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| **Programme Name** | **Bachelor of Technology (Textile Engineering)** | **Semester V** |
| **Course Title** | **TEXTILE TESTING - I** |
| **Course Code** | **PCC-TEX-301A** |
| **Purpose** | To study the principles of physical and mechanical testing of fiber and yarn  |
| **Course Outcomes** | After completing this course student will be able to:CO1.Test and evaluate the fabric dimensional and aesthetic properties. CO2.Perform and evaluate fabric tensile properties. CO3.Understand the testing methods of fabric comfort and handle properties.CO4.Understand the testing methods of technical textiles CO5.Explain various statistical quality control charts used in textiles. |
| **Prerequisite** | Knowledge of Fabric Physical and mechanical properties.  |

**PCC-TEX-301A**

**TEXTILE TESTING - I**

L T P Sessional: 25 Marks

3 1 - Exam: 75 Marks

 Total: 100 Marks

 Time: 3 hrs.

***Note:*** *Nine questions will be set in the question paper i.e. two from each unit. The students will be required to attempt one question from each unit****.*** *Question no. 1 is compulsory. It is objective type 15 questions of multiple choice covering all the four units.*

**Unit I**

**Sampling Methods and Moisture Calculation**

Introduction of textile testing, Reason for Testing, standardization of testing, sampling, sampling techniques, square, cut square, zoning technique, Routine sampling techniques used in the textile industry

Moisture:-effect of moisture or physical properties regain and content, correct invoice weight, Atmospheric conditions for testing, Control of testing room atmosphere, moisture regain & moisture content, importance of moisture in textiles, measurement of moisture regain & content, effect of moisture on properties (physical & mechanical) of textile material, factors affecting the regain, Shirley moisture meter.

**Unit II**

**Cotton Fibre Testing**

Fibre Dimension: fibre fineness, fineness measurement, fibre length, method of measurement: direct method high volume instrument, advance fibre information system Grading of cotton fibre with respect to staple length, laboratory measurement of fibre length, span length, Baer sorter, servo fibro graph, maturity coefficient measurement by NaOH method, fibre fineness by airflow meter. Fibre bundle strength by Pressley, Stelometer, determination of trash content: Shirley trash analyzer.

Fibre quality index, salient features of HVI, AFIS, Nep count. Wrapping test for lap, sliver and roving.

**Unit III**

**Yarn Evenness Testing**

Yarn testing, linear density, yarn numbering systems, conversion methods, and measurement of yarn number.

Twist, classification of twist, twist measurement, Twist, Measurement of twist in continuous filament spun and plied yarns.

Evenness testing of yarns. Nature and causes of irregularities, principles and methods of evenness testing: evaluation and interpretation of evenness measurements. Measurement of sliver and yarn unevenness, Capacitive and optical principle of measuring unevenness, salient features of Uster evenness tester, yarn imperfections and classimat yarn faults.

**Unit IV**

**Yarn Tensile Testing**

Strength and elongation test, Definition, force-elongation curve, Factor affecting tensile testing, Fibre strength and Yarn strength.

Various terms related to tensile testing, stress-strain curve, various methods for finding the yield point, Application of tensile force by CRL, CRE and CRT method, various principles (pendulum lever, balance principle, inclined plane, strain gauge principle, etc.) to apply tensile load on textile specimen.

Yarn testing machines- Single yarn strength tester, Uster, Instron testing machine, lea strength testing.

Hairiness: Determination of yarn hairiness.

**Suggested Text Books & References:**

1. Booth, J.E., “Principles of Textile Testing”, Butterworths, London
2. Quality Control and Testing Management by Dr. V.K. Kothari
3. Slater, “Textile Progress – Physical Testing and Quality Control”, Textile Institute, Manchester
4. “Handbook of Methods of Tests for Cotton Fibres, Yarns and Fabrics”, CTRL, Bombay
5. “Cotton Assessment and Appreciation”, SITRA Report, Coimbatore.
6. Savile, B.P.,” Physical testing of textiles”
7. Grover, E. and Hamby, D.S., “Handbook of Textile Testing and Quality Control”, Wiley Eastern, New Delhi, 1969

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| **Programme Name** | **Bachelor of Technology (Textile Engineering)** | **Semester V** |
| **Course Title** | **YARN MANUFACTURING-III** |
| **Course Code** | **PCC-TEX-303A** |
| **Purpose** | **-**To study the unconventionalspinning techniques  |
| **Course Outcomes** | After completing this course, students will be able to:CO1 – Interpret mechanism of yarn formation in open end spinning systems.CO2 – Understand the false twist principle in air-jet spinning system. CO3–Compare the structure and properties of rotor, air-jet, friction and compact yarn with ring yarn.CO4 – Understand the electrostatic, self-twist, wrap and adhesive spinning methods.CO5 – Illustrate the production of compact, fancy yarns and sewing yarns.  |
| **Prerequisite** | Fundamentals of yarn manufacturing process. |

**PCC-TEX-303A**

**YARN MANUFACTURING-III**

L T P Sessional: 25 Marks

3 1 - Exam: 75 Marks

 Total: 100 Marks

 Time: 3 hrs

***Note:***

*Nine questions will be set in the question paper i.e. two from each unit. The student will be required to attempt one question from each unit. Question No.1 is compulsory. It is objective type 15 questions of multiple choice covering all the four units.*

# UNIT-I

Forces acting on yarn and traveler during spinning, spinning tension in ring frame, Theory of yarn balloon, Limitations of ring spinning systems, modern developments in ring frame, Introduction to new spinning systems, Advantages and comparison of new spinning system over ring spinning system, Introduction to open-end spinning.

**UNIT-II**

**Rotor Spinning:** Principle and raw material preparation. Design and working of rotor spinning machine and effect of each on the process and product quality. Production calculation, Effect of fibre properties on the rotor yarn property, Structure of rotor spun yarns, End uses of rotor yarns, new developments

**Air-jet Spinning**: false-twist process: generation of false twist, forming a yarn with the aid of false twist spinning elements. Murata Jet spinner: operating principle, Raw material requirements, Yarn Characteristics and end uses.

**UNIT-III**

**Friction Spinning**: Operating principle, Classifications, Dref-2 process & DREF-3 process: Working principle, Technological interrelationship, Advantages & disadvantages, use of friction spun yarn.

# Working principle and Specifications: Electrostatic spinning, Self-twist spinning (Repco spinning), Wrap spinning (Parafil process), Adhesive spinning, Twilo process (TNO), Bobtex process -.

**UNIT-IV**

# Compact Spinning: principle, different methods of fibre compacting, properties of yarn.

# Comparative analysis of yarn structure, properties and their end use application produced from rotor, air-jet, friction techniques and compact spun yarn viz a viz ring spun yarn.

Production of fancy yarn & their applications.

Production of Industrial yarn- Sewing thread.

**Suggested Text books and References**

1. Klein. W., “Manual of Textile Technology”, ‘Short Staple Spinning Series’, Vol. 1 to 6. - Textile Institute. Manchester.
2. Salhotra K R, “Spinning of Man Made Fibres and Blends on Cotton Spinning System”, The Textile Association, Mumbai, 1989.
3. Oxtoby, E., Spun Yarn technology.
4. Lawrence C A, “Fundamental of Spun Yarn Technology” CRC Press, USA, 2003.
5. Fancy Yarns, “Their Manufacture and Application,” 1st Edition, R H Gong R M Wright, Woodhead Publishing Limited, UK, 2002.

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| **Programme Name** | **Bachelor of Technology (Textile Engineering)** | **Semester V** |
| **Course Title** | **FABRIC MANUFACTURING – III** |
| **Course Code** | **PCC-TEX-305A** |
| **Course Purpose** | * To study the modern methods of fabric production
* To understand the nonwoven production processes
 |
| **Course Outcomes** | After completing this course, students will be able to:CO1 – Contrast between shuttle and shuttle-less weaving CO2 – Explain principles of projectile looms, rapier looms and jet looms.CO3 – Describe multiphase weaving machines.CO4 –Discuss the positive let-off and positive take-up motions of weaving machines. CO5 – Summarise nonwoven production techniques. |
| **Prerequisite** | Completion of course Fabric Manufacturing- II  |

**PCC-TEX-305A**

**FABRIC MANUFACTURING-III**

L T P Sessional: 25 Marks

3 1 - Exam: 75 Marks

 Total: 100 Marks

 Time: 3 hrs

***Note:***

*Nine questions each of 15 marks will be set in the question paper i.e. two from each unit. The students will be required to attempt one question from each unit. Question No.1 is compulsory. It is objective type 15 questions of multiple choice covering all the four units.*

**UNIT I**

Introduction to Shuttle-less Weaving. Advantages of Shuttle-less weaving, comparison with shuttle weaving. Features of unconventional weaving. Different Selvedge: Tucked-in, Leno, fused, Stitched. Their mechanism of formation, their characteristics and uses. Weft Accumulator.

***Projectile Weaving Machine***: Basic principle of projectile weaving. Feeding of yarn to projectile. Sequence of weft insertion. Cam driven shedding, Dwelling Sley beat-up, Torsion bar picking. Energy utilization during picking.

**UNIT II**

***Rapier Weaving Machine*:** Classification based on type of rapier, system of weft insertion and number of rapiers. Sequence of weft insertion for Gabler and Dewas system, their comparison. Driving of flexible and rigid rapiers. Asynchronized rapier timing. Rapier buckling.

**Air Jet Weaving Machine:** Principle of weft insertion. Air requirements. Path of the yarn on loom. Sequence of weft insertion. Control of air stream by relay nozzle, confuser profile reed and suction. Design of air jet nozzle. Air drag force, factors affecting drag force.

**UNIT III**

**Water Jet Weaving Machine:** Principle of weft insertion. Path of the yarn on loom. Quality of water required. Sequence of weft insertion. Water jet nozzle. Merits and demerits of water jet weaving. Fabric drying on loom.

**Multiphase Weaving:** Principle of multiphase weaving. Warp way and weft way multiphase looms. Circular loom.

**Positive Let-off:** Hunt’s let-off, electronic let-off.

**Positive Continuous Take-up:** Sulzer take-up and Shirley take-up.

**UNIT IV**

**Nonwoven:** Definition and classification. Fiber properties requirements. Parallel laid, Cross laid, aerodynamic, Wet laid and Spunbonded technique of web formation. Web bonding techniques: Needle punching, Spunlace, Spunbond, Meltblown Thermal bond and Chemical bonding. Application of various non-woven fabrics.

**Suggested Text Books and References**

1. Talukdar, M., “Weaving Mechanism, Management”, Mahajan Publisher, Ahmedabad.

2. Adanur, S. “Weaving Technology”

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| **Programme Name** | **Bachelor of Technology (Textile Engineering)** | **Semester V** |
| **Course Title** | **FABRIC STRUCTURE & DESIGN** |
| **Course Code** | **PCC-TEX-307A** |
| **Course Purpose** | -To understand and apply the concept of designing of woven fabrics  |
| **Course Outcomes** | After completing this course, students will be able to:CO1 – Explain the fundamentals of woven design productionCO2 –. Understand and apply elements of colour in textile designingCO3– Construct different types of weave designs and their derivatives along with draft and peg plan.CO4 – Determine fabric parameters for a particular weave. |
| **Prerequisite** | Basic knowledge of fabric manufacturing  |

**PCC-TEX-307A**

**FABRIC STRUCTURE & DESIGN**

L T P Sessional: 25 Marks

3 1 - Exam: 75 Marks

 Total: 100 Marks

 Time: 3 hrs

**Note**- Total eight questions will be set in the question paper taking two questions from each unit by the paper setter for the examination. The student will be required to attempt any five questions taking at least one question from each unit.

**UNIT –I**

Elements of colour -physical basis of color, light and color phenomenon, complementary colors and color measurements, attributes of primary and secondary color, color contrast and color harmony, application of color.

General passage of material through loom, Classification of woven structures, basic elements of woven design, Method of notation of structure or design, weave repeat, types of draft plans. Selection of reed and its importance in fabric design.

**UNIT – II**

**Plain weave and derivatives**- warp rib, weft rib, matt, hopsack, fancy matt, stitched hopsack Classification of plain cloth.

**Twill weave and derivatives**- zig-zag, herringbone, broken, transpose, and rearrange twills on sateen base, combined, steep and flat twill, diamond, effect of twist on prominence of twill lines, characteristics of twill weave.

**Fabric set calculation**

Yarn and cloth relationships-GSM Calculation

**UNIT – III**

Sateen & Satins, Crepe weaves, Mock-leno, Cork screw, Honey-comb, Huck-a-back, Bed ford cord, Welt and pique fabrics.

**UNIT – IV**

Extra warp and weft figuring, Velvet and Velveteen, Backed fabric, Double cloth classification Stitched double cloth, Wadded double cloth, belting structures, label weaving-narrow

**Suggested Text Books and References**

1. Watson’s Textile Design and Colour: Elementary weaves and Figured fabrics, edited by Z. J. Grosicki., Woodhead Publication, Seventh edition.

2. Watson’s Advance Textile Design: Compound Woven Structure edited b*y* Z Grosicki, Woodhead Publication, Series No.-2

3. Fabric Structure and Design, by N. Gokarneshan, New Age International, 2nd Edition

4. Woven Fabric Structure Design and Product Planning by J. Hayavadana, Woodhead Publishing India Pvt. Ltd.

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| **Programme Name** | **Bachelor of Technology (Textile Engineering)** | **Semester VI** |
| **Course Title** | **TEXTILE TESTING LAB - I** |
| **Course Code** | **PCC-TEX-309LA** |
| **Purpose** | To provide hands-on experience on testing of physical and mechanical properties of fibers and yarns. |
| **Course Outcomes** | After completing this course student will be able to:CO1- Perform and evaluate fabric tensile strength tests. CO2- Test and evaluate the fabric dimensional and aesthetic properties. CO3- Test and evaluate the fabric comfort properties. |
| **Prerequisite** | Knowledge of fabric physical and mechanical properties.  |

**PCC-TEX-309LA**

**TEXTILE TESTING LAB - I**

L T P Practical/viva: 60 Marks

 2 Sessional: 40 Marks

 Total: 100 Marks

 Time: 2 hrs

1. To determine moisture parameters of the fibers.
2. To determine the staple length of natural fibers.
3. To determine the fineness of natural fibers.
4. To determine the maturity of the fibers.
5. To find the strength and elongation of natural, manmade & synthetic fiber.
6. To determine the linear density of fibers.
7. To determine the spin finish percentage in manmade fibers.
8. To determine blend percent of the material.
9. To determine the linear density of a given yarn.
10. To determine the twist per inch of the yarn.
11. To determine the hairiness of the yarn.
12. To determine the strength & elongation of a given yarn.
13. To determine the count strength product of the yarn.

**Note**: The above experiment should be conducted and shall be decided on factors like:

1. Facilities installed at institute
2. Accessibility to industry & nearby institute like IIT Delhi, NITRA Ghaziabad, Textile Committee and NITRA Panipat.
3. Trend of technological developments in National & International perspective.

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| **Programme Name** | **Bachelor of Technology (Textile Engineering)** | **Semester V** |
| **Course Title** | **FABRIC MANUFACTURING – III Lab** |
| **Course Code** | **PCC-TEX-311LA** |
| **Course Purpose** | -To provide practical knowledge on modern methods of fabric production. |
| **Course Outcomes** | After completing this course, students will be able to:CO1–Recognise various selvedges and understand their manufacturing. CO2 – Demonstrate the weft insertion and various mechanisms in projectile, rapier and air-jet looms.CO3 – Compare the shuttle looms and shuttle-less looms. |
| **Prerequisite** | Knowledge of fundamentals of weaving. |

**PCC-TEX-311LA**

**FABRIC MANUFACTURING –III LAB**

L T P Practical/viva: 60 Marks

 2 Sessional: 40 Marks

 Total: 100 Marks

 Time: 2 hrs

**LIST OF EXPERIMENTS**

1. To study the different selvedge formation: Tuck-in, Leno, Fused and Knitted selvedge.
2. To study the working of positive let-off and electronic let-off and their advantages.
3. To study the working of Matched cam beat-up.
4. To study the working of Electronic Dobby and development of designs in electronic dobby.
5. To study the working of Flexible Rapier loom system and sequence of weft insertion.
6. To study the working of Rigid Rapier loom system and sequence of weft insertion.
7. Studies of different mechanism on Somet flexible rapier drive.
8. To study the working of torsion bar picking and sequence of weft insertion in projectile loom.
9. To study the working of Air jet nozzle and sequence of weft insertion in air jet weaving.
10. To study the advantages and disadvantages of various shuttle less looms.

**Note:** Any 8 experiments from the above list of experiments are to be performed by each student.

**Note**: The above experiment should be conducted and shall be decided on factors like:

1. Facilities installed at Institute
2. Accessibility to industry & nearby institute like IIT Delhi, NITRA Gaziabad, Textile Committee and NITRA Panipat.
3. Trend of technological developments in National & International perspective.

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| **MC-903A** | **ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE** |
| **Lecture** | **Tutorial** | **Practical** | **Credit** | **Major Test** | **Minor Test** | **Total** | **Time** |
| **3** | **0** | **0** | **0** | **100** | **-** | **100** | **3 Hrs.** |
| **Purpose** | **To understand the values of Indian tradition.** |
| **Course Outcomes** |
| **CO1** | **Students will be able to understand the concept of Traditional knowledge and its importance** |
| **CO2** | **Students will be able to know the need and importance of protecting traditional knowledge.** |
| **CO3** | **Students will be able to know the various enactments related to the protection of traditional knowledge.** |
| **CO4** | **Students will be able to understand the concepts of Intellectual property to protect the traditional knowledge.** |

## UNIT-I

##  INTRODUCTION TO TRADITIONAL KNOWLEDGE Define traditional knowledge, nature and characteristics, scope and importance, kinds of traditional knowledge, the physical and social contexts in which traditional knowledge develop, the historical impact of social change on traditional knowledge systems. Indigenous Knowledge (IK), characteristics, traditional knowledge vis-à-vis indigenous knowledge, traditional knowledge Vs western knowledge traditional knowledge vis-à-vis formal knowledge.

**UNIT-II**

## PROTECTION OF TRADITIONAL KNOWLEDGE

Protection of traditional knowledge: The need for protecting traditional knowledge Significance of TK Protection, value of TK in global economy, Role of Government to harness TK.

## LEGAL FRAMEWORK AND TK

A: The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, Plant Varieties Protection and Farmer's Rights Act, 2001 (PPVFR Act); B: The Biological Diversity Act 2002 and Rules 2004, the protection of traditional knowledge bill, 2016. Geographical indicators act 2003

**UNIT-III**

## TRADITIONAL KNOWLEDGE AND INTELLECTUAL PROPERTY

Systems of traditional knowledge protection, Legal concepts for the protection of traditional knowledge, Certain non IPR mechanisms of traditional knowledge protection, Patents and traditional knowledge, Strategies to increase protection of traditional knowledge, global legal FORA for increasing protection of Indian Traditional Knowledge.

**UNIT-IV**

**TRADITIONAL KNOWLEDGE IN DIFFERENT SECTORS:**

Traditional knowledge and engineering, Traditional medicine system, TK and biotechnology, TK in agriculture, Traditional societies depend on it for their food and healthcare needs, Importance of conservation and sustainable development of environment, Management of biodiversity, Food security of the country and protection of TK. 139

## Text Books:

1. Environmental Studies- Deswal and Deswal. Dhanpat Rai and Co.
2. Environmental Science and Engineering Anandan, P. and Kumaravelan, R. 2009. Scitech Publications (India) Pvt. Ltd., India.
3. Environmental Studies. Daniels Ranjit R. J. and Krishnaswamy. 2013. Wiley India.
4. Environmental Science- Botkin and Keller. 2012. Wiley, India

## Reference Books:

## Traditional Knowledge System in India by Amit Jha Atlantic publishers, 2002.

## "Knowledge Traditions and Practices of India" Kapil Kapoor1, Michel Danino

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| **Programme Name** | **Bachelor of Technology (Textile Engineering)** | **Semester VI** |
| **Course Title** | **TEXTILE TESTING - II** |
| **Course Code** | **PCC-TEX-302A** |
| **Purpose** | To study the principles of physical and mechanical testing of fabric. |
| **Course Outcomes** | After completing this course student will be able to:CO1-Test and evaluate the fabric dimensional and aesthetic properties. CO2-Perform and evaluate fabric tensile properties. CO3-Understand the testing methods of fabric comfort and handle properties.CO4-Understand the testing methods of technical textiles CO5-Explain various statistical quality control charts used in textiles. |
| **Prerequisite** | Knowledge of Fabric Physical and mechanical properties.  |

**PCC-TEX-302A**

**TEXTILE TESTING - II**

L T P Sessional: 25 Marks

3 1 - Exam: 75 Marks

 Total: 100 Marks

 Time: 3 hrs

***Note:***

*Nine questions will be set in the question paper i.e. two from each unit. The student will be required to attempt one question from each unit. Question No.1 is compulsory. It is objective type 15 questions of multiple choice covering all the four units*.

**UNIT I**

**Fabric Testing**

Importance of fabric testing, scope of fabric testing.

**Structural Properties of Fabric:-**

Thickness, crimp, weight and shrinkage test - Definition, significance, effect on fabric properties and measurement methods. Cover factor - Definition, significance, derivation of cover factor.

**Serviceability testing parameters of fabrics:-**

Abrasion resistance of fabric- Definition, factors affecting abrasion resistance, assessment of abrasion damage, methods of measuring abrasion resistance & evaluation of results.

Fabric Pilling, Creasing and crease recovery- Concept, mechanism, factors affecting and methods of assessment.

**UNIT II**

**Mechanical Properties of fabric:-**

Fabric Strength Testing: Tensile, tearing and bursting strength tests; principles and operation of equipment, Factors affecting test results, Evaluation and interpretation of tensile test results

**Low stress mechanical properties of fabric:-**

Fabric bending, stiffness, compression, softness, shearing and drape Test:-Principle, terminology, quantities and units, experimental method.

**UNIT III**

**Fabric Comfort: -** Introduction, importance and classification of comfort.

**Transport Properties of Fabric:-**Fabric Porosity and Air Permeability: -Concept, Importance, Factors affecting, methods of testing, relationship between fabric porosity and air permeability.

**Water-Fabric Relation**: - Concept, Importance, water vapour permeability, moisture transport, Fabric Wettability, Water proofing and water repellency testing.

**Fabric Handle**:-Introduction, factors affecting fabric handle, subjective & objective evaluation of fabric handle by KES and FAST system.

**UNIT IV**

**Testing of Garment and Garment Accessories:-**

Tests related to garment performance and appearance such as measurement of seam pucker, seam slippage and seam strength etc.

Testing of fusible Interlinings, zippers, elastic waistband, sewing threads, buttons, snap fasteners.

**Statistical Quality control in Textiles**: Concept of quality, quality assurance, concept of reproducibility and repeatability, methods pertaining to fibre, yarn and fabric testing.

International quality parameters & standards like USTER standards, AATCC, JIS and ASTM.

**Suggested Text /References Books**

1. Booth, J.E., “Principles of Textile Testing”, Butterworts, London
2. Kothari, V.K., “Physical Testing of Textiles”
3. Fabric testing, ED. Jinlian HU, Woodhead publication CRC Press, 2008.
4. Saville, BP, Physical testing of textiles, Woodhead publication CRC Press 1999.
5. Slater, “Textile Progress – Physical Testing and Quality Control”, Textile Institute, Manchester.

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| **Programme Name** | **Bachelor of Technology (Textile Engineering)** | **Semester VI** |
| **Course Title** | **Garment Technology** |
| **Course Code** | **PCC-TEX-304A** |
| **Purpose** | To explain the process of conversion of fabric into garment. |
| **Purpose** | After completing this course students will able to:CO1: Explain the overview and sequence of garment manufacturing.CO2: Discuss the concept of pattern making and marker planning process.CO3: Illustrate the spreading and cutting techniques CO4: Select different types of stitches, seams and sewing machines for garment manufacturing.CO5: Explain different types of finishing methods used for garment making.  |
| **Prerequisite** | Students should have knowledge of Fabric manufacturing and Yarn manufacturing |

**PCC-TEX-304A**

**GARMENT TECHNOLOGY**

L T P Sessional: 25 Marks

3 1 - Exam: 75 Marks

 Total: 100 Marks

 Time: 3 hrs

***Note:***

*Nine questions will be set in the question paper i.e. two from each unit. The student will be required to attempt one question from each unit. Question No.1 is compulsory. It is objective type 15 questions of multiple choice covering all the four units*.

**UNIT-I**

**Overview of clothing manufacturing and related fabric quality requirements**

Introduction to clothing manufacturing, the structure of clothing industry, Organization chart of clothing factory, Relationship between fabric properties and making up process. Fabric quality requirement for garment industry, Evaluation of sewability.

**UNIT-II**

**Pattern making, Spreading and Marker Planning**

**Pattern Making:** Introduction to pattern making and garment construction. Different terminologies, Drafting, Basic bodies blocks. CAD for pattern making.

**Spreading and Marker Planning**: Planning, drawing and reproduction of marker, Methods of marker planning and marker used-normal marker planning and computerized marker planning, Introduction to symmetrical and asymmetrical fabrics, Criteria for spreading, methods of spreading, spreading machines, Principles of lay plan, types of lay plan.

**UNIT-III:**

**Cutting and Sewing**

**Cutting:** Criteria for cutting, cutting methods and cutting machines- straight knife, band knife, notches and drills, computer-controlled knives, die cutting, laser cutting, plasma cutting and ultrasonic cutting.

**Sewing**: Properties of seams, seam types, stitch types, sewing feed mechanisms, sewing machine needles, sewing threads and sewing problems.

**Introduction to Sewing Machinery**: Basic sewing machines and associated work aids.

**UNIT-IV**

**Pressing, Fusing and Trimming and Garment Accessories**

**Pressing:** Purpose of pressing, equipment used and various pressing methods.

**Fusing**: Requirements of Fusing, fusing process and equipment used.

**Trimming and Garment Accessories**: definition, types, trimming methodologies, Care labeling in garment manufacturing.

 **Suggested Text /References Books**

1. Cooklin Gerry, Steve G. H., and John M, “Garment Technology for Fashion Designers”, Wiley-Blackwell, 2012 Edition.

2. Gini S. F, “Fashion from Concept to Consumer”, Pearson Education, 2009.

3. Harold Carr & Barbara Latham, “The Technology of Clothing manufacture,4th Edition Wiley- Blackwell, 2008.

4. Aldrich W, “Metric Pattern Cutting for Women’s Wear, Wiley-Blackwell, 2008.

5. Mehta P V and Bhardwaj S K, “Managing Quality in Apparel Industry”, New Age International Pvt Ltd, 1998.

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| **Programme Name** | **Bachelor of Technology (Textile Engineering)** | **Semester VI** |
| **Course Title** | **Knitting Technology** |
| **Course Code** | **PCC-TEX-306A** |
| **Purpose** | To understand the technologies of knitting  |
| **Course Outcomes** | After completing this course students will able to: CO1: Understand the basic concept of knitting and its elementsCO2: Relate and contrast different weft knitted methods and weft knitted structuresCO3: Compare different warp knitted methods and warp knitted structuresCO4: Solve numerical problems associated with knitting CO5: Compare woven and knitted structure |
| **Prerequisite** | Yarn and fabric manufacturing process and their properties |

**PCC-TEX-306A**

**KNITTING TECHNOLOGY**

L T P Sessional: 25 Marks

3 1 - Exam: 75 Marks

 Total: 100 Marks

 Time: 3 Hrs.

***Note:***

*Nine questions will be set in the question paper i.e. two from each unit. The student will be required to attempt one question from each unit. Question No.1 is compulsory. It is objective type 15 questions of multiple choice covering all the four units*.

**UNIT-I**

Concept of knitting, weft knitting, warp knitting, comparison between woven and knitted fabric, comparison of warp and weft knitting, **Knitting needles**: spring beard, latch, compound needles, knitting cycle of latch, spring bearded and compound needle, classification of knitting machines, yarn quality requirements for weft knitting, **Knitting elements**: cylinder, knitting cam, sinker, feeder, stop motions.

**UNIT-II**

Working of plain, rib and interlock knitting machine, pattern wheel, pattern drum, punched steel tape needle selection mechanism, basic principles and elements of flat knitting machines- different types of flat knitting machines; mechanical and computerized knitting machines, weft knit structures, technical terms and symbolic representation of weft knit structures, Characteristics of plain, rib, Interlock, purl knit structures

**UNIT-III**

Fundamentals of formation of knit, tuck and float stitches, Derivatives of weft knit structures, Faults in knitted fabrics and their causes and remedies - dimensional parameters such as stitch length, WPI, CPI, stitch density, GSM, Tightness factor-spirality, Production calculations of weft knitting.

Warp knitting machines: needle bar, sinker bar, guide bar, pattern wheel, chain link, Warp knitting fundamentals, knitting cycle for warp knitting- closed lap and open lap stitches, Raschel, compound needle and Tricot knitting machines, Comparison of raschel and tricot knitting machines

**UNIT-IV**

Materials for warp knitting: direct warping and indirect warping for warp knitting, production calculations of warp knitting. Representation of warp knit structures, chain link notation, basic warp knitted structures, Chain or pillar stitch and atlas lap, Two bar structures; Full tricot, Locknit, Reverse locknit, Satin. Application of weft and warp knit fabric in Technical Textiles. Seamless knitting: working and advantages.

**Suggested Text /References Books:**

1. Spencer D. J, “Knitting Technology” Woodhead Publishing Ltd. Cambridge, England.

2. Ajgaonkar, D. B. “Knitting Technology”.

3. “Knitting Technology” NCUTE Publication.

4. Booth J. E., “Textile Mathematics Vol-3” The Textile Institute Manchester Publication.

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| **Programme Name** | **Bachelor of Technology (Textile Engineering)** | **Semester VI** |
| **Course Title** | **THEORY OF TEXTILE STRUCTURE** |
| **Course Code** | **PCC-TEX-308A** |
| **Course Purpose** | * To study the structural models of fibre assemblies.
 |
| **Course Outcomes** | After completing this course, students will be able to:CO1 – Analyse the ideal yarn geometry.CO2 – Analyse and evaluate the fibre migration in yarn.CO3 – Analyse the mechanical properties of yarn.CO4 –Analyse the fabric geometryCO5–Solve the numerical problems associated with yarn and fabric structure. |
| **Prerequisite** | Knowledge of yarn manufacturing and fabric manufacturing. Basic mathematics and physics |

**PCC-TEX-308A**

**THEORY OF TEXTILE STRUCTURE**

L T P Sessional: 25 Marks

3 1 - Exam: 75 Marks

 Total: 100 Marks

 Time: 3 hrs

***Note:***

*Nine questions will be set in the question paper i.e. two from each unit. The student will be required to attempt one question from each unit. Question No.1 is compulsory. It is objective type 15 questions of multiple choice covering all the four units*

**UNIT-I**

**Yarn Geometry**: Idealized yarn geometry, relationship of yarn number and twist factor, Twist contraction and retraction, limits of twist.

**Packing of fibre in yarn**: Ideal packing, hexagonal close packing and other forms. Packing factor and its measurement, measurement of packing density and radial packing density, specific volume of yarns, relation between twist, diameter and twist angle.

**UNIT-II**

**Fibre migration**: Ideal migration, tracer fiber technique, characterization of migration behavior, migration in spun yarns, mechanisms of migration, effect of various parameters on migration behavior

**Mechanics of staple fibre yarns:** Translation of fiber properties into yarn properties; Extension of continuous, filament yarn for small strains and large strains; Prediction of breakage, Nature of rupture for continuous filament yarn, Extension and breakage of spun yarn

**UNIT-III**

Elements of fabric geometry. Cloth setting theories, Fabric cover, fractional and total cover, Fabric cover and fabric weight relationship, Pierce’s fabric geometry, flexible and elastic thread model, jammed structure, square fabric, crimp interchange, Relationship between h, p, c, Kemp’s Race Track Model.

**UNIT-IV**

Geometry of weft and warp knitted structures, influence of friction on knit geometry, Fabric, deformation under tensile stress, prediction of modulus; tensile properties in bias direction. Other fabric deformation – compression, shear, bending and buckling; fabric handle; Spirality and skewness formation and its control

**Suggested Text/ References Books**

1. Hearle, J. W. S., Grosberg, P., and Backer, S., “Structural mechanics of fibre, yarn and fabrics”, Wiley Inter-science Publication.

2. “Textile Yarn, Technology, Structure & Application” – Goswami B.C., Martindale, J.G., Scardino F.L., Wiley Inter-science publication, 1977, U.S.A.

3. Zurek, W., “Structure of Yarn”, Foreign Scientific Publications.

4. Cloth Geometry, F.T Pierce.

5. Woven Textile Structure: Theory & Application, B. K. Behera & P. K. Hari, Woodhead Textiles Series No. 115.

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| **Programme Name** | **Bachelor of Technology (Textile Engineering)** | **Semester VI** |
| **Course Title** | **TEXTILE TESTING LAB - II** |
| **Course Code** | **PCC-TEX-310LA** |
| **Purpose** | To provide hands-on experience on testing of physical and mechanical properties of fabrics. |
| **Course Outcomes** | After completing this course student will be able to:CO1. Perform and evaluate fabric tensile strength tests. CO2. Test and evaluate the fabric dimensional and aesthetic properties. CO3. Test and evaluate the fabric comfort properties. |
| **Prerequisite** | Knowledge of fabric physical and mechanical properties.  |

**PCC-TEX-310LA**

**TEXTILE TESTING LAB - II**

L T P Practical/Viva: 60 Marks

 2 Sessional: 40 Marks

 Total: 100 Marks

 Time: 2 hrs

1. To determine the stiffness property of the fabric.
2. To determine the tensile strength of the fabric.
3. To determine the tearing strength of the fabric.
4. To determine the bursting strength of the fabric.
5. To determine air permeability of fabrics.
6. To determine the shower proof property of a fabric.
7. To determine the drape property of fabrics.
8. To determine the crimp and areal density of fabrics.
9. To determine crease resistance property of the fabric.
10. To determine the pilling property of the fabric.
11. To determine water vapor permeability of the fabric.
12. To determine the thermal comfort property of the fabric.
13. Determine and compare the seam strength, seam slippage and seam puckering of a fabric sewn with different types of sewing threads.

**Note**: The above experiment should be conducted and shall be decided on factors like:

1. Facilities installed at Institute

2. Accessibility to industry & nearby institute like IIT Delhi, NITRA Ghaziabad, Textile Committee and NITRA Panipat.

3. Trend of technological developments in National & International perspective

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| **Programme Name** | **Bachelor of Technology (Textile Engineering)** | **Semester VI** |
| **Course Title** | **Garment Technology Lab** |
| **Course Code** | **PCC-TEX-312LA**  |
| **Purpose** | To develop drafting and pattern making skills To impart hands on experience in various sewing machines. |
| **Purpose** | After completing this course students will able to:CO1: Design and develop drafts for basic patterns.CO2: Make use of different types of sewing machines. CO3: Construct samples of various seam classes.CO4: Create different stitch classes  |
| **Prerequisite** | Students should have knowledge of Garment manufacturing. |

**PCC-TEX-312LA**

**GARMENT TECHNOLOGY LAB**

L T P Practical/Viva: 60 Marks

 2 Sessional: 40 Marks

 Total: 100 Marks

 Time: 2 hrs

1. Developments of patterns based on anthropometric data
2. Working on sewing machines
3. Production of different types of stitches (Chain stitch, Lock stitch and Overlock stitch)
4. Production of different seam types (Superimposed seam, Lapped Seam, Bound Seam, Flat Seam, Decorative seam, Edge neatening seam, Belt loop Seam etc.)
5. Determination of seam strength
6. Determination of seam pucker

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| **Programme Name** | **Bachelor of Technology (Textile Engineering)** | **Semester VI** |
| **Course Title** | **Knitting Technology Lab** |
| **Course Code** | **PCC-TEX-314LA** |
| **Purpose** | To impart practical knowledge of knitting machines To construct and analyse various knit structures  |
| **Purpose** | After completing this course students will able to:CO1: Identify various components of flat and circular knitting machines.CO2: Explain different process parameters in designing of weft knitted structure. CO3: Analyse weft knitted fabric structures. |
| **Prerequisite** | Students should have knowledge of weaving and knitting technology |

**PCC-TEX-314LA**

**KNITTING TECHNOLOGY LAB**

L T P Practical/viva: 60 marks

- - 2 Sessional: 40 marks

 Total: 100 marks

 Duration of Exam: 3 hours

**List of Experiment:**

1. Study on single jersey circular knitting machine-yarn supply arrangements, loop forming mechanism, take down motion and production calculations.
2. Study on Flat knitting machine-yarn supply arrangements, loop forming mechanism, take down motion.
3. Study on double jersey circular knitting machine-yarn supply arrangements, loop forming mechanism, take down motion and production calculations
4. Development of Plain, Rib, and Interlock fabric samples.
5. Setting of knitting Cam.
6. Development of derivative knitted structures on flat bed knitting machine.
7. Analysis of knitted structures.
8. Determination of Ks, Kc and Kw values.
9. Effect of stitch length, stitch density, course count, wale count on fabric aerial density.

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| **Programme Name** | **Bachelor of Technology (Textile Engineering)** | **Semester VI** |
| **Course Title** | **MULTI FIBRE SPINNING** |
| **Course Code** | **PEC-TEX-316A** |
| **Purpose** | * To study thevarious aspects multi fibre spinning.
 |
| **Course Outcomes** | After completing this course, students will be able to:CO1-Select the right method of blending based on constituent fibres characteristics.CO2-Interpret the effect of blend composition and fibre characteristics on the properties of blended yarn. CO3-Explain the construction and working of woolen and worsted spinning systems.CO4-Illustrate the spinning of jute and silk. CO5-Classify and explain the methods of recycled fibre spinning. |
| **Prerequisite** | Knowledge of short staple spinning. |

**PEC-TEX-316A**

 **MULTI FIBRE SPINNING**

L T P Sessional: 25 Marks

3 1 - Exam: 75 Marks

Total: 100 Marks

Time: 3 hrs

***Note:***

*Nine questions will be set in the question paper i.e. two from each unit. The student will be required to attempt one question from each unit. Question No.1 is compulsory. It is objective type 15 questions of multiple choice covering all the four units*.

**UNIT I**

Characteristics of man-made fibres, objectives of blending, selection of fibre specification for blending, processing of short, medium and long staple manmade fibres on cotton system, measures of blend intimacy, factors influencing blend intimacy, structure an properties of blend yarns, Effect of blend composition & fibre characteristics on properties of blended yarn. Blend mechanics. Advantages & disadvantages of different blending technique.

**UNIT II**

**Wool Spinning:** Impurities in wool fibre. Wool blending, wool sorting, wool, wool scouring, drying, back washing. Woollen and worsted carding, intermediate gilling, auto leveler in gillbox, rectilinear combing, rubbing frame, and spinning.

**UNIT III**

# Jute Spinning: Basic concepts of the spinning process and the machinery. Jute retting, stripping, jute grading, jute batching, fibre defects. Jute carding; breaker and finisher card. Drawing and Spinning.

**UNIT IV**

# Silk Spinning: Introduction to Silk filament processing. Flow chart for spun silk processing – Cocoon beater, Filling operation, Circular dressing, Spreader, Sett Frame, Drawbox, Rover.

**Waste Spinning:** Cotton waste and its varieties, classification and possible end uses, machines and processes to produce waste yarns e.g. condenser system, coiled system.

**Suggested Text/ References Books**

1. Salhotra K R, “Spinning of Man Made Fibres and Blends on Cotton Spinning System”, The Textile Association, Mumbai, 1989.
2. Oxtoby, E. “Spun Yarn Technology”. Butterworths, London, 1987.
3. [W S Simpson](https://www.amazon.in/s/ref%3Ddp_byline_sr_book_1?ie=UTF8&field-author=W+S+Simpson&search-alias=stripbooks) and [G Crashaw](https://www.amazon.in/s/ref%3Ddp_byline_sr_book_2?ie=UTF8&field-author=G+Crawshaw&search-alias=stripbooks), Wool: Science and Technology, Woodhead Publishing Series in Textiles, 2002.
4. Goswami, B.G. “Textile Yarns; Technology, Structure & Applications”. Textile Institute, Manchester.
5. Atkinson, R. R., Jute- Fibre to yarn, B. I. Publications, Bombay,1965.
6. Basu A. (Ed.), Advances in Silk Science and Technology, Woodhead Publishing Series in Textiles, 2015.
7. Lawrence, C.A., Fundamentals of Spun Yarn Technology, 1st Ed., CRC Press, LLC, Florida, USA, 2003.
8. Thornley T, Cotton waste: its production, manipulation and uses, University of California, London, Scott, Greenwood & Son 8 Broadway, Ludgate, B.C., 1912.
9. Horrocks A. R. (Ed.), Recycling Textile and Plastic Waste, Woodhead Publishing Limited, Cambridge, England, 1996.

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| **Programme Name** | **Bachelor of Technology (Textile Engineering)** | **Semester V** |
| **Course Title** | **STRUCTURE AND PROPERTIES OF FIBRES** |
| **Course Code** | **PEC-TEX-318A**  |
| **Course Purpose** | * To study the structure and properties of textile fibres
 |
| **Course Outcomes** | After completing this course, students will be able to:CO1–Understand the fine structure and their physical and chemical properties of textile fibres CO2–Interpret the mechanical and frictional properties of textile fibres. CO3– Describe the moisture and optical properties of textile fibres CO4–Understand the thermal behaviour and electrical properties of textile fibres |
| **Prerequisite** | Knowledge of textile fibers. |

**PEC-TEX-318A**

**STRUCTURE AND PROPERTIES OF FIBRES**

L T P Sessional: 25 Marks

3 1 - Exam: 75 Marks

 Total: 100 Marks

 Time: 3 Hrs.

***Note:***

*Nine questions will be set in the question paper i.e. two from each unit. The student will be required to attempt one question from each unit. Question No.1 is compulsory. It is objective type 15 questions of multiple choice covering all the four units.*

**UNIT-1**

**Structure of fibres**

Morphology and order in fibre structure, concept and theories of orientation, crystallization and its measurement technique such as X-ray.

**Chemical and physical structure of fibres** such as wool, silk, cotton and bast fibre and man- made fibre such as Nylon, PET, Acrylic and Viscose.

**UNIT-2**

**Mechanical properties**

Theory of load-elongation curve, stress-strain curve, modulus, elasticity and visco elasticity, work of rupture/toughness, yield point, creep and stress relaxation behavior of fibres and simple spring and dash pot models simulating textile fibers.

**Frictional properties of fibers**

Nature and measurements.

**UNIT-3**

**Moisture properties**

Relation between moisture regain and relative humidity, hysteresis, absorption in fibers, diffusion theories of moisture absorption-general view, diffusion of moisture, quantitative analysis of moisture absorption, swelling.

**Optical properties of fibers**

Refractive index and polarization of light, birefringence and its measurement.

**UNIT-4**

**Thermal properties**

Molecular motion and transition phenomenon, thermal expansion behaviour, first order and second order transition phenomenon.

**Electrical properties**

Introduction to electrical properties such as dielectric properties such as electric properties and static charge generation

**Suggested Text Books and References**

1. Morton W E and Hearle J W S, “Physical Properties of Textile Fibres”, The Textile Institute, Manchester (1993)

2. Meredith R, “The mechanical properties of Textile Fibres”, North Holland co; Amsterdam (1959)

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| **Programme Name** | **Bachelor of Technology (Textile Engineering)** | **Semester VI** |
| **Course Title** | **MANUFACTRING OF SPECILITY FABRICS** |
| **Course Code** | **PEC-TEX-320A** |
| **Purpose** | * To study thevarious aspects manufacturing of specialty fabrics
 |
| **Course Outcomes** | After completing this course, students will be able to:CO1-Select the right method of production of technical fabrics bases on their requirement.CO2-Interpret the effect of manufacturing technology on the properties of fabrics. CO3-Understand the various 3D structure produced using weaving and knitting CO4-Illustrate the fabric manufacturing process used for terry, carpet and home furnishing.  |
| **Prerequisite** | Knowledge of basic fabric manufacturing |

**PEC-TEX-320A**

**MANUFACTRING OF SPECILITY FABRICS**

L T P Sessional: 25 Marks

3 1 - Exam: 75 Marks

 Total: 100 Marks

 Time: 3 Hrs.

***Note:***

*Nine questions will be set in the question paper i.e. two from each unit. The student will be required to attempt one question from each unit. Question No.1 is compulsory. It is objective type 15 questions of multiple choice covering all the four units.*

**UNIT-1**

Introduction and method of production of some common fabrics like Lappets, Swivels, Ondule fabrics, Tuck fabrics, woven, Gauge and leno structure with their mechanism, Madras muslin structures

**Industrial fabrics** especially kind of canvases, Belts, Parachute Fabrics, Umbrella cloth and Lycra Fabric

**UNIT-2**

**3D Weaving Structure**: introduction, changes required in preparatory process, process parameters, study of the manufacturing setup of 3D weaving, quality aspects and end uses

**3D Knitting** **Structure**: introduction, changes required in preparatory process, process parameters, study of the manufacturing setup of 3D Knitting, quality aspects and end uses

**UNIT-3**

**Woven Terry Fabrics**: introduction, classification, raw material, different types of preparatory process used for terry weaving, weaving of terry fabrics, quality control in terry weaving, end uses of terry structure

**Carpet Manufacturing**: introduction, classification, raw material, different types of preparatory process modifications used for carpet weaving, carpet manufacturing process parameters and machine parameters, quality aspects and end uses.

**UNIT-4**

**Fabrics Used in Home Furnishing Applications**: introduction, classification, raw material, different types of preparatory process used for home furnishing manufacturing. Fabric manufacturing process parameters and machine parameters for home furnishing, quality aspects and end uses.

**Suggested Text/References Books**

1. Singh Jitendra Pratap and Verma Swadesh, Woven Terry Fabrics: Manufacturing and Quality Management by Woodhead Publishing House
2. Goswami K K, Advance Carpet Manufacturing by Woodhead Publishing House