Syllabus

For

M.Tech. (Textile Technology)

(Effective from the Session: 2016-17)
# Course Structure and Evaluation Scheme for M.Tech
## Textile Technology, effective from 2016-17

### Semester I

<table>
<thead>
<tr>
<th>S. No</th>
<th>Sub. Code</th>
<th>Name of the Project</th>
<th>Periods</th>
<th>Credit</th>
<th>Evaluation Scheme</th>
<th>Subject Total</th>
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<tbody>
<tr>
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<tr>
<td>1</td>
<td>MTTT101</td>
<td>Quality Evaluation of Textiles</td>
<td>3</td>
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<td>2</td>
<td>MTTT102</td>
<td>Modern method of Yarn Production</td>
<td>3</td>
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<tr>
<td>3</td>
<td>MTTT011 / MTTT012</td>
<td>Knitting and Nonwoven/ Structural Mechanics of Yarn</td>
<td>3</td>
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<tr>
<td>4</td>
<td>MTTT021 / MTTT022</td>
<td>Technical Textiles/ High performance fibres &amp; Composites</td>
<td>3</td>
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<tr>
<td>5</td>
<td>MTCC101</td>
<td>Research Process &amp; Methodology</td>
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|       | MTTT151   | Quality Evaluation of Textiles Lab | 0 | 0 | 3 | 2 | 20 | 30 | 50 |       |
|       | MTTT152   | Modern Methods of Yarn Production Lab | 0 | 0 | 2 | 1 | 20 | 30 | 50 |       |

**Total** | **18** | **600** |

### Semester II

<table>
<thead>
<tr>
<th>S. No</th>
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<td>MTTT201</td>
<td>Characterization of Polymers and Fibres</td>
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<td>Modern Method of Fabric Production</td>
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<td>MTTC031 / MTTT032</td>
<td>Nano technology in textiles/ Structural Mechanics of Fabrics</td>
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<td>4</td>
<td>MTTT041 / MTTT042</td>
<td>Functional Textiles / Textile Costing and Cost Control</td>
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<td>MTT051 / MTT052</td>
<td>Instrumentation &amp; Automatic Controls / Statistics &amp; Controls for Textile Industry</td>
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|       | MTTT251   | Characterization of Polymers and Fibres Lab | 0 | 0 | 3 | 2 | 20 | 30 | 50 |       |
|       | MTTT252   | Modern Method of Fabric Production Lab | 0 | 0 | 2 | 1 | 20 | 30 | 50 |       |

**Total** | **18** | **600** |
# Proposed Course Structure and Evaluation Scheme for M. Tech. Textile Technology

## Semester III

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<th>S. No</th>
<th>Subject Code</th>
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<td>Dissertation</td>
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## Semester IV

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<th>Subject Total</th>
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<td>Theory</td>
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<td>Dissertation (Final)</td>
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</table>
1. MTTT 101 Textile Quality Evaluation (L T P 3 0 0) Credit 3

UNIT I: Fibre classification, properties and standards, methods of measuring fibre fineness, Methods of Measuring fibre length, HVI testing- the basics, Application of HVI, AFIS- the basics, Testing & data analysis, maturity and fineness testing, Application of NIR spectroscopy for textile measurement, properties.

Unit 2: MASS VARIATION OF TEXTILE STRANDS: 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, VARIANCE LENGTH CURVES AND SPECTROGRAM OF TEXTILE STRANDS: 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 periodic mass variation in the form of spectrogram; determination of theoretical wave length from spectrum; comparison between normal and ideal spectrum; type of faults and their representation in spectrogram; interpretation of superimposed waves in spectrogram

UNIT II: Strength & Elongation tests:, definitions of different terms of tensile tests, factors affecting tensile testing, fibre strength, yarn strength & fabric strength test methods, Influence of testing factors on yarn tensile properties; measurement and application of yarn modulus; creep and stress relaxation of yarn; significance of estimating minimum yarn strength, seam strength.

UNIT IV: Hygral expansion, relaxation shrinkage, swelling shrinkage, methods of measuring dimensional stability, Snagging test, wrinkle recovery & pilling resistance, abrasion resistance test, factors affecting abrasion resistance,

2. MTTT 102 Modern Methods of Yarn Production

Processing variables and their influence on properties of direct spun yarn, Physics of texturing, false twist texturizing, Tow crimping, edge crimping, air bulking, knit-de-knit and other methods of texturing. Effect of thermal and mechanical variables on properties of bulked yarns. Method of producing bulk yarn, production and properties of stretch yarn.


3. Departmental Elective 1
3.1 MTTT011: Knitting & Non-Woven (L T P 3 0 0) Credits 3
Concepts of loop formation in weft and warp knitting. Different forces acting on the needle butt and mechanics of loop formation. Study of dynamics of knitting process. Study of different machines, process and yarn parameters affecting the yarn tension in knitting zone and loop length. Concept of ‘Robbing Back’ of yarn in loop. Study of design and performance of high sped knitting cam and increase in machine production. Yarn feeding devices on circular knitting machines. Geometry and properties of weft knitted fabrics – importance of Doyle’s and Munden’s research, k-values and Pierce’s geometry. Outlines of process control in knitting. Use of electronics and computers and other developments in knitting. Features of warp knitted fabrics and their uses.

3.2 MTTT012: Structural Mechanics of Yarn (L T P 3 0 0) Credits = 3

References :

4. Departmental Elective 2
4.1 MTTT021: Technical Textiles (L T P 3 0 0) Credits 3
Composites: Basic concepts, classification, manufacturing techniques-from fibre to composite, textile composites, composite applications, reuse & recycling; geotextiles: basic classification, main functions of a geotextiles, applications; Architectural textiles, concepts of tensegrity structures.
Automotive Textiles: requirements on automotive textiles including tyre cords, air bags, seat belts and seat fabrics, carpets, trims.

Principles of filtration, industrial filtration in textile, chemical, food and metallurgical applications.

Medical textile materials and structures; application of compression bandage technology for medical care; integrating electronic sensors into medical textiles; knitted electro-textiles.


Technical clothing, sportswear, spacewear, sailing equipment.

Medical and Smart Textiles


Definition of home textiles- requirements. Kitchen linen, Bedlinen, Furnishing, Floor coverings, Wall coverings, Decoration fabrics.

4.2 MTTT022: High Performance Fibres & Composites


5. MTCC101: Research Process & methodology: As per AKTU Syllabus

6. MTTT151: Quality Evaluation of textiles Lab (L T P 0 0 3) credits 2
As per syllabus

7. MTTT152: Modern methods of yarn Production Lab:
As per syllabus
2nd Semester M. Tech. Textile Technology

1. MTTT201: Characterization of Polymers and Fibres (L T P 3 0 0) Credits 3

   FIBRE STUDY: Basic concept of crystalline regions, and orientation - their effects on fibre properties. Sources of elucidation of fibre structure.

   MOISTURE PROPERTIES: Definitions, humidity, regain moisture content. Hygroscopic nature and moisture absorption behaviour of textile fibres, relation between regain and relative humidity, Quantitative theory of moisture absorption, effect of temperature, stresses and hydrophilic groups, crystalline and non-crystalline regions on moisture regain. Heats of sorption. - Definition of heat absorption and heat of wetting.


   ELECTRICAL PROPERTIES: Definition of mass specific resistance and the influence of moisture. Dielectric constant – factors influencing the dielectric properties of fibres.

   STATIC ELECTRICITY: Problems and elimination in textile processes – electrostatic series.


2. Modern methods of fabric production (L T P 3 0 0) credits 3

   Advancement in wrap winding machines, study of automatic wrap winding machines, mechanism used in wrap winding machine. Different type of pirn winding machines, advancement in pirn winding machines.

   High production warping machines with creel development. Modern developments in sectional warping machines. Various controls used in sizing, automatic sow box, modern drying system of sizing machine.

   Basic mechanical principle of sulzer projectile loom, Modern developments in air jet and water jet looms. Study of flexible and rigid rapier loom, study of multiphase and circular looms.

3. Departmental Elective 3:

3.1 MTTT031: Nano Technology in textiles (L T P 3 0 0) credits 3

   Nanoscale – Definition, various methods of manufacturing nano materials and their characterization. Nanofibers - Manufacturing, properties and uses of nanofibre, Nanofinishes - Super hydrophobicity and lotus effect, self cleaning, UV protection, Antimicrobial finishes

   Application of Plasma in Textiles

   Concept, types of plasma and their generation, Plasma treatment of textile for water and oil repellency, Interfacial engineering of functional textiles for biomedical applications, plasma modification of wool, plasma modification of natural cellulosic fibers, characterization of plasma treated textiles.

   Development in Finishing

   Various Low liquor and minimum application techniques in textile finishing, their advantages and limitations, wrinkle free finishing – concept of wet and moist cross linking, various eco-friendly resin finishes, Bio-Finishing,Concept of UV-A and UV-B, factors affecting UV protection. Various UV- protection finishes and their evaluation, antimicrobial finishes – mode of action, factors affecting, various antimicrobial finishes. Developments in textile finishing such as soil release, flame retardant, antistatic, fluoro chemicals, silicone finishes.
Wash down effects on denim
Stone wash,, enzyme wash, combined stone and enzyme wash, acid wash, ball blast, whiskering, sand blast, ice wash.
Developments in finishing machineries.
Developments in stenters and physical finishing machines

3.2 MTTT032: Structural mechanics of Fabrics (L T P 3 0 0) Credits 3

References:

4. Departmental Elective 4:
4.1 MTTT041: Functional Textiles (L T P 3 0 0) Credits 3
Chemical and mechanical finishing. The challenges and charm of Chemical finishing. Importance of chemical finishing. Application of chemical finishes.

TEXT BOOKS:
4.2 MTTT042: Textile Costing & Cost Control (L T P 3 0 0) Credits 3

COSTING IN SPINNING INDUSTRY: Elements of cost – Ascertainment of Clean Cotton Cost – Cost Statements Quantity and value of total cotton/ Man-made fiber issued input, wastage and output in each processing cost center up to yarn stage- Net Mixing Cost- Waste multipliers for each cost center mixing wise Cost Centrewise conversion cost, Selling price of various wastes. Power cost estimation, Yarn realisation statement, Decision making using Contribution per frame shift among various counts of yarn production.

COSTING IN WEAVING INDUSTRY:–Elements of cost Calculation of Yarn requirements for weaving –computation of value loss and net realization, Cost Statements– Cost centre wise conversion cost from winding to weaving, Sort wise cost of production of Grey Cloth sort wise stock accounting of Grey cloth, Cost of Sizing material, Cost of sales of cloth sold in grey stage and sales realization


TEXT BOOKS:
• Bhave P V and Srinivasan V,”Cost accounting in textile mills”,ATIRA monograph, Ahmedabad,India, 1974 2.
• Shinn William,”Elements of Textile Costing” School of Textiles,North Corolina state,1965
• Jain IC,”Cost accounting-An introduction”, Prentice hall, NewDelhi, 2001
• Ratnam T V,”Cost control and costing in spinning mills”, Seshan printers, Coimbatore, India, 1992

5. Departmental Elective 5
5.1 MTTT051: Instrumentation & Automatic Controls (L T P 3 0 0) credits 3

Significance of Measurement and Instrumentation

Introduction
Generalized configuration and functional stages of measuring systems.

Review of Industrial Instrumentation
The transducer and its environment; an overview;
Sensing process and physical laws.
Transducer classification and their modeling; information, energy and incremental models;
Developments in sensors, detectors and transducer technology; displacement transducers;
force, torque and motion sensors; piezoelectric transducers; capacity type transducers; Strain gage transducers; accelerometers, pressure transducers based on elastic effect of volume and connecting tubing.

Instruments and Control Systems Concepts
Characteristics of instruments,
Design and selection of components of a measuring system.
Dynamic Response of Instruments:
Mathematical model of a measuring system, response of general form of instruments to various test inputs; Time domain and frequency domain analysis.
Elementary transfer functions and Bode plots of general transfer functions. Nyquist, Nichols Plot.
Stability by graphical and analytical Methods, Design of Stabilizing Networks, Minor loop correction
Characteristics of control loop elements.

Errors in Measurement
Errors in Measurement and Its Analysis:
Causes and types of experimental errors; Systematic and random errors. Uncertainty analysis;
Computation of overall uncertainty;
Estimation for design and selection for alternative test methods.

5.2 MTTT052: Statistics & Controls for Textile Industry (L T P 3 0 0) Credits 3
STANDARD PROBABILITY DISTRIBUTIONS: Mean and variance of Probability distribution, Geometric distribution, Binomial distribution, Poisson distribution, Normal approximation to Binomial and Poisson. (10)
STANDARD SIGNIFICANCE TESTS: Hypothesis, significance level, interpretation of significance test, single and double tail tests. Errors and choice of sample size. Test for single mean, two means – test for single variance, two variances and single proportion. Rejection of outliers.
ANALYSIS OF VARIANCE: ANOVA for different models, test of significance – comparison with a control, global comparisons. Rank test. (10)

Total L: 60
REFERENCES:

6. MTTT251: Characterization of polymers & Fibres Lab (L T P 0 0 3) credits 2
As per syllabus
7. MTTT252: Modern methods of Fabric Production (L T P 0 0 2) Credits 1
As per Syllabus