

ANNA UNIVERSITY:: CHENNAI 600 025
AFFILIATED INSTITUTIONS
M.TECH.TEXTILE TECHNOLOGY
(WITH SPECIALIZATION IN TEXTILE CHEMISTRY)
REGULATIONS – 2017
CHOICE BASED CREDIT SYSTEM

1. Programme Educational Objectives (PEOs):

To enable the graduate students of Textile Technology and allied studies to

- a. Enhance their knowledge related to the theory of colouration and textile wet processes
- b. Enhance their knowledge on advances in textile chemical processes
- c. Design, conduct and interpret the results of the textile experiments
- d. Design new processes and products
- e. Engross in life-long learning to keep abreast with emerging technologies

2. Programme Outcomes (POs):

Upon completion of the programme, the student shall be able to

1. Effectively teach the students at the undergraduate level
2. Innovate new process or product at the textile wet processing industry or textile research organizations.
3. Effectively carryout fundamental and applied research, and manage research and development activities in textile wet processing industry and research organizations
4. Manage textile wet processing industry and solve technological problems
5. Use the advanced techniques, skills, and modern tools necessary for practicing in the textile wet processing industry.
6. Communicate effectively and work in interdisciplinary groups.
7. Review, comprehend and report technological development.

3. PEO / PO Mapping

PEO	POs						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7
a	✓	✓	✓	✓			
b	✓	✓	✓		✓		✓
c			✓	✓	✓	✓	
d		✓	✓		✓	✓	✓
e	✓	✓	✓				✓

4. Semester Course wise PO Mapping

Y E A R	S E M E S T E R	Course Title	1	2	3	4	5	6	7
		I	S E M E S T E R I	Textile dyes and Auxiliaries	✓	✓	✓	✓	
Theory of Textile Chemical Processing	✓			✓	✓	✓			
Fibre science	✓				✓	✓			
Statistics Application in Textile Engineering	✓				✓	✓	✓		
Colouration and Finishing Technology	✓			✓	✓	✓			
Fabric Processing and Analysis Lab	✓			✓	✓		✓		
S E M E S T E R II	Advanced Finishing Technology		✓	✓	✓	✓	✓		✓
	Advances in Processing Machinery		✓	✓	✓	✓	✓		✓
	Clothing science		✓	✓	✓			✓	
	Textile Effluent Management		✓			✓	✓	✓	✓
	Product Development Laboratory			✓	✓		✓	✓	✓
	Technical seminar					✓	✓	✓	
Y E A R II	S E M E S T E R III	Course Title	1	2	3	4	5	6	7
		ProjectWork (Phase I)		✓	✓	✓	✓	✓	✓
		Internship	✓		✓		✓		
	S E M E S T E R IV	Project Work (Phase II)							
			✓	✓	✓	✓	✓	✓	

	Course Title	1	2	3	4	5	6	7
PROFESSIONAL ELECTIVES	Advances in Textile Printing	✓	✓		✓			
	Textile Polymer Rheology	✓	✓	✓				
	Financial Management in Textile Industry	✓			✓		✓	
	Enzyme Technology for Textile Processing	✓	✓	✓	✓		✓	
	Nano Technology in Textiles	✓	✓	✓		✓	✓	
	High Performance and Specialty Fibres	✓	✓	✓				✓
	Advanced Instruments for Textile Wet Processing	✓		✓	✓			✓
	Textile Reinforced Composites	✓	✓	✓			✓	
	Colour Science	✓	✓			✓		✓
	Chemical Processing of Synthetic and Blended Textiles	✓	✓		✓			
	Project Planning and Management	✓	✓		✓		✓	✓
	Surface Modification of Textiles	✓	✓				✓	
	Design and Analysis of Textile Experiments	✓	✓	✓		✓		
	Medical Textiles	✓	✓	✓				✓
	Protective Textiles	✓	✓	✓				✓

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CHOICE BASED CREDIT SYSTEM
I TO IV SEMESTERS CURRICULUM AND SYLLABUS

SEMESTER I

SI. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1	TY5101	Textile Dyes and Auxiliaries	PC	4	4	0	0	4
2	TY5102	Theory of Textile Chemical Processing	PC	4	4	0	0	4
3	TY5103	Fibre Science	PC	3	3	0	0	3
4	TY5104	Colouration and Finishing Technology	PC	4	4	0	0	4
5	TX5151	Statistical Application in Textile Engineering	PC	4	4	0	0	4
PRACTICAL								
6	TY5111	Fabric Processing and Analysis Laboratory	PC	4	0	0	4	2
TOTAL				23	19	0	4	21

SEMESTER II

SI. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1	TY5201	Advanced Finishing Technology	PC	3	3	0	0	3
2	TY5202	Advances in Processing Machinery	PC	3	3	0	0	3
3	TY5203	Textile Effluent Management	PC	3	3	0	0	3
4	TX5251	Clothing Science	PC	4	4	0	0	4
5		Professional Elective I	PE	3	3	0	0	3
6		Professional Elective II	PE	3	3	0	0	3
PRACTICAL								
7	TY5211	Product Development Laboratory	EEC	4	0	0	4	2
8	TY5212	Technical Seminar	EEC	2	0	0	2	1
TOTAL				25	19	0	6	22

SEMESTER III

SI. No	COURSE CODE	COURSETITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
THEORY								
1		Professional Elective III	PE	3	3	0	0	3
2		Professional Elective IV	PE	3	3	0	0	3
3		Professional Elective V	PE	3	3	0	0	3
PRACTICAL								
4	TY5311	Internship	EEC	-	0	0	0	1
5	TY5312	Project Work (Phase I)	EEC	12	0	0	12	6
TOTAL				21	9	0	12	16

SEMESTER IV

SI. No	COURSE CODE	COURSETITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
PRACTICAL								
1	TY5411	Project Work (Phase II)	EEC	24	0	0	24	12
TOTAL				24	0	0	24	12

TOTAL CREDITS: 71

LIST OF PROFESSIONAL ELECTIVES

SEMESTER II, PROFESSIONAL ELECTIVE 1

SI. No	COURSE CODE	COURSETITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
1	TY5091	Advances in Textile Printing	PE	3	3	0	0	3
2	TY5001	Textile Polymer Rheology	PE	3	3	0	0	3
3	TX5071	Financial Management in Textile Industry	PE	3	3	0	0	3

SEMESTER II, PROFESSIONAL ELECTIVE 2

SI. No	COURSE CODE	COURSETITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
1	TY5071	Enzyme Technology for Textile Processing	PE	3	3	0	0	3
2	TX5092	High Performance and Specialty Fibres	PE	3	3	0	0	3
3	TX5093	Nano Technology in Textiles	PE	3	3	0	0	3

SEMESTER III, PROFESSIONAL ELECTIVE 3

SI. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1	TY5002	Advanced Instruments for Textile Wet Processing	PE	3	3	0	0	3
2	TX5094	Textile Reinforced Composites	PE	3	3	0	0	3
3	TY5003	Colour Science	PE	3	3	0	0	3

SEMESTER III, PROFESSIONAL ELECTIVE 4

SI. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1	TY5004	Chemical Processing of Synthetic and Blended Textiles	PE	3	3	0	0	3
2	TX5074	Project Planning and Management	PE	3	3	0	0	3
3	TY5005	Surface Modification of Textiles	PE	3	3	0	0	3

SEMESTER III, PROFESSIONAL ELECTIVE 5

SI. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1	TX5072	Design and Analysis of Textile Experiments	PE	3	3	0	0	3
2	TX5091	Medical Textiles	PE	3	3	0	0	3
3	TX5073	Protective Textiles	PE	3	3	0	0	3

Professional Core (PC)

S. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	TY5101	Textile dyes and Auxiliaries	PC	4	4	0	0	4
2.	TY5102	Theory of Textile Chemical Processing	PC	4	4	0	0	4
3.	TY5103	Fibre Science	PC	3	3	0	0	3
4.	TX5151	Statistical Application in Textile Engineering	PC	5	3	2	0	4
5.	TY5104	Colouration and Finishing Technology	PC	4	4	0	0	4
6.	TY5111	Fabric Processing and Analysis Laboratory	PC	4	0	0	4	2
7.	TY5201	Advanced Finishing Technology	PC	3	3	0	0	3
8.	TY5202	Advances in Processing Machinery	PC	3	3	0	0	3
9.	TX5251	Clothing Science	PC	4	4	0	0	4
10	TY5203	Textile Effluent Management	PC	3	3	0	0	3
11	TY5211	Product Development Laboratory	PC	4	0	0	4	2

Employability Enhancement Courses (EEC)

S. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	TY5212	Technical Seminar	EEC	2	0	0	2	1
2.	TY5312	Project Work (Phase I)	EEC	12	0	0	12	6
3.	TY5311	Internship	EEC	-	0	0	0	1
4.	TY5411	Project Work (Phase II)	EEC	24	0	0	24	12

OBJECTIVES

- To enable the students to study about the evaluation of sizing ingredients, dyestuff, chemicals and auxiliaries in dyeing, printing paste ingredients and finishing agents.

UNIT I**12**

Evaluation of sizing ingredients which includes natural and synthetic adhesives, lubricants and miscellaneous additives such as deliquescent materials, antiseptics etc. Evaluation of desizing agents, chelating agents, enzymes etc.

UNIT II**6**

Evaluation of dyestuff / pigments / dyestuff precursors: Purity, strength and characteristics.

UNIT III**12**

Evaluation of chemicals and auxiliaries used in dyeing such as Dye fixing agents, dispersing agents, leveling agents, antifoaming agents, carriers and accelerants and miscellaneous chemicals and auxiliaries.

UNIT IV**18**

Evaluation and testing of printing paste ingredients such as thickeners, humectants / hygroscopic agents, Carriers / Accelerators / swelling agents, wetting agents / surface active agents, solvents / solution aids / dispersing agents, oxidizing agents and oxygen carriers, reducing / resisting / discharging agents, cross-linking agents and catalysts used in pigment printing and miscellaneous chemicals.

UNIT V**12**

Evaluation of finishing agents like stiffening/filling agents, cross linking agents, fluorescent brightening agents, softening agents, water repelling agents, flame retarding agents, antistatic agent, soil releasing agents, anti-pilling agents, rot proofing, mildew proofing agent.

TOTAL : 60 PERIODS**OUTCOMES**

- Upon completion of this course the student shall be able to know about the evaluation of sizing ingredients, dyestuff, chemicals and auxiliaries in dyeing, printing paste ingredients and finishing agents.

REFERENCES:

- Desai N. F., "Profiles in Analysis of Chemicals", Gokul Publishers, 1983, ISBN : B001BX2XW8.
- Rosen M. J. and Goldsmith H. A., "Systematic Analysis of surface Active Agents", Inter science Publisher inc., New York, 1960.
- Shenai V. A. and Mehra N. H., "Evaluation of Textile Chemicals", Sevak Publication, Mumbai.
- Trotman E. R., "Dyeing and Chemical Technology of Textile Fibres", Charles Griffin & Co. Ltd., U.K., 1984, ISBN : 0 85264 165 6.

OBJECTIVES

- To enable the students to study about the mechanism of Preparatory process
- To enable the students to study about elements of dye chemistry
- To enable the students to study the about Printing methods & styles and the
- Necessity of Finishing

UNIT I DE-SIZING**12**

Necessity for Desizing and grey preparation - Mechanism of Desizing – important Desizing chemicals for grey fabrics and their chemistry – Efficiency of Desizing. scouring: Mechanism of Scouring - surface tension and the mode of action of surface-active compounds - theory of detergency - important Scouring agents for Textile fibres and their chemical actions – practical problems in the Scouring of cotton and its blends.

UNIT II BLEACHING**12**

Mechanism of Bleaching - important Bleaching agents for Textile fibres and their chemical actions - chemistry of peroxide bleach and use of per-acetic acid for synthetic fibres – concept of full bleach and half bleach- Application of OBA to textile materials. Mercerisation: Mechanism of Mercerization - influencing parameters on Mercerisation quality of textile materials — methods of Mercerisation – evaluation of Mercerisation.

UNIT III ELEMENTS OF DYE CHEMISTRY**12**

Classification of dye stuffs according to their chemical constitution / structure and specific applications –VBT and MO Theory of colour - interaction of dye molecules with polymeric chains – Fick 's first and second Laws of diffusion – Adsorption theory – Study about natural dyes and their application to fibres like cotton, wool and silk.

UNIT IV PRINTING**12**

Printing methods and styles – Dye selection for Printing –Study about Printing thickeners and other Printing auxiliaries. Importance of various after treatment for printing materials. Printing of cellulosic, silk, polyester and nylon materials.

UNIT V FINISHING**12**

Necessity for Finishing – important mechanical finishes like heat setting, anti-shrink, calendaring, Finishing chemicals for textile fibres and their chemistry – assessment methods for finished materials.

OUTCOMES

- Upon completion of this course the student shall be able to know the mechanism
- Preparatory process & Elements of dye chemistry
- Printing methods, styles & Necessity of Finishing

TOTAL: 60 PERIODS**REFERENCES**

1. Burkinshaw S.M., "Chemical Principles of Synthetics Fibre Dyeing", Blackie, 1995, ISBN : 0751400432 .

2. Clifford Preston, "The Dyeing of Cellulosic fibres", Dyer Company Publications Trust, 1986, ISBN : 9780901956439.
3. Lueas J. et al, "Colour Measurement - Fundamentals Vol.1", Eurotex, 1996
4. Shore J., "Cellulosics Dyeing", SDC, 1995, ISBN : 0 901956 68 6.
5. Shore J., "Colorants & Auxiliaries (Vol. 1 & 2)", SDC, 1990
6. Trotman E. R., "Dyeing and Chemical Technology of Textile Fibres", Charles Griffin & Co. Ltd., U.K., 1984, ISBN : 9780471809104.

TY5103

FIBRE SCIENCE

L T P C

3 0 0 3

OBJECTIVES

- To enable the students to study about
- the modern concepts of fiber structure and its mechanical properties, molecular theory of moisture on fiber properties, optical properties and structural characterization of fibers

UNIT I

9

Modern concepts of fiber structure, Generalized Hook's Law, Component of Stress and strain. Linear visco-elastic behavior of fibers.

UNIT II

9

Boltzmann superposition principle. Study of dynamic mechanical properties and their investigation in study of fibers. Introduction to mechanical properties of fiber composites. Temperature dependence of visco-elastic behavior. Time-Temperature Equivalence and Superposition. WLF equation. Study of fiber stiffness and torsion.

UNIT III

9

Study of molecular theory of moisture hysteresis, 2 and 3 phase moisture adsorption theories. Heat of sorption in textile fibers. Effect of moisture on mechanical properties of fibers.

UNIT IV

9

Study of optical properties, thermal, frictional, electrical, Di-electric and static properties of fibers."

Unit V

9

Physical methods of structural characterization of fibers, viz., DGC, TEM, SEM, WAXS, SAXS, IRS, NMR, DSC and DTA.

TOTAL: 45 PERIODS

OUTCOMES

- Upon completion of this course the student shall be able to know the modern concepts of fiber structure and its mechanical properties
- Molecular theory of moisture on fiber properties
- Optical properties and structural characterization of fibers

REFERENCE BOOKS:

1. Campell D. and White J.R., "Polymer characterization, Physical Techniques", McGraw – Hill, New York, 1969.
2. Hunt B.J. and James M.I., "Polymer characterization" ,Springer, London, 1993,ISBN : 978-0751400823.

3. Morton W. E. and Hearle J. W. S., "Physical Properties of Textile Fibres", The Textile Institute, Washington D.C., 2008, ISBN : 9781845692209.
4. Sperling L.H., "Introduction to Physical polymer science", John Wiley & Sons, 2005, ISBN: 978-0-471-70606-9.
5. Ward I.M., Sweeney J., "Mechanical properties of polymers", John Wiley & Sons, 2012, ISBN-13: 978-1444319507.

TY5104

COLOURATION AND FINISHING TECHNOLOGY

**L T P C
4 0 0 4**

OBJECTIVES

- To enable the students to study about
- the mechanism of Preparatory process, dyeing techniques and theory, Printing & finishing methods and the effluent treatment process

UNIT I MECHANISM OF PREPARATORY PROCESSES

12

Desizing, Scouring, Bleaching, Mercerization, Heat setting. Degradation of fibres associated with chemical pre-treatment processes. Combined pretreatment processing of textiles.

UNIT II DYEING TECHNIQUES

6

Exhaust and Padding Principle. Low liquor applications. Use of microwave, ultrasonic waves, Apparel dyeing.

UNIT III DYEING THEORY

12

Chemical Constitution of Colourants, Resonance, Theory of Molecular Orbitals, Free electron model, Dye-Fibre Bonds, Influence of fibre structure on dye uptake, Thermodynamic Considerations, Heat of Dyeing, Adsorption Isotherms, Kinetics of Dye Adsorptions. Functions and properties of dyeing auxiliaries.

**UNIT IV
PRINTING**

18

The production and properties of printing pastes, Principles of direct, resist, discharge printings. Transfer, digital and ink-jet printing. After-treatment processes.

FINISHING

Mechanism of Softening, Easy-care and durable press finishes of cellulose, water repellent, soil-release, flame-retardant, anti-static, anti-pilling, insect resist and mite protection finishes.

**UNIT V
EFFLUENT TREATMENT**

12

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.

TOTAL: 60 PERIODS

OUTCOMES

- Upon completion of this course the student shall be able to know the mechanism

- Preparatory process & dyeing techniques, theories
- Printing methods, finishing & effluent treatment processes

REFERENCES:

1. Broadbent A. D., "Basic Principles of Textile Coloration", Society of Dyers and Colourists, Bradford, 2001, ISBN : 0 901956 76 7.
2. Eco friendly Textiles: Challenges to the Textile Industry", Textiles Committee, Mumbai, 1996, ISBN : 9788190800143 .
3. Karmakar S. R., "Chemical Technology in the Pretreatment Processes of Textiles", Elsevier Science, Netherlands, 1999.
4. Miles L. W. C., "Textile Printing", Society of Dyers and Colourists, Hobbs The Printers, Hampshire, U.K., 2003, ISBN : 0 901956 33 3.
5. Schindler W. D. and Hauser P. J., "Chemical Finishing of Textiles", Woodhead Publishing Limited, Cambridge, 2004, ISBN : 9781855739055.
6. Shore J., "Colorants and Auxiliaries", Society of Dyers and Colourists, Bradford, 1990, ISBN : 9780901956514.
7. Trotman E. R., "Dyeing and Chemical Technology of Textile Fibres", Charles Griffin & Company Limited, London, 1984, ISBN : 9780471809104.

TX5151

STATISTICAL APPLICATIONS IN TEXTILE ENGINEERING

**L T P C
4 0 0 4**

OBJECTIVES :

- This course is designed to provide a solid foundation on topics in statistics that can be used to determine the capability of a textile material to meet the specified requirements by subjecting the item to a set of physical, chemical, environmental or operating actions, and conditions. It is framed to address the issues in textile engineering using statistical applications such as probability distributions, estimation theory, testing of hypothesis, analysis of variance, non-parametric tests and design an analysis of experiments.

UNIT I PROBABILITY DISTRIBUTION AND ESTIMATIONS

12

Applications of Binomial, Poisson, Normal, t, Exponential, Chi-square, F and Weibull distributions in textile engineering - Point estimates and interval estimations of the parameters of the distribution functions.

UNIT II HYPOTHESIS TESTING

12

Sampling distribution - Significance tests applicable to textile parameters – Normal test, t - test, Chi - square test and F - test - p-values - Selection of sample size and significance levels with relevance to textile applications - Acceptance sampling.

UNIT III ANALYSIS OF VARIANCE AND NON-PARAMETRIC TESTS

12

Analysis of variance for different models – Non - parametric tests - Sign test - Rank test - Concordance test.

UNIT IV PROCESS CONTROL AND CAPABILITY ANALYSIS**12**

Control charts for variables and attributes - Basis, Development, Interpretation, Sensitizing rules, Average run length - Process capability analysis.

UNIT V DESIGN AND ANALYSIS OF EXPERIMENTS**12**

2^k full-factorial designs - Composite designs - Robust designs - Development of regression Models - Regression coefficients - Adequacy test - Process optimizations.

TOTAL : 60 PERIODS**OUTCOMES :**

After completing this course, students should demonstrate competency in the following topics:

- Applications of distributions and estimation of parameters
- Use statistical tests in testing hypotheses on data.
- List the guidelines for designing experiments, recognize the key historical figures in Design of Experiments, conduct statistical tests and analyze the results.
- Analyze the significance of sampling and its techniques and different models using ANOVA
- Design and interpret the process control charts
- Analyze the experiments by applying suitable non-parametric tests

The students should have the ability to use the appropriate and relevant, fundamental and applied mathematical and statistical knowledge, methodologies and modern computational tools.

REFERENCES :

1. Douglas C. Montgomery, "Design and analysis of experiments", John Wiley & Sons, Singapore, 2000.
2. Leaf G.A.V., "Practical Statistics for the Textile Industry, Part I and II", the Textile Institute, Manchester, 1984.
3. Montgomery D.C., "Introduction to Statistical Quality Control", John Wiley and Sons, Singapore, 2002.
4. Ronald D. Moen, Thomas W. Nolan, Lloyd P. Provost, "Quality improvement through planned experimentation", McGraw-Hill, 1998.

TY5111**FABRIC PROCESSING AND ANALYSIS LABORATORY****L T P C****0 0 4 2****OBJECTIVES**

To train the students in identification of dyes and fabric processing and analysis

1. Identification of dyes.
2. Activity of textile enzymes
3. Blend dyeing of textile substrates
4. Measurement of Unknown dye concentration in dye bath
5. Determination of Colour parameters for a given Fabric
6. Analysis of residual formaldehyde content in fabric
7. Analysis of aryl amines in dyes
8. Pentachloro phenol testing on fabrics
9. Analysis of heavy metals in fabrics

OUTCOMES

Upon completing this practical course, the student would be able to

- Identify dyes and its concentration in dye bath, determine colour parameters in a fabric and analyse the processed fabrics.

EQUIPMENT LIST

- | | |
|---|---------|
| 1. Micropipette | - 6 no. |
| 2. UV – Vis Spectrophotometer | - 1 no. |
| 3. Atmospheric Pressure sample dyeing machine (different types) | - 2 no. |
| 4. High pressure sample dyeing machine (different types) | - 2 no. |
| 5. GC/MS system or LC/MS system (preferable) | - 1 no. |
| 6. Atomic absorption spectrometer (preferable) | - 1no. |

TY5201

ADVANCED FINISHING TECHNOLOGY

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

OBJECTIVES

- To enable the students to study about
- the importance of finishing, concept of flame proof and retardancy, soil release and anti pilling finish, mechanical finishing and other techniques in finishing

UNIT I

9

Commercial importance of finishing – Advances in Resin finishing, Mechanism of creasing, Types of Resins. Anti crease, wash and wear, durable press resin finishing. Causes & remedies of strength losses of Resin finished fabric. Mechanism of Chlorine retention. Formaldehyde Release from Resin finished goods. Study about eco friendly method of anti crease finishing

UNIT II

9

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, Mildew proof finishes and Rot proof finishing.

UNIT III

9

Soil Release Finishing: Mechanism of soil retention & soil release. Various soil releases finishes for cotton, Polyester and its blends. Detail study of antistatic finishes. Antipilling Finishing: chemical and mechanical methods to produce antipilling finish.

UNIT IV

9

Detail study about mechanical finishing of textile materials like calendaring, compacting, Sanforising, Beach finishing. Object of Heat setting. Various methods of heat setting and mechanism of heat

setting. Foam Finishing. Detailed study of various techniques of foam application. Drawbacks of foam finishing.

UNIT V

9

Mechanism in the weight reduction of PET by using alkali; micro encapsulation techniques in finishing process, Detail study of the process to produce silk like Polyester. Felting of wool, Study about cationic, reactive and silicon emulsion softeners. Brief study about stiffening of textile materials

TOTAL: 45 PERIODS

OUTCOMES

- Upon completion of this course the student shall be able to know the importance of finishing
- Concept of flame proof and retardancy, soil release and anti pilling finish
- Mechanical finishing and other techniques in finishing

REFERENCES

1. Fiscus G. and Grunenwald D., "Textile finishing : A complete guide", High tex, Blackwells Bookshop, Leeds, U.K, 2004.
2. Lewin and Sello, "Functional finishes - Part A & Part B", CRC Press,1994, ISBN : 0824771184.
3. Microencapsulation in finishing, Review of progress of Colouration, SDC, 2001.
4. Perkins W.S., "Textile colouration and finishin", Carolina Academic Press, U.K, 2001

TY5202

ADVANCES IN PROCESSING MACHINERY

L T P C
3 0 0 3

OBJECTIVES

- To enable the students to study about
- advances in fibre, cheese and other dyeing machines, dryer and other finishing machines, working principle of different printing machines and garment dyeing machines

UNIT I

9

Advances in fiber dyeing machine - Advances in cheese dyeing machine- importance of winding in yarn dyeing — calculation of winding density — various yarn dyeing defects caused by cheese dyeing machine - detailed maintenance schedule for cheese dyeing machines.

UNIT II

9

Advances in Beam dyeing - Advances in soft flow dyeing machines, Advances in jet dyeing machines — Developments in jiggers, Continuous dyeing machineries & its developments— Various dyeing defects caused by the above machineries.

UNIT III

9

Hydro extractor, Rope opener RF dryer, Yarn dryer, Knitted fabric dryer, Hot flue dryer, Stenter& its type. Sanforising machine, Compacting machines, Beach finishing machines.

UNIT IV**9**

Principle and working of fully automatic flat bed screen printing machine –Rotary Printing machine- Transfer Printing Machine-Garment Printing machines- Various practical problems & possible remedies in the above Printing machineries.

UNIT V**9**

Garment dyeing machines, Tumble dryer, Fusing machines, Backfilling machine, Importance of maintenance of processing machineries, Machineries used for foam application. Preparation of screens for Rotary Printing machines.

TOTAL : 45 PERIODS**OUTCOMES**

- Upon completion of this course the student shall be able to know about advances in fibre, cheese and other dyeing machines
- Dryer and other finishing machines
- Working principle of different printing machines and garment dyeing machines

REFERENCES

1. Bhagwat R. S., "Wet Processing Machineries", Mahajan Publications, 2000
2. Gokhale S. V. and Dhingra A.K., "Maintenance in chemical processing department of textile mills", ATIRA, 1994.
3. Patel, "Textile Wet processing machineries", ATIRA, 1995
4. Usenko V., "Processing of manmade fibres", M.I.R. Publishers, Moscow, 1975.

TY5203**TEXTILE EFFLUENT MANAGEMENT****L T P C
3 0 0 3****OBJECTIVES**

- To enable the students to study about
- the pollution monitoring and control, Wastewater characteristics, identification and reduction of pollution sources in textile wet processing, health, safety and waste management in textile industry

UNIT I**9**

Industrial policy of India; pollution monitoring and control; functions and activities of Ministry of environment; Central and State pollution control boards; environmental clearance and guidelines for industries; environment impact assessment; fiscal incentives for environmental protection; environmental auditing.

UNIT II**9**

Wastewater characteristics; wastewater treatment - objectives, methods and implementation considerations; recycling of effluents.

UNIT III**9**

Identification and reduction of pollution sources in textile wet processing; pollution control in man-made fibre industry; analysis of textile processing effluents – colour, odour, pH, total solids, suspended

solids, total dissolved solids, BOD, COD, total alkalinity, chloride, sulphates, calcium and chromium; tolerance limits for effluents; bio - degradability of textile chemicals and auxiliaries

UNIT IV

9

Technical regulations on safety and health aspects of textile materials – banned dyes and chemicals; eco labeling, eco friendly textile processes - machines and specialty chemicals; natural dyes and environmental considerations.

UNIT V

9

Need for solid and hazardous waste management in textile industry, types and sources of solid and hazardous wastes, storage, collection and transport of wastes, waste processing technologies, waste disposal

TOTAL: 45 PERIODS

OUTCOMES

- Upon completion of this course the student shall be able to know about pollution monitoring and control
- Wastewater characteristics and identification and reduction of pollution sources in textile wet processing
- Health, safety and waste management in textile industry

REFERENCES

1. Chritie R., "Environmental aspects of textile dyeing", Woodhead Publishing Ltd, 2007, ISBN : 1845691156 .
2. Cooper P., " Colour in Dyehouse Effluent", Woodhead Publishing Ltd., 1995, ISBN : 0 901956 69 4.
3. Eco-Textiles: Regulations, Labels, Processing and Testing, A Special Report", The BombayTextile Research Association, Mumbai, 1996.
4. Manivasakam N., "Treatment of Textile Processing Effluents (including analysis)", Sakhi Publications, Coimbatore, 1995.
5. Skelly J. K., "Water Recycling in Textile wet Processing", Woodhead Publishing Ltd., 2003, ISBN : 1 85573 541 5.
6. Slater K., "Environmental impact of textiles: Production Processes and Protection", Woodhead Publishing Ltd, 2003, ISBN : 9781855735415.
7. Symposium Proceedings on Eco - Friendly Textile Processing", Department of textile Technology, Indian Institute of Textile Technology, New Delhi, 1995.
8. Thobanoglous G. and Burton F. L., "Waste Water Engineering and Treatment, Disposal, Reuse (Metcalf & Eddy Inc., California)", Tata McGraw-Hill Publishing co Ltd, NewDelhi, 1995.
9. Trivedi R.K., "Handbook of Environmental laws, Acts, Guidelines, Compliances and Standards", Vol. 1, Enviro Media, India, 1996.

TX5251

CLOTHING SCIENCE

L T P C

4 0 0 4

OBJECTIVES

To enable the students to learn about the

- Important characteristics of the fabric responsible for its comfort properties and
- Different phenomena which take place in the fabric related to the comfort properties of the fabric.

OBJECTIVES

- To enable the students to know about
- Ways to improve the absorbency, whiteness of fabric by various preparatory processes, development of simultaneous dyeing & finishing process and Transfer printing process for Natural Synthetics

LIST OF EXPERIMENTS

1. Single stage scouring and bleaching of cotton using hydrogen peroxide bleaching.
2. Solvent scouring of cotton fabric
3. Single bath bleaching and OBA treatment of polyester fabric.
4. Simultaneous dyeing and Resin finishing of cotton fabric.
5. Transfer printing of polyester
6. Transfer printing of Cotton
7. Bio polishing of cotton fabric
8. Dyeing of P/C blend using single bath method
9. Denim washing

TOTAL : 60 PERIODS**OUTCOMES**

Upon completion of this course the student shall be able to know about the

- Combined preparatory & Dyeing processes
- Eco friendly finishing processes
- Method of Transfer printing for cotton & PET

LIST OF EQUIPMENTS REQUIRED

- | | |
|--------------------------------------|---------|
| 1. Dye bath | - 1 no. |
| 2. Miniature Jigger | - 1 no. |
| 3. Miniature Winch | - 1 no. |
| 4. Miniature Kier | - 1 no. |
| 5. Padding Mangle | - 1 no. |
| 6. Vacuum ironing and steam iron box | - 1 no. |
| 7. Steamer | - 1 no. |
| 8. Garment Washing machine | - 1 no. |
| 9. High temperature dyeing machine | - 1 no. |
| 10. Curing Chamber | - 1 no. |

OBJECTIVES

- To enable the students to study about
- evolution of digital printing, digital image and colour management, pre treatments for inkjet printing, quality evaluation and special printing techniques

UNIT I**9**

Ink jet printing-evolution of digital printing, Comparison with conventional printing techniques, theoretical foundations for inkjet technologies- Continuous and drop on demand technologies

UNIT II**9**

Digital image design, editing and data storage systems, Pixel and image formation in digital printers, Digital colour management- Colour gamut and rendering intent, Colour communication.

UNIT III**9**

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; washing of ink jet prints; heat and sublimation printing.

UNIT IV**9**

Quality evaluation of textile substrates used for ink jet printing and inks used for inkjet printing, advantages and limitation in inkjet printing, technoeconomics of ink jet printing.

UNIT V**9**

Special printing techniques- Developments in Photo printing, Blast printing with Indigo, Developments in Xerox printing and Laser printing for fancy effects; Yarn printing; printing of carpets, velvets and knits; Ecofriendly alternatives for auxiliaries used in conventional printing

TOTAL :45 PERIODS**OUTCOMES**

- Upon completion of this course the student shall be able to know about evolution of digital printing, digital image and colour management
- Pre treatments for inkjet printing
- Quality evaluation and special printing techniques

REFERENCES

1. Miles L W C, "Textile Printing", Society of Dyers and Colourists, Hobbs The Printers, Hampshire, UK, 2003.
2. Shenai V A, "Technology of Printing", Sevak Publishers, Mumbai, 1990.
3. Shore J, "Colorants & Auxiliaries", Vol. I & II, Society of Dyers and Colourists, UK, 1990.
4. Tyler D, "Textile Digital Printing Technologies", Textile Institute Publication UK, Vol.37 No.4, 2005
5. Ujje, "Digital Printing of Textiles", CRC, Wood Head Publishing Ltd, UK, 2006.

OBJECTIVES

- To enable the students to learn about fluid flow and its related aspects with respect to melt and solution spinning.

UNIT I**13**

Basic modes of deformation, Startup deformation, Step strain, Oscillatory shear; Linear responses-Elastic Hookean solids, Viscous Newtonian liquids and non Newtonian fluids; Viscoelastic responses - Boltzmann superposition principle, Maxwell model ; Classical rubber elasticity.

UNIT II**9**

Viscosity-Effect of Pressure, temperature, activation energy, molecular weight and molecular weight distribution on viscosity, crosslinking, crystallinity branching, copolymerization, fillers, plasticizers and shear rate dependence of viscosity

UNIT III**9**

Laminar flow through various profiles, flow analysis - power law, turbulent flow analysis, turbulence dumping.; rheological models for extensional viscosity; Flow in conical dies – pressure drop due to shear, extensional flow and pressure drop at die entry, flow in wedge shaped die; Swelling due to shear stresses and swelling due to tensile stresses.

UNIT IV**9**

Shear rheometry- Linear displacement, Sliding plate rheometer, Co-cylinder axial sliding rheometer; Rotational motion - Parallel disks, Cone-plate and. Cone-partitioned plate; Rheo-optical methods- Flow birefringence, Scattering (X-ray, light, neutron), Spectroscopy (NMR, fluorescence, IR, Raman, dielectric)

UNIT V**5**

Rheological behaviour of important thermoplastics, Applications of rheology to polymer processing.

OUTCOMES

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

- Characterize rheological behaviour of fluids and
- Analyse the effect of molecular parameters on the fluid flow.

TOTAL: 45 PERIODS**REFERENCES**

- Brydson J.A., "Flow properties of polymer melts", life books, London, 1978.
- Chang Dae Han, "Rheology in Polymer Processing", Academic Press, New York, 1976
- Crawford R.J., "Plastics Engineering", Butterworth – Heinemann, Oxford, 1998
- Ferry J.D., "Viscoelastic Properties of Polymers", John Wiley & Sons, New York, 1986.
- John M. Dealy and Kurt F. Wissburn, "Melt rheology and its role in plastics Processing", Chapman, London, 1995.
- Lenk R.S., "Polymer Rheology", Applied Science, London, 1978.
- Richard C. Progelhof and James L. Throne, "Polymer Engineering Principles", Hanser Publishers, New York, 1993.

OBJECTIVES

To enable the students to learn about

- Costing of textile products
- Different sources of finance, cost of capital and investment appraisal techniques
- Financial statements

UNIT I**14**

Goals and functions of finance; types of costs; costing – concepts, classification; preparation of cost sheet; costing of yarn, fabric and garments; breakeven analysis

UNIT II**9**

Investment appraisal; Payback period method, Accounting Rate of Return; DCF methods - IRR, NPV, PI; depreciation - concept, methods

UNIT III**9**

Capital structure; sources of finance-debt, equity; cost of capital; working capital management; estimation of working capital

UNIT IV**13**

Tools of financial analysis and control – profit and loss account, balance sheet; financial ratio analysis; analysis of operating and financial leverage; dividend policy; illustrations for spinning mill, composite mill and garment industry

OUTCOMES

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

- Calculate the cost of yarn, fabric and garment
- Identify the sources for capital and calculate cost of capital
- Calculate depreciation and carryout investment appraisal
- Interpret and analyze financial statements

TOTAL: 45 PERIODS**REFERENCES**

1. Aswat Damodaran, "Corporate finance theory and practice", John Wiley and Sons, Asia., 2000.
2. Bhave P.V. and Srinivasan V., "Costing accounting to textile mills", ATIRA, Ahmadabad, 1976.
3. Hrishikes Bhattacharya, "Working capital management", strategies and techniques", Prentice – Hall of India Pvt.Ltd., New Delhi, 2001.
4. James C. Vanhorne, "Financial management and policy", Pearson Education Asia (Low priced edition) 12th edition, 2002.
5. Khan and Jain, "Basic financial management and practice", Tata McGraw Hill, New Delhi, 5th edition, 2001.
6. Narang, G. B. S. and Kumar V., "Production and costing", Khanna Publishers, New Delhi, 1988.

7. Pandey I. M., "Financial management", Vikas Publishing House Pvt. Ltd., New Delhi, 8th Edition, 1999.
8. Prasanna Chandra, "Financial management, theory and practice", Tata McGraw -Hill Publishing Co Ltd., 5th edition, New Delhi, 2001.
9. Thukaram Rao M.E., "Cost accounting and financial management", New Age International, Bangalore, Karnataka., 2004.
10. Thukaram Rao M.E., "Cost and management accounting", New Age International, Bangalore, Karnataka., 2004.

TY5071

ENZYME TECHNOLOGY FOR TEXTILE PROCESSING

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

OBJECTIVES

To enable the students to learn about

- Enzymes, types and kinetics of enzyme reaction on textile fibres
- Application of enzymes on different fibres and
- Treatment of enzyme effluents.

UNIT I ENZYMES

9

Nomenclature and classification of enzymes; characteristic features of enzymes; modifiers of enzyme activity - activators and inhibitors; specificity of enzyme action; extraction and purifications of enzymes.

UNIT II ENZYME KINETICS

9

Kinetics of single-substrate enzyme-catalysed reactions; Basics of kinetics of multi-substrate enzyme-catalysed reactions.

UNIT III ENZYMES FOR COTTON FIBRE

9

Chemistry and structure of cotton fibre; enzymes in pretreatment of cotton substrates – desizing, scouring, bleaching and bio finishes.

UNIT IV ENZYMES FOR OTHER FIBERS

9

Enzymes for processing and functionalizing protein fibres; enzymatic modification of polyester, polyamide, polyacrylonitrile and cellulose acetate fibres.

UNIT V ENZYMES IN EFFLUENT TREATMENT

9

Enzyme technology and biological remediation, Enzyme decolourisation and decolouration by biosorption and enrichment cultures.

TOTAL : 45 PERIODS

OUTCOMES

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

- Give the rationale for selecting enzymes for particular processing and
- Appreciate limitations of existing processing operations using chemicals.

REFERENCES

1. Cavaco-Paulo A. and Gubitz G., "Textile processing with enzymes", Woodhead Publishing Ltd, Cambridge, UK, 2003.
2. Freifelder D., "Molecular Biology ", Jones and Bartlett Publishers Inc. 1987.
3. Nierstrasz V. and Cavaco-Paulo A., "Advances in textile biotechnology", Woodhead Publishing Ltd, Cambridge, UK, 2010.

TX5092

HIGH PERFORMANCE AND SPECIALITY FIBRES

L T P C

3 0 0 3

OBJECTIVES

To enable the students to learn about

- Advanced spinning technology for manufacturing high performance fibres, their properties and applications

UNIT I **ADVANCED SPINNING TECHNOLOGY**

9

Advances in conventional fibre forming process; gel spinning; liquid crystal spinning; electro-spinning

UNIT II **HIGH PERFORMANCE FIBRES FOR INDUSTRIAL APPLICATIONS**

9

Manufacturing, properties and applications of glass fibres, basalt fibres; carbon fibres, high performance polyethylene fibres; ceramic fibres

UNIT III **HIGH PERFORMANCE FIBRES FOR MEDICAL APPLICATIONS**

13

Manufacturing, properties and applications of alginate fibres; chitosan fibres; regenerated silk and wool protein fibres; synthetic biodegradable fibres

UNIT IV **SPECIALITY FIBRES**

14

Hollow and profile fibres; blended and bi-component fibres; film fibres and functionalized fibres for specific applications; manufacturing, properties and applications of chemical and thermal resistant fibres

TOTAL: 45 PERIODS

OUTCOMES

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

- Understand the method of producing high performance fibres
- Select a high performance fibres for right type of end uses

REFERENCES

1. Hearle J. W. S., "High Performance Fibres", Woodhead Publishing Ltd., Cambridge, England, 2001.
2. Hongu T. and Phillips G.O., "New Fibres", Woodhead Publishing Ltd., England, 1997.
3. Kothari V. K., "Textile Fibres: Development and Innovations", Vol. 2, Progress in Textiles, IAFL Publications, 2000.
4. Peebles L.H., "Carbon Fibres", CRC Press, London, 1995.

OBJECTIVES

- To enable the students to study about
- basic concepts of Nano Technology, preparation, characterization and application of various particles on textile substrates and principle and factors involved in electrospinning

UNIT I**9**

Nano Technology: definition and basic concepts, particle size, nano particles; Different types of process: Top down approach, bottom up approach; Synthesis of nano materials used in textiles.

UNIT II**9**

Preparation, characterization, and application of silver, iron, ZnO, TiO₂, MgO, SiO₂ & Al₂O₃, Indium-tin oxide on textile substrates

UNIT III**9**

Preparation, Characterisation and application of Ceramic, Carbon black, Clay, and Cellulose Nanowhiskers; Self- assembled nanolayer films; Nano structuring of polymers with cyclodextrins,

UNIT IV**9**

Preparation, Characterization and properties of CNT, application of CNT in polymer and textiles. Effect of process conditions upon CNT structure and properties

UNIT V**9**

Principle of electrospinning. Factors involved in electrospinning of nanofibres; methods to produce nanoyarns, Ecological considerations of nanoparticles and nanofibres

TOTAL: 45 PERIODS**OUTCOMES**

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

- Basic concepts of Nano Technology preparation,
- Characterization and application of various particles on textile substrates
- Principle and factors involved in Electrospinning

REFERENCES:

1. Ashutosh Sharma, Jayesh Bellare and Archana Sharma, "Advances in Nanosciences and Nanotechnology", NISCAIR, First Edition, 2004.
2. Bhushan Bharat, "Springer Handbook of Nanotechnology", Springer, 2007.
3. Brown P and Stevens K, "Nano fibres and Nanotechnology in Textiles", Woodhead Publishing Limited, 2007.
4. Brown P and Stevens K., "Nano fibres and Nanotechnology in Textiles", Woodhead Publishing Limited, 2007.
5. "Industry insight Indian nanotechnology", Cygnus Business Consulting and Research, 2006.
6. Jurgen Schulte, "Nanotechnology: Global strategies, industry trends and applications", Wiley Publications, 2005.
7. Lynn E. Foster, "Nanotechnology: Science, Innovation and Opportunity", Prentice Hall Professional Technical Reference, 2005.

2. Day R. A. and Unerwood A .L., "Qualitative inorganic analysis - Vth edition", Prentice- all of India, New Delhi, 1991.
3. Gurdeep R. Chatwal Sham K. Anand, "Instrumental Methods of Chemical Analysis", Himalaya Publishing House, 2012, ISBN : 9789350248362.
4. Murthy D.V. S., "Transducers and Instrumentation", Prentice Hall of India Ltd., 1999.
5. Rouessac F., "Chemical analysis – modern international method and techniques", Wiely, New delhi, 1999.

TX5094

TEXTILE 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 and testing of composites and
- Mechanics of failure of composites

UNIT I REINFORCEMENTS

9

Manufacturing, properties and applications of Glass, Quartz, Boron, Silicon carbide, Carbon, HPPE and Aramid fibers.

UNIT II MATRICES

9

Preparation, Chemistry, Properties and applications of thermoplastic and thermoset resins- Unsaturated Polyester, Vinyl Ester, Epoxy, Phenolics, polyimides, polyurethanes, polyamides, Polypropylene, PEEK and Polycorbanate

UNIT III COMPOSITE MANUFACTURING

9

Composites manufacturing for both thermoplastics and thermosets- Hand layup, Filament Winding, Resin transfer moulding, prepregs and autoclave moulding, pultrusion, vaccum impregnation methods, compression moulding; post processing of composites and Composite design requirements

UNIT IV TESTING

9

Fibre volume and weight fraction, specific gravity of composites, tensile, flexural, impact, compression, interlaminar shear stress and fatigue properties of thermoset and thermoplastic composites.

UNIT V MECHANICS

9

Micro mechanics, macro mechanics of single layer, macro mechanics of laminate, classical lamination theory, failure theories and prediction of interlaminar stresses using software

TOTAL: 45 PERIODS

OUTCOMES

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

- Select different types of textile reinforcements and matrices for the manufacture of

- composites for getting different characteristics and
- Evaluate the characteristics of composites

REFERENCES

1. Bor Z.Jang, "Advanced Polymer composites", ASM International, USA, 1994.
2. Carlsson L.A. and Pipes R.B., "Experimental Characterization of advanced composite Materials", Second Edition, CRC Press, New Jersey, 1996.
3. George Lubin and Stanley T. Peters, "Handbook of Composites", Springer Publications, 1998.
4. Mel. M. Schwartz, "Composite Materials", Vol. 1 & 2, Prentice - Hall PTR, New Jersey, 1997.
5. Richard M. Christensen, "Mechanics of composite materials", Dover Publications, 2005.
6. Sanjay K. Mazumdar, "Composites Manufacturing: Materials, Product, and Process Engineering", CRC Press, 2001.

TY5003

COLOUR SCIENCE

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

OBJECTIVES

- To enable the students to learn about colour description and colour measurement.

UNIT I

9

COLOUR AND COLOUR VISION

Definition of colour and its classification; Structure and function of the eye — Detail and study about eye and brain system; colour consistency tests for defective colour vision.

UNIT II

9

COLOUR DESCRIPTION

Arrangement of colour; visual attribution of colour; Beer-Lambert's law; colour primaries and colour mixing; additive and subtractive colour mixing; colour specification; colour order systems – Munsel, Ostwald and CIE colour order systems.

UNIT III

9

COLOUR MEASUREMENT

Principles of colour measurement; Tristimulus values; CIE diagram; standard Illuminant; standard observer; spectral reflectance; graphical and numeric representations.

UNIT IV

9

COLOUR MATCHING

Definition; Manual colour matching; single constant Kubelka – Munk theory, spectral and tristimulus match; Metamerism; Concept of computer colour matching system. Application of CCM system to Textile processing; Advantages and Limitations of CCM system.

UNIT V

9

COLOUR DIFFERENCE AND COLOUR PREDICTION

Colour difference - Perceptibility and acceptability; methods of assessment of colour difference formula; Measurement of fluorescence – Visual, photoelectric colourimeter and Spectro photometric; Characterisation of colour displays; colour mapping for two- dimensional texture image; texture effect on visual colour difference evaluation; colour synthesis for three-dimensional objects.

TOTAL : 45 PERIODS

OUTCOME

- Upon completion of this course, the student shall become knowledgeable about Fundamentals of colour measurement and Prediction of recipe for colour matching.

REFERENCES

1. Choudhury A. K. R., "Modern concepts of colour and appearance", Oxford and IBH Publishing Ltd, 2000.
2. Mc Laren K., "The color science of Dyes & Pigments", Adam Hilger Ltd., 1983, ISBN : 0 852744269.
3. Park J., "Instrumental Colour formulation: A Practical guide", Woodhead Publishing, 1993, ISBN : 0 901956 54 6.
4. Shah H. S. and Gandhi R. S., "Instrumental colour measurement and computer aided colour matching for textiles", Mahajan Book Publication, 1990, ISBN : 9788185401003.
5. Sule A. D., "Computer colour analysis", New Age International Publishers, 2002, ISBN : 9788122413960.

TY5004

CHEMICAL PROCESSING OF SYNTHETIC AND BLENDED TEXTILES

L T P C

3 0 0 3

OBJECTIVES

- To enable the students to study about various Preparatory processes for manmade fabrics
- To enable the students to study about dyeing of synthetic fibres and their blends
- To enable the students to study the about printing and finishing of synthetic fabrics

UNIT I PREPARATORY PROCESS AND MASS COLOURATION

9

Various preparatory processes for manmade textile -Heat setting of synthetic fabrics - effects of heat setting on dyeing. Mass colouration of Polyester, Nylon, Acrylic and polypropylene, Advantages & Disadvantages of Mass Colouration; Difference between Mass Colouration and Dyeing.

UNIT II DYEING OF PET, NYLON AND ACRYLIC 9

Polyester Dyeing: carrier, HTHP and thermal methods of dyeing. Practical problems and their solutions. Stripping of dyed PET. Dyeing of nylon. Dyeing with acid dyes- High temperature dyeing. Low temperature dyeing of Nylon 66 – Dyeing with disperse dyes. Barriness of dyeing. Dyeing of Acrylic Fibres: – Dyeing with cationic dyes– stripping of cationic dyes, dyeing with disperse dyes, dyeing of acrylic blends, differentially dyeable acrylic fibres.

UNIT III DYEING OF BLENDS 13

Dyeing of Polyester Blends: Various shop floor practices of dyeing of polyester/cellulosic blended fabrics. Practical problems and their solutions. Various shop floor practices of dyeing of polyester/wool blended fabrics. Practical problems and their solutions. Dyeing of polyester with cationic dyes. Dyeing of Micro polyester fabric. Dyeing of polyamide cellulosic blends –polyamide/wool blends, polyamide/polyester blends-Stripping of Nylon dyed material. Practical problems and remedies in Nylon Dyeing. Dyeing of unmodified and modified polypropylene.

UNIT IV PRINTING 9

Printing of synthetic and blended fabrics with different dye classes - Direct, resist and discharge styles of printing - Transfer printing of polyester and blends.

UNIT V FINISHING 5

Different functional and easy care finishes on synthetics and blends like anti-static, soil-release, soil-resistant, flame-retardant.

TOTAL: 45 PERIODS

OUTCOMES

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

- Various Preparatory processes for manmade fabrics
- Dyeing of synthetic fibres and their blends
- Printing and finishing of synthetic fabrics

REFERENCES:

1. Duckworth C., "Engineering in Textile Colouration", Dyers Company Publications Trust, UK, 1983, ISBN : 9780901956316.
2. Gulrajani M. L., "Polyester Dyeing", Indian Institute of Technology Delhi, New Delhi, 1995.
3. Mittal R. M. and Trivedi S. S., "Chemical Processing of Polyester and Blends", ATIRA,Ahmadabad, 1998.
4. Shore J., "Blend Dyeing", Society of Dyers Colourists, London, 1998.
5. Vaidya A. A., and Datye K. V., "Chemical processing of Synthetic Fibres and Blends", John Wiley and Sons, New Delhi, 1999.

TX5074

PROJECT PLANNING AND MANAGEMENT

L T P C

3 0 0 3

OBJECTIVES

- To enable the students to study about
- the introduction to project management, planning and budgeting process, scheduling and resource allocation, control and completion, project organization and conflict management

UNIT I **9**

INTRODUCTION TO PROJECT MANAGEMENT: Project Management –Definition, Goal; Lifecycles; project selection methods; project formulation; project manager – roles, responsibilities and selection; project teams

UNIT II **9**

PLANNING AND BUDGETING: Planning process – work break down structure, role of multidisciplinary teams; budgeting the project – Methods; cost estimating and improvement; budget uncertainty and risk management

UNIT III **9**

SCHEDULING & RESOURCE ALLOCATION: PERT & CPM Networks, crashing; project uncertainty and risk management; simulation, Gantt charts, expediting a project – resource loading and leveling; allocating scarce resources, Goldratt’s Critical Chain

UNIT IV **9**

CONTROL AND COMPLETION: Plan-Monitor-Control cycle; data collecting and reporting; project control; designing the control system; project evaluation, auditing and termination

UNIT V **9**

PROJECT ORGANISATION & CONFLICT MANAGEMENT: Formal organisation structure; Organisation design, types of project organizations; conflict – origin & consequences; managing conflict, team methods for resolving conflict.

TOTAL: 45 PERIODS

OUTCOMES

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

- Introduction to project management, planning and budgeting process
- Scheduling and resource allocation
- Control, Completion, Project organization and Conflict management

REFERENCES

1. Clifford Gray and Erik Larson, Project Management, Tata McGraw Hill Edition, 2010
2. Gido and Clements, Successful Project Management, 5th Edition, Thomson Learning, 2011
3. Harvey Maylor, Project Management, 4th Edition, Pearson Education, 2010.
4. John M. Nicholas, Project Management for Business and Technology - Principles and Practice, 4th Edition, Pearson Education, 2012.

TY5005

SURFACE MODIFICATION OF TEXTILES

L T P C

3 0 0 3

OBJECTIVES

- To enable the students to study about importance and application of surface modification of textile materials

- To enable the students to study about plasma technology and high energy radiation
- To enable the students to study the about surface modification of textile by physical methods and by enzyme treatment and characterize it

UNIT I INTRODUCTION 5

Importance of surface modification of textiles materials. Physical, Chemical and Bio Methods. Potential applications.

UNIT II PLASMA SCIENCE AND TECHNOLOGY 13

Definition, generation, characterization, classification of plasma with special reference to cold plasma. Low pressure plasma versus atmospheric plasma. Microdischarge versus glow discharge. Corona, DBD, OAUGP.

HIGH ENERGY RADIATIONS

Electromagnetic spectrum. Wavelength and photon energy of Electron beam, gamma rays, X-rays, VUV light and UV light. Equipments based on light source, laser and electron beam.

UNIT III SURFACE MODIFICATION OF TEXTILES BY PHYSICAL METHODS 9

Interaction of plasma and light with substrate and mechanisms of modifications. Plasma treatment for enhancement of hydrophilicity, hydrophobicity, shrink proofing of wool, enhancement in dyeing characteristics and for enhancement in pretreatments. Plasma induced polymerization. Plasma metallisation, plasma cleaning, UV &VUVirradiations, electron beam for irradiations for similar applications and for ablation.

UNIT IV ENZYME TREATMENT 9

Mechanism of specific interaction of enzymes with substrates. Surface modification of natural and synthetic fibres with enzymes - mechanism, characterization and challenges.

UNIT V CHARACTERISATION 9

Characterization of modified and unmodified textile substrates using FTIR, XPS, SEM, AFM, TEM. Surface characterization challenges.

TOTAL : 45 PERIODS

OUTCOMES

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

- Importance and application of surface modification of textile materials
- Plasma technology and high energy radiation
- Surface modification of textile by physical methods and by enzyme treatment and characterize it

REFERENCES:

1. Pastore C. M. and Kieken P., "Surface characteristics of Fibers and Textiles," Marcel Dekker, Inc., New York, 2001.

REFERENCES

1. Leaf G.A.V., "Practical Statistics for the Textile Industry, Part I and II", The Textile Institute, Manchester, 1984, ISBN:0900739517.
2. Montgomery, D.C., Design and Analysis of experiments, John Wiley and Sons, 2003.
3. NicoloBelavendram, Quality by Design; Taguchi techniques for industrial experimentation, Prentice Hall, 1995.
4. Phillip J.Rose, Taguchi techniques for quality engineering, McGraw Hill, 1996.

TX5091

MEDICAL TEXTILES

L T P C

3 0 0 3

OBJECTIVES

To enable the students to learn about

- Different types of biomaterials and
- Biomedical application of textile structures.

UNIT I

9

Biomaterials—introduction, types; natural, polymeric and biological biomaterials

UNIT II

9

Textile based healthcare and hygiene products; application of nano technology in medical hygiene textiles; advanced textile materials in healthcare; infection control and barrier materials; plasma treated barrier materials.

UNIT III

9

Bandages and pressure garments - elastic and non elastic compression bandages, support and retention bandages; bandaging textiles; evaluation of bandages; bandages for various end uses.

UNIT IV

9

Wound – types, healing process; requirements of wound dressing; wound care materials – types, advantages and limitations; Testing of wound dressings; advanced wound dressings

UNIT V

9

Implantable products; sutures – requirements, classifications, specifications, materials and their applications; vascular grafts, artificial ligaments, artificial tendons; scaffolds for tissue engineering; intelligent textiles for medical applications

OUTCOMES

Upon completion of this course, the student shall know the

- Types of materials available for biomedical applications
- Functional requirements of textile structures for specific end uses and
- Selection and characterization of textile materials used for biomedical applications.

TOTAL: 45 PERIODS

REFERENCES

1. Adanur S., " Wellington Sears Handbook of Industrial Textiles" Technomic Publishing Co.,

- Inc., Lancaster Pennsylvania 1995, ISBN 1-56676-340-1.
2. Allison Mathews and Martin Hardingham ., "Medical and Hygiene Textile Production - A hand book", Intermediate Technology Publications, 1994.
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TX5073

PROTECTIVE TEXTILES

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OBJECTIVES:

To enable the students to understand about

- Functional requirements of protective clothing
- Selection of fibre, yarn and fabric for developing protective clothing
- Evaluation of protective clothing

UNIT I FIBRE REQUIREMENTS

9

Suitability and properties of high performance fibres for various protective clothing – chemical composition and physical structure

UNIT II YARN AND FABRIC REQUIREMENTS

9

Types of yarns; woven, knitted and non - woven fabric structures, methods of production, effect of structure on their performance

UNIT III CLOTHING CONSTRUCTION

9

Method of construction of garments according to various protective end uses like protection against cold, ballistic protection, use of different fabric type (knitted, woven, and Non-woven), coated / laminated in different places; use of inter lining and composites; 3D structures; high tech textiles – variable electronics; protective garments for industrial and apparel end uses

UNIT IV FINISHING OF PROTECTIVE CLOTHING

9

Types of finishes - fire retardant finishes, water repellent finishes, anti - microbial finishes; chemical finishes against radiation and chemicals; method of application of finishes; protective finishes for health care garments

UNIT V QUALITY EVALUATION

9

Evaluation of protective fabrics; desirable properties of protective textiles, method of testing for thermal protective performance, abrasion and wear resistance, evaluation of resistance to mildew, ageing, sunlight, chemical, electrostatic and electrical resistivity, impact properties; ASTM standards for protective garments

OUTCOMES:

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

- Select fibre, yarn and fabric for developing protective clothing for different applications
- Understand different types of finishes given to develop protective clothing
- Understand the evaluation of protective clothing

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