

GUJARAT TECHNOLOGICAL UNIVERSITY

BRANCH NAME: TEXTILE PROCESSING
SUBJECT NAME: INSTRUMENTAL ANALYSIS IN TEXTILE PROCESSING
(DEPARTMENTAL ELECTIVE - II)
SUBJECT CODE: 2172806
B.E. 7th SEMESTER

Type of course: Textile Processing Engineering

Prerequisite: Zeal to learn the subject

Rationale: This subject includes the analysis and characterization various textile auxiliaries and textile materials. Various instrumental analytical methods such as spectroscopy, microscopy, chromatography, thermal analysis etc are employed. This subject covers basic principles behind working of these instruments, applications and interpretations of results. Quantitative evaluation by these methods is also studied.

Teaching and Examination Scheme:

Teaching Scheme			Credits C	Examination Marks						Total Marks
L	T	P		Theory Marks			Practical Marks			
				ESE (E)	PA (M)		ESE (V)		PA (I)	
					PA	ALA	ESE	OEP		
3	0	2	5	70	20	10	20	10	20	150

L- Lectures; T- Tutorial/Teacher Guided Student Activity; P- Practical; C- Credit; ESE- End Semester Examination; PA- Progressive Assessment; OEP-Open Ended problem; AL-Active learning.

Content:

Sr. No.	Content	Total Hrs.	Weightage (%)
1.	Introduction: Importance of instrumental characterization of textile materials, textile auxiliaries and chemicals. Various instrumental techniques.	06	16.7
2.	Application of Spectroscopy: Principal and applications of various spectroscopic methods such as IR, FTIR, NMR, Electron Spectroscopy (ESCA) etc.	06	16.7
3.	Application of Microscopy: Principle and working of SEM, TEM, AFM, FFM, ECFM etc.	05	13.9
4.	Applications Of Chromatography: Principle and working of paper chromatography, TLC, HPCL, GC, GPC etc.	05	13.9
5.	Principal and applications of X-ray diffraction techniques in the study of fine structure of fibres and polymers.	05	13.9
6.	Thermal Analysis: Principle, working and applications of DSC, DTA, TGA etc.	05	13.9

7.	Particle size analyzer: Principle, working and applications of zeta sizer for nano particle size determination.	04	11
----	--	----	----

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
12	14	10	14	12	08

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Books:

1. Hand Book of Analysis of Synthetic Polymer and Plastics- J. Urbanski
2. Modern Textile Characterization Methods-Mastura Raheel
3. Advances in Fibre Science.- S. K. Mukhopadhyay
4. Man-made Fibres- R. W. Moncrieff

Course Outcome:

After learning the course the students should be able to:

1. Understand the fundamental principle of working of various instrumental analysis techniques.
2. Select the correct test method for a given specimen.
3. Perform the test.
4. Interpret the data obtained from instrumental out puts.
5. Characterize the interaction of textile fibres with different chemicals and/or the modification of fibres due to various chemical reactions.

List of Experiments:

1. To synthesize different molecular weight poly acrylamide and determine their viscosity average molecular weight.
2. To determine the critical dissolution time (CDT) of polyester, acrylic, nylon and polypropylene fibres.
3. To determine the densities of polyester, acrylic, nylon and polypropylene materials.
4. To determine the melt flow indices of polyester, acrylic, nylon and polypropylene materials.
5. To study the refractive indices of polyethylene glycol of different grades.
6. To study the paper chromatography for the separation of dyes from a mixture.
7. To find out the BOD values of polyacryl amide
8. To degree of polymerization and molecular weight of polyvinyl acetate.
9. To find out the retention of cross linking agent on cotton fabric.

Design based Problems (DP)/Open Ended Problem:

1. To synthesize grafted fibres and analyze the product using sophisticated instruments.

2. To synthesize copolymer of polyvinyl acetate using different co monomers such as acryl amide, acrylic acid etc and study their instrumental analysis and performance.
3. To study the thermal degradation of polymer to correlate with its structural changes.
4. To examine the chemically modified fibres under SEM.

Major Equipments: AAS, FTIR, BOD incubator, Oven, Visible spectrophotometer, Electronic balance, Glass apparatus etc, density gradient column, refractometer, MFI, viscometers, TLC papers etc.

List of Open Source Software/learning website:

1. <http://www.wto.org/>
2. <http://www.wtin.com/>
3. <http://textileinformation.blogspot.in/>
4. <http://www.fibre2fashion.com/>
5. <http://textilelearner.blogspot.in/>
6. <http://www.fashion-era.com/>

ACTIVE LEARNING ASSIGNMENTS: Preparation of power-point slides, which include videos, animations, pictures, graphics for better understanding theory and practical work – The faculty will allocate chapters/ parts of chapters to groups of students so that the entire syllabus to be covered. The power-point slides should be put up on the web-site of the College/ Institute, along with the names of the students of the group, the name of the faculty, Department and College on the first slide. The best three works should submit to GTU.