ANNA UNIVERSITY, CHENNAI

AFFILIATED INSTITUTIONS

R - 2009

M.TECH. TEXTILE TECHNOLOGY

I TO IV SEMESTERS (FULL TIME) CURRICULUM AND SYLLABI

SEMESTER I

SL. NO	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	TX9211	Theory of Yarn Spinning	4	0	0	4
2.	TX9212	Technologies of Fabric Formation	4	0	0	4
3.	TX9213	Colouration and Functional Finishes	3	0	2	4
4.	TX9214	Textile Quality Evaluation	3	0	2	4
5.	TX9215	Statistics in Textile Engineering	3	1	0	4
		TOTAL	**17**	**1**	**4**	**20**

LIST OF ELECTIVES

SL. NO	COURSE CODE	COURSE TITLE	L	T	P	C
1.	TX9251	Bonded Fabrics	3	0	0	3
2.	TX9252	Textile Reinforced Composites	3	0	0	3
3.	TX9253	Computer Applications in Textile Technology	0	0	6	3
4.	TX9254	Theory of Textile Structures	3	0	0	3
5.	TX9255	Theory of Colouration	3	0	0	3
6.	TX9256	Operations Research	3	0	0	3
7.	TX9257	Environmental Management for Textile Industry	3	0	0	3
8.	TX9258	Total Quality Management in Textile Industry	3	0	0	3
9.	TX9259	Medical Textiles	3	0	0	3
10.	TX9260	Characterization of Textile polymers	3	0	0	3
11.	TX9261	Clothing Science	3	0	0	3
12.	TX9262	Applied Mathematics in Textile Technology	3	0	0	3
13.	TX9263	Management and Information Systems	3	0	0	3
14.	TX9264	Protective Clothing	3	0	0	3
15.	TX9265	Supply Chain Management	3	0	0	3

TX 9211 **THEORY OF YARN SPINNING** **L T P C**
4 0 0 4

UNIT I FIBRE DISPERSION AND CLEANING 18

Mechanism of ginning of cotton, factors affecting ginning; the necessity fibre-individualization; fibre opening and cleaning in blow-room machinery; forces acting on the fibre during carding operation; the mechanism of fibre dispersion, fibre transfer, short fibre removal and trash removal; entanglement and disentanglement of fibres; theory of hook formation; the new approaches to improve fibre-dispersion in carding operation; mechanism of removal of short fibre, neps and trash in comber.

UNIT II ATTENUATION AND FIBRE STRAIGHTENING 18

Principle of roller drafting and its application in yarn production; ideal drafting; factors affecting drafting force, fibre dynamics during drafting, drafting irregularities and their causes and remedies; amount of draft and draft distribution on strand irregularity; the function of aprons in roller drafting; limitation of apron-drafting and the scope for improvement; mechanism of wire- point drafting and its application in yarn production; merits and demerits of wire-point drafting; comparison of wire-point drafting with roller drafting; influence of fibre-extent on yarn quality; improvement of fibre-extent by carding, drafting and combing actions.

UNIT III TWISTING 12

Twisted yarn geometry, forces acting on fibre and yarn during twisting, effect of fibre helix angle on strength, parameters affecting optimum twist level; balloon and spinning triangle formation and their effects on yarn quality and productivity; fundamental requirement to create real twist in a strand, mechanism of twisting principles in ring spinning, separation of twisting and winding actions of yarn; modified twisting principles - open end twisting, false twisting, air-jet twisting, air-vortex twisting, up-twisting, two-for-one twisting, hollow-spindle twisting; merits and demerits of modern twisting system.

UNIT IV FIBRE BLENDING AND LEVELLING 12

Importance of achieving homogeneous blending in fibre-mix; types of mixing during spinning preparatory process; lateral and longitudinal fibre blending; analysis of fibre blend index values; process parameters of spinning machinery for processing blended material; influence of intermediate product uniformity on yarn uniformity; different methods of levelling adopted during spinning processes.

TOTAL: 60 PERIODS

REFERENCES

1. Oxtoby E., "Spun Yam Technology", Butterworths, London, 1987
2. Klein W., "The Technology of Short-staple Spinning", The Textile Institute, Manchester, 1998. ISBN: 1870812980.
3. Klein W., "A Practical Guide to Opening and Carding", The Textile Institute, Manchester, 1999. ISBN: 1870812999.
4. Klein W., "A Practical Guide to Combing, Drawing and the Roving Frame", The Textile Institute, Manchester, 1999. ISBN: 1870372287.
5. Klein W., "A Practical Guide to Ring Spinning", The Textile Institute, Manchester, 1999. ISBN: 1870372298.
6. Lord P.R., "Yarn Production: Science, Technology and Economics", The Textile Institute, Manchester, 1999. ISBN: 1870372174.
7. Salhotra K.R. and Chattopadhyay R., "Book of papers on Blow room, Card", Indian Institute ofTechnology, Delhi, 1998.
8. Shaw J., "Short-staple Ring Spinning", Textile Progress, The Textile Institute, Manchester, 1982
9. Doraiswamy I., Chellamani P., and PavendhanA., "Cotton Ginning", Textile Progress, Vol. 24, No.2, The Textile Institute, Manchester1993. ISBN: 1870812484.
10. Grosberg P. and Iype C, "Yarn Production: Theoretical Aspects", Textile Institute, 1999, ISBN: 1870372034.

TX 9212 TECHNOLOGIES IN FABRIC FORMATION L T P C
4 0 0 4

UNIT I ADVANCE IN SHUTTLE LESS WEAVING 24

Developments in tappet, dobby for high speed shedding; electronic jacquard developments - actuators, independent drives technology; modern yarn feeders for shuttleless looms and its control; basics of fluid dynamics; weft yarn arrival issues and developments; automatic weft arrival control, air jet nozzle design and nozzle arrangements in loom; let-off and take -up system – tension and starting mark correction; air jet and rapier loom control systems; automation and electronics; terry pile mechanisms in shuttleless loom; advances in rapier drives; loom networking and data system

UNIT II WEAVING OF TEXTILE REINFORCEMENT FOR COMPOSITES 12

Woven textile reinforcement for composites - classifications; technologies for 3D multilayered fabrics, 3D orthogal interlaced and 3D orthogonal non - interlaced production machinery development; evaluation of 3D weaving technologies; tri - axial and multi - axial weaving machines, tri - axial 3D and multi - axial 3D weaving machines, tape weaving technology for composite

UNIT III KNITTING AND BRAIDING OF TEXTILE REINFORCEMENT FOR COMPOSITES 12

Multi axial 3D warp knitting machine, hybrid technologies for composite preform manufacturing; braiding, 3D braiding technology

UNIT IV ADVANCES IN BONDED FABRICS 12

Nano fibre based bonded fabrics – production – electro static spinning, fibre splitting, characterisation and application; multi layered filter fabric design and production (micro and nano fibre composition); development in machinery for modern spun bonding and melt blown plant and automation.

TOTAL: 60 PERIODS

REFERENCES

1. Sabit Adanur., “Handbook of weaving”, Technomic Publishing Co. Inc. 2001
2. Marks R. and Robinson T.C., “Principles of weaving”, The Textile Institute, 1976.
3. Vangheluwe L., “Air- jet weft insertion”, Textile progress, Vol. 29, No 4, Textile Institute Publication, 1999, ISBN; 1870372255.
4. Miravete A., “3D textile reinforcements in composite materials”, Woodhead Publishing Ltd., Cambridge, U.K, 1999.
5. Tsu-Wei Chou, Frank K. Ko, “Composite Materials Series 3 - Textile Structural composites”, Elsevier Science Publishing company Inc., 1989.
6. A. R. Bunsell, (ed), “Composite Materials Series 2 – Fiber reinforcement for Composite Materials”, Elsevier Science Publishing company Inc., 1989.

TX 9213 COLOURATION AND FUNCTIONAL FINISHES L T P C
3 0 2 4

UNIT I COLOURATION I 5
Mass colouration, colour measurement and matching

UNIT II COLOURATION II 5
Chemical processing in denim production, unconventional dyeing techniques, ink jet printing

UNIT III THEORY OF DYEING 9
Adsorption isotherms, thermo dynamics of dyeing – dye affinity, activity of dyes, heat of dyeing, entropy; rate of dyeing and half dyeing time

UNIT IV FINISHING I 13
Water proofing, flame proofing, soil release finish and coated textiles

UNIT V FINISHING II 13
Antimicrobial finishes, bio finishing, plasma treatment, self cleaning materials and UV protection

PRACTICALS: 30

1. Determination of concentration of dye in solution
2. Determination of concentration of dye in fabric
3. Determination of colour parameters
4. Determination of fastness properties of dyed materials
5. Determination of functional groups in fibres and chemicals
6. Determination of activity of enzymes
7. Evaluation of flame retardant fabrics
8. Evaluation of water proofed fabrics

TOTAL: 75 PERIODS

REFERENCES

1. Shah H. S. and Gandhi R. S., “Instrumental colour measurements and computer aided colour matching for textiles”, Mahajan Book Publications, 1990.
2. Vaidhya A. A. and Datye K. V., “Chemical Processing of man - made fibres and blends”, John Wiley and Sons, New York, 1984.
3. Parmer M. S. Satsang S. S. and Jai Prakash., “Denim - A Fabric for all”, NITRA 1996.
4. Johnson A., “The Theory of Colouration of Textiles”, SDC, 2nd edition, 1989, ISBN: 09901956481.
5. Ujiie H.,“Digital printing of textiles “Woodhead Publishing Ltd., 2006, ISBN 1 85573 951 8

TX 9214 TEXTILE QUALITY EVALUATION L T P C
3 0 2 4

UNIT I MASS VARIATION OF TEXTILE STRANDS 5
Depiction of mass variation of textile strands in time and frequency domain; interpretation and significance of U% and CV% for textile strands; classification and analysis of yarn faults created by mass variation

UNIT II VARIANCE LENGTH CURVES AND SPECTGROGRAM OF TEXTILE STRANDS 13

Effect of specimen length and total length on mass variation measurements of textile strands; theory of construction of VL curve; analysis of variance length curves to understand and avoid the introduction of mass variation during the spinning operation; determination of period mass variation in the form of spectrogram; determination of theoretical wave length spectrum; comparison between normal and ideal spectrum; type of faults and their representation in spectrogram; interpretation of superimposed waves in spectrogram

UNIT III TENSILE PROPERTIES OF YARN 4

Testing factors influencing the yarn tensile properties; measurement and application of yarn modulus; creep and stress relaxation of yarn; significance of estimating minimum yarn strength

UNIT IV MECHANISM OF FABRIC FAILURE 5

Mode of fabric failure – tensile, tear, abrasion, slippage, bursting and fatigue; influence of fibre, yarn characteristics and fabric structure on fabric failure

UNIT V COMFORT AND LOW STRESS MECHANICAL PROPERTIES 9

Role of transmission properties on thermal properties and thermal comfort viz., air permeability, water vapour permeability, resistance to penetration of liquid water, resistance to flow of heat and electrical conductivity; low stress mechanical properties during tensile, compression, bending, shear and buckling deformation; influence of low stress mechanical properties of fabrics on fabric handle, tailorability and sewability

UNIT V FABRIC APPEARANCE AND OTHER PROPERTIES 9

Study of fabric appearance in terms of drape, formability, crease recovery, wrinkle recovery and pilling resistance; influence of fibre, yarn characteristics and fabric structure on the fabric appearance; evaluation of fabric properties like dimensional stability, flammability, impact resistance, absorbency

PRACTICALS 30

1. Measurement of U%, of sliver, roving and yarn
2. Measurement of imperfections and hairiness of yarn
3. Analysis of variance-length curve
4. Analysis of spectrogram
5. Measurement and analysis of single yarn tensile properties at different test conditions
6. Study of creep behaviour of yarn
7. Measurement and analysis of yarn faults
8. Measurement and analysis of surface and compression property of fabric

TOTAL: 75 PERIODS

REFERENCES

1. Furter R., “Evenness testing in yarn production: Part I”, The Textile Institute, Manchester, 1982.
2. Furter R., “Evenness testing in yarn production: Part II”, The Textile Institute, Manchester, 1982.
3. Furter R., “Strength and elongation testing of single and ply yarns”, The Textile Institute, Manchester, 1985.
4. Steadman R.G., “Cotton testing”, Textile Progress, Vol. 27, No.1.Text.Inst, 1997, ISBN:1870812859.
5. Lord P.R. and Grover G., “Roller drafting”, Textile Progress, Vol. 23 No.4, Textile Institute, 1993, ISBN:1870812468.

6. "Instrumentation in the textile industry", Vol. 1; 1996, Instrument Society of America, 1997, ISBN:1556175973.
7. Kothari V.K., "Progress in Textiles: Science & Technology Vol. 1, Testing and Quality Management", IAFL Publications, New Delhi, 1999, ISBN: 81-s901033-0-X.
8. Slater K., Charles C., Thomas Springfield I.L., "Human Comfort", 1985.
9. Bishop D.L., "Fabrics: Sensory and Mechanical Properties", Textile Progress Vol. 26/3, 1994. ISBN: 1870812751.
10. Ukponmwan J., Mukhopadhuau A. and Chatterjee K., "Pilling", Textile Progress, Vol. 28/3, 1996. ISBN: 1870372153.
11. Li, "The Science of Clothing Comfort", Textile Progress, Vol., 29/3, 1997, ISBN: 1870372247.
12. Seyam, "Structural Design of Woven Fabric: Theory and Practice", Textile Progress, Vol., 31/3, 1999.
13. Laing and Sleivert, "Clothing Textiles and Human Performance", Textile Progress, Vol. 32/4, 2000.
14. Ponmwan, J.O, "The Thermal Insulation Properties on fabrics", Textile Progress, Vol. 24, No.4, Textile Insttitute, 1993, ISBN: 1870812654.

TX 9215 STATISTICS IN TEXTILE ENGINEERING L T P C
3 1 0 4

UNIT I PROBABILITY DISTRIBUTION AND ESTIMATIONS 6

Applications of Binomial, Poisson, normal, student's, 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 quality parameters – normal test, t-test, chi-square test and F-test; 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

UNIT IV PROCESS CONTROL AND CAPABILITY ANALYSIS 12

Control charts for variables and attributes - basis, development, interpretation, sensitizing rules, average run length; capability analysis

UNIT V DESIGN AND ANALYSIS OF EXPERIMENTS 18

2^k full-factorial designs; design and analysis of second-order composite designs; robust designs; development of regression models, calculation of regression coefficients; adequacy test for regression equations; process optimizations, multivariate analysis

TOTAL: 60 PERIODS

REFERENCES

1. Montgomery D.C., "Introduction to Statistical Quality Control", John Wiley and Sons, Inc., Singapore, 2002, ISBN: 997151351X.
2. Leaf G.A.V., "Practical Statistics for the Textile Industry, Part I and II", The Textile Institute, Manchester, 1984, ISBN:0900739517.
3. Douglas C. Montgomery, "Design and analysis of experiments", John Wiley & Sons, Inc, Singapore, 2000, ISBN 9971 51 329 3
4. Ronald D. Moen, Thomas W. Nolan, Lloyd P. Provost, "Quality improvement through planned experimentation', McGraw-Hill, 1998, ISBN 0-07-913781-4

TX 9251 **BONDED FABRICS** **L T P C**
3 0 0 3

UNIT I INTRODUCTION **9**
Definition; Classification of bonded fabrics; fibres used in bonded fabric industry; consumption and production figures of bonded fabrics

UNIT II WEB PREPARATION **9**
Fibres used for wet and dry method of web preparation; fibre orientation in the web; opening and cleaning machines used; machines used for the production of parallel laid; cross-laid and random laid webs; web uniformity

UNIT III BONDING **9**
Technology of bonding webs by mechanical, thermal and chemical methods; production of bonded, melt blown and spun lace techniques

UNIT IV FINISHING AND END USES **9**
Dry and wet finishing of bonded fabrics; various end uses of bonded fabric properties

UNIT V STRUCTURAL MECHANICS **9**
Evaluation of non woven fabrics; effect of fibre, web and processing parameters on bonded fabrics

TOTAL: 45 PERIODS

REFERENCES

1. Lunenschloss J., Albrecht W. and David Sharp., “Non-woven Bonded Fabrics”, Ellis Horwood Ltd, New York, 1985, ISBN: 0-85312-636-4.
2. Gulrajani M.L., “Non wovens”, Textile Institute, Manchester, 1992.
3. Mrstina V. and Feigl F., “Needle punching Textile Technology”, Elsevier, New York, 1990.
4. Dharmadhikary R.K., Gilmore T.F., Davis H.A. and Batra S.K., “Thermal bonding of nonwoven fabrics”, Textile Progress, Vol.26, No.2, Textile Institute Manchester, 1995, ISBN: 1870812786
5. Jirsak O. and Wadsworth L.C., “Non woven Textiles”, Textile Institute, Manchester, 1999, ISBN: 0 89089 9788
6. Russell S., “Hand book of nonwovens”, Textile Institute, Manchester, 2004, ISBN: 1 85573 603 9.

TX 9252 **TEXTILE REINFORCED COMPOSITES** **L T P C**
3 0 0 3

UNIT I CHARACTERISATION OF COMPOSITES **13**
Classification of composites; characteristics of composites - tensile, shear, composition, flexural; thermoplastic responses of composite; use of high performance fibres

UNIT II COMPOSITES WITH GLASS FIBRES **9**
Glass fibres properties; glass fibre reinforced polymers; manufacture of glass fibre composites

UNIT III COMPOSITES WITH CARBON FIBRES **9**
Carbon fibre reinforced composites; testing of carbon reinforced composites

UNIT IV COMPOSITES WITH FABRICS 9

Textile structure of composites- woven, knitted, braided material and three dimensional fabrics

UNIT V FLEXIBLE COMPOSITES 5

Fibre reinforced plastics; fabric reinforced composites; flexible composites; applications

TOTAL: 45 PERIODS

REFERENCES

1. Fitzer E., "Carbon fibre and their composites", Sporinger Verlag, Weinheim, 1985
2. Richardson M.O.W., "polymer engineering composites", Elsevier, Amsterdam 1977.
3. Miravele A., "Three dimensional textile reinforcement for composite materials", Textile Institute, 1999, ISBN:1855733765.

TX 9253 COMPUTER APPLICATIONS IN TEXTILE TECHNOLOGY L T P C
0 0 6 3

LIST OF EXPERIMENTS

1. File handling
2. Correlation and regression
3. ANOVA
4. Graphical programming – mechanical link simulation
5. Image Analysis – Filament yarn filament count and diameter variation
6. Simple Back- Propagation ANN for modeling
7. Local serial port programming (Input and Output)
8. Local parallel port programming (Input and Output)
9. Data acquisition and Plotting – ADC
10. Inverter control DAC
11. Binary Control Loop – Hardware setup and programming
12. PIC controller hardware setup, programming and performance plot
13. Remote port access – Parallel port
14. Remote port access – Serial Port (virtual port)
15. Socket programming – Ethernet
16. Multi drop bus Data system -RS-485 based data access and control

TOTAL : 90 PERIODS

TX 9254 THEORY OF TEXTILE STRUCTURES L T P C
3 0 0 3

UNIT I YARN GEOMETRY 9

Elements of yarn geometry; geometry of helix and its application to yarn structures; yarn diameter, packing of fibres in yarn; estimation of packing density and radial packing density of yarn; geometry of folded yarns

UNIT II FIBRE MIGRATION 9

Migration characteristics in continuous filament and spun yarns; effect of various parameters on migration; measurement of fibre migration in yarn; effect of migration on tensile behaviors and hairiness of the yarn

UNIT III YARN MECHANICS 9

Analysis of tensile behavior, prediction of breakage - continuous filament yarn and spun yarn; effect of fibre properties and geometrical configuration of yarn on the tensile and bending properties of yarn; design of yarn structures for certain functional uses

UNIT IV BLENDED YARN MECHANICS 5

Blend irregularity; measurement of blending irregularity; concept of elongation balance; effect of properties of constituent fibres and blend composition on behavior of blended yarns

UNIT V FABRIC MECHANICS 13

Pierce's geometry of plain weave fabrics; crimp balance equation; theoretical treatment of fabric deformation in tension, bending and shear, cloth buckling and recovery; geometry of nonwoven and knitted fabrics

TOTAL : 45 PERIODS

REFERENCES

1. Hearle J.W.S., Grosberg P. and Baker S., "Structural Mechanics of fibres, yarns and fabrics", Wiley Interscience, New York, 1969.
2. Goswami B.C., Martindale J.G. and Scardino F.L., "Textile Yarns: Technology, Structure and Applications", Wiley Interscience, New York, 1985.
3. Hearle J.W.S., Thwaitesand J.J. and Amikrbayhat A., "Mechanics of Flexible Fibre Assemblies", Maryland, 1980.
4. Postle P., Dejong S.and Carnaby G.A., "The Mechanics of Wool Structure", Ellis Horwood, London, 1988.

TX 9255 THEORY OF COLOURATION L T P C
3 0 0 3

UNIT I PHYSICAL CHEMISTRY 18

First law of thermo dynamics and its application in thermo chemistry, second law of thermo dynamics, free energy, thermodynamics of solutions, surface adsorption, adsorption at interface, activity of dye affinity, substantivity, heat of dyeing and entropy; donor membrane equilibrium, order of reactions

UNIT II PHYSICAL AND CHEMICAL STRUCTURE OF FIBRES AND DYE UP-TAKE 9

Effect of orientation, crystallinity, chemical structure and chemical modification of fibres on kinetics and equilibrium of sorption of solvent and dye molecules

UNIT III DYE-FIBRE BONDS 9

Surface energy and interfacial effects, inter molecular forces, identification of dye fibre forces, specific dye – fibre bonds

UNIT IV DIFFUSION AND RATES OF DYEING 9

Fick's law of diffusion, diffusion in the steady and non - steady state, boundary layers in diffusion, diffusion in final bath, parameters that affect diffusion and rates of dyeing, diffusion coefficient and concentration, activation energies of diffusion

TOTAL : 45 PERIODS

REFERENCES
1. Johnson A., "The Theory of colouration of Textiles", SDC 2nd edition, 1989. ISBN: 0901956481.
2. Peters A.T. and Freeman H.S., "Physico – Chemical Principles of Colour Chemistry", Blackie, 1995, ISBN: 0751402109.
3. Bird C.L., "The Theory of coloration of Textiles", Dyers Co., Publications Trust,1975.
4. Vickerstaff T., "The Physical Chemistry of Dyeing", Imperial chemical Industries Ltd, 1950.
5. Peters R.H., "The physical Chemistry of Dyeing", Elsevier scientific publishing co, 1975.

TX 9256 OPERATIONS RESEARCH L T P C
3 0 0 3

UNIT I LINEAR PROGRAMMING TECHNIQUES 9

Linear programming – formulation, solution by graphical and simplex methods; dual simplex method; duality; sensitivity analysis

UNIT II TRANSPORTATION AND ASSIGNMENT MODELS 13

Transportation problem – North / West corner Solution, least cost method, Vogel's approximate method, optimality check - Modi method, stepping stone method; solution to assignment problem- Hungarian method; unbalanced, infeasible assignment problems; maximisation in assignment problems; transhipment problems

UNIT III INTEGER LINEAR PROGRAMMING, GAME THEORY, DECISION MAKING THEORY 9

Solution to integer programming problem - Branch and bound algorithm, cutting plane algorithm; Game theory: Two person – zero sum games: saddle point, dominance rule, graphical and method of matrices; Decision making under risk: decision trees, decision making under uncertainty

UNIT IV PROJECT SCHEDULING 9

CPM and PERT networks for project scheduling- finding critical path, probability and cost consideration in the project scheduling; crashing; resource planning, levelling

UNIT V QUEING MODELS 5

Queuing theory – single and multi-channel models – infinite number of customers and infinite calling source

TOTAL: 45 PERIODS

REFERENCES
1. Panneerselvam R., "Operations Research", Prentice Hall of India, 2002.
2. Tulsin P.C., "Quantitative Techniques: Theory and Problems", Pearson Education, 2002.
3. Ronald L. Rardin., "Optimization in Operations Research", Pearson Education, 1998.
4. Hillier and Lieberman, "Introduction to Operations Research", McGraw-Hill International Edition, 7 th Edition, 2001
5. Hamdy A Taha, "An Introduction to Operations Research", Prentice Hall, Sixth edition, 2000.
6. Ravindran, Phillips, Solberg, "Operations Research: Principles and practice", 2nd edition, John Wiley, 1987.

7. Srivastava U.K., Shenoy G.V. and Sharma S. C., "Quantitative Techniques for Managerial Decision", 2nd Edition, Prentice Hall of India, 2001.
8. Gupta P. K. and Hira D. S., "Problems in Operations Research", S. Chand and Company, 2002.
9. Gupta P.K. and Hira D.S., "Operations Research", S. Chand and Co. Ltd., New Delhi, 2002.
10. Sharma J. K., "Operations Research: Theory and Applications", Macmillan, 1997.
11. Mustafi C.K., "Operations Research: Methods and Practice", New Age International Pvt. Ltd. Publisher, 2000.
12. Kalavathy S., "Operations Research", Vikas Publishing House Pvt. Ltd., 2000.

TX 9257 ENVIRONMENTAL MANAGEMENT FOR TEXTILE INDUSTRY L T P C
3 0 0 3

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 **13**

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 **5**

Air and noise pollution in textile industry; solid waste disposal

TOTAL: 45 PERIODS

REFERENCES

1. Trivedi R.K., "Handbook of Environmental laws, Acts, Guidelines, Compliances and Standards", Vol. 1, Enviro Media, India, 1996.
2. George Thobanoglous and Franklin L. Burton., "Waste Water Engineering and Treatment, Disposal, Reuse (Metcalf & Eddy Inc., California)", Tata McGraw-Hill Publishing co Ltd, New Delhi, 1995.
3. Manivasakam N., "Treatment of Textile Processing Effluents (including analysis)", Sakhi Publications, Coimbatore, 1995.
4. "Eco-Textiles: Regulations, Labels, Processing and Testing, A Special Report", The Bombay Textile Research Association, Mumbai, 1996.
5. "Symposium Proceedings on Eco - Friendly Textile Processing", Department of textile Technology, Indian Institute of Textile Technology, New Delhi, 1995.

6. Skelly J. K., "Water Recycling in Textile wet Processing", Woodhead Publishing Ltd, 2003, ISBN: 0 901956 80 5.
7. Cooper P., " Colour in Dyehouse Effluent", Woodhead Publishing Ltd, 1995, ISBN:0 901956 694
8. Slater K., "Environmental impact of textiles: Production Processes and Protection", Woodhead Publishing Ltd, 2003, ISBN:1 85573 541 5.
9. Chritie R., "Environmental aspects of textile dyeing", Woodhead Publishing Ltd, 2007, ISBN:1 84569 115 6.

TX 9258 TOTAL QUALITY MANAGEMENT IN TEXTILE INDUSTRY L T P C
3 0 0 3

UNIT I INTRODUCTION TO QUALITY MANAGEMENT 9

Definitions of quality, quality philosophies of Deming, Crossby and Miller; customer focus; leadership – concepts; quality planning; quality costs; vision, mission statements and Quality Policy.

UNIT II PRINCIPLES OF TOTAL QUALITY MANAGEMENT 9

Evolution of TQM, TQM models; continuous process improvement – Juran Trilogy, PDSA Cycle, 5S, Kaizen; supplier performance measures; Deming wheel; internal external customer concept; customer satisfaction index, customer retention; team work and team building, empowerment

UNIT III QUALITY MANAGEMENT TOOLS 18

Principles and applications of Quality Function Deployment, Failure Mode and Effect Analysis, Seven old QC tools, Seven New Management tools, Statistical Quality Control techniques, Mistake proofing, Benchmarking, JIT, and Kanban; Taguchi Quality Loss Function, Total Productive Maintenance (TPM), Process Capability analysis

UNIT IV QUALITY SYSTEMS 9

ISO 9000 and other quality system – elements, implementation of quality system in spinning, weaving and garment industry; TQM implementation strategies

TOTAL: 45 PERIODS

REFERENCES:

1. Dale H. Besterfiled. et al., "Total Quality Management", Pearson Education Asia, 1999.(Indian reprint 2002).
2. Rose J.E., "Total Quality Management", Kogan Page India Pvt., Ltd., 1993.
3. William J. Kolarik., "Creating Quality", McGraw-Hill, Inc., NY, 1995.
4. Jill A. Swift., Joel E. Ross and Vincent K. Omachonu, "Principles of Total Quality", St. Lucie Press, US, 1998.
5. Samuel K. Ho, "TQM, An Integrated approach", Kogan Page India Pvt Ltd, 2002.
6. Dale H. Besterfield et al, "Total Quality Management", Pearson Education Asia, 2001.
7. P.L.Jain, "Quality Control and Total Quality Management", Tata McGraw - Hill, 2001.
8. John Bank J.E., "Total Quality Management", Prentice Hall, India, 1993.

TX 9259 MEDICAL TEXTILES L T P C
3 0 0 3

UNIT I **9**
Bio materials – metals, ceramics, composites and textile materials; speciality medical fibres

UNIT II **9**
Healthcare and hygiene products types; advanced textile materials in healthcare; infection control and barrier materials; study of non-woven hygienic products; plasma treated barrier materials

UNIT III **9**
Specification, properties and manufacture of range of bandages and pressure garments - elastic and non elastic compression bandages, support and retention bandages, bandaging textiles, evaluation of bandage and bandages for various end uses

UNIT IV **9**
Wound – types, healing process; requirement of wound dressing; an overview of wound care materials - study of various kinds of wound care dressing and advanced wound dressings;

UNIT V **9**
Implantable products; sutures – requirements, classifications, specifications, materials used –their properties and application; vascular grafts, artificial ligaments, artificial tendons and scaffolds; intelligent textiles for medical applications.

TOTAL : 45 PERIODS

REFERENCES

1. Allison Mathews and Martin Hardingham ., “Medical and Hygiene Textile Production - A hand book”, Intermediate Technology Publications, 1994.
2. Anand S.C., Kennedy J.F. Miraftab M. and Rajendran S., “Medical Textiles and Biomaterials for Health care”, Wood head Publishing Ltd. 2006.
3. Joon B. Park. and Joseph D. Bronzino., “Biomaterials – Principles and Applications”,CRC Press Boca Raton London, NewYork, Washington , D.C. 2002
4. Anand S., “ Medical Textiles”, Textile Institute, 1996, ISBN: 185573317X
5. Horrocks A.R. and Anand S.C, “Technical Textiles”, Textile Institute,1999, ISBN: 185573317X.
6. Adanur S., “ Wellington Sears Handbook of Industrial Textiles”’ Technomic Publishing Co., Inc., Lancaster Pennylvania 1995, ISBN 1-56676-340-1.
7. Michael Szycher and Steven James Lee, “Modern Wound Dressing: A Systematic Approach to Wound Healing”, Journal of Biomaterials Applications, 1992

TX 9260 CHARACTERISATION OF TEXTILE POLYMERS L T P C
3 0 0 3

UNIT I MOLECULAR WEIGHT **14**
Polymer solution thermo dynamics; molecular weight and molecular dimensions by end group analysis, osmometry, light scattering, viscometry, gel permeation chromatography, high performance liquid chromatography

UNIT II MOLECULAR STRUCTURE CHARACTERISATION **9**
Infrared, NMR, UV –visible, raman spectroscopy, mass spectroscopy

UNIT III THERMAL PROPERTIES **13**
Thermal properties by differential scanning calorimetry, differential thermal analysis, thermo gravimetry, thermo-mechanical analyzer, dynamic mechanical and di-electric analysis

UNIT IV OTHERS **9**

Optical and electron microscopy; SEM, TEM, X-ray scattering from polymers, birefregence, crystallinity by density measurements,

TOTAL: 45 PERIODS

REFERENCES

1. Gupta V.B. and Kothari V.K., "Man Made Fibre production," Chapman and Hall, 1985.
2. Bill mayer, "Textbooks of Polymer Science," 3rd ed., Wiley, 1984.
3. Sperling, "Introduction to Physical Polymer Science," Wiley, 1986.
4. Campell D. and White J.R, "Polymer characterization, Physical Techniques", McGraw – Hill, New York, 1969.
5. Stamm M., "Polymer surfaces and Interfaces", Springer1st ed., 2008.

TX 9261 CLOTHING SCIENCE **L T P C**
3 0 0 3

UNIT I COMFORT **9**

Thermal properties, moisture-vapour transmission, liquid-moisture transmission, air-permeability, aesthetic comfort, static electricity

UNIT II DURABILITY **9**

Abrasion resistance, tensile and tearing strength, launder ability, seam - slippage and strength

UNIT III HANDLE AND EASY CARE **13**

Low - stress mechanical properties, formability, crease resistance, anti - shrink, pilling resistance behaviour – role of fibre properties and chemical treatments

UNIT IV ERGONOMIC REQUIREMENTS **5**

Anthropometric, product sizing, size, fit and weights

UNIT V DESIGN OF TEXTILE PRODUCTS **9**

Material selection for given end - use and design of textile products

TOTAL: 45 PERIODS

REFERENCES

1. Slater K., "Comfort Properties of Textiles", Textile Progress, Vol. 9, No. 4, 1977.
2. Booth J. E., "Principles of Textile Testing", Newenes, Butterworth's, London, 1983.
3. Postle R., (ed.), Kawabata S. and Niwa M.., "Objective Evaluation of Fabrics", Textile Machinery Society, Japan, Osaka, 1983.
4. Morton W.E. and Hearle J.W.S., "Physical Properties of Textile Fibers", North Holland, Amsterdam, 1986.
5. Goswami B.C., Martindale J. and Scandino F.L., "Textiles Yarns Technology, Structure and Applications", Wiley Interscience, New York, 1997.

TX 9262 APPLIED MATHEMATICS IN TEXTILE TECHNOLOGY **L T P C**
3 0 0 3

UNIT I SYSTEM OF LINEAR EQUATIONS **9**

Softwares for numerical analysis; Linear equations and solutions; Gauss elimination; partial pivoting; Gauss-Jordan elimination; Decomposition – LU decomposition, SVD; iterative methods – Jacobi iteration, Gauss - seidal iteration; applications in textile materials and machines

UNIT II CURVE FITTING AND INTERPOLATION 9

Least Square Curve fitting – linear, polynomial and exponential; Fourier transform- FFT versus DFT, physical meaning of DFT, yarn evenness spectrogram generation; Lagrange polynomial, Newton polynomial, cubic spline; polymer intrinsic viscosity determination from an experimental data and other applications

UNIT III NUMERICAL DIFFERENTIATION AND INTEGRATION 9

Numerical differentiation - Difference approximation for first, second and higher derivatives, approximation error; Numerical integration – Trapezoidal, Simpson method, Gauss quadrature, Double integral; analysis of stress strain curve, weaving sley acceleration and others

UNIT IV DIFFERENTIAL EQUATIONS 9

Ordinary differential equations and solutions- Taylor's series, Euler's method, Runge- Kutta method; water reservoir, heat transfer in sizing drying cylinder

UNIT V MODELING AND SIMULATION 9

Modelling and simulation of textile process - yarn irregularity due to change in the nip point and attenuation of the sliver; ballooning and yarn tension in ring frame, numeric solution of yarn shape and tension in rotor spinning, yarn motion in air jet weaving; tension during unwinding of yarn from drum feeder

TOTAL : 45 PERIODS

REFERENCES

1. Gerald C. F and Wheatley P. O., "Applied numerical analysis", 7th Edition, Pearson Education Asia, New Delhi, 2007.
2. Jaan Kiusalaas, "Numerical Methods in Engineering With MATLAB", Cambridge University Press, 2005.
3. Won Young Yang et al., "Applied numerical analysis using MATLAB", Wiley Interscience, 2005.
4. Sabit Adanur, "Handbook of weaving", Technomic Publishing Co. Inc., 2001.
5. Grosberg P. C. Iype, "Yarn Production – Theoretical Aspects", Textile Institute, 1999.

TX 9263 MANAGEMENT AND INFORMATION SYSTEMS L T P C
3 0 0 3

UNIT I MANAGEMENT OF SYSTEMS – SYSTEM CONCEPT 9

Introduction to system - definition, classification, characteristics of a system; problem solving - conventional approach, systems approach and advantages, procedure for engineering a system; system theory of organization and management; textile system analysis case studies

UNIT II INFORMATION TECHNOLOGY 9

Computer and networking – intranet , internet, web server; information system, architecture, modern information systems; information system in business function – marketing, sales, HR, ERP; applications - data and knowledge management, data base architecture, web data base, data warehousing data mining, knowledge management

UNIT III MANAGEMENT INFORMATION SYSTEMS 9

Management functional areas; decision making in management; concept of DSS, EIS, ES; planning information system, implementation – cost benefit analysis, testing and security

UNIT IV ENTERPRISE RESOURCE PLANNING (ERP) 9

ERP – Origin, concept, Materials Requirement Planning, Manufacturing Resource planning, CIM, SCM, CRM, ERP and MIS – functional analysis; evaluation of ERP Tangible and intangible benefits

UNIT V ERP IMPLEMENTATION 9

ERP implementation – need analysis, feasibility analysis; ERP modules, soft wares, functional requirement specification, ERP consultant; case studies; business process reengineering and process innovation; BPR steps and techniques; implementation approaches; case studies for spinning and weaving mills

TOTAL : 45 PERIODS

REFERENCES

1. Sharma S. C., "Management of Systems", Khanna Publishers, Delhi 1996.
2. Kenneth C., Laudon and Jane Price Laudon, "Management Information systems Managing the digital firm", Pearson Education Asia.
3. Gordon B. Davis., "Management Information system: Conceptual Foundations, Structure and Development", McGraw Hill, 1974.
4. Effy oz., "Management Information Systems", 2nd Edition, Thomson Learning Course Technology, 2000.
5. W.S. Jawadekar, "Management Information Systems", Tata McGraw Hill Publishing Company, Delhi, 2002.
6. Joyce J. Elam., "Case series for Management Information System" Silmon and Schuster, Custom Publishing, 1996.

TX 9264 PROTECTIVE CLOTHING L T P C
3 0 0 3

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 .

TOTAL : 45 PERIODS

REFERENCES

1. Adanur S., "Wellington sears handbook of Industrial textiles" Technomic publishing co. inc., 1995, ISBN : 1 – 56676 – 340 – 1
2. Pushpa Bajaj and Sengupta A.K, "Protective clothing", the Textile Institute, 1992, ISBN 1-870812 – 44-1
3. Chellamani K.P. and Chattopadhyyay D., "Yarns and Technical Textiles", SITRA, 1999.
4. Mukhopadhyay S.K. and Partridge J.F., "Automotive Textiles", Textile Progress, Vol29, No1/2, 1999, ISBN:1870372212

5. Horrocks A.R. and Anand S.C., “Handbook of Technical Textiles”, The Textile Institute, Manchester, 2000, ISBN: 1855733854.
6. Anand S.C., “Medical Textiles”, Textile Institute, Manchester, 2001, ISBN:185573494X.
7. Scott R.A., “Textiles for protection”, Woodhead Publishing Ltd., Cambridge, UK, 2005, ISBN 1-85573-921-6.
8. Saville B.P., “Physical testing of textiles”, Woodhead Publishing Ltd., Cambridge, UK, 1999, ISBN 1-85573-367-6.
9. Long A.C., “Design and manufacture of Textile Composities”, Woodhead Publishing Ltd., Cambridge, UK, 2005, ISBN 1-85573-744-2.
10. Fung W, “Coated and laminated textiles”, Woodhead Publishing Ltd, Cambridge, UK, 2002, ISBN 1-85573-576-8.
11. Anand S.C., Kennedy J.F., Miraftab.M and Rajendran.S., “Medical textiles and biomaterials for health care”, Woodhead Publishing Ltd, Cambridge, UK,2006, ISBN 1-85573-683-7.
12. Fung W. and Hardcastle, “Textiles in automotive engineering”, Woodhead Publishing Ltd, Cambridge, UK, 2001, ISBN 1-85573-493-1.
13. John N.W.M., “Geo Textile”, Blackie and Sons Ltd, London, U.K. , 1987, ISBN 0-412-01351-7.
14. Allison Mathews. and Martin Hardingham, “Medical and Hygiene Textile Production – A hand book” Intermediate Technology Publications, 1994.

TX 9265 SUPPLY CHAIN MANAGEMENT L T P C
3 0 0 3

UNIT I **9**

Supply Chain Management - scope and importance, customer driver strategies, logistics and competitive strategy

UNIT II **9**

Management of transportation - inventory, order processing, purchasing, warehousing, materials handling, packaging; customer service management; marketing and supply chain interface; finance and supply chain interface

UNIT III **9**

Distribution network planning and warehouse location; integrated supply, production, distribution policies and plans

UNIT IV **18**

Import-Export logistic management; export shipping, air transportation management – documentation, insurance, packaging and others; Foreign exchange – concept; methods of International payment settlement; international commercial terms; exchange control regulations for imports and exports – textile products

TOTAL : 45 PERIODS

REFERENCES

1. Donald J. Bowersox and David J. Closs, “Logistical Management”, Tata McGraw-Hill Editions, New Delhi, 2000.
2. Jeremy F. Shapiro, “Modelling and Supply Chain”, Thomson Learning, U.K., 2001.
3. Monczka, Trend, Handfiled, “Purchasing and Supply chain management”, Thomson south- western college publishing, Kentucky, 2000.
4. Bligh, Philip; Douglas Turk, “CRM unplugged – releasing CRM's strategic value”, Hoboken: John Wiley & Sons, 2004, ISBN 0-471-48304-4.

5. David Taylor and David Brunt, “Manufacturing Operations and Supply Chain Management”, Vikas Thomson Learning, New Delhi, 2001.
6. Philippe - Pierre Dornier, “Global operations & logistics”, John Wiley & sons Inc, New York, 2002.
7. Sahay B.S., “Supply chain management for global competitiveness”, Macmillan India Ltd, Delhi, 2000.
8. David Hutchins, “Just in Time”, Jaico Publishing House, Mumbai, 2001.
9. David Simchi, Levi and Philip Kaminsk, “Designing and Managing the supply chain”, McGraw-Hill Companies Inc., New York, 2000.