GUJARAT TECHNOLOGICAL UNIVERSITY

BRANCH NAME: TEXTILE PROCESSING
SUBJECT NAME: TECHNOLOGY OF DYEING - III
SUBJECT CODE: 2182801
B.E. 8th SEMESTER

Type of course: Textile Processing Engineering

Prerequisite: Zeal to learn the subject

Rationale: This subject refers to the chemistry of dyeing. The dye-fibre bonding is also a part. The compatibility of dyes to a particular fibre is also involved in the subject. Various parameters and aspects of Kinetics and thermodynamics of dyeing are the heart of the course.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
L	T	P	C	Theory Marks			Practical Marks			
				ESE (E)	PA(M)		PA (V)		PA (I)	
					PA	ALA	ESE	OEP		
4	0	3	7	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	Nature of Dye Fibre Bonds: Physical, Chemical and Mechanical Forces	08	14
2	Kinetics and Thermodynamics of Dyeing Process: Introduction, Laws of Diffusion , Diffusion in Steady State and Non Steady State, Influence of Various Factors, Adsorption Isotherms, Affinity, Heat of Dyeing, Entropy of Dyeing	12	21.5
3	Donnan Theory of Membrane Equilibrium	12	21.5
4	Study of Thermodynamic and Kinetic Aspects of Various Dyes - Fibre Systems such as Direct, Vat, Reactive, Azoic Dyes on Cellulose, Acid Dyes on Nylon and Wool, Cationic Dyes on Acrylic Fibres and Disperse Dye on Polyester. Concept of Cohesive Energy Density and Solubility Parameter in Polyester Dyeing	14	25
5	Compatibility of Dyes on Different Groups on Fibres eg. Acid Dyes on Nylon, Direct Dyes on Cotton, Disperse Dyes on Polyester & Cationic Dyes on Acrylic & CDPET Fibres	10	18

Suggested specification table with marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level

15	17	10	08	10	10

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. Chemistry of the Textile Industry - C. M. Carr
2. Theory of Colouration of Textiles - Alan Johnson
3. Dyeing of Textile Materials, the Scientific Basis and the Techniques of Application - Ceggara Jose
4. Dyeing & Chemical Technology of Textile Fibres - E.R.Trotman
5. Chemistry of Dyes and Principle of Dyeing - V. A. Shenai

Course outcome:

After learning the content of the subject the students will be able to:

1. Understand the very fundamentals of textile coloration.
2. Learn the physico-chemical principles of textile dyeing process.
3. Quantify the unique properties of dyes and fibers by using kinetics and thermodynamics of dyeing.
4. Understand the influence of process parameters on quality and economy of dyeing.
5. Optimize the process parameters and to achieve right first time dyeing.

List of Experiments:

1. Calibration Chart Preparation of Tertiary Colours using reactive Dyes.
2. (**Three Lab** for three different range of mixture shades)
3. Calibration Chart Preparation of Tertiary Colours using Disperse Dyes.
4. To match the given shade on cotton with reactive dyes using calibration chart.
5. (**Three lab** for three different shades)
6. To match the given shade on Polyester with reactive dyes using calibration chart.
7. Solid Shade Dyeing on Polyester/Cotton Blend Using Disperse/reactive System.
8. Cross Dyeing of Polyester/Nylon Blend.
9. Cross Dyeing of Polyester/CDPET Blend.

Design based Problems (DP)/Open Ended Problem:

1. To determine the rate of dyeing and diffusion coefficient of a few cotton dyes.
2. To determine the compatibility index of ionic dyes.
3. To Study leveling behavior of various disperse dyes on polyester.
4. To carry out microscopic characterization of dyed fiber for study of dye penetration under the influence of a specific set of process parameters.

Major Equipments: Water heating bath, Laboratory H.T.H.P beaker dyeing machine, Laboratory Hank Dyeing machine, scientific weighing balance, 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.