

PROPERTIES OF FIBRES

Subject Code: BTEXS1-501

LT P C 3 1 0 4

Duration: 60 Hrs.

Course Objectives:

1. Understand various methods of fibre structure investigation and moisture related behaviour
2. Understand tensile characteristics of fibres under diverse testing conditions
3. Understand Viscoelasticity and Rigidity of fibres
4. Understand other properties such as optical, thermal, frictional and static electricity

Course Outcomes:

At the end of the course students will be able to

1. Analyse fibre structure data and moisture dependent fibre characteristics
2. Demonstrate the response of fibre towards tensile loading under different practical situation
3. Model viscoelastic behaviour and interpret rigidity and dynamic loading fibre character
4. Apply knowledge of optical, frictional, static and thermal properties in solving real life problems

UNIT- I (18 Hrs.)

Traditional View of Fibre Structure and its Later Development: Study of the methods of investigation of fibre structure, e.g, X-ray diffraction, electron microscopy and absorption of infra - red radiation. Fibre density and its measurement.

Moisture Relations in Textile Fibre: Measurement of moisture absorption, measurement of regain, relationship between Moisture Regain and Moisture Content, Swelling of fibres-definitions and measurement. Heat of sorption- definitions, measurement and its effect on properties of textile material. Quantitative theory of moisture absorption. **Hysteresis** of moisture absorption.

UNIT-II (15 Hrs.)

Tensile Properties of Fibre: - Factors determining the result of tensile tests. Quantities & units of different parameters. Experimental methods. Elementary study of Fiber fracture.

Effect of Variability: Effect of specimen length on strength, weak link effect.

Elastic Recovery: Definition, experimental methods, change of properties as a result of straining.

Study of Time Dependence: creep behavior, relaxation of stresses with time & its effect on tensile testing.

UNIT – III (12 Hrs.)

Introduction to Dynamic Testing: Basic concept & definition of elastic, viscoelastic and plastic deformations. Characterization of viscoelastic behavior, Concepts of Voight & Maxwell model. Test method for dynamic testing. Bending & torsional rigidity of fibre: Elementary concepts, theories and measurements.

UNIT- IV (15 Hrs.)

Fibre Friction and its Measurement: nature of friction & equations. Fibre to fibre and fibre to metal friction. Basic concept of Thermal properties & heat setting.

Optical properties of fibre: Definition of refractive index, concept of fibre birefringence and orientation, Dichroism. **Introduction to Dielectric Property** & static charge generation in textile material.

Recommended Books:

1. W.E. Morton & J.W.S. Hearle, 'Physical Properties of Fibres', 4thEdn., WoodheadPublishing Limited, Cambridge, UK, 2008.
2. V.K. Kothari, 'Progress in Textile Science & Technology', Vol - II, IAFL Publishers, NewDelhi, 2000.

FABRIC MANUFACTURE - III

Subject Code: BTEXS1-502

LT PC 3 0 0 3

Duration: 45 Hrs.

Course Objectives

1. To explain design features, construction, working of different mechanisms of automatic shuttle looms
2. To explain features of package changing mechanism of automatic looms.
3. To explain construction and working principles of doobies.
4. To explain construction & development of Jacquard machines.

Course Outcomes

At the end of the course students will be able to understand

1. Design features, construction, working of different mechanisms of automatic shuttle looms
2. Design features, construction, working of different dobbies arrangement.
3. Construction and development of dobby designs.
4. Construction & development of Jacquard Designs.

UNIT-I (7Hrs)

DOBBY: Object of dobby, scope of dobby, different types of dobby and their mechanisms such as Positive and Negative dobby. Pegging systems as per design of fabric, Functions of Paper dobby & Climax dobby.

UNIT-II(10Hrs)

JACQUARD: Scope of jacquard, different types of jacquard such as single lift single cylinder, Double lift single cylinder, double lift double cylinder, Cross border jacquard, Jacquard card punching systems as per fabric design.

UNIT-III (8Hrs)

Study of Automatic Package Changing mechanism (Pirn changing and shuttle changing). Functions of Multiple Box motion. (2x1 and 4x1 drop box) Different types of non-conventional weaving machines. Temple motions and its importance, Different types of temples used in loom

UNIT-IV (20 Hrs)

Unconventional Loom: History behind their development Sulzer projectile weaving machines (Shedding, beat-up, torsion bar picking, let-off and Take-up mechanism). Projectile checking and return. Elitex and Sulzer airjet weaving machine. Picking System of water jet weaving machine. Projectile loom. Different types of Rapier weaving machines. Weft feeding system to the shuttle-less weaving machines. Basic principles of Multiphase weaving & Circular weaving machine.

Recommended Books:

1. R. Marks and A.T.C. Robinson, 'Principles of Weaving', Textile Institute, **1976**.
2. Prabir Kumar Banerjee, 'Principles of Fabric Formation', CRC Press, **2015**.
3. P.R. Lord & M.H. Mohamod, 'Weaving: Conversion of Yam to Fabric', Merrow Publishing Co. Ltd., **1992**.
4. V. Valeriy, Choogin, 'Mechanisms of Flat Weaving Technology', Woodhead Publishing, **2013**.
5. Sabit, Adanur, 'Handbook of Weaving', Technomic Publications, **2001**.

NON-WOVEN TECHNOLOGY

Subject Code: BTEXS1-503

L T P C 3 0 0 3

Duration-45 Hrs.

Course Objectives

1. To understand the concept of Nonwoven Textiles
2. To define Nonwovens and Understand Basics
3. To classify Nonwovens
4. To analyze and identify the Nonwoven products and to apply knowledge of Nonwovens in testing and product development.

Course Outcomes

At the end of the course students will be able to

1. Describe the logic and processes involved in Nonwovens.
2. Classify the Nonwovens.
3. Prepare technical data sheet of each sector of Nonwovens and Compile the fibres used, technology applied in manufacturing of Nonwovens.
4. Evaluate the performance of Nonwovens with different Indian and International standards.

UNIT-I (8 Hrs.)

Introduction to nonwovens, Classification of non-woven fabrics. Application areas of non wovens, Raw material - fibre - natural, synthetic, Various industrially produced fibres.

UNIT-II (10 Hrs.)

Dry-laid nonwovens from staple fibres: fiber preparation, web formation and bonding, wet laid nonwovens: Raw material, web formation and bonding, Meltblown technology: web formation and various process variables.

UNIT-III (12 Hrs.)

Spun bond technology. Needle punched nonwovens, Developments in needle punching machine, Spun lace (hydro entanglement technology), Thermal bonding of nonwoven fabrics: various binders and methods of thermal bonding.

UNIT-IV (15 Hrs.)

Chemical bonding of nonwoven fabric: Various types of binder, their properties and formulations, various bonding techniques. Stitch bonding, finishing of non wovens. End uses of non-woven fabric

Recommended Books:

1. Albrecht, Wilhelm, 'Nonwoven Fabrics: Raw Materials, Manufacture, Applications, Characteristics, Testing Processes', Wiley VCH, 2006.
2. S. Russel, 'Handbook of Nonwovens', Woodhead Publishing, 2006.

TEXTILE TESTING -I

Subject Code: BTEXS1-504

L T P C 3 1 0 4

Duration: 60 Hrs.

Course Objectives

1. To impart knowledge about significance and selection of sample
2. To provide knowledge about technical significance of fibre and yarn properties.
3. To impart knowledge about testing methodologies for evaluation of fibre and yarn properties.
4. To explain significance of moisture in textiles and its measurement.

Course Outcomes

At the end of the course students will be able to

1. Understand the sampling technique and its significance.
2. Understand technical significance of fibre and yarn properties.
3. Analyse and interpret results of fibre and yarn properties.
4. Analyse moisture and its importance in textile materials.

UNIT-I (9 Hrs.)

Introduction: Aim and scope of testing, Sample and Population, Sampling techniques for fibre, yarn and fabrics, Sample Size and Sampling errors.

UNIT-II (14 Hrs.)

Moisture in Textiles: Absolute humidity, Relative Humidity, Moisture content, Moisture regain, Relation between Moisture Regain and Moisture Content, Factors affecting regain of textile materials, effect of moisture on fibre properties, standard atmospheric conditions, measurement of atmospheric conditions, Moisture measuring Instruments.

UNIT-III (15 Hrs.)

Testing of Fibres: Cotton fibre testing such as length, fineness, maturity, neps, strength, elongation, trash-content, grading of different cotton, fibre contamination measurement, application of HVI and AFIS. Testing of wool and manmade staple fibers, measurement of fiber friction and crimp,

UNIT-IV (22 Hrs.)

Testing of Yarn: Yarn numbering and conversion system, Measurement of yarn twist, relation between yarn count, twist and yarn diameter, tensile properties, various type of measuring instruments and their working principles, factors affecting tensile properties, elastic recovery, effect of impact loading and fatigue behavior, yarn friction. Evenness testing of yarns, nature and causes of irregularities, principles and methods of evenness testing, evaluations and interpretation of evenness results, concept of index of irregularity, variance length curves and spectrogram analysis, yarn faults, classification, utility and principle of different types of measuring instruments. Yarn hairiness, principle of measurement, measuring instruments. Test for filament and textured yarn.

Recommended Books:

1. B.P. Saville, 'Physical Testing of Textiles', Woodhead Publishing Ltd. Cambridge, 2002.
2. V.K. Kothari, "Textile Fibers: Developments and Innovations", IAFL Publications, New Delhi, 2000.
3. J.E. Booth, 'Principles of Textile Testing', CBS Publishers and Distributors, New Delhi, 1999.
4. P. Angappan and R. Gopalakrishnan, 'Textile Testing', SSM Institute of Textile Technology, Komarapalayam, 2002.
5. A. Basu, 'Textile Testing', SITRA Coimbatore, 2002.
6. V.K. Kothari, 'Progress in Textile: Science & Technology', Vol. 1, Testing & Quality control, IAFL Publications, New Delhi, 1999.

TEXTILE CHEMICAL PROCESSING-II

Subject Code: BTEXS1-505

L T P C 3 1 0 4

Duration: 60 Hrs.

Course Objectives

1. To describe the objects of sizing and preparatory processes
2. To describe the process sequence in pre-treatment of various types of textiles.
3. To explain the role of various chemicals used in pre-treatment of textiles with their objectives.
4. To explain the importance and evaluation methods of mercerization.

Course Outcomes

At the end of the course students will be able to

1. Illustrate the importance of sizing and pretreatments
2. Describe process sequence in pre-treatment of various types of textiles.
3. Understand objectives various chemicals used in pre-treatment of textiles.
4. Illustrate the importance and evaluation of mercerization.

UNIT-I (15 Hrs.)

Concept of Colour: Visible spectrum, wavelength and blindness of colour. Metamerism/isomerism.

Theories of Colour: Additive and subtractive theories. Primary, secondary, tertiary, complementary and contrasting colours. Tristimulus values of colour. Computer colour matching, Kubelka-Munk equation, reflectance factor, colour-co-ordinates, CIELAB values. Dye uptake on textiles.

UNIT-II (15 Hrs.)

Theory of Dyeing: Dye-fibre interaction, free volume theory.

Dyeing of textiles: Dyeing technology of natural and manmade textiles with direct, reactive, vat, insoluble azoic, sulphur, solubilized vat, acid, metal-complex, basic and disperse dyes.

UNIT-III (15 Hrs.)

Colouration with Pigments. Auxiliaries used in dyeing.

Dyeing of Blends: Classification of blends, shades and methods for dyeing of blends. Suitability of each method for dyeing of specific blend.

Dyeing Machineries: loose fibre, yarn and package dyeing machines. Jigger, winch, jet and HTHP beam dyeing m/cs. Padding mangles.

Identification of Dyes: Identification of dye on dyed natural and manmade textiles.

UNIT-IV (15 Hrs.)

Printing Methods: Hand block, roller and screen printing processes. Construction and working of roller printing machine, photoelectric method of screen preparation. Drawback and advantage of each method.

Print Paste: Constituent and characteristics of print paste, classification and mechanism of working of thickeners.

Printing after Treatments: Importance of steaming, curing, ageing of prints. Mechanism of each process.

Printing Styles: Direct, discharge and resist styles of printing on natural, man-made and blended textiles.

Transfer Printing: Types, mechanism of transfer in each type and machineries. Transfer printing of natural, man-made and blended textiles.

Recommended Books:

1. L.W.C. Miles, 'Textile Printing', Dyers Company Publication Trust, Bradford, England, 1981.
2. V.A. Shenai, 'Technology of Printing', Sevak Publications, Mumbai, 1990.
3. D.M. Nunn, 'The Dyeing of Synthetic Polymer and Acetate Fibres', Dyers Company Publication Trust, London, 1979.
4. J. Shore, 'Cellulosic Dyeing', Society of Dyers & Colourists, Bradford, UK, 1979.
5. A.K. Roy Choudhary, 'Textile Preparation & Dyeing', Science Publishers, USA, 2006.
6. 'Cotton Piece Dyeing', ATIRA.
7. 'Dyeing of Polyester & Cellulose Blends', ATIRA.
8. V.A. Shenai, 'Technology of Dyeing', Sevak Publications, Mumbai.
9. Jose Cegarra, 'The Dyeing of Textile Materials'.
10. E.R. Trotman, 'Dyeing and Chemical Technology of Textile Fibre'.
11. J.N. Chakraborty, 'Fundamentals and Practices in Colouration of Textiles', Woodhead Publishing India Pvt. Ltd.

TEXTILE TESTING LAB -I

Subject Code: BTEXS1-506

L T P C 0 0 2 1

Duration: 20 Hrs.

At least 10 experiments are to be performed by each student

1. To prepare a Bear Sorter diagram and determine the following:
 - ◆ Mean Length
 - ◆ Effective length
 - ◆ Short fibres Percentage
 - ◆ Dispersion Percentage
2. Determine 2.5 % S.L., 50 % S.L., and uniformity ratio of a given cotton using fibro graph. Construct a fibro gram by re-setting the counters for various S.L. between 5 % to 90 %. Compare the fibro gram of manmade fibre with cotton.
3. Determine the micronaire value of a given cotton sample by Air-Flow method. Convert the result into SI units and give a suitable rating to the fibre sample.
4. Determine maturity coefficient and maturity ratio of a given sample by caustic soda method. Give appropriate rating to the fibre sample.
5. Determine Pressley Index of a cotton sample by Pressley Tester at zero and 3 mm gauge length and convert result into tenacity. Compare and comment on the results at different gauge lengths.
6. Determine the bundle strength and elongation of a given manmade fibre using Stelometer. Study the effect of rate of loading on tensile properties of the fibre.
7. Study the imperfections at different sensitivity level for different yarn samples.
8. Prepare yarns Appearance Boards and compare with ASTM standards.
9. Study the hairiness of a given yarns using Hairiness Tester. Compare the results of Evenness Tester and Hairiness Tester with ASTM grade.
10. Determine bending rigidity by (HEART) loop method.
11. Determine the Lea C.S.P by Lea CSP Tester and Auto-sorter and compare the results.
12. Fibre Testing by HVI
13. Determine moisture content/regain of a fibre sample by hot air oven method.
14. Determine crimp (crimp %) of a given manmade fibre sample.
15. Determine fibre fineness of a manmade fibres/filaments by:

- ◆ whole fibre method
 - ◆ vibroscope
16. Tensile properties of a staple fibre by:
- ◆ vibromat
 - ◆ Instron/zwick UTM
- Determine stress relaxation and creep recovery of fibre.

TEXTILE CHEMICAL PROCESSING LAB-II

Subject Code: BTEXS1-507 L T P C 0 0 2 1 Duration: 20 Hrs.

- At least 10 experiments are to be performed by each student
1. To dye the fabric with direct dye and it's after treatment
 2. To dye the fabric with reactive dyes
 3. To dye fabric with Sulphur dyes
 4. To dye cotton with Azoic dyes
 5. To dye cotton with Vat dyes
 6. To dye cotton with Indigoid dyes
 7. To dye wool fibre with Reactive dyes
 8. To dye wool fibre with Acid/Metal Complex dyes
 9. To dye silk with acid dyes / acid mordant dyes
 10. To dye polyester with disperse dyes
 11. To dye nylon with acid dyes / metal complex dye
 12. To dye acrylic with basic dyes
 13. To print cotton fabric with hand block method in direct style
 14. To print cotton fabric with hand block in discharge style
 15. To print cotton fabric with hand block in resist style
 16. Study of fastness properties of different dyed samples

FABRIC MANUFACTURING LAB – III

Subject Code: BTEXS1-508 L T P C 0 0 2 1 Duration: 20 Hrs.

1. Study of Let-off mechanism of shuttle less weaving machine.
2. Study of take-up mechanism of shuttle less weaving machine.
3. Study of weft insertion mechanism of Air-jet loom
4. Study of weft insertion mechanism of rapier weaving machine.
5. Study of selvage formation technique of Air-jet weaving machine.
6. Study of temple motions.
7. Study of pirn changing mechanism.
8. Study of side/centre weft fork mechanism.
9. Study of (4x1) multiple box motion.
10. Identification of fabric faults by fabric inspection machine