

**ANNA UNIVERSITY, CHENNAI**

**AFFILIATED INSTITUTIONS**

**R - 2009**

**M.TECH. TEXTILE TECHNOLOGY**

**I TO IV SEMESTERS (FULL TIME) CURRICULUM AND SYLLABI**

**SEMESTER I**

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

**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 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, Manchester 1993. ISBN: 1870812484.
10. Grosberg P. and Iype C, "Yarn Production: Theoretical Aspects", Textile Institute, 1999, ISBN: 1870372034.

**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 orthogonal 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.

<b>UNIT I</b>	<b>COLOURATION I</b>	<b>5</b>
Mass colouration, colour measurement and matching		
<b>UNIT II</b>	<b>COLOURATION II</b>	<b>5</b>
Chemical processing in denim production, unconventional dyeing techniques, ink jet printing		
<b>UNIT III</b>	<b>THEORY OF DYEING</b>	<b>9</b>
Adsorption isotherms, thermo dynamics of dyeing – dye affinity, activity of dyes, heat of dyeing, entropy; rate of dyeing and half dyeing time		
<b>UNIT IV</b>	<b>FINISHING I</b>	<b>13</b>
Water proofing, flame proofing, soil release finish and coated textiles		
<b>UNIT V</b>	<b>FINISHING II</b>	<b>13</b>
Antimicrobial finishes, bio finishing, plasma treatment, self cleaning materials and UV protection		
<b>PRACTICALS:</b>		<b>30</b>
<ol style="list-style-type: none"> <li>1. Determination of concentration of dye in solution</li> <li>2. Determination of concentration of dye in fabric</li> <li>3. Determination of colour parameters</li> <li>4. Determination of fastness properties of dyed materials</li> <li>5. Determination of functional groups in fibres and chemicals</li> <li>6. Determination of activity of enzymes</li> <li>7. Evaluation of flame retardant fabrics</li> <li>8. Evaluation of water proofed fabrics</li> </ol>		

**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, 2<sup>nd</sup> edition, 1989, ISBN: 09901956481.
5. Ujiie H., "Digital printing of textiles" Woodhead Publishing Ltd., 2006, ISBN 1 85573 951 8

**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 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 Institute, 1993, ISBN: 1870812654.

TX 9215

STATISTICS IN TEXTILE ENGINEERING

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<b>UNIT I</b>	<b>PROBABILITY DISTRIBUTION AND ESTIMATIONS</b>	<b>6</b>
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		
<b>UNIT II</b>	<b>HYPOTHESIS TESTING</b>	<b>12</b>
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		
<b>UNIT III</b>	<b>ANALYSIS OF VARIANCE AND NON-PARAMETRIC TESTS</b>	<b>12</b>
Analysis of variance for different models; non-parametric tests		
<b>UNIT IV</b>	<b>PROCESS CONTROL AND CAPABILITY ANALYSIS</b>	<b>12</b>
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