GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Diploma in Engineering

Level: Diploma

Branch: Textile Processing Technology

Course / Subject Code : DI02028011

Course / Subject Name : Textile Fiber Science - II

w. e. f. Academic Year:	2024 – 2025
Semester:	2nd
Category of the Course:	ESC-04

Prerequisite:	The basic element of textile is fibres, which are usually converted in to yarn and then fabric. A textile fibre can be natural or artificial. Textile fibres are either collected or extracted or manufactured from a variety of sources and their quality vary considerably in term of strength, colour, texture, size, shape and surface quality. A textile fibre's physical and chemical properties always have a high impact on characteristics and end use performance.
Rationale:	The knowledge of textile fibres is the basis of the textile manufacturing & processing. To achieve the best quality of textile materials, the diploma engineers must have adequate knowledge of the morphological structure, chemical composition, physical & chemical properties of the various Natural & Synthetic fibres. They need to adopt a relevant methodology for the chemical processing of different fibres. They must also posses' knowledge about the application areas of the fibres. This course is developed in such a way by which fundamental information will help the diploma engineers to apply the basic concepts of textile fibres to solve broad based problems in the textile industry.

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes
01	Classify the various polymers.
02	Classify the man-made fibres.
03	Relate the properties of polyester fibre for suitable chemical wet processes.
04	Relate the properties of polyamides fibre for suitable chemical wet processes.
05	Relate the properties of acrylic fibre for suitable chemical wet processes.

**Revised Bloom's Taxonomy (RBT)*

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Teaching and Examination Scheme:

Teaching Scheme (in Hours)			Total Credits L+T+ (PR/2)	Assessment Pattern and Marks				Total Marks
				Theory		Tutorial / Practical		
L	T	PR	C	ESE (E)	PA / CA (M)	PA/CA (I)	ESE (V)	
2	0	2	3	70	30	20	30	150

Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1.	1.1 Terms of polymer science: Monomers, Polymers, Functionality of monomers, Repeat unit and Degree of polymerization 1.2 Importance of Glass Transition Temperature 1.3 Explain Amorphous & crystalline region in polymers 1.4 Classification of Polymers & Different forms of Polymers 1.5 Copolymers & its Classification 1.6 Differentiate between thermoplastic & thermosetting plastic	6	20
2.	2.1 Characteristics of fibre forming polymers 2.2 Classification of Man-Made Fibres 2.3 Fibre formation: Wet Spinning, Dry Spinning & Melt Spinning 2.4 Importance of stretching and drawing 2.5 Glass Transition Temperature of various textile fibres 2.6 Spun and Filament Yarn	6	20
3.	3.1 Raw material for polyester fibre 3.2 Polymerisation process for polyester fibre 3.4 Spinning process for polyester fibre 3.4 Physical & chemical properties of polyester fibre 3.5 Microscopic View (Longitudinal & Cross-sectional View) 3.6 Chemically Modify Polyester (CD-PET) 3.7 Application of polyester fibre	6	20
4.	4.1 Raw material for Polyamide fibres 4.2 Polymerisation process for Nylon 6 & Nylon 66 fibre 4.3 Spinning process for Nylon 6 & Nylon 66 fibre 4.4 Physical & chemical properties of Nylon 6 & Nylon 66 fibres 4.5 Microscopic View (Longitudinal & Cross-sectional View) 4.6 Application of Nylon 6 & Nylon 66 fibre	6	20

5.	5.1 Raw material for Acrylic fibre 5.2 Polymerisation process for Acrylic fibre 5.3 Spinning process for Acrylic fibre 5.4 Physical Properties, Chemical Properties of Acrylic fibre 5.5 Microscopic View (Longitudinal & Cross-sectional View) 5.6 Applications of Acrylic fibre	6	20
	Total	**30**	**100**

Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks (in %)					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
40	**40**	**10**	**10**	**0**	**0**

Where R: Remember; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create (as per Revised Bloom's Taxonomy)

References/Suggested Learning Resources:

(a) Books:

1. A Text-Book of Fibre Science & Technology - S. P. Mishra
2. Textile Fibres (Vol. – I) - V. A. Shenai
3. Hand Book of Textile Fibres (Vol. – II) - J. Gordon Cook

(b) Open source software and website:

1. www.nptel.iitm.ac.in
2. https://ndl.iitkgp.ac.in
3. www.textileschool.com
4. www.textileguide.chemsec.com

Suggested Course Practical List:

1. Identify the class of fibre by burning test. (Polyester)
2. Identify the class of fibre by burning test. (Polyamide)
3. Identify the class of fibre by burning test. (Acrylic)
4. Prepare a microscopic Views (Longitudinal & Cross sectional) of polyester fibre.
5. Use chemical tests to identify polyester fibre.
6. Determine moisture regain & moisture content of the given polyester fibre samples.
7. Prepare a microscopic Views (Longitudinal & Cross sectional) of polyamide fibres.
8. Use chemical tests to identify polyamides fibre.
9. Determine moisture regain & moisture content of the given polyamides fibre samples.
10. Prepare a microscopic Views (Longitudinal & Cross sectional) of acrylic fibre.
11. Use chemical tests to identify acrylic fibre.
12. Determine moisture regain & moisture content of the given acrylic fibre samples.

List of Laboratory/Learning Resources Required:

1. Electric Oven
2. Desiccator
3. Electronic Weighing Balance
4. Suitable Glassware

Suggested Project List:

1. Technique of polymerization
2. Prepare a detailed classification of Synthetic Textile fibres on a full imperial sheet & Give example of each type of fibre with samples.
3. Prepare a Comparative table for physical properties of different synthetic fibres.
4. Prepare a Comparative table for Chemical properties of different synthetic fibres.
5. Study microscopic views of different synthetic textile fibres.
6. Applications of various synthetic textile fibres.
7. Literature survey of elastomeric textile fibres.

Suggested Activities for Students: If any

1. Collect 5 different synthetic fibres and measure its moisture content & moisture regain.
2. Compare hygroscopic nature of synthetic fibres with natural fibres and reflect your views.
3. Measure the denier of synthetic fibres and summarise.
4. Collect different samples of synthetic and natural fabrics and measure their GSM and Wt/Mtr.

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