GUJARAT TECHNOLOGICAL UNIVERSITY

Master of Engineering
Subject Code: 3722516
Semester – II
Subject Name: Advanced Chemical Processing

Type of course : Elective

Prerequisite : Basic knowledge of Various Textile Chemical Processes at BE level

Rationale : Advanced chemical processing covers most of the industrial practices and their advancement in to the subject along with advancement in specialty kind of processes.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE (E)	PA (M)	ESE (V)	PA (I)	
3	0	2	4	70	30	30	20	150

Content:

Sr. No.	Content	Total Hrs
1	CHEMICAL PROCESSING OF SYNTHETIC AND BLENDED TEXTILES Various preparatory processes for manmade textile, dyeing of pet, nylon and acrylic, dyeing of blends practical problems and their solutions. Dyeing of polyester with cationic dyes. Printing of synthetic and blended fabrics with different dye classes - direct, resist and discharge styles of printing - transfer printing of polyester and blends. Different functional and easy care finishes on synthetics and blends like anti-static, soil-release, soil resistant, flame-retardant.	8
2	ENZYME TECHNOLOGY FOR TEXTILE PROCESSING Nomenclature and classification of enzymes; characteristic features of enzymes; basics of kinetics of multi-substrate enzyme-catalysed reactions. Enzymes for cotton fibre chemistry and structure of cotton fibre; enzymes for other fibers enzymes for processing and functionalizing protein fibres; enzymatic modification of polyester, polyamide, polyacrylonitrile and cellulose acetate fibres.	7
3	ADVANCES IN PROCESSING MACHINERY Advances in fiber dyeing machine - Advances in Beam dyeing - Advances in soft flow dyeing machines, Advances in jet dyeing machines — Developments in 8jiggers, Continuous dyeing machineries & its developments—Principle and working of fully automatic flatbed screen printing machine –Rotary Printing machine, Transfer Printing Machine-Garment Printing machines- Garment dyeing machines, Tumble dryer, Fusing machines, Backfilling machine	8

4	ADVANCES IN TEXTILE PRINTING Ink jet printing-evolution of digital printing, Comparison with conventional printing techniques, theoretical foundations for inkjet technologies- Continuous and drop on demand technologies, Pretreatment of substrates for inkjet printing; Ink jet heads, Inks used for printing- dye fibre interaction, surface energy of inks, dye ink formulation; fixation procedures for inks on substrates; Special printing techniques- Developments in Photo printing, Blast printing with Indigo, Developments in Xerox printing and Laser printing for fancy effects	**8**
5	ADVANCED FINISHING TECHNOLOGY Commercial importance of finishing – Advances in Resin finishing, Mechanism of creasing, Types of Resins, Anti crease, wash and wear, durable press resin finishing. Concept of Flame proof & flame retardancy. Concept of pyrolysis, Flame retardant finishes for cotton, Concept of waterproof and water repellent Finishes, Durable water repellent finishes on cotton, Soil Release Finishing: Mechanism of soil retention & soil release. Various soil releases finishes for cotton, Polyester and its blends. Study about mechanical finishing of textile materials like calendaring, compacting, Sanforising, Beach finishing. Object of Heat setting.	**8**
6	EFFLUENT TREATMENT Introduction. Flow chart of effluent treatment processes. Primary, Secondary and Tertiary treatments. Evaporation and Reverse osmosis. Colour removal in waste water. Recovery and reuse of water. Advances in Effluent Treatment. Introduction to concept of eco-friendly textile, Norms for effluent discharge.	**4**

Reference Books:

1. Chemical technology in the pre- treatment processes of textiles, S.R.Karmakar
2. Technology of bleaching and mercerizing, Vol. III, V. A. Shenai
3. Textile scouring and bleaching, E. R. Trotman
4. Technology of Dyeing, Vol. IV, V. A. Shenai
5. Dyes & Pigment : new research, Arnold R lang
6. Technology of Printing, Vol. IV, Dr. V. A. Shenai.
7. Technology of Finishing, Dr. V. A. Shenai.
8. Textile Finishing, Dr. Nalankilli

Course Outcomes:

Sr. No.	CO statement	Marks % weightage

CO-1	Understand the need, significance and detailed process of wet preparatory processes like desizing, scouring, bleaching, optical brightening, etc	20
CO-2	Analyze and Compare different methods for the said preparatory processes from techno-commercial point of view.	20
CO-3	Know about various machineries used for various wet processes.	20
CO-4	Know the object, significance and technical need of the textile printing; Different ingredients required to get print; various styles and methods of printing	20
CO-5	Know the principle, techno-physical aspects, machineries and application process of different mechanical finishes on natural, regenerated and synthetic textiles.	20

List of Experiments:

1. To carry out Acid and enzymatic Desizing of cotton fabric.
2. To carry out bleaching of scoured cotton fabric using hydrogen peroxide.
3. To carry out dyeing of cotton fabric using vat dye.
4. To carry out dyeing of Nylon fabric using acid dye.
5. To carry out dyeing of polyester fabric using disperse dye.
6. To carry out dyeing of acrylic yarn using basic dye.
7. To produce tone in tone effect on cotton fabric using hot brand reactive dye.
8. To carry out printing of polyester fabric by direct style with disperse dyes.
9. To carry out white & colour discharge printing on polyester fabric.
10. To impart temporary and permanent stiff finish to the cotton fabric using suitable stiffening agents.
11. To impart crease resistant and durable press finish to cotton fabrics.
12. To impart water repellant finish on textiles using aluminum soap.

Major Equipment:

Water Heating Bath, Kier, Padding Mangle, HTHP Beaker Dyeing Machine, Oven, HTHP Steamer, Etc.

List of Open Source Software/learning website:

http://nptel.iitm.ac.in, World Wide Web, Google Search Engine etc.