

## M. TECH. I SEMESTER (Textile Technology)

Sub. Code	Name of Subject	Teaching Periods			Duration of Exams (Hours)	Maximum Marks Allocation			
		L	T	P		Internal	End Term	Practical	Total
1M TT1	Theory and Design of Spinning Machinery	3	1	-	3	25	100	-	125
1MTT 2	Theory and Design of Weaving Machinery	3	1	-	3	25	100	-	125
1MTT 3	Design of Experiments and Analytical Techniques	3	1	-	3	25	100	-	125
1MTT 4	Elective-I								
1MTT 4.1	Functional and High Performance Textiles								
1MTT 4.2	Computer Programming and its Applications	3	1	-	3	25	100	-	125
1MTT 4.3	Project presentation, appraisal & implementation								
		12	4	-	12	100	400	-	500
1 MTT 5	Design of Spinning & Weaving Machinery Lab	-	-	3	3	60	-	40	100
	<b>Total</b>	-	-	<b>3</b>	<b>3</b>	<b>60</b>	<b>-</b>	<b>40</b>	<b>100</b>
	<b>Grand Total</b>	<b>12</b>	<b>4</b>	<b>3</b>	<b>15</b>	<b>160</b>	<b>400</b>	<b>40</b>	<b>600</b>

## II SEMESTER (Textile Technology)

Sub. Code	Name of Subject	Teaching Periods			Duration of Exams	Maximum Marks Allocation			
		L	T	P		Internal	End Term	Practical	Total
2M TT1	Modern Technology of Yarn Production	3	1	-	3	25	100	-	125
2M TT 2	Modern Technology of Fabric Production	3	-	-	3	25	100	-	125
2MTT 3	Theory of Textile Structure	3	-	-	3	25	100	-	125
2MTT4	Elective I								
2MTT4.1	Development in Texturizing								
2MTT4.2	Process Control in Spinning & Weaving	3	-	-	3	25	100	-	125
2MTT4.3	Evaluation of Textile Materials								
		<b>12</b>	<b>4</b>	<b>-</b>	<b>-</b>	<b>100</b>	<b>400</b>	<b>-</b>	<b>500</b>
2 MTT 5	Modern Technology of Yarn & Fabric Production Lab	-	-	3	3	60	-	40	100
	<b>Total</b>	<b>12</b>	<b>4</b>	<b>3</b>	<b>3</b>	<b>60</b>	<b>-</b>	<b>40</b>	<b>100</b>
	<b>Grand Total</b>	<b>12</b>	<b>4</b>	<b>3</b>	<b>15</b>	<b>160</b>	<b>400</b>	<b>40</b>	<b>600</b>

### III SEMESTER (Textile Technology)

Sub. Code	Name of Subject	Teaching Periods			Duration of Exams (Hours)	Maximum Marks Allocation			
		L	T	P		Internal	End Term	Practical	Total
3MTT1	Structure and Properties of Fibres	3	1	-	3	25	100	-	125
3MTT2 3 MTT 2.1	Elective Development in Fibre Production								
3MTT2.2	Management of Textile Production	3	1	-	3	25	100	-	125
3MTT2.3	Electronics & Controls for Textile Industry								
3MTT 3	Seminar	-	-	3	3	150	-	-	150
3M TT4	Dissertation Stage I	-	-	-	-	100	-	-	100
<b>Total</b>		<b>06</b>	<b>02</b>	<b>03</b>	<b>09</b>	<b>300</b>	<b>200</b>	<b>-</b>	<b>500</b>
<b>Grand Total</b>		<b>-</b>	<b>-</b>	<b>03</b>	<b>-</b>	<b>300</b>	<b>200</b>	<b>-</b>	<b>500</b>

### IV SEMESTER (Textile Technology)

Sub. Code	Name of Subject	Teaching Periods			Duration of Exams (Hours)	Maximum Marks Allocation			
		L	T	P		Internal	End Term	Practical	Total
4MTT 1	Dissertation Stage II	-	-	3	3		-	500	500
<b>Grand Total</b>		<b>-</b>	<b>-</b>	<b>03</b>	<b>-</b>		<b>-</b>	<b>500</b>	<b>500</b>

**Grand Total 2200**

**Theory and Design of Spinning Machinery****[1MTT1]**

<b>Class M. TECH. (Textile Technology)</b>	<b>Evaluation</b>
Schedule per week Lectures : 3	Examination Time = Three (3) Hours Maximum Marks = 150 [Mid-term (50) & End-term (100)]

<b>Contents of the Subject</b>
Design principles of modern openers and blenders. Feed Regulation. Theories of carding. Design aspects of high production cards. Effects of lap preparation on carding efficiency. Drafting force. Theories of drafting. Mechanism of hook removal during drafting. Auto leveling. Developments in high speed fly frames. Twist flow in Ring Spinning, Spinning Tension. Developments in design of ring travelers. Spindles and high speed ring frame. Automated Spinning.

**Theory and Design of Weaving Machinery:****[1MTT2]**

<b>Class M. TECH. (Textile Technology)</b>	<b>Evaluation</b>
Schedule per week Lectures : 3	Examination Time = Three (3) Hours Maximum Marks = 150 [Mid-term (50) & End-term (100)]

<b>Contents of the Subject</b>
<p>Theory, measurement and control of yarn tension in unwinding from spinning packages during winding. Study of warp tension variation during winding, Development in design and operation of modern winding, warping, sizing machines. Theory and design principles of latest automatic controls in size regulation in sizing. Factors affecting size pick up and drying rate in sizing. Expression for drying capacity of sizing machine.</p> <p>Kinematics of loom slay, Picking system elastic model, shuttle checking.</p> <p>Cloth fell equation and its applications</p> <p>Design problems of conventional weavings.</p> <p>Principles underlying unorthodox weaving machinery picking system: toggle torsion bar picking, air jet nozzle, water jet nozzle, rapier drives.</p> <p>Kinematics of weft population in unconventional weaving machines: air drag theory.</p> <p>Loom timings for shuttle less looms.</p>

**Design of Experiments and Analytical Techniques****[1MTT3]**

<b>Class M. TECH. (Textile Technology)</b>	<b>Evaluation</b>
Schedule per week Lectures : 3	Examination Time = Three (3) Hours Maximum Marks = 150 [Mid-term (50) & End-term (100)]

<b>Contents of the Subject</b>
Sampling techniques, sample size, Principles of experimental design. Selecting a statistical design. Running experiments in Blocks, Latin squares. Factorial Designs & Analysis. Fractional factorial experiments. Use of replicates. Techniques of optimisation. Response surface designs. Statistical principles in data analysis. Fitting data. Linear regression with one, and several variables. Polynomial models. ANOVA. Use of Computers. software packages. Rank correlation, Coefficient of concordance. Sampling inspection. Acceptance sampling : OC curve, Acceptance sampling by variables, Producer risk condition. Control Chart: Average run length, Modified control limits for averages, Cusum chart.

**Functional and High Performance Textiles:****[1MTT4.1]**

<b>Class M. TECH. (Textile Technology)</b>	<b>Evaluation</b>
Schedule per week Lectures : 3	Examination Time = Three (3) Hours Maximum Marks = 150 [Mid-term (50) & End-term (100)]

<b>Contents of the Subject</b>
<p>Protective clothing: Clothing requirements for thermal protection, ballistic protection, UV-protection, protection from electro-magnetic radiation and static hazards, protection against micro-organisms, chemicals and pesticides. Design principles and evaluation of protective clothing.</p> <p>Medical Textiles: Textiles in various medical applications. Application oriented designing of typical medical textiles. Materials used and design procedures for protecting wounds, cardiovascular application, sutures etc.</p> <p>Sportswear: Clothing requirements for different sports. Development of highly functional fibres, yarns and fabrics for temperature control and moisture management. Stretch, bulky and light weight fabrics. Composites: Two and three dimensional fabrics and triaxially braided materials for composites. Production and properties of performs and composites. Properties and uses of rigid composites. Stimuli sensitive intelligent textiles - their production, properties and applications. Smart textile incorporating functional devices. Miscellaneous: Glass, ceramic and metallic fibres and their textile products.</p>

**Computer Programming and its Applications:****[1MTT4.2]**

<b>Class M. TECH. (Textile Technology)</b>	<b>Evaluation</b>
Schedule per week Lectures : 3	Examination Time = Three (3) Hours Maximum Marks = 150 [Mid-term (50) & End-term (100)]

<b>Contents of the Subject</b>
Fundamentals of Computer Programming, Programming Methodology: Structured Programming and concepts of Object-Oriented Programming. Programming in C++ - Statements and Expressions, Control statements. Structure, Functions: Function Overloading etc. C++ as Object-Oriented Programming Language- Classes and Objects, Data Abstraction, Inheritance - Multilevel and Multiple inheritance etc., Polymorphism - operator overloading and virtual functions, file handling. Application development using C++.

**Project Presentation, Appraisal & Implementation:****[1MTT4.3]**

<b>Class M. TECH. (Textile Technology)</b>	<b>Evaluation</b>
Schedule per week Lectures : 3	Examination Time = Three (3) Hours Maximum Marks = 150 [Mid-term (50) & End-term (100)]

<b>Contents of the Subject</b>
<p>Overview – Capital expenditure, Phase of capital budgeting, Project development cycle, Objectives of investment, decision-making, Risk &amp; return. Identification of investment opportunities – Governmental regulatory framework – Generation &amp; screening of project ideas – Project identifications for an existing company. Market &amp; demand analysis – Information required for market &amp; demand analysis – demand forecasting methods – market planning.</p> <p>Technical Analysis – Material inputs &amp; utilities – Manufacturing process / technology – Plant capacity – location &amp; site – structures &amp; civil works – Machineries &amp; equipments – Project charts &amp; layouts – Work schedule – Need for tendering alternatives. Financial Analysis – Cost of Project – Means of finance – Estimation of Sales &amp; Production – Cost of production – Working capital requirement &amp; financing – Profitability projections – Break even point – Project cost flow statements – Projected balance sheet – Multi – year projection.</p> <p>Time value of money – Future value of single amount, Future value of an annuity – Present value of single amount – Present value of an annuity.</p> <p>Cost of Capital – Basic concepts – Cost of debt – cost of preference capital – cost of Equity Capital – Weighted average cost of capital – Marginal cost of capital-Cost of capital for a new company.</p> <p>Appraisal criteria – Urgency, Pay back period – Accounting, Debt service coverage ratio, Rate of Return, Net present value – Internal rate of return – Annual capital charge – Investment appraisal in practice</p> <p>Review – Initial review, performance evaluation.</p> <p>Analysis of Risk – Types &amp; measurement of project risk – Analytical derivation or simple estimation – Sensitivity Analysis – Scenario analysis – Selection of a project-Risk analysis in practice.</p> <p>Project implementation – Forms of project organization – Project planning – project control – Human aspects of project management – Pre-requisites for successful project implementation.</p> <p>Review-Initial review, performance evaluation.</p>

**Modern Technology of Yarn Production****[2MTT1]**

<b>Class M. TECH. (Textile Technology)</b>	<b>Evaluation</b>
Schedule per week Lectures : 3	Examination Time = Three (3) Hours Maximum Marks = 150 [Mid-term (50) & End-term (100)]

<b>Contents of the Subject</b>
<p><b>Causes</b> leading to advent of unconventional spinning systems. Principles and Engineering Design of rotor, air-jet and friction spinning.- Evaluation of vortex spinning-critical review of both systems. Structure &amp; properties of these unconventional yarns. Effect of raw material and machine variables on yarn characteristics. Plying of these yarns.</p> <p>Other unconventional spinning systems, viz. Self Twist, Integrated, Disc., Parafil, etc- their working principles, properties and end use of yarns spun of these system.</p>

**Modern Technology of Fabric Production****[2MTT2]**

<b>Class M. TECH. (Textile Technology)</b>	<b>Evaluation</b>
Schedule per week Lectures : 3	Examination Time = Three (3) Hours Maximum Marks = 150 [Mid-term (50) & End-term (100)]

<p>Limitations of shuttle loom with respect to loom speed, picking, shuttle checking, slay motion etc.</p> <p>Evolution in weft insertion :-</p> <ol style="list-style-type: none"> <li>a) Theory of weft insertion by projectile, various developmental stages of picking motion up to torsion rod picking principle. Geometrical aspects torsion rod, energy for picking, projectile flight &amp; checking.</li> <li>b) Theory of weft insertion by air jet picking process, various developmental stages of air jet picking up to multi-nozzles &amp; weft guiding elements.</li> <li>c) Theory of weft insertion by rapier. Various developmental stages of rapier insertion systems up to positive rapiers. Evaluations in the rapier drive.</li> <li>d) Theory of weft insertion by water jet, various developmental stages in water jet picking system.</li> <li>e) Limitations of single phase weaving systems. Various developmental stages in multiphase weaving machine.</li> </ol> <p>3) Evolution of design features in other mechanisms of weaving machines.</p> <ol style="list-style-type: none"> <li>a) Shedding – Cam motion, dobby motion, jacquard motion</li> <li>b) Beat up – Crank to cam operated motion.</li> <li>c) Let off – Mechanical warp let off motion for single &amp; double beam &amp; their limitations. Motorized let off motion.</li> </ol> <p>Take up – Mechanical take up motion &amp; their limitations, the fabric winding systems, electronics take up motion.</p> <ol style="list-style-type: none"> <li>e) Control systems - Warp &amp; weft monitor system, weft feeders, selvedge, color control, lubrication, cleaning drive, intelligent monitoring system, net working, automation for minimizing the down time.</li> </ol>
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**THEORY OF TEXTILE STRUCTURE****[2MTT3]**

<b>Class M. TECH. (Textile Technology)</b>	<b>Evaluation</b>
Schedule per week Lectures : 3	Examination Time = Three (3) Hours Maximum Marks = 150 [Mid-term (50) & End-term (100)]

<b>Contents of the Subject</b>
<p>Elements of yarn geometry. Geometry of helix and its application to yarn structure. Geometry of folded yarns.</p> <p>Translation of fibre properties into yarn behaviour. Theories of yarn irregularity and blend irregularity. Theories of machines of yarn structure under tension, compression, bending and shearing.</p> <p>Fibre migration characteristics of spun and continuous filament yarns. Concept of similar yarns. Effect of properties of constituent fibres and blend composition on the behaviour of composite yarns.</p> <p>Theories of cloth setting. Geometry of woven fabrics based on the assumption of flexible rigid threads. Application of fabric geometry in fabric weaving and processing.</p> <p>Later modifications to Peirce's fabric geometry. Use of weavability graphs. Effect of yarn properties and their configuration in fabric on fabric properties such as extensibility. Stiffness and drape. Distribution of stress in fabrics under elongation, beginning, buckling and shearing. Effect of fabric relaxation on its properties.</p>

**Developments in Texturing****[2MTT4.1]**

<b>Class M. TECH. (Textile Technology)</b>	<b>Evaluation</b>
Schedule per week Lectures : 3	Examination Time = Three (3) Hours Maximum Marks = 150 [Mid-term (50) & End-term (100)]

<b>Contents of the Subject</b>
<p>Principles of texturing and modern classification; False twist texturing process- mechanisms and machinery, optimization of texturing parameters, barre?, structure-property correlation of textured yarns; Draw-texturing- the need and fundamental approaches; Friction texturing- the need and development, mechanics of friction texturing, latest development in twisting devices, optimization of quality parameters. Noise control in texturing. Air jet texturing - Principle, mechanisms, development of jets and machinery, process optimization and characterization, air jet texturing of spun yarns. Air interlacement - Principle and mechanism, jet development and characterization. Bulked continuous filament yarns - Need, principle, technology development. Hi-bulk yarns - Acrylic Hi-bulk yarn production, mechanism and machines involved, other such products. Solvent and chemical texturing - Need, texturing of synthetic and natural fibres.</p>

**Process Control in Spinning & Weaving:****[2MTT4.2]**

<b>Class M. TECH. (Textile Technology)</b>	<b>Evaluation</b>
Schedule per week Lectures : 3	Examination Time = Three (3) Hours Maximum Marks = 150 [Mid-term (50) & End-term (100)]

<b>Contents of the Subject</b>
Optimum fibre-mix for various end use requirements. Yarn realization. Waste control in blowroom and card for all types of fibres spun on cotton system. Minimisinglea count variation. Controlling yarn irregularity, imperfections and faults. Yarn tenacity and elongation. Hairiness. Machinery audit. Indices of productivity. Production of high quality export yarns. Trouble Shooting, some case studies. Role of ambient temperature and humidity. Life of accessories. Workload. Principles for control of productivity in different sections, Contribution of control in yarn, winding, warping, sizing & weaving to the cost of production in fabric manufacture. Splicing, machine allocation and load distribution, Control of migration in sizing, size droppings, sizing materials. Loom allocation. Control of value loss in fabrics through evaluation & grading of fabric defects. Temperature and humidity control & its effect on performance. Control of loom accessories. Control of loss of efficiency by snap study. Controls in the process of high twist yarns, blended yarns, filament yarns in warp and weft. Controls in the winding for processing yarns for dyeing & knitting. Controlling sloughing off during winding, warping & weaving. on-line data system and its use in controls.

**Evaluation of Textile Material:****[2MTT4.3]**

<b>Class M. TECH. (Textile Technology)</b>	<b>Evaluation</b>
Schedule per week Lectures : 3	Examination Time = Three (3) Hours Maximum Marks = 150 [Mid-term (50) & End-term (100)]

<b>Contents of the Subject</b>
Characterization of Fibre : Birefringence, sonic modulus, density measurements, thermal analysis, X-rays (orientation and crystallinity). Yarn Testing: Tensile properties, hairiness, cross-sectional studies and yarn preparation.
Evaluation of spliced yarn and sized yarn. Testing of technical textile; coated fabrics, geo-textiles, filter fabrics. Simulation of knitted and woven structure, comfort properties of fabric, water repellency. Computer colour matching, measurement of U-V protective character of textile material.

**Structure and Properties of Fibres****[3MTT1]**

<b>Class M. TECH. (Textile Technology)</b>	<b>Evaluation</b>
Schedule per week Lectures : 3	Examination Time = Three (3) Hours Maximum Marks = 150 [Mid-term (50) & End-term (100)]

<b>Contents of the Subject</b>
<p>Study of fibre structure by X-rays, IR Spectroscopy, optical and electron microscopy. Determination of degree of crystallinity, orientation, crystal size and morphology. Structure of fibres, morphology and order in fibre structure. Theories of fine structures of fibres. The Mechanical properties of fibres. Theories of elasticity. Thermodynamics analysis of deformation. Rubber elasticity of long chain molecules and molecular network. Application to fibres. Theories of visco-elasticity. Stress relaxation, creep, stress-strain relations, Temperature of visco-elasticity as applied to natural fibres. The Boltzman supervision principle and Nutting's Power Law, their application to fibres. Sorption isotherms, heat of sorption, swelling and theories of moisture sorption.</p> <p>Di-electric properties. Effects of frequency and temperature on dielectric constant and static electricity.</p> <p>Frictional properties – Theory of friction and lubrication and its application to fibres. Measurement of friction. Thermal and optical behaviour of fibres.</p>

**Developments in Fibre Production****[3MTT2.1]**

<b>Class M. TECH. (Textile Technology)</b>	<b>Evaluation</b>
Schedule per week Lectures : 3	Examination Time = Three (3) Hours Maximum Marks = 150 [Mid-term (50) & End-term (100)]

<b>Contents of the Subject</b>
<p>Fibre modification and evaluation of their properties. Advances in fibre extrusion processes and discussion on structure and properties of the product. Developments in post extrusion operations. New fibres based on performance and functional applicability. High temperature resistant fibres – Nomex, Kelvar, PBO – production, properties, structure and applications. High strength, high modulus fibres – Spectra (UHMWPE) – production, properties, structure and application. Different routes for production of carbon fibres, their structure, properties and end uses. Optical fibres – Different type, Signal losses, their remedy, production and properties and uses. Geotextiles – definition, properties, usage.</p> <p>Spin finish – their properties, uses and necessity.</p>

**Management of Textile Production****[3MTT2.2]**

<b>Class M. TECH. (Textile Technology)</b>	<b>Evaluation</b>
Schedule per week Lectures : 3	Examination Time = Three (3) Hours Maximum Marks = 150 [Mid-term (50) & End-term (100)]

<b>Contents of the Subject</b>
<p><b>Production Information</b> Production information of the entire unit, Product range and quantity production information systems Feeding and retrieval of data</p> <p><b>Productivity Planning</b> Production Capacity and the productivity obtained from each machine, Analysis of the data and planning of production.</p> <p><b>Output of Human Resource</b>, analysis and strategy</p> <p><b>Production 'Planning</b> Study of market demand and supply analysis, Technology and product design for various textile products and forecasting future trends</p> <p><b>Work Study</b>, Method of Work study, Study and work measurement, Application of time study in a textile mill, importance and use of snap study, TPM</p>

**Electronics and Controls for Textile Industry:****[3MTT2.3]**

<b>Class M. TECH. (Textile Technology)</b>	<b>Evaluation</b>
Schedule per week Lectures : 3	Examination Time = Three (3) Hours Maximum Marks = 150 [Mid-term (50) & End-term (100)]

<b>Contents of the Subject</b>
<p>Overview of electronics and controls in modern textiles equipments and machines. Overview of basic analog electronics: Elements (R, L, C, V, I), circuit laws and theorems. Overview of basic digital electronics: Gates and ICs. Sensors and transducers (displacement, position, force, temperature, pressure, flow). Signal Conditioning. Control elements, systems and examples. Data acquisition, analysis, control and automation by microprocessors and micro controllers. Motor and power drives. Power control devices. Some applications of data acquisitions and control systems in textiles and case studies. Laboratory: Experiments on sensors and transducers (displacement, position, strain, temperature, rotational speed). Basic analog circuits with diodes and transistors. Basic digital Gates. SCR and TRIAC control of motor speed. Data acquisition and control with micro processors/ micro controllers.</p>

Dissertation & Viva-Voce:

[4MTT1]

<b>Class M. TECH. (Textile Technology)</b>	<b>Evaluation</b>
Schedule per week Practical : 3	Examination Time = Three (3) Hours Maximum Marks = 500 [Mid-term (200) & End-term (300)]

<b>Contents of the Subject</b>
Each student individually will carry out a project of an experimental and/or theoretical nature in one of the main branches of textile technology and present his findings in a systematic manner in the Project Report duly approved and signed by his Supervisor / Guide (to be nominated by the <b>Principal, MLVTEC</b> ). Each candidate would submit three (3) typed copies of the Project Report to <b>Principal, MLVTEC</b> at least 15 days before the commencement of fourth semester examination. One copy of the Project Report will be returned to the candidate after viva-voce examination. The original report and second copy will be retained by the concerned Department / Institution and the Supervisor respectively.