PTX3I101 FIBRE SCIENCE & TECHNOLOGY-I (3-0-0)

Course Objectives

To enable the students to learn about :

- Fibre forming polymer, textile fibres and their characteristics.
- Natural fibres and their properties & usrs
- Basic concept of manufacturing of regenerated cellulosic fibres, their properties and uses
- Basic concept of manufacturing of synthetic fibres, their pro[erties and uses

Course Outcomes

After successful completion of this course, the students should be able to

- Understand fibre forming polymer , essential and desirable properties of textile fibres and classification of textile fibres.
- Know the sources, chemical composition, properties and uses of different natural fibres.
- Get exposure to manufacturing process of different man-made fibres , their properties and uses.
- Obtain exposure various post spinning operations preferred in man made fibre
- Do the identification of different natural and man-made fibres.

Module-I (12 Hours)

Introduction of fibres. Introduction of polymers. Requirements and essential properties of fiber forming polymers. Essential and desirable properties of textile fibers. Classification of textile fibers.

Natural fibres :

Cotton : Chemical composition; Grading of cotton - Different Varieties including organic as well as Bt cotton. Distinctive properties and end uses

Flax: Extraction process; Chemical composition; Distinctive properties and end uses

Jute: Varieties, Extraction process, Chemical composition ; Distinctive properties and end uses

Module-II (8 Hours)

Wool : Varieties and grading of wool fibres, Chemical composition; Wool scouring. Distinctive properties and end uses

Silk : Varieties of natural silk, Rearing of silk worm, cocooning, silk reeling, throwing and; Chemical composition; Distinctive properties and end uses.

Module-III (12 Hours)

Man-made fibres : Classification of man-made fibres, Basic production systems of the man- made fibre - Melt spinning, solution dry spinning and solution wet spinning - basic principles, brief idea about spinning head, spinneret, quench chamber, & coagulation bath, spin finish application.

a) Brief outline of manufacturing process of regenerated fibers viz.viscose rayon and diverse form of viscose, acetate -rayon, cupra-ammonium rayon. Distinctive properties and end uses

b) Raw material, technology of polymerization and brief outline of manufacturing process and parameters for polyester, nylon 6, nylon 66 and polypropylene. Distinctive properties and end uses of those fibres

c) Raw materials, technology of polymerization and brief outline of manufacturing process and parameters for acrylic fibre by dry spinning. Wet spinning of acrylic. Different solvents and parameters of regeneration bath for wet spinning of acrylic. Distinctive properties and end uses

Module IV (08 Hours)

Drawing and heat setting of fibres: Object of drawing. Concept of neck drawing. Effect of drawing conditions on the structure and properties of fiber. Object of heat setting. Effect of heat setting parameters on the structure and properties of fiber. **Identification of different fibres:** Identification of fibres by feel, microscopic view, burning behavior and solubility test. Effect of alkalis ,acids, oxidizing & reducing agent and water on natural and ma-made fibres.

Books Recommended:

1. Cook Gordon J, "Hand Book of textile fibre", Vol. I and II, Woodhead Fibre Science
2. Series, UK, 1984.
3. "Hand Book of Fibre Chemistry", Ed. M Lewin and E M Pearce, Mercel Dekker Inc.,1998.
4. Shenai V A, " Textile Fibre ", Sevak Publications, Mumbai,
5. W.E. Morton & J.W.S. Hearle, Physical properties of textile fibres, Textile Institute, U.K.
6. Progress in textiles: Science and technology Vol.-2 By Dr. V.K. Kothari, I.I.T. Delhi.
7. Gowariker V R, Viswanathan N V and Sridhar J, "Polymer Science", New Age International Ltd., New Delhi, 1996.
8. Fibre Science and Technology- S P Mishra
9. R.W. Moncrieff - Manmade Fibres
10. Vaidya A A, "Production of Synthetic Fibres", 1st Ed., Prentice Hall of India, New Delhi, 1988.
11. H.F. Mark, S.M. Atlas and E. Cernia," Man-made Fibres Science and Technology, Vol. 1,2,3,"
12. "Manufactured Fibre Technology", 1st Ed. V B Gupta and V K Kothari, 1st Ed., Chapman and Hall, London, 1997.
13. Textbook of Polymer Science by F.W. Billmeyer.