

ANNA UNIVERSITY, CHENNAI

AFFILIATED INSTITUTIONS

R - 2013

B. TECH. TEXTILE CHEMISTRY

SEMESTER – VII

CODE	COURSE TITLE	L	T	P	C
THEORY					
TC6701	Water and Effluent Treatment and Pollution Control	3	0	0	3
TT6701	Total Quality Management for Textile Industry	3	0	0	3
TC6702	Process and Quality control in Textile Wet Processing	3	0	0	3
TT6702	Operation Research for Textile Industry	3	0	0	3
	Elective II	3	0	0	3
	Elective III	3	0	0	3
PRACTICALS					
TC6711	Product Development Laboratory	0	0	3	2
TC6712	Problem Analysis and Case Studies in Wet Processing Laboratory	0	0	3	2
TC6713	Mini project	0	0	3	2
	TOTAL	18	0	9	24

ELECTIVE II

CODE	COURSE TITLE	L	T	P	C
TC6004	Technical Textiles	3	0	0	3
TC6005	Fibre Reinforced Composites	3	0	0	3
TC6006	Clothing Science and Product Engineering	3	0	0	3

ELECTIVE – III

CODE	COURSE TITLE	L	T	P	C
TC6007	Nonwoven Fabrics and specialty Fabrics	3	0	0	3
TC6008	Advanced Wet Processing Machinery	3	0	0	3
TC6009	Energy Management and Conservation in Textile Industry	3	0	0	3

TC6701 WATER AND EFFLUENT TREATMENT AND POLLUTION CONTROL L T P C
3 0 0 3

OBJECTIVES:

- To impart awareness about the pollution created by different stages of wet processing
- To familiarize the students about the importance of water and its analysis
- To enable the students to understand about the waste water treatment plants and various treatments carried out

UNIT I

9

Constituents of water and their effect on Textile wet processing –Water pollution – programmes which includes WHO, ISO standards for raw water criteria – Effluent discharge standards for inland surface water public sewers, on land for irrigation, marine coastal areas and drinking water parameters – Quality requirements of water for cotton and synthetic Textile processing . Water softening .Water analysis- Colour, pH value, dissolved solids, suspended solids, total hardness (Calcium + Magnesium)- EDTA method, total iron-thiocyanate method, Alkalinity, acidity , chlorides dissolved oxygen , BOD and COD.

UNIT II

9

Characteristics and treatment of cotton, synthetics and wool processing effluents. Reduction of pollution load. Introduction - Textile Effluent treatment methods-. Primary treatment methods - screening, sedimentation, equalisation, neutralisation, coagulation and flocculation.

UNIT III

9

Secondary treatment methods – Trickling filtration, Activated sludge process, aerated lagoons, secondary sedimentation, oxidation ponds, Anaerobic Digestion, sludge disposal, removal of interfering substances in secondary biological treatment.

UNIT IV

9

Tertiary treatment – Evaporation (solar and steam). Membrane technologies (MF, UF, NF & RO) ,Reverse osmosis, ion exchange and activated carbon treatment. Model schematic diagram for – Wastewater treatment plant for textile mills – Primary and Secondary units & Tertiary treatments, Quality parameters at entry and exit of RO. Chlorine trioxide treatment, ozone treatments, enzymatic decolourisation.

UNIT V

9

Air Pollution – Gaseous and Aerosols – Effects of air pollution – Effect of Sulphur oxide on human health – Properties of air pollutants – control of air pollutants – Air pollution control equipment – Ambient air quality standards – Emission limits at chimney level –Noise pollution – Types of noise (Steady state noise – Impulse noise) –ill effects of noise –Noise measurement – Control of noise pollution – Shape noise levels in decibels.

TOTAL : 45 PERIODS

OUTCOMES:

Upon completion of the course, the students will be able to

- Understand the textile processing related causes for pollution
- Understand the effluent discharge standards and different processes involved in waste water treatment
- Perform the research and development to produce zero discharge effluents

TEXTBOOKS:

1. Rao,C.S., “Environment Pollution control Engineering”, New age International Ltd. and Publishers, N.Delhi, 2004.
2. Reife, A., and Freeman, H.S., (Ed)., “Environmental chemistry of dyes and pigment”, Wiley., London, 2000, ISBN: 047158276.

REFERENCES:

1. Horrockks, A.R (Ed)., “Ecotextiles’98: Sustainable development”, The Text.Inst., Manchester 1999, ISBN: 1855732426.
2. Modak.P., “The textile industry and the environment”, UNEP:HMSO, Blackwells, Leeds, 2003, ISBN: 9280713671

TT6701

TOTAL QUALITY MANAGEMENT FOR TEXTILE INDUSTRY

**L T P C
3 0 0 3**

OBJECTIVES:

- To enable the students to understand about total quality management, different TQM tools and techniques and Quality standards
- To train the students to apply TQM tools in textile industry

UNIT I	INTRODUCTION	9
Introduction - Need for quality - Evolution of quality - Definition of quality - Dimensions of product and service quality - Basic concepts of TQM – TQM Framework - Contributions of Quality Gurus – Barriers to TQM – Cost of Quality.		
UNIT II	TQM PRINCIPLES	9
Quality statements - Customer focus –Customer orientation, Customer satisfaction, Customer complaints, Customer retention - Continuous process improvement – PDCA cycle, 5S, Kaizen - Supplier partnership – Partnering, Supplier selection, Supplier Rating.		
UNIT III	TQM TOOLS & TECHNIQUES I	9
The seven traditional tools of quality – New management tools – Six-sigma: Concepts, methodology, applications to spinning, weaving, chemical processing and garment industries – Bench marking – Reason to bench mark, Bench marking process – FMEA - Stages, Types		
UNIT IV	TQM TOOLS & TECHNIQUES II	9
Quality circles – Quality Function Deployment (QFD) – Taguchi quality loss function – TPM – Concepts, improvement needs – Performance measures – BPR; application of TQM tools in textile industry.		
UNIT V	QUALITY SYSTEMS	9
Need for ISO 9000- ISO 9000-2000 Quality System – Elements, Documentation, Quality auditing- QS 9000 – ISO 14000 – Concepts, Requirements and Benefits - Quality Council – Leadership, Employee involvement – Motivation, Empowerment, Team and Teamwork, Recognition and Reward.		

TOTAL : 45 PERIODS

OUTCOMES:

Upon completion of the course, the students will be able to

- Understand the principle of TQM, different TQM tools and techniques
- Develop innovative tools to implement TQM in the textile industry

TEXTBOOKS:

1. Dale H.Besterfield, et al., “Total Quality Management”, Pearson Education Asia, Third Edition, Indian Reprint , 2006.
2. Suganthi,L and Anand Samuel, “Total Quality Management”, Prentice Hall (India) Pvt. Ltd., 2006

REFERENCES:

1. James R. Evans and William M. Lindsay, “The Management and Control of Quality”, (6th Edition), South-Western (Thomson Learning), 2005.
2. Oakland, J.S. “TQM – Text with Cases”, Butterworth – Heinemann Ltd., Oxford, Third Edition , 2003.
3. Janakiraman,B and Gopal, R.K, “Total Quality Management – Text and Cases”,Prentice Hall (India) Pvt. Ltd., 2006.

TC6702 PROCESS AND QUALITY CONTROL IN TEXTILE WET PROCESSING L T P C
3 0 0 3

OBJECTIVES:

- To enable the students to learn about the process control at machinery involved in the chemical processing
- To familiarize the students about the importance of process control and quality control
- To enable the students to learn the various quality control tests involved in chemical processing

UNIT I

9

Definition of Process control and Quality control – Need for quality control in textile wet processing – Flow charts indicating Process control and Quality control tests to be carried out in Desizing, Scouring, Bleaching, Souring, Mercerizing, Dyeing, Printing and finishing – Identification and estimation of residual starch – Determination of weight loss during Desizing and Scouring – Estimation of Residual Wax content and Total wax content by Soxhlet extraction method – Estimation of Copper number – Determination of Cuprammonium fluidity – Determination of Acid groups by methylene blue absorption method – Absorbency tests by Drop test method and wicks method.

UNIT II

9

Determination of ash content – Determination of Whiteness and Whiteness retention - Determination of Barium Activity number – Shrinkage of fabric – Determination of Light fastness by xenon Arc lamp – Determination of fastness to Washing – Determination of fastness to Dry and Wet rubbing – Determination fastness to Alkaline and Acidic Perspiration – Determination fastness to Hot pressing – Determination fastness to Dry cleaning and sublimation.

UNIT III

9

Determination of efficiency of Water Proofing – Determination of efficiency of Flame Proofing – Determination of efficiency of Starching, by Bending length method – Determination of efficiency of Resin finishing by CRA. Estimation of residual formaldehyde present in resin finished fabric. Evaluation of efficiency of wetting agent by Sinking Time method – Evaluation of Dispersing agent – Evaluation of efficiency of detergents by Foam stability test – Identification of various fibres like Cotton, Viscose, Polyester, Wool, Acrylic and Nylon – Quantitative and Qualitative analysis of mixtures of blends like P/C, P/V, Acrylic/Cotton, Cotton/Viscose/Wool and Nylon/Acrylic/Cotton.

UNIT IV

9

Estimation of Purity of dyes by Dyeing Trails and by using Spectrophotometer. Concept of Computer Colour matching – Advantages of Computer colour matching system and its limitations – Working principle of computer colour matching – Estimation of purity of Sodium Hydrosulphite, Sodium Nitrite, Sodium silicate – Estimation of strength of Hydrogen peroxide, Estimation of available Chlorine in Hypochlorite solution. Identification of dyes on Cellulose fibre, Protein fibre and synthetic fibre.

UNIT V

9

Necessary of Eco-friendly processing – Concept of Eco-Friendly processing – The German Ban – List of banned Amines and Chemicals – Alternatives – Eco-labelling.-Tolerance limits of chemicals and auxiliaries in the export fabrics – Possible sources of contamination of red listed chemicals – ISO 14000 certification. Brief mention about the instruments used for measuring the various eco-parameters.

TOTAL : 45 PERIODS

OUTCOMES:

Upon completion of the course, the students will be able to

- Measure the quality particulars of textile material at different stages of chemical processing and know the standards
- carry out the various process and quality control measures during the chemical processing of textile materials

TEXTBOOKS:

1. Vaidya A.A. and Datye, K.K “Chemical processing of synthetic and blends”, John Wiley and Sons, New York, 1995.
2. Shenai V.A. – Technology of Textile Processing, Vol.8 Evaluation of Textile Chemicals, Edn.3, Sevak Publications, Mumbai 1995.

REFERENCES:

1. Indian Standard Institution (Delhi) – ISI Handbook of Textile Testing, Indian Standards Inst., New Delhi, 2004
2. AATCC Technical manual, 2008 Association of Textile chemists and Colorists. USA.
3. Orientation Programme on Wet Processing-Quality & Process Control, BITRA Publications. 1986

TT6702

OPERATION RESEARCH FOR TEXTILE INDUSTRY

L T P C
3 0 0 3

OBJECTIVES:

To enable the students to learn about

- Various operations research (OR) methods that can be applied in the textile industry
- Designing of OR problem related to textile industry
- Method of solving OR problems

UNIT I

9

Scope of operation research, applications, limitations; linear programming problems – construction, solutions by graphical method, simplex method, Big M method; sensitivity analysis; application of LP technique for mixing optimization in spinning mill

UNIT II

9

Transportation problem – construction, initial basic feasible solution – North West Corner rule, lowest cost entry method, Vogel's Approximation Method; optimality test - MODI method, stepping stone method; replacement analysis

UNIT III

9

Assignment problem – construction, solution by Hungarian method, application in textile industry; sequencing problems; integer programming – construction, solving by cutting plane method

UNIT IV

9

Game theory- two person zero sum games, solving by matrix method, graphical method; Decisions theory - decisions under assumed certainty, decision under risk, decision under uncertainty, illustrations from textile industry; inventory control - EOQ models-deterministic models –probabilistic models

UNIT V

9

Project planning and control models: CPM, PERT – network representation, determining critical path, project duration; crashing of project duration; resource leveling

TOTAL : 45 PERIODS

OUTCOMES:

Upon completion of the course, the students will be able to

- Design operations research problems that can be applied to textile industry.
- Solve the OR problems

TEXTBOOKS:

1. Hamdy A Taha, "An Introduction to Operations Research, Prentice Hall, 8th Edition.
2. Panneerselvam R., "Operations Research", Prentice Hall of India, 2002
3. Sharma J. K., "Operations Research: Theory and Applications", Macmillan, 1997

REFERENCES:

1. Hillier and Lieberman, "Introduction to Operations Research", McGraw-Hill International Edition, Seventh Edition, 2001
2. W.J. Fabrycky, P.M. Ghare & P.E. Torgersen, "Applied Operation Research and Management Science", Prentice Hall, New Jersey, 1984
3. Tulsian P.C., "Quantitative Techniques Theory and Problems", Dorling Kindersley (India) Pvt. Ltd., 2006
4. Ronald L. Rardin, "Optimization in Operations Research", Pearson Education, 1998
5. Srivastava U.K., Shenoy G.V., Sharma S. C., "Quantitative Techniques for Managerial Decision", Second Edition, New Age International (P) Ltd., 2007
6. Gupta P. K., Hira D.S., "Problems in Operations Research", S. Chand & Company, 2002
7. Mustafi C.K., "Operations Research: Methods and Practice", 3rd Edition, New Age International (P) Ltd., 2007

TC6711

PRODUCT DEVELOPMENT LABORATORY

L T P C
0 0 3 2

OBJECTIVE:

To practice the students in developing the textile products based on wet processing

LIST OF EXPERIMENTS

1. Development of Low temperature peroxide bleaching in soft flow
2. Development of combined desizing and scouring using bio technology
3. Development of dyeing of cotton fabric with Jigger
4. Development of dyeing of cotton fabric with Winch
5. Development of one bath dyeing of PET / CO blends
6. Development of producing of aroma / Ayurvedic finishing on textile materials

TOTAL: 45 PERIODS

OUTCOME:

Upon completing this practical course, the student would be able to develop textile products using dyeing, finishing with special finishes

LIST OF EQUIPMENT FOR BATCH OF 30 STUDENTS

1. Jigger
2. Winch
3. Padding mangle
4. Soft flow dyeing machine
5. Water Bath
6. Beaker dyeing machine
(Each one equipment)

TC6712

**PROBLEM ANALYSIS AND CASE STUDIES IN
WET PROCESSING**

L T P C
0 0 3 2

OBJECTIVE:

To expose the students to analysis of problems related to chemical processing of textile materials.

LIST OF EXPERIMENTS

1. Analyse the Problem & Case Studies in Desizing
2. Analyse the Problem & Case Studies in Scouring
3. Analyse the Problem & Case Studies in Bleaching
4. Analyse the Problem & Case Studies in Mercerizing
5. Analyse the Problem & Case Studies in Dyeing
6. Analyse the Problem & Case Studies in Printing
7. Analyse the Problem & Case Studies in Finishing (Mechanical and Chemical finishing)

REFERENCE:

Critical solution in Dyeing of Cotton Textile materials, R.Shamey & T.Hussg in Textile Progress Vol. 37 July 2005 Page 1-84.

OUTCOME:

Upon completing this practical course, the student would be able to analyse the problems and find solutions for problems related to wet processing of textile materials.

LIST OF EQUIPMENT FOR BATCH OF 30 STUDENTS

1. Padding mangle
 2. Beaker Dyeing Machine
 3. Hot air oven
 4. Water Bath
 5. Table screen Printing
 6. Soft flow Dyeing Machine
 7. IR Dyeing Machine
 8. Steamer
 9. Weighing Balance
 10. Tensile strength tester
 11. Jigger
 12. Winch
 13. Laundro Meter
 14. Crock meter
- (Each one machine)

ELECTIVES

TC6004 TECHNICAL TEXTILES L T P C

3 0 0 3

OBJECTIVE:

To enable the students to learn about production, properties & application of various technical textile products viz., tyre cords, fabrics, belts, filter fabrics and medical textiles.

UNIT I HIGH PERFORMANCE FIBRE 9

Manufacture of glass filaments and staple fibre - manufacture of staple fibre yarn properties and applications of filament and staple fibre yarns. Asbestos Thread: Manufacturing process - properties and applications of asbestos yarn. Ultra High Modulus fibres - Carbon fibres - Aramid and related fibres.

UNIT II TYRE CORDS AND FABRICS 9

Requirements of tyre cord - suitability of various fibres-Polyester and Nylon tyre cords - manufacture of tyre cords - physical and mechanical property requirements of tyre cord fabrics- fabric design - Specifications - Rubberised textiles.

UNIT III BELTS 9

Conveyor belts - physical and mechanical properties-construction, manufacture of conveyor belts & power transmission belts. HOSE: Construction, applications and properties (physical and mechanical).

UNIT IV FILTER FABRICS 9

General consideration of filtration of solids from liquids, solid from gases, solids from solids, liquids from liquids, liquids from gases and gases from gases.

PROTECTIVE CLOTHING: Fire protection-thermal protection - electro-magnetic protection - water proof fabrics - protection against microorganisms, chemicals and pesticides - protection against aerosols.

UNIT V MEDICAL TEXTILES 9

Surgical Textiles - Suture threads, Cardio Vascular Textiles - Knitted cardiac biological valves. Dialysis Textiles- Hollow fibres as dialysis membrane. Hospital Textiles - Operation and post operation clothing—disposable draperies; sanitary applications.

GEO-TEXTILES: Geo Textile functions - raw materials - woven, non-woven and knitted geo textiles- Applications of geo-textiles for drainage, separation, soil reinforcement, filtration and erosion control. Textile materials in foot-wear, automotive, agriculture and maritime applications.

TOTAL : 45 PERIODS

OUTCOMES:

Upon completion of the course, the students will be able to

- Understand different high performance fibres and their properties
- Explain various method of production of technical textiles, their properties and applications

TEXT BOOKS:

1. Horrocks A. R., Anand S.C., "Handbook of Technical Textiles", Woodhead Publishing, Cambridge, 2000
2. Adanur S., "Handbook of Industrial Textiles", Technomic Publication, Lancaster, 2001

REFERENCES:

1. Kanna M.C., Hearle, O Hear., Design and manufacture of Textile Composites, Textile progress , Textile Institute, Manchester, April 2004.
2. Scott, Textile for production, Textile progress , Textile Institute, Manchester, Oct. 2005.
3. Shishoo, Textile in spot, Textile progress, Textile Institute, Manchester, Aug. 2005
4. Fung W., Collins & Aikman Textiles in Automotive Engineering ,Woodhead Publishing Ltd., UK, 2000.

5. Kennady, Anand Miraftab, Rajandran, Medical Textile & Biomaterials for Health care, Woodhead publishing Ltd., UK, 2005

TC6005

FIBRE REINFORCED COMPOSITES

L T P C
3 0 0 3

OBJECTIVES:

To enable the students to learn about

- Reinforcements, matrices used for the composites
- Manufacture of composites and
- Mechanics of failure of composites

UNIT I INTRODUCTION

9

Types of composites - fibre particulate and laminar composites - examples. Fibre composites: Constituents - functions of fibre and matrix — Properties of fibres — Critical fibre length - Aligned and random fibre composites — property prediction - rule of mixtures — simple problems.

UNIT II COMPOSITE MATERIALS

9

Types of high performance fibres - properties - types of matrix materials – Thermoset and Thermo plastics properties — short fibre composites — fibre matrix interface — coupling agents — coupling of interfaces and interfacial reaction in fibre composites - tensile strength of continuous and discontinuous composites -fracture mode in fibre composites.

UNIT III PREPREGS

9

Introduction to manufacturing techniques - property requirements — Textile preforms - weaving, knitting and braiding.

UNIT IV COMPOSITE MANUFACTURING TECHNOLOGY

9

Vacuum bagging - compression moulding — injection moulding - pultrusion – thermoforming — filament winding - resin transfer moulding.

UNIT V PROPERTIES OF COMPOSITES

9

Testing of composites— Fibre volume fraction -Laminar tensile - shear - compression - and flexural properties — interlaminar fracture/failure modes in composites – applications for composites.

TOTAL : 45 PERIODS

OUTCOMES:

Upon completion of this course, the student shall be able to

- Select different types of textile reinforcements and matrices used for the manufacture of
- Composites and their behaviors and
- Understand the mechanics of failure of composites

TEXT BOOKS:

1. Hull.D, “An introduction to composite materials”, Cambridge University Press - Cambridge, 1998
2. Gupta.L, “Advanced Composite Materials”, Himalayam Books, New Delhi, 1998.
3. Textile Progress monogram on “Hybrid yarns and textile performing for thermoplastic composites” by R. Alagirusamy, R Fanguero, V. Ogale and N. Padaki Textile Progress 2006 Vol 38 No. 4 (Wood Head Publishing Limited)

REFERENCES:

1. Mathews F.L and Rawlings R.D “Composite Materials Engineering science” Chapman & Hall, London 1994.

2. Bogdanovich.A and Pastore.C, Mechanics of Textile and Laminated composites, Chapman & Hall, 1997
3. Hearle. J.W.S — “High performance fibres composites and engineering textile structures Journal of the textile institute (special issues) - The Textile Institute 1990.
4. Kostikov, V.L., Fibre Science and Technology (Soviet Advanced Composites Technology Series), Chapman & Hall, 1995.
5. Carlsson L.A. and Byron Pipes R. “Experimental characteristics of advanced composite materials” Prentice Hall, Inc 1987.
6. Pipes, R.B., Composite Material Series, Vol. 1 to 3, Elsevier, 2003.
7. Ken Ashbee, Fundamental principles of fibre reinforced composites, Technomic Publishing Co. Inc., Pennsylvania USA, 1989.
8. Leonard Hoilaway, Handbook of Polymer composites for Engineers, Woodhead Publishing Ltd., Cambridge, England, 2004.
9. Geier, M.H., Quality Handbook for Composite Materials, Chapman and Hall, London, U.K., 1994.
10. Gill R.M., Carbon fibres in composite materials, Butterworth Group, 2000.
11. De.S.K. and White J.R. Short fibre polymer composites, Wood head, Manchester,2001, ISBN:1855732203

TC6006

CLOTHING SCIENCE AND PRODUCT ENGINEERING

**L T P C
3 0 0 3**

OBJECTIVES:

To enable the students to learn about the

- Measurement of properties of fabrics related to comfort
- Important characteristics of the fabric responsible for its comfort properties and
- Design logics of textile products and apparels.

UNIT I

9

DIMENTIONAL STABILITY: Hygral expansion - Relaxation shrinkage – Felting shrinkage - methods of measuring dimensional stability to dry cleaning and Dry heat.

SERVICEABILITY: Snagging - Pilling - Abrasion resistance - Tearing strength – Tensile strength - Bursting strength -Corrosive strength - Launderability - Crock resistance - Flammability - Scorching - Fusing - Static electricity - Seam strength and slippage

UNIT II

9

COMFORT: Thermal comfort & conductivity - Air permeability - Water vapour permeability - moisture transport - wetting - wicking - sensorial comfort – water absorption - water repellency – oil repellency – soil resistance.

AESTHETICS: Colour - colour fastness - shade variation – colour measurement

UNIT III

9

FABRIC HANDLE: Bending - Drape - Crease recovery - fabric thickness - Shear – Bias extension - formability - fabric friction - objective evaluation of fabric hand by KES and FAST

UNIT IV

9

INTRODUCTION TO DESIGN LOGIC OF TEXTILE PRODUCTS – Classification of textile products and components.**YARN DESIGN :** Material, technology, and specifications - yarn design elements - design based on structure and material properties

FABRIC DESIGN : Material, technology, and specifications - Fabric design elements - design based on structure and material properties

UNIT V

9

DESIGN OF APPAREL FABRICS : Design of women's & Girl's wear - fabric types and materials for European, American and Indian styles - design of men's and boy's wear - fabric type and materials for European, American and Indian styles – Tailorability of fabrics – tailorability of woven and knitted garments – tailorability of leather garments – tailorability of fur garments.

TOTAL : 45 PERIODS

OUTCOME:

Upon completion of this course, the student shall be able to understand different phenomena such as wetting, wicking and, heat and moisture interaction and Engineer the textile products and design apparels.

TEXT BOOKS:

1. Ed Postle R., Kawabata.S and Niwa M., "Objective Evaluation of Fabrics", Textile Machinery Society, Japan, Osaka, 1983
2. Miller "Textiles: Properties and Behaviors in Clothing use", Textile Institute, 1998.
3. PradipV, Metha, " An Introduction to Quality Control for the Apparel Industry", ASQC Quality Press, Marcel Dekker Inc" New York, 1992

REFERENCES:

1. Wngate loB, and Mohler J.F. "Textile fabrics and their selection", Prentice -HallInc, New Jersey, 1984.
2. Mastudaira T, and Suresh M.N., "Design Logic of Textile Products", Textile Progress, Textile Institute, Manchester, 1997.
3. Slater.K., "Comfort Properties of Textiles", Textile Institute, Manchester, Vol 9, No..4, 1997.
4. Saville B.P, Physical Testing of Textiles, The Textile Institute, Wood head publishing limited, Cambridge, 1999.
5. Matisunita, Design Logics, Textile Progress, UK

TC6007

NONWOVEN FABRICS AND SPECIALTY FABRICS

**L T P C
3 0 0 3**

OBJECTIVES:

To enable the students to learn about

- Production of fabrics by different non woven technologies
- Finishing and testing non wovens

and to expose the students to specialty fabrics, their construction and applications

UNIT I INTRODUCTION

9

Definition - Classification - Nonwoven manufacturing processes. Raw materials - Binders. Web forming - Lay process. Extrusion nonwovens-spun laying, spun bonding. Dry and wet lay process - Types - Raw materials - Fibre preparation - Process variables - Properties.

UNIT II BONDING

9

Needling: Principle - Needle characteristics - Process variables – Needled-fabric properties. Loop formation processes - Types - Process variables - fabric properties. Hydro entanglement process - Principle - Process variables - Fabric properties. Drying -Hot air bonding - Heat setting - Thermal calender bonding - Ultrasound bonding. Chemical bonding - Saturation bonding, Print bonding, Foam bonding and Spray bonding. Nonwoven composites

UNIT III FINISHING AND TESTING 9

Mechanical finishing: Shrinking - Compacting and creping, glazing – Calendering – Pressing – Perforating – Slitting – Breaking – Emerising – Raising – Shearing – Singeing – Sewing - Quilting and welding. Chemical finishing washing – Dyeing – Printing – Finishing - Softening - Special effects, coating, laminating and flocking Sampling and statistics - Testing conditions - Standards and specifications. Testing of raw materials and finished nonwoven fabrics. Quality control aspects in nonwoven production.

UNIT IV APPLICATIONS AND PRODUCT DEVELOPMENT 9

Nonwovens for hygiene, medicine – safety, cleaning, household products, home textiles - apparels and technical applications. Re-utilization of nonwovens Concepts and definitions - Product development for garments, decorative fabrics, home textiles and technical textiles. Costing of nonwoven products. Techno economics

UNIT V SPECIALTY FABRICS 9

Introduction - yarn and fibre types, fabrics. Preparation for narrow fabric production winding, warping, sizing, looming, Woven narrow fabrics and their constructions - structure of narrow fabrics woven on shuttleless looms. Conventional shuttle looms, unconventional shuttle looms and shuttle less looms for narrow fabrics, Elasticated fabrics, zip - fastener tapes, curtain - heading tapes, ladder tapes, trimmings, braids, labels, nets, laces, flocked fabrics – Coated and laminated textiles. 3D fabrics. Non-pile carpet weaves and their looms. Pile surfaced carpet weaves and their looms. Needle felt floor coverings.

TOTAL : 45 PERIODS

OUTCOMES:

Upon completion of this course, the student shall be able to

- Understand different methods of production and testing of nonwovens and
- Understand different types of specialty fabrics

TEXTBOOKS:

1. Russel.S, "Handbook of Nonwovens", The Textile Institute Publication, 2007.
2. Wilhelm Albrecht etal., " Nonwoven fabrics", WILEY - VCH Verlag Gmbh & Company, Germany, 2003.

REFERENCES:

1. Irsak.C, " Nonwoven Textiles" Textile Institute", Manchester, 1999
2. Krcma.R., Manual of Non-wovens, Textile Trade Press, Manchester 1993.

**TC6008 ADVANCED WET PROCESSING MACHINERY L T P C
3 0 0 3**

OBJECTIVES:

- To enable the students to learn about the working principles of wet processing machineries.
- To enable the students to know about the operations of machines and its maintenance schedules
- To expose the students to latest wet processing machineries

UNIT I 9

Advances in continuous processing of cotton and wool materials - - Advances in heating systems hank and yarn dyeing machines(cheese and warp) - importance of winding in yarn dyeing —

calculation of winding density - detailed maintenance schedule for cheese dyeing machines. Use of microprocessors in processing machines.

UNIT II

9

Advances in Beam dyeing - Advances in soft flow, over flow, jet dyeing machines — Developments in jiggers,—Detail maintenance schedule for beam dyeing, jet dyeing and jiggers.

UNIT III

9

Detail study and developments in vertical drying ranges - RF dryer, yarn dryer, tubular & open width knitted fabric dryer, Tumble dryer, developments in balloon padding, hydro extractor, rope opener, maintenance schedule for the above machines. Heating systems for hot air stenters, Clip & pin type of stenters; Jig stenters — over feeding system and its importance - Hot flue dryer — float dryer — maintenance schedule for the above machines.

UNIT IV

9

Developments in preparation of screens for roller, rotary, flat bed screen printing machines. Principle and working of fully automatic flat bed screen printing machine – with programmer line diagram and its advantages - developments in agers - Developments in garment printing machines - various practical problems & possible remedies, Transfer printing machines and dyeing.

UNIT V

9

Developments in finishing machineries — Calenders, sanforising machine, Back-filling machine, maintenance schedule for the above machineries. Shop floor problems & possible remedies in finishing department, Sand blasting machine, Peach finishing, Raising, Shearing machines.

TOTAL : 45 PERIODS

OUTCOMES:

Upon completion of this course, the student shall be able to

- Understand about the advances in wet processing of textile materials
- Understand about advanced wet processing machinery used in the industry

TEXTBOOKS:

1. Gokhle S.V. and Dhingra A.K., "Maintenance in Chemical Processing Department of Textile Mills", , ATIRA, Ahmedabad,1984.
2. R.S.Bhagwat, "Development in Textile Processing Machines" Colour Publications pvt.Ltd, 2000.

REFERENCES:

1. Datye. K.V. and Vaidya. A.A., Chemical Processing of Synthetic fibres and blends, John Wiley & Sons, New York.1995
2. Chakravarth. R.R. Technology of Bleaching and Dyeing of Textile Fibres, Vol. 1 Part 2, , Mahajan Book Distributors, Ahmedabad. 1982
3. Usenko.V. Processing of Manmade Fibres, MIR Publishers, Moscow. 1995
4. Shirley Institute, Jet dyeing Machines, Shirley Institute Publications, (S 33),U.K.1981
5. Shenai V.A. Technology of Textile Processing, Sevak Publication, 306, Sri Hanuman Industrial Estate, GD Ambedkar Road, Wadala, Bombay.1995
6. Cegarra,J., Puente,P., and Valldeperas,J., "The dyeing of Textile materials", The Text. Inst., Manchester, 1998, ISBN: 1870812581.
7. Viallier,P., "Heat transfers in Textile finishing industry", Eurotex, 1991, Blackwells Bookshop, Leeds, U.K.

OBJECTIVES:

To enable the students to learn about

- Consumption of energy at various sectors of textile industries
- Techniques of saving energy

UNIT I SOURCES OF ENERGY 9

Limitations of Natural resources. Unexploited energy sources and problems in their exploitation. Concept of energy management - need for energy conservation- global energy scenario with specific reference to India -Demand side Management (DSM).

UNIT II ENERGY CONSUMPTION 9

Spinning – Weaving – Knitting - Processing – Garmenting. Auxiliary machineries Component wise consumption - Specific energy consumption (UKG) - Cost of energy Vs sales value of textile product. Conservation of energy.

UNIT III ENERGY AUDIT 9

Concept - Types of audit - Instrumentation - methodology - analysis. Electrical and Thermal audit

UNIT IV ENERGY CONSERVATION 9

Techniques of energy saving: Energy efficient equipments for various processing machines and ancillaries – Preparatory – Spinning - Post Spinning - Weaving Wet Processing - Humidification/Air conditioning – Lighting – Compressors - Boilers – Generators. Different types of fuels. Economics of energy conservation techniques.

UNIT V NON-CONVENTIONAL ENERGY SOURCES 9

Solar energy: Different type of collectors – Photovoltaic cell - Wind energy - Bio energy - co-generation.Environmental impact on energy.Analog - Digital - Computerized instruments Measurement techniques. Maintenance of instruments.

TOTAL : 45 PERIODS

OUTCOME:

Upon completion of this course, the student would understand the consumption of energy at difference stage of processing, energy audit procedure, energy conservation and different types of non conventional energy sources available.

TEXTBOOKS:

1. Energy Conservation in Textile Industry, SITRA, 1985
2. Vallier,P," Energy uses in the Textile Finishing Industry", Eurotex, 1990
3. Palaniappan C et ai, "Renewable Energy Applications to Industries", Narose Publishing House, 1998.

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1. Proceedings of International Seminar cum Exhibition ASIA Energy Vision 2020" - sustainable energy supply, November 15-17, 1996.
2. Proceedings of the Seminar, "Strategies for Sustainability of Energy Efficient and Environmental Friendly Technologies in Small and Medium Scale Sector", PSG College of Technology, November 24, 2000.
3. Pradeep Chaturvedi & Shaltni Joshi," Strategy for Energy Conservation in India", Concept Publishing Co. , 1995. Heat economy in Textile mills", ATIRA, Ahmedabad, 1996.
4. Energy conservation in Textile Industry", SITRA, Coimbatore,1997.
5. Vallier,P., "Energy uses in the textile finishing industry", Eurotex, 1999.

6. Sang Yang Kim, Grady, P.L. and Hersh, S.P., "Energy consumption and conservation in the fibre producing and textile industry", Textile Progress , Vol. 13, No.3, Textile Inst., Manchester,
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