
L	T	P	ICSE%	ESE%	Credit
0	0	2	60	40	1

Course Content

Modules	Description
Module 1	To find the value of resistors, inductors and capacitors using various methods
Module 2	To verify the Nodal and Mesh analysis techniques
Module 3	To verify the Superposition theorem.
Module 4	To verify Thevenin's & Norton's theorem
Module 5	To study the RL, RC and RLC series circuit
Module 6	To study the RL, RC and RLC parallel circuit
Module 7	To verify Forward and reverse characteristics of PN junction diode.
Module 8	To verify Forward and reverse characteristics of Zener diode.
Module 9	To verify Zener diode as voltage regulator.
Module 10	To verify I/p and o/p characteristics of BJT
Module 11	To verify Half wave and Full wave rectifier

Module 12	To verify Bridge rectifier
Module 13	To study the Architecture of Microprocessor
Module 14	To verify the characteristics of LVDT

Text Books :

1. B.L.Theraja, "Text Book of Electrical Technology", Published by S.Chand & Co Ltd, India, ISBN-13. 978-8121924405.
2. Mittle. V.N., Mittle Arvind, "Basic Electrical and Electronics Engineering", Tata McGraw Hill, ISBN-13. 978-0074516324.
3. V.K.Mehta , "Principles of Electrical Engineering", by S.Chand& Co. Ltd, India.

Programme Name	Bachelor of Technology in Textiles	Semester	I
Course Code	R5TT1024L		
Course Title	Design Thinking & Idea Lab		
Course Type	Vocational and Skill Enhancement Course		
Course Objectives	To introduce the working principles of electrical Electronic devices		
Course outcome	<ol style="list-style-type: none"> 1. Identify an opportunity from a problem. 2. Frame an idea for a product or service idea. 3. Design and develop a prototype solution for the problem. 4. Present and pitch solution to the problem. 		
Teaching Scheme		Examination Scheme	
L	T	P	ICSE%
0	0	3	60
			ESE%
			40
			Credit
			1.5

Course Content

Module	Description
Module 1	Introduction to design thinking -Understanding of mindsets: Empathy, Optimism, Embrace ambiguity, Learn from failures
Module 2	Use of design thinking tool – Convergent and divergent thinking and iterations in design
Module 3	Use of design thinking – Analyzing the design of a product or service as a system
Module 4	Ideation tools – story telling and design representation
Module 5	The design challenge from customer perspective -use of brainstorming and bodystorming for prototyping
Module 6	The design challenge final prototype making and pitching the idea with presentation and documentation.

Programme Name	Bachelor of Technology in Textiles	Semester	I
Course Code	R5HS1001L		
Course Title	Business & Technical Communication		
Course Type	Ability Enhancement Course		
Course outcome	1. Apply the principles and practices of business communication for communicating in a professional environment. 2. Design a technical document with correctness of language, appropriate vocabulary and style. 3. Display competence in oral and visual communication. 4. Demonstrate capabilities for self -assessment and development.		
Teaching Scheme		Examination Scheme	
L	T	P	ICSE%
1	0	2	60
			ESE%
			40
			Credit
			2

Course Content

Module	Description
Module 1	Foundations of Business English <ul style="list-style-type: none"> ● Introduction to Business English and its importance in the professional world. ● Business Vocabulary and commonly used expressions. ● Business Idioms at the workplace.
Module 2	Business and Technical Writing <ul style="list-style-type: none"> ● Understanding Business writing language, style and tone. ● Crafting clear and concise business documents: Instruction Manuals/Brochures. ● Developing Email Etiquette.
Module 3	Business Grammar and Language Usage <ul style="list-style-type: none"> ● Review of essential English grammar rules. ● Identifying commonly made errors in Indian English.
Module 4	Group Discussion <ul style="list-style-type: none"> ● Basics of a Group Discussion. ● Understanding the different types of Group Discussions. ● Practical tips and suggestions for a GD.
Module 5	Presentation Skills <ul style="list-style-type: none"> ● Structuring a compelling business presentation. ● Engaging an audience and using visual aids effectively.

Module 6	Introduction to Public Speaking for Engineers <ul style="list-style-type: none"> ● Techniques to manage and reduce public speaking anxiety. ● Crafting a clear and concise speech outline. ● Tailoring the message for different audiences.
Module 7	Critical Thinking Skills <ul style="list-style-type: none"> ● Introduction to the processes of logical reasoning to interpret arguments ● Evaluating information from a lens of fact checking, evidentiary support, confirmation bias and language analysis.

Text Books

1. H. S. Mukherjee, Business Communication: Connecting at Work, Oxford University Press; Pap/Cdr edition (26 November 2012), (ISBN: 9780198073475)
2. A. Rizvi, Effective Technical Communication, McGraw Hill Education; 1 edition (27 June 2005), (ISBN: 0070599521)
3. M. Raman, P. Singh, Business Communication, Oxford; Second edition (6 August 2012), (ISBN: 9780198077053)

Recommended Reading:

1. E. H. Mcgrath, Basic Managerial Skills for All, Prentice Hall India Learning Private Limited; 9 edition (2011), (ISBN: 9788120343146)
2. R. Subramanian, Professional Ethics, Oxford University Press; Second edition (17 April 2017), (ISBN: 0199475075)

SEM II

Program Name	Bachelor of Technology in Textiles	Semester	II				
Course Code	R5PH1011T						
Course Title	Chemistry						
Course Type	Basic Science Course						
Course Outcomes	<ol style="list-style-type: none"> 1. Correlate the different chemical reaction mechanisms with rate of reaction that are used in the industrial synthesis of organic molecules and drugs. 2. Rating the chemical fuels based on their chemical composition, and properties. Choosing the alternate energy sources. 3. Analyze the basic cause of corrosion, its reactions & corrective preventive measure to reduce the rate and adopt suitable method of treatment suitable for various industrial applications. 4. Analyse functional material based on their structure, and performance. Rationalize the concept Sustainability and adopt green chemistry approach 5. Select appropriate separation methods required in manufacturing industries by understanding the basic concept of chromatographic techniques. Choose the spectroscopic techniques for characterization of materials. 						
Teaching Scheme			Examination Scheme				
L	T	P	TA%	MST%	ESE%	ESE (hr)	Credit
2	1	0	20	30	50	3	3

Course Contents

Modules	Description	Lectures
Module 1	Reactions, Mechanisms & Kinetics: Introduction to Chemical reactions, Material balance for organic reactions, Mass balance and stoichiometry, SN1, SN2 Reactions, Chemical Kinetics, Energy profile diagram, Synthesis of drug molecule.	05
Module 2	Energy Sources: Types of Chemical fuels , Calorific value, Determination of calorific value, combustion calculations, Analysis of coal, proximate and ultimate analysis, Fuels for IC engines, Effect of Chemical composition of fuel on knocking, anti knocking agents. Limitations of fossil fuels, Alternative fuels: Power alcohol, biomass, biogas, biodiesel, Green hydrogen.	05
Module 3	Science of Corrosion: Direct chemical corrosion, Electrochemical corrosion and its reaction mechanisms, Types of electrochemical corrosion, (differential aeration, galvanic, concentration cell), Electrochemical corrosion like Pitting, Intergranular, Soil, Waterline. Factors affecting corrosion, Protection of corrosion,	05

	Applications with few practical problems of corrosion.	
Module 4	Functional Materials For Engineers: Plastic, Elastomeric, & Fiber forming polymers, structural requirement, molecular weight determination, effect of structure, bonding, molecular weight, degree of polymerization on the performance of the polymers. Glass transition temperature, Structure property relationship. Lubricants: Types of lubricants, Mechanism of lubrication, Physical and Chemical properties of lubricants, selection of lubricants. Cementations Materials: Chemical composition of cement, Admixtures used in concrete, Chemical reactions involved, bitumen emulsions.	06
Module 5	Identification, Separation & Purification: Types of Separation techniques: Column Chromatography, Thin layer chromatography, Paper chromatography. Spectroscopic principles and its applications, U.V. Spectroscopy, Fourier Transform Infra-Red Spectroscopy, Flame photometry. Determination of hardness of water by EDTA method and removal of hardness by ion exchange and zeolite method.	05
Module 6	Sustainable Engineering Chemistry: Concept of sustainability and its significance, Waste minimization, Atom Economy, Reduction of Materials and Energy requirement, Green Chemistry approach, Industrial applications of green chemistry.	04

Textbooks

1. Engineering Chemistry by Jain and Jain, Danpatrai publications; 16th edn. (2013)
2. Engineering Chemistry by Dr. S.S. Dara, Dr. S.S. Umare, S. Chand & Company Ltd, 12th ed.
3. A Text Book of Engineering Chemistry by Shashi Chawla, Danpatrai publications; 4th edn; (2010)

Reference Books:-

1. Polymer Science - Billmeyer, F. John Wiley & Sons, N.Y.; 3rd edn (1984)
2. Introduction to Material Science William Callister, John Wiley & Sons, N.Y.; 9th edn; (2013)
3. Engineering Chemistry - NPTEL web-book, by T.L. Tembe, Kamaluddin and M.S. Krishnan
4. Fundamentals of Molecular Spectroscopy: Colin N. Banwell & Elaine M. McCash, Tata McGraw-Hill 4th edn.
5. Fundamentals of Electrochemistry, Second Edition, V. S. Bagotsky, Wiley Interscience (2006).

Program Name	Bachelor of Technology in Textiles		Semester	II	
Course Code	R5CH1021P				
Course Title	Chemistry Laboratory				
Course Type	Basic Science Course				
Course Outcomes	1. Determine the quality of water suitable for different sectors. 2. Determine physical and chemical characteristics of lubricating oils. 3. Synthesis of Biodiesel, Chalcones and calculating atom economy. 4. Analysis of coal by proximate method. 5. Separate and analyze by Chromatographic techniques				
Teaching Scheme			Examination Scheme		
L	T	P	ICSE%	ESE%	Credit
0	0	2	60	40	1

Course Contents (Any 10)

1. Saponification value of oils
2. Acidvalue of an Oil
3. Viscosity&Viscosity Index by Redwood Viscometer
4. Flash Point by Abel's & Pensky-Marten's Apparatus
5. Conductometric titrations
6. Analysis Of fuel: Proximate analysis of coal sample
7. Determinationof adulteration in transport fuels
8. Separation by TLC & Paper chromatography
9. Determination of alkali metals by Flame photometry
10. Synthesis of Biodiesel to find out Atom Economy.
11. Synthesis of drug molecule
12. Determination of hardness of water by EDTA method.

Reference :

1. Lab. Manual for Engineering Chemistry - Dr.S.K.Basin& Dr. S.K. Rani, Dhanapat Rai Publishing Company; (2009)
2. Practical Manual for Chemistry of Engineering Materials - D.D. Shah, Nandu Publication, Mumbai
3. Post Graduate Practical Chemistry - H.N. Patel, S.P. Turakhia, S.S. Kelkar, S.R. Puniyani, Himalaya Publishing House, 5thedn; (2008)
4. A Manual of Practical Engineering chemistry Sudha Jain & Shradha Sinha ,S.Chand Company Ltd 1st edn(2002)

Program Name	Bachelor of Technology in Textiles		Semester	II			
Course Code	R5MA1015T						
Course Title	Mathematics – II (<i>Textile Technology</i>)						
Course Type	Basic Science Course						
Course Outcomes	<ol style="list-style-type: none"> 1. Examine the different types of data and its interpretation using statistics. 2. Apply the discrete and continuous probability distributions to find probabilities of various events and the expected value of a random variable. 3. Find the relation between two or more phenomena with the help of curve fitting and correlation regression analysis. 4. Determine the effect of various parameters using ANOVA. 5. Demonstrate the ability of statistical quality control with suitable case studies. 6. Estimate population parameters using sampling and Perform hypothesis testing on population means, variances and proportions. 						
Teaching Scheme			Examination Scheme				
L	T	P	TA%	MST%	ESE%	ESE (hr)	Credit
2	1	0	20	30	50	3	3

Course Contents

Modules	Description	Lectures
Module 1	<p>Introduction and need for statistics in Textiles:</p> <p>Introduction to statistics, Methods of data collection, need for SQC techniques, Classification and graphical representation of data</p> <p>Frequency distribution, Measures of central tendency -concepts of Mean, Median & Mode, Partition values- concept of quartiles, percentile; Measures of dispersion quartile deviation, Standard Deviation, Coefficient of variation.</p>	06
Module 2	<p>Correlation & Regression Analysis:</p> <p>Introduction to bi-variate data, Correlation analysis, Coefficient of correlation and Rank correlation, Regression analysis, curve fitting, method of least squares, Multivariate data analysis.</p>	08
Module 3	<p>Probability Distributions:</p> <p>Review of Probability, Conditional probability, Bayes' theorem. Discrete and continuous random variables, Probability density function, Expectation, Variance, Moments, Binomial distribution, Poisson distribution, Normal distribution.</p>	08
Module 4	<p>Estimation and Testing of Hypothesis:</p> <p>Concepts of Statistical hypothesis, Null and Alternate hypothesis, Critical region, Two types of errors, Level of significance, Tests of</p>	12

	significance based on Large sample theory, Student's t test, F test and Chi-square test; Sampling distribution of sample mean and sample proportion, standard error of estimator, Estimation of parameters- point estimation & interval estimation(confidence intervals), Central Limit Theorem.	
Module 5	Analysis of Variance: Introduction, one way analysis and two way analysis.	03
Module 6	Statistical Quality Control: Introduction to Statistical quality control techniques and control charts- Mean chart, R chart, np chart, p chart, C chart.	03

Reference Books:-

1. Statistics for Textile Engineers, Edited by J. R. Nagla, Woodhead Publishing India Pvt. Ltd, 2014, ISBN978-93-80308-37-1
2. Principles of Textile testing, J.E.Booth, Heywood books, London, 1961.
3. Fundamentals of Mathematical Statistics by V. K. Kapoor and S. C. Gupta, Sultan Chand and Sons, 2020.
4. Probability, Statistics and Random Processes by T. Veerarajan, Tata McGraw - Hill Education, Second edition 2002.

Programme Name	Bachelor of Technology in Textiles	Semester	II				
Course Code	R5TT1026T						
Course Title	Raw materials for Textiles						
Course Type	Engineering Science Course						
Course objective	To apprise students about the raw materials for Textiles						
Course Outcomes	<ol style="list-style-type: none"> 1. Identify and Classify the various raw materials. 2. Discuss the structure and properties of various raw materials. 3. Relate the properties of raw materials. to the applications. 4. Relate the structure of polymers on its properties and process. 5. Understand properties and applications of hi- tech fibres in textiles. 						
Prerequisite	Fibre Physics, Chemistry						
Teaching Scheme			Examination Scheme				
L	T	P	TA%	MST%	ESE%	ESE (hr)	Credit
2	0	0	20	30	50	2	2

Course Content

Module	Description
Module 1	Over view of Raw materials for Textiles: Polymers-Fibres,- yarns & Fabrics, Polymers as fibres- plastics and rubbers. Properties and Structure of fibres- plastics and rubbers, Importance of raw materials in the field of Medical, Military, Infrastructure, Composites, etc.
Module 2	Definition of terms – Fibre, fibre morphology- influence of chain folding, fibrillar structure etc, Textile fibre, Classification of textile fibre according to their origin
Module 3	Fibre properties and applications: Natural fibres like Cotton,Wool, Silk, Jute, Ramie, Flax, Banana, coir etc. Regenerated fibres like Viscose-Casein etc.. Man-made fibres like PET, PP, PA, PAN, Glass, Carbon, etc.
Module 4	Polymers properties and applications: Polyethylene, LDPE, HDPE, LLDPE, UHMWPE, Poly(Vinyl Chloride), Poly(Vinylidene Chloride), Polytetrafluoroethylene, Polyisobutylene, Polystyrene, Acrylonitrile, butadiene styrene, etc.
Module 5	Properties of high - tech fibres and applications:- Aromatic polyamides, Super absorbent fibres, High density polyolefin, Polyvinyl fibres, Carbon fibre, PPS fibre, PBO fibre, Glass fibre and their applications.
Module 6	Over view of Manufacturing techniques: Spinning of Manmade fibres via melt spinning and solution spinning. Manufacturing of bicomponent, hollow fibres and microdenier fibres.

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. Manufactured Fibre Technology, V.B. Gupta and V.K. Kothari, Springer Science + Business Media, 2003, ISBN 978-94-010-6473-6

Recommended reading:

1. Tatsuya Hongu, Glyn O. Phillips, Machiko Takigam, New Millennium Fibers, Woodhead Publishing Ltd., CRC Press LLC, 2005, ISBN 0-8493-2598-6.
2. H.V.S. Murthy, Introduction to Textile Fibres (Revised edition-2015), Wood Head Publication, ISBN 9789385059094 .

Program Name		Bachelor of Technology in Textiles		Semester	II		
Course Code		RSSE1001T					
Course Title		Engineering Mechanics					
Course Type		Engineering Science Course					
Course Outcomes		1. Analyse the force system and relate it to the Engineering Applications. 2. Calculate centroids and centre of gravity of plane areas and volumes. 3. Analyse the different motions of a particle and apply principles of work, energy, impulse & momentum.					
Teaching Scheme		Examination Scheme					
L	T	P	TA%	MST%	ESE%	ESE (hr)	Credit
2	0	0	20	30	50	2	2

Course Contents

Modules	Description
Module 1	Fundamental of Mechanics: Review of basic concepts – mass, space, time and force: Particles and rigid bodies: Scalars and vectors: Free, sliding, fixed and unit vectors: Addition, subtraction and multiplication of two vectors. Definition of a force: Classification of forces: Principles of transmissibility, etc
Module 2	Force Systems: Introduction to different force systems, Composition of forces, triangle, parallelogram and polygon law of forces, addition of two parallel forces, Resolution of forces, moment of a force, Varignon's Theorem, Couple of forces, force – couple systems, Resultant of a force system, Equilibrium conditions for a force system, Free body diagram, Different types of supports, etc.
Module 3	Distributed Forces. Line, area and volume distributions of forces, Centre of gravity, Centre of mass, Centroid of plane figures, Centroid of composite figures, Moment of Inertia, Area and mass moments of inertia, Perpendicular and parallel axes theorems of moment of inertia, Radius of gyration, etc. distribution, Poisson distribution, Normal distribution.
Module 4	Dry Friction Laws of dry friction, Co-efficient of friction, Angle and cone of friction, Angle of repose, Applications of friction to wedges and screw jacks, etc.
Module 5	Virtual Work Work done by forces and couples, Virtual displacement and virtual work, Principle of virtual work for equilibrium bodies in equilibrium, Active force diagram, Degree of freedom, etc.

Module 6	Kinematics of Particles: Differential equations of kinematics, plane, rectilinear and curvilinear motions, Cartesian co- ordinate system, Normal and tangent co-ordinate system, projectile motion, etc.
Module 7	Kinetics of Particles: Newton's second law of motion, Work and energy principle, Gravitational-potential energy, elastic-potential energy, kinetic energy, power, efficiency, Principle of impulse and momentum, Impact motion, Direct central impact, etc.

Recommended books

1. A textbook of Engineering Mechanics, Dr. Sadhu Singh (S. Chand publishing)
Tayal A.K., Mechanics for Engineering, Statics and Dynamics, Umesh Publication, N. Delhi, 2008.
3. Engineering Mechanics, K. L. Kumar, Veenu Kumar, McGraw Higher Education.

Additional Reading

1. Shames I.H, Engineering Mechanics, P.H.I. India 1980.
2. Kumar K. L., Engineering Mechanics, McGraw Hill publishing company New Delhi 2008.
3. Beer and Johnston, Mechanics for Engineers, McGraw Hill, 2009.
4. Timoshenko and Young, Mechanics for Engineers, McGraw Hill, 2010.
5. Mclean and Nelson, Mechanics for Engineers, Schaum Outline Series 2010.
6. Hibbeler R.C., Mechanics for Engineers, Pearson Education, 2012.

Program Name			Bachelor of Technology in Textiles	Semester	II
Course Code			R5SE1001L		
Course Title			Engineering Mechanics Laboratory		
Course Type			Engineering Science Course		
Course Outcomes			1. Experimentally verify the Laws of static equilibrium including friction. 2. Analyse the experimental errors and comment on possible reasons for the errors.		
Teaching Scheme			Examination Scheme		
L	T	P	ICSE%	ESE	Credit
0	0	2	60	40	1

Course Contents (Any 10)

1. **Bell Crank Lever:**
 - Study the equilibrium conditions of a bell crank lever under different loads and angles.
 - Calculate the mechanical advantage and efficiency of the bell crank lever.
2. **Simple Beam:**
 - Determine the reactions at the supports of a simple beam loaded with various point loads and distributed loads.
 - Verify the principles of equilibrium and deflection calculations for the beam.
3. **Simple Jib Crane:**
 - Analyze the forces acting on a simple jib crane and calculate the reactions at its base.
4. **Link Chain:**
 - Study the forces acting on a link chain when subjected to a load.
 - Determine the tension in different segments of the chain and its equilibrium conditions.
5. **Screw Jack (Friction):**
 - Investigate the working of a screw jack, considering frictional forces.
 - Calculate the input force required to lift a given load using the screw jack.
6. **Shear Leg Apparatus:**
 - Set up and analyze a shear leg apparatus to lift a load using multiple ropes and pulleys.
 - Calculate the forces in the ropes and verify equilibrium conditions.
7. **'g' by Falling Weight Method:**
 - Measure the acceleration due to gravity using the falling weight method.
 - Analyze the motion of a freely falling weight and calculate 'g' from the recorded data.
8. **Plane Motion of Bodies:**
 - Investigate the motion of bodies on inclined planes under the influence of gravity.
 - Determine the acceleration, time of motion, and distance covered on the inclined plane.
9. **Moment of Inertia (M.I.) of Flywheel:**
 - Determine the moment of inertia of a flywheel experimentally using rotational dynamics
 - Compare experimental results with theoretical calculations.

10. Compound Pendulum:

- Study the behaviour of a compound pendulum and analyze its oscillations.
- Calculate the period of oscillation and verify the principles of simple harmonic motion.

11. Torsional Pendulum:

- Set up a torsional pendulum and measure the torsional constant of the material.
- Calculate the moment of inertia of the pendulum and analyze its oscillations.

12. Principle of Conservation of Energy (Connected Bodies with Flywheel):

- Study the energy transfer and conservation principles in a system of connected bodies with a flywheel.
- Analyze the changes in potential and kinetic energy and validate the principle of conservation of energy.

13. Stiffness of Spring:

- Determine the stiffness (spring constant) of a spring experimentally.
- Analyze the relationship between force and displacement for the spring.

Program Name	Bachelor of Technology in Textiles		Semester	II			
Course Code	R5CO1001T						
Course Title	Programming for Problem Solving						
Course Type	Engineering Science Course						
Course Outcomes	1. Interpret the concepts of the C++ programming language. 2. Use control structures such as loops and conditional statements to control the flow of programs. 3. Develop simple C++ programs to solve computational problems using fundamental programming constructs. 4. Use file handling to store and retrieve data efficiently from files. 5. Develop problem-solving skills by applying C++ programming techniques to real-world scenarios and challenges.						
Teaching Scheme			Examination Scheme				
L	T	P	TA%	MST%	ESE%	ESE (hr)	Credit
2	0	0	20	30	50	2	2

Course Contents

Modules	Description
Module 1	Introduction to Programming and C++: Elements of a computer systems, DOS Commands & Linux environment, Overview of programming languages, Introduction to C++ and its features, Setting up a C++ development environment, Language Processors, Object Oriented Programming Paradigm and benefits, Applications of Object Oriented programming.
Module 2	Beginning with C++: Tokens, Expressions, Control Structures, Array, Functions, Structures, Unions and pointers, String Manipulation.
Module 3	C++ Programming Features: Classes, Objects, Constructors, Destructors, Inheritance and Polymorphism, Virtual Base Classes, Abstract Classes.
Module 4	Working with Files: Classes for File Stream Operations and I/O stream operation, Opening and Closing a File, Detecting end-of-file, more about Open(): File Modes, Sequential Input and Output operations.
Module 5	Case Studies of C++ Programming: Number Conversions, Telecom Billing System, Logistic management of solid waste, Design of a scientific calculator, Library Management System, Rock Paper Scissor Game, Tariff Calculation, Electronic circuit analyzer etc.

Recommended books

1. The C++ Programming Language, Fourth Edition by Bjarne Stroustrup, Addison-Wesley Educational Publishers Inc
2. Object-Oriented Programming with C++, 8th edition, by E Balagurusamy, Publisher

McGraw Hill.

3. How to Solve It: A New Aspect of Mathematical Method, by G. Polya, Princeton University Press, 2015

Additional Reading

1. Effective C++, 3rd edition, by Scott Meyers, Addison-Wesley Educational Publishers Inc.
2. Solving Mathematical Problems: A Personal Perspective, Illustrated Edition, by Terence Tao, Oxford University Press, 2006.

Program Name	Bachelor of Technology in Textiles	Semester	II		
Course Code	R5CO1001L				
Course Title	Programming for Problem Solving Laboratory				
Course Type	Engineering Science Course				
Course Outcomes	1. Understand Linux Environment, basic Linux commands and computer elements. 2. Demonstrate proficiency in writing basic C++ programs, including understanding data types, variables, control structures, and functions. 3. Implement classes and objects, understand inheritance and polymorphism, and apply OOP principles in their code. 4. Apply C++ knowledge to design and implement complete software solutions for specific problem domains. 5. Develop their ability to manipulate strings, including concatenation, substring extraction, and other string operations. 6. Read from and write to files in C++, enabling them to process data from external sources				
Teaching Scheme			Examination Scheme		
L	T	P	ICSE%	ESE%	Credit
0	0	2	60	40	1

Course Contents

- Study of Linux Commands, language processor and Computer Elements.
- Study of Input and Output operations in C++ - Write a program in C++ for entering the detailed information of student and print all details of student.
- Study of for loop in C++ - Write a program in C and C++ to print Fibonacci series of any number inputted by person.
- Additional Program for practice - Write a program in C++ to find binary values of integer using for loop.
- Study of if-else loop in C++ - Write a program in C++ to check whether entered character is a vowel or not using if-else statement.
Study of if - else if - else loop in C++ - Write a C++ program to accept marks of 5 subjects for a student. Calculate the total and percentage of marks, also decide grade of student depending on the percentage using if-else-if-else statements.
Study of while loop and do-while in C++ - Write a C++ program to display numbers from 1 to 10 with the help of a while loop and do-while loop.
- Study of switch case in C++ - Write a program in C++ to make a menu driven calculator.
Additional Program for practice: Write a menu driven program in C++ to find sum of positive numbers, sum of negative numbers & avg of all numbers in an array.
- Study of arrays and structures in C++
 - Write a program in C++ to display the information of 10 employees using array of structure variable.
 - Write a program in C++ to illustrate use of array within structure.
 - Write a program in C++ to illustrate use of nested structure.
- Study of Classes and Objects in C++ - Write a program in C++ to add two integers using classes.
Additional Program for practice: Read and Print Student Information using class Student.

9. (a) Study of Function Overloading in C++.
(b) Study of Operator Overloading in C++ (Overloading unary and binary operators).
10. Study of Constructors and Destructors in C++ -
11. Write a program in C++ with class Rectangle with the data fields width, length, area and colour. The length, width and area are of double type and colour is of string type. The methods are get_length(), get_width(), get_colour() and find_area(). Create two objects of Rectangle and compare their area and colour. If the area and colour both are the same for the objects then display "Matching Rectangles", otherwise display "Non-matching Rectangle". Use Constructors.
Additional Program for Practice - Write a program in C++ to implement Stack. Design the class for stack and the operations to be performed on stack. Use Constructors and destructors.
Study of Inheritance, virtual class and virtual function in C++ - Create a base class called shape. Use this class to store two double type values that could be used to compute the area of figures. Derive two specific classes called triangle and rectangle from the base shape. Add to the base class, a member function get_data to initialize base class data members and another member function display_area() to compute and display the area of figures. Make display_area as a virtual function and redefine this function in the derived classes to suit their requirements.
12. Study of friend class and friend function in C++.
13. Study of String Manipulation in C++ - Write a program in C++ to perform string operations by using predefined string functions.
14. Study of File Handling in C++ -Write a program in C++ to open, read and close a file using file stream operations.

Recommended books

1. The C++ Programming Language, Fourth Edition by Bjarne Stroustrup, Addison-Wesley Educational Publishers Inc
2. Object-Oriented Programming with C++, 8th edition, by E Balagurusamy, Publisher McGraw Hill.
3. How to Solve It: A New Aspect of Mathematical Method, by G. Polya, Princeton University Press, 2015

Additional Reading

1. Effective C++, 3rd edition, by Scott Meyers, Addison-Wesley Educational Publishers Inc.
2. Solving Mathematical Problems: A Personal Perspective, Illustrated Edition, by Terence Tao, Oxford University Press, 2006.

Programme Name	Bachelor of Technology in Textiles	Semester	II				
Course Code	R5TT1027T						
Course objective	To introduce the manufacturing process for textile substrate development.						
Course Title	Technology of Textile Manufacturing						
Course Type	Program Core Course						
Course Outcomes	<ol style="list-style-type: none"> 1. Outline the different steps involved in conventional staple fibre spinning 2. Explain the functions of various spinning preparatory processes 3. Describe the various machinery used for spinning preparatory 4. Comprehend the role of various weaving preparatory processes 5. Describe the various loom mechanisms and their importance to fabric formation 						
Prerequisite	Fundamentals of basic raw materials in textiles.						
Teaching Scheme			Examination Scheme				
L	T	P	TA%	MST%	ESE%	ESE (hr)	Credit
2	0	0	20	30	50	2	2

Course content

Modules	Description
Section I	
Module 1	Introduction to the process of conventional staple yarn spinning: Elements of Fibre preparation, Elements of grading of fibres and it's importance on spinning, fundamental concepts behind opening, cleaning and attenuation of staple fibres
Module 2	Opening & Cleaning: Detailed study of opening and cleaning machines, dimensions, driving arrangement, speed calculations, opening intensity and cleaning efficiency etc. modern developments in opening and cleaning machines and comparison of their features over the conventional ones.
Module 3	Study of card feeding system: dimensions, driving arrangement, speed calculations. Detailed study of different zones of carding machine. Card clothing design and importance. Forces acting at various stages of carding. Modern carding machines and features.
Module 4	Study of constructional details, driving arrangement and calculation of draw frame. Driving arrangement and building of package, material flow through various segments, flow charts of different types of yarns and its manufacturing techniques.
Module 5	Roller weighing systems in drafting on drawframe, concept of drafting and doubling. Introduction to law of addition of irregularity. Causes and control of irregularity in drafted materials. Introduction to autolevellers, types and importance in drawframe
Section II	

Module 6	Introduction to the methods of manufacturing various fabric types. Outline of weaving and preparatory processes and Textile Industry.
Module 7	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. Pirn winding: Objectives, systems of weft preparation, and different types of pirn winding machines
Module 8	Warping: Objects, classification, Beam warping, Sectional warping, creels, headstock, stop motions, modern developments, and comparison of various types of warping machines.
Module 9	Plain Looms: Classification of weaving machines; Primary, Secondary and Auxiliary motions of loom. Shedding: Objectives and Introduction to different Shedding Devices, Tappet shedding mechanism, negative and positive shedding tappets, Heald reversing motions. Picking & checking mechanisms. Over-pick & Under-pick mechanisms, Picking Cams. 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.

Text Books :

1. Introduction to Textile Fibres By H. V. Sreenivasa Murthy.
2. Technology of short staple spinning by w. Klein.
3. Talukdar M.K. & Ajgaonkar D.B and Wadekar, Sizing- Materials , Methods and Machines , Textile Trade Press ,Bombay,1982.
4. P.K. Banerjee ,Weaving Mechanism, Woodhead Publications, 2014.
5. Winding, Warping & Sizing – BTRA Silver Jubilee monograph series.
6. 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.

Programme Name	Bachelor of Technology in Textiles	Semester	II		
Course Code	R5TT1028L				
Course objective	To introduce the practical aspects of manufacturing process for textile substrate development.				
Course Title	Technology of Textile Manufacturing Lab				
Course Type	Vocational and Skill Enhancement Course				
Course Outcomes	<ol style="list-style-type: none"> 1. Outline the passage of material on various spinning and weaving machines. 2. Learn the mechanisms of different types of yarn and fabric forming machines. 3. Estimate the parameters for processing of materials on various textile machines. 4. Calculate the production of various spinning and weaving machines. 				
Prerequisite	Fundamentals of basic raw materials in textiles, Basic mathematics, Mechanics of textile machines.				
Teaching Scheme			Examination Scheme		
L	T	P	ICSE%	ESE	Credit
0	0	4	60	40	2

Course content

Modules	Description
Module 1	General Introduction to tools, drives and gauges and the passage flowchart of yarn manufacturing
Module 2	Study of ginning machines: Classification, passage of material and calculation etc.
Module 3	Study of opening and cleaning machines, dimensions, driving arrangement, speed calculations,
Module 4	Study of carding machine: Passage of material and calculations etc.
Module 5	Study of draw frame machine: Passage of material and calculations etc.
Module 6	Study of cheese and cone winding machines. Passage of yarn. Calculations of winding machines. Productions of machines. Study of pirn winding machines
Module 7	Study of sectional warping machines and related calculations
Module 8	Study of passage of warp yarn through a plain power loom and introduction to primary and secondary motions of loom.
Module 9	Study of tappet shedding motion and related settings.
Module 10	Study and setting of beating motion and shuttle box
Module 11	Study of secondary loom motions -- let off and take up mechanisms
Module 12	Study of auxiliary loom mechanisms – warp protector, weft proctor and warp stop motion

Recommended Readings:

1. Carl A. Lawrence, Fundamentals of Spun Yarn Technology, CRC Press, 2003.
2. 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
5. Talukdar M.K. & Ajgaonkar D.B and Wadekar, Sizing- Materials, Methods and Machines Textile Trade Press ,Bombay,1982.
6. Winding, Warping & Sizing – BTRA Silver Jubilee monograph series.
7. Gokarneshan N., Practical Guide to Fabric Manufacture & Cloth Analysis Laboratory, Mahajan Pulishers Pvt. Ltd., Ahmadabad, 2005, ISBN 81-85401-26-8.
8. Workshop manuals for spinning and weaving machines etc.

Programme Name	Bachelor of Technology in Textiles	Semester	II				
Course Code	R5TT1029T						
Course objective	To introduce various cultural and regional diversity of traditional Indian textiles and their adaptation by contemporary Brands/ Designers/ Industry						
Course Title	Traditional Textiles of India						
Course Type	Indian Knowledge System						
Course Outcomes	1. Familiarize with the origin, motifs, colors, equipment and technology used for natural dyes/painted/printed/woven textiles of India 2. Sensitize students to the Indian traditional textile crafts through appreciation of its various manufacturing methods 3. Elaborate various artistic textile materials.						
Prerequisite	Students should have knowledge about various regions of India, cultural history and traditional rituals.						
Teaching Scheme			Examination Scheme				
L	T	P	TA%	MST%	ESE%	ESE (hr)	Credit
2	0	0	20	30	50	2	2

Course content

Modules	Description
Module 1	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
Module 2	Ritualistic textiles: Ritualistic Textiles with regards to historical perspective, origin, significance, technique 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, process 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

Module 3	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, Pochampalli etc Printed and Painted Textiles – Sanganeri. Kalamkari., block printing, Ajrakh, Dabu Prints, Roghan / khadi / Tinsel printing, Warak Printing etc
Module 4	Traditional floor covering Carpets, Durries and Namdahs - Looms, technique, material, colour and motifs, layout and evolution Carpets from Kashmir and UP Bhadohi / Mirzapur-Sultan Zain – ulabidin, Hand Knotted, Senna Knot, Abrash, Knots per inch, Talim Durries from Warangal, Punjab, U.P. Namdah - Felted floor covering.
Module 5	Textile articles from north east Weaving on back strap loom Mekhala chadder & gamocha from Assam Moirangphee sari, Innaphi Phanek Shawls of Manipur and Naga shawl

Text Books :

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 Book