

UNIVERSITY DEPARTMENTS
ANNA UNIVERSITY CHENNAI : : CHENNAI 600 025
REGULATIONS - 2009
CURRICULUM I TO IV SEMESTERS (FULL TIME)
M.TECH. TEXTILE TECHNOLOGY

SEMESTER I

SL. NO	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	TX9111	Theory of Yarn Spinning	4	0	0	4
2.	TX9112	Technologies of Fabric Formation	4	0	0	4
3.	TX9113	Colouration And Functional Finishes	3	0	2	4
4.	TX9114	Textile Quality Evaluation	3	0	2	4
5.	TX9115	Statistics In Textile Engineering	3	1	0	4
TOTAL CREDITS			17	1	4	20

SEMESTER II

SL. NO	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	TX9121	High Performance Fibres	4	0	0	4
2.	TX9122	Technical Textiles	4	0	0	4
3.	E1	Elective I	3	0	0	3
4.	E2	Elective II	3	0	0	3
5.	E3	Elective III	3	0	0	3
6.	E4	Elective IV	3	0	0	3
TOTAL CREDITS			20	0	0	20

SEMESTER III

SL. NO	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	TX9131	Financial Management	3	1	0	4
2.		Elective V	3	0	0	3
PRACTICAL						
3.	TX9135	Project (Phase I)	0	0	12	6
TOTAL CREDITS			6	1	12	13

SEMESTER IV

SL. NO	COURSE CODE	COURSE TITLE	L	T	P	C
PRACTICAL						
1.	TX9141	Project (Phase II)	0	0	24	12
TOTAL CREDITS			0	0	24	12

TOTAL CREDITS TO BE EARNED FOR THE AWARD THE DEGREE = 65

LIST OF ELECTIVES

SL NO	COURSE CODE	COURSE TITLE	L	T	P	C
1.	TX9151	Bonded Fabrics	3	0	0	3
2.	TX9152	Textile Reinforced Composites	3	0	0	3
3.	TX9153	Computer Applications In Textile Technology	0	0	6	3
4.	TX9154	Theory of Textile Structures	3	0	0	3
5.	TX9155	Theory of Colouration	3	0	0	3
6.	TX9156	Operations Research	3	0	0	3
7.	TX9157	Environmental Management for Textile Industry	3	0	0	3
8.	TX9158	Total Quality Management in Textile Industry	3	0	0	3
9.	TX9159	Medical Textiles	3	0	0	3
10.	TX9160	Characterization of Textile polymers	3	0	0	3
11.	TX9161	Clothing Science	3	0	0	3
12.	TX9162	Applied Mathematics in Textile Technology	2	0	2	3
13.	TX9163	Management and Information Systems	3	0	0	3
14.	TX9164	Protective Clothing	3	0	0	3
15.	TX9165	Supply Chain Management	3	0	0	3

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.

L : 45 , T : 15 , 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 of Technology, 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.

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
6. Schindler W.D. and Hauser P.J., "Chemical Finishing of Textiles", Woodhead Publishing Ltd., 2004, ISBN: 855739054
7. Heywood D., "Textile Finishing", Woodhead Publishing Ltd., 2003, ISBN: 0901956813
8. Sen A.K., "Coated Textiles: Principles and Applications", Woodhead Publishing Ltd., 2001, ISBN: 1587160234
9. Cavaco – Paulo A. and Gubitz G.M., "Textile Processing with enzymes", Woodhead Publishing Ltd., 2002, ISBN: 1 85573 610 1
10. Dhishoo R., "Plasma technologies for Textiles", Woodhead Publishing Ltd, 2007, ISBN: 84569 0737

TX 9114	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 SPECTROGRAM 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 VI 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. Pomwan, J.O, "The Thermal Insulation Properties on fabrics", Textile Progress, Vol. 24, No.4, Textile Institute, 1993, ISBN: 1870812654.

TX 9115

STATISTICS IN TEXTILE ENGINEERING

**L T P C
3 1 0 4**

UNIT I PROBABILITY DISTRIBUTION AND ESTIMATIONS 12

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 12

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

L: 45 , T : 15 , 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 9121

HIGH PERFORMANCE FIBRES

L T P C
4 0 0 4

UNIT I ADVANCED SPINNING TECHNOLOGY 12

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

UNIT II HIGH PERFORMANCE FIBRES FOR INDUSTRIAL APPLICATIONS 12

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 18

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

UNIT IV SPECIALITY FIBRES 18

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

L : 45 , T : 15 , TOTAL : 60 PERIODS

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.

TX 9122

TECHNICAL TEXTILES

L T P C
4 0 0 4

UNIT I FILTRATION TEXTILES 12

Theory of dust collection, cleaning systems, fabric selection for dust collection, finishing treatments; solid, liquid separation, fabric selection - filtration, requirements, yarn and fabric construction for filter fabrics, finishing treatments

UNIT II GEO TEXTILES 6

Geo textiles – types, structures, manufacture, properties, evaluation, applications

UNIT III DEFENCE AND PROTECTIVE TEXTILES 12

Thermal insulation materials; study of water vapour permeable / water proof materials, military combat clothing systems; camouflage textiles, UV wave band, visible wave band, visual decoys; infrared camouflage; protective textiles against micro organisms, chemicals and pesticides, evaluation technique

UNIT IV TRANSPORTATION TEXTILES 6

Fibre requirements–fibre, plastic composites; textiles applications in all kinds of road transport vehicles, rail, aircrafts, marine

UNIT V MEDICAL TEXTILES 12

Textile materials in medical applications; bandages and pressure garments; evaluation technique; study of various kinds of wound care dressing and advanced wound dressings; implantable and non implantable materials; study of sutures

UNIT VI FINISHING AND COATING OF TECHNICAL TEXTILES 6
 Mechanical finishes – types, machines; heat setting; chemical finishes - coating of technical textiles, different techniques; fusible interlinings

UNIT VII AGRO TEXTILES 6
 Agricultural fabrics – construction details, properties, applications

L : 45 ,T : 15 ,TOTAL : 60 PERIODS

REFERENCES

1. Horrocks A.R. and Anand S.C., "Handbook of Technical Textiles", The Textile Institute, Manchester, 2000, ISBN: 1855733854.
2. Anand S.C., "Medical Textiles", Textile Institute, Manchester, 2001, ISBN:185573494X.
3. Adanur S., "Wellington sears handbook of Industrial textiles" Technomic publishing co. inc., 1995, ISBN : 1 – 56676 – 340 – 1.
4. Pushpa Bajaj and Sengupta A.K., "Protective clothing", the Textile Institute, 1992, ISBN 1-870812 – 44-1.
5. Scott R.A., "Textiles for protection", Woodhead Publishing Ltd, Cambridge, UK, 2005, ISBN 1-85573-921-6.
6. Fung W, "Coated and laminated textiles", Woodhead Publishing Ltd, Cambridge, UK.2002, ISBN 1-85573-576-8.
7. 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.
8. Fung W. and Hardcastle, "Textiles in automotive engineering", Woodhead Publishing Ltd,Cambridge, UK, 2001, ISBN 1-85573-493-1.
9. John N.W.M., "Geo Textile", Blackie and Sons Ltd, London, U.K.1987, ISBN 0-412-01351-7.
10. Allison Mathews and Martin Hardingham, "Medical and Hygiene Textile Production – A hand book", Intermediate Technology Publications, 1994.
11. David Arvil, "An Innovative Approach to Spunbond Agricultural Crop Cover", Journal of Industrial Textiles, Vol.30, No.4, April (2001) 311-319.
12. Jurg Rupp, "Creating a garden with needle – punched fabrics", Nonwovens and Industrial Textiles, 2 (2002) 49-50.

TX 9131	FINANCIAL MANAGEMENT	L T P C
		3 1 0 4
UNIT I		12
Goals and functions of finance; costing – concepts, classification; preparation of cost sheet; costing of yarn, fabric and garment		
UNIT II		12
Investment appraisal; Payback period method, Accounting Rate of Return; introduction to discounting and cash flows estimation, DCF methods - IRR, NPV, PI; Discounted payback methods; depreciation - concept, methods		
UNIT III		6
Financing and dividend policies; cost of capital, source of capital		
UNIT IV		6
Working capital management; estimation of working capital, requirements for spinning mill, composite mill and garment unit		

UNIT V**24**

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

L : 45 , T :15 ,TOTAL : 60 PERIODS**REFERENCES**

1. Pandey I. M., "Financial management", Vikas Publishing House Pvt. Ltd., New Delhi, 8th Edition, 1999.
2. Bhavé P.V. and Srinivasan V., "Costing accounting to textile mills", ATIRA, Ahmadabad, 1976.
3. Thukaram Rao M.E., "Cost and management accounting", New Age International, Bangalore, Karnataka., 2004.
4. Thukaram Rao M.E., "Cost accounting and financial management", New Age International, Bangalore, Karnataka., 2004.
5. Prasanna Chandra, "Financial management, theory and practice", Tata McGraw -Hill Publishing Co Ltd., 5th edition, New Delhi, 2001.
6. James C. Vanhorne, "Financial management and policy", Pearson Education Asia (Low priced edition) 12th edition, 2002.
7. Narang, G. B. S. and Kumar V., "Production and costing", Khanna Publishers, New Delhi, 1988.
8. Aswat Damodaran, "Corporate finance theory and practice", John Wiley and Sons, Asia., 2000.
9. Hrishikes Bhattacharya, "Working capital management", strategies and techniques", Prentice – Hall of India Pvt.Ltd., New Delhi, 2001.
10. Khan and Jain, "Basic financial management and practice", Tata McGraw Hill, New Delhi, 5th edition, 2001.

TX 9151**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 9152

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", Springer 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.

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**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 9155

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.

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; transshipment 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, 7th 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.

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. Chrutie R., "Environmental aspects of textile dyeing", Woodhead Publishing Ltd, 2007, ISBN:1 84569 115 6.

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 Pennsylvania 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 9160 **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, birefrence, 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 9161

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 9162

APPLIED MATHEMATICS IN TEXTILE TECHNOLOGY

**L T P C
2 0 2 3**

UNIT I	SYSTEM OF LINEAR EQUATIONS	6
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	6
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	6
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 3
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

PRACTICALS: 30

1. Solving linear equations for Computer Colour matching
2. Uneven yarn Stress Analysis
3. Polymer IV determination
4. Spectrogram generation from yarn evenness data
5. Analysis of two yarn stress strain curve
6. Loom slay acceleration
7. Yarn heat transfer analysis in texturing
8. Simulation yarn irregularity due to change in the nip point and deformation of the sliver
9. Modelling and simulation of ballooning and yarn tension in ring frame,
10. Numeric solution of yarn shape and tension in rotor spinning,
11. Simulation of yarn motion in air jet weaving;

L: 45 , T : 15 , TOTAL : 60 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 9163 MANAGEMENT AND INFORMATION SYSTEMS L T P C
2 0 2 3**

UNIT I MANAGEMENT OF SYSTEMS – SYSTEM CONCEPT 6
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 6
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 6

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) 6

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 6

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

PRACTICALS 30

1. Setting up of local area network
2. Installation of web server, fileserver and database server
3. Developing e- commerce application
4. CPM and PERT using Project management software
5. Customised installation of Open source ERP software for a garment unit
6. Inventory and Purchase process setup for garment unit
7. Costing for garments
8. HR for garment unit
9. Point of sale setup for garment retail
10. CRM and content management garment unit

L: 45 , T : 15 , TOTAL : 60 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 9164 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 Chattopadhyay 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 Composites", 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., Mirafab.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.

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.