PTX6I101   THEORY OF TEXTILE STRUCTURE

Course Objectives:

- To enable the students to understand the fundamentals of the yarn structure, measures of structural parameters and factors influencing them.

- To enable the students to learn about geometry of woven, knitted and nonwoven fabrics and understand the deformation of fabric under stress

Course Outcomes :

Upon completion of the course the student will be able to illustrate :

- Ideal helical model of yarn and different structural parameters
- Method of measuring structural parameters
- Effect of different parameters affecting the structure of yarn and on its properties
- Models proposed for geometry of woven fabrics
- Characteristics of fabric on deformation
- Structural characteristics of knitted and nonwovens
- And design the fabric to get the desired property

Module-I

1. **Geometry of twisted yarn :** Idealized helical yarn structure; yarn count and twist factors, twist contraction; Limits of twist.
2. **Packing of fibres in yarn :** Idealized packing; measurement of packing density and radial packing density of yarn; Packing in actual yarns; Specific volume of yarns; measurement of yarn diameter.
3. **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

Module-II

4. **Structural Mechanics**: 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, **Blended Yarn:** Blended yarn structure, Humburgers Theory.

5. Structure property relationship of ring, rotor, air-jet, friction spun yarn., Extension of continuous filament yarn.

Module-III
6. **Fabric Geometry**: Engineering approach to the analysis of fabric, Pierce geometrical model relationship between h, p, c, Crimp interchange, Jammed Structure, concept of similar cloth. Minimum possible cover factor. Race track geometry, close limit of weaving concept of pierce elastic thread model.
7. Geometry of weft and warp knitted structures, influence of friction on knit geometry.

Module-IV

8. Fabric deformation under tensile stress; prediction of modulus; tensile properties in bias direction.
9. Other fabric deformation – compression, shear, bending and buckling; fabric handle; Spirality and skewness formation and its control.
10. Structure of felts and stitch bonded fabric; Basic of braided fabric structure.

Books Recommended:

1. Hearle J. W. S., "Structural Mechanics of Fibers, Yarns and Fabrics", Wiley-Interscience, New York, 1969.
2. Goswami B. C., "Textile Yarns: Technology, Structure and Applications", Wiley-Interscience, New York, 1977.
3. Jinlian Hu., "Structure and Mechanics of Woven Fabrics", Woodhead Publishing Ltd., 2004.
4. Hearle J. W. S., John J., Thwaites. and Jafargholi Amirbayat., "Mechanics of Flexible Fibre Assemblies", Sijthoff and Noordhoff, 1980.
5. Hassan M. Berery., "Effect of Mechanical and Physical Properties on Fabrics Hand", Wood head publishing Ltd., 2005.

PC   THEORY OF TEXTILE STRUCTURE LABORATORY

1. To study the effect of twist level on structure of ring spun yarns .
2. To study the packing of fibres in real twisted yarn.
3. To determine the specific volume and diameters of twisted yarn.
4. To asses the fibre migration of ring spun yarn.
5. To compare fibre migration behavior of ring spun yarn and rotor spun yarn.
6. To study the tensile behavior and breakage of ring and rotor spun yarn.
7. To study the tensile behavior and breakage of filament yarn.
8. To study the deformation of woven fabric under tensile stress.
9. To analyse the construction of a single & double jersy.
10. To analyze the structure and properties of a needle punched fabric