

TAMIL NADU PUBLIC SERVICE COMMISSION

TEXTILE TECHNOLOGY

(DEGREE STANDARD)

CODE:406

UNIT- I: FIBRE PROPERTIES AND MANUFACTURE

- i) Classification of fibres, production of natural fibres - cotton, jute, silk, wool; Identification of natural and synthetic fibres
- ii) Fine, gross structure and properties of fibres
- iii) Microscopic, physical and chemical test methods for fibre identification; blend analysis
- iv) Morphology characterization – Density, XRD, Electron microscopy
- v) Thermal characterization methods - DSC, TGA, DMA / TMA, FTIR spectroscopy
- vi) Mechanical – Tensile, Elastic recovery, Time Effect, Bending, Twisting and Compression
- vii) Optical - Absorption and dichroism, Reflection and lustre.
- viii) Electrical and Thermal Properties - Dielectric property, Static Electricity, Structural changes in fibres on thermal treatment.
- ix) Moisture Property – Absorption, Desorption, Swelling, Theories of moisture sorption
- x) Requirements of fibre forming polymers
- xi) Spinning of Polymers - Melt Spinning, Wet spinning, Dry spinning, Dry-jet-wet Spinning and Gel spinning
- xii) Post Spinning Operations – Drawing, Crimping, Heat setting, Tow-to-top conversion, Texturing methods.

UNIT- II: YARN MANUFACTURE, YARN STRUCTURE AND PROPERTIES

- i) Principle of ginning
- ii) Blow room machines; principles of opening, cleaning and mixing / blending of fibrous materials; cleaning efficiency; calculations
- iii) Carding machine; Fundamentals of carding, settings, card clothing, autoleveller; calculations
- iv) Comber; Lap preparation, combing cycle, mechanisms; combing efficiency; calculations
- v) Draw frame; doubling and drafting, settings, autoleveller; calculations
- vi) Roving frame; drafting, twisting, bobbin building; calculations
- vii) Ring frame; drafting, twisting, cop formation, forces acting on yarn and traveller; limitations, compact yarn spinning; calculations
- viii) Ring doubler and TFO - principle; single and folded yarn twist
- ix) Alternate Spinning systems - rotor, two nozzle air-jet, air vortex, friction, core, wrap, twist-less spinning process
- x) Helical geometry, packing density, yarn diameter, yarn contraction, yarn twist and relation to yarn strength - staple fibre yarn and filament; mass irregularity of yarn; structure - property relations of ring, rotor, air-jet and friction spun yarns

UNIT- III: WEAVING PREPARATORY AND WEAVING, FABRIC STRUCTURE AND PROPERTIES

- i) Cheese, Cone winding - random and precision winding, winding parameters
- ii) Yarn clearers and Tensioners; yarn splicing
- iii) Types of warping - beam and sectional warping, pirn winding process;
- iv) Sizing techniques, sizing of spun and filament yarns; Beam Gaiting
- v) Principles of fabric formation in shuttle looms – primary, secondary and auxiliary motions
- vi) Shedding – Types and Principles, Reversing Motions
- vii) Beat up - types, kinematics of sley
- viii) Principles of weft insertion in shuttleless looms - Rapier, air-jet, projectile, water-jet, circular and multiphase
- ix) Basic woven fabric constructions and its derivatives - plain, twill, satin; honeycomb, warp and weft figuring, warp and weft pile, backed fabrics, double cloth
- x) Pierce's geometry of plain woven fabrics; structure - property relationship

UNIT - IV: KNITTING and NONWOVEN MANUFACTURE

- i) Knitting - yarn quality requirements, principles of weft and warp knitting
- ii) Basic weft and warp knitted structures and its properties; calculations
- iii) Circular, Flat and Warp knitting machines
- iv) Geometry of plain knitted fabrics
- v) Nonwovens – Needle punch, spun lace, spun bond, melt blown, thermal bond
- vi) Finishing of nonwovens - mechanical, chemical

UNIT - V: PREPARATORY AND COLOURATION

- i) Preparatory processes for natural fibres, synthetics and common blends
- ii) Classification of dyes, auxiliaries and their properties
- iii) Dyeing of fabrics using various dye classes.
- iv) Batch-wise and continuous dyeing techniques
- v) Dyeing machines for fibre, yarn, woven and knitted fabrics
- vi) Styles and methods of printing; print paste preparation
- vii) Pigment printing
- viii) Digital Printing and Transfer Printing
- ix) Fixation and after treatment process
- x) Washing and drying of fabrics
- xi) Colour measurement and colour difference calculation of dyed fabrics
- xii) Fastness to wash, perspiration, light and rub

UNIT - VI: FINISHING AND SUSTAINABLE PROCESSING

- i) Mechanical finishing of Textiles - shrink proof, raising and calendering
- ii) Heat setting of synthetic fabrics
- iii) Chemical finishes - crease resistant, water proof, water repellent, flame retardant, soil release, UV resistant, anti microbial, anti-static, softening, stiffening, elastomeric, self cleaning
- iv) Bio-polishing of cotton fabrics
- v) Washing and fading of denim fabrics
- vi) Eco-friendly processing; Eco standards and Eco labels
- vii) Minimum application technique, waterless dyeing
- viii) Characteristics of Effluent and Effluent treatment

UNIT- VII: QUALITY EVALUATION OF TEXTILES

- i) Sampling techniques
- ii) Measurement of fibre properties - length, strength, fineness, maturity and trash
- iii) HVI and AFIS techniques
- iv) Determination of yarn properties - count, twist, strength and elongation, unevenness and hairiness
- v) Determination of fabric properties - construction parameters, tear, tensile strength and elongation; air permeability, drape, bending, crease and wrinkle recovery, thickness, pilling, abrasion, shrinkage
- vi) Low stress mechanical properties of fabrics - FAST and KESF
- vii) Yarn defects and analysis; diagram, spectrogram, VL curve

UNIT- VIII: GARMENT MANUFACTURE AND SPECIAL FINISHES

- i) Fabric defects and analysis
- ii) Garment manufacture - Pattern making, Marker planning, Spreading and Cutting,
- iii) Stitches and Seams, Sewing defects
- iv) Types of spreading, cutting and sewing machines; mechanisms and accessories
- v) Sewing threads
- vi) Components and trims
- vii) Pressing, packing, care labels
- viii) Garment Inspection and Merchandising

UNIT- IX: TECHNICAL TEXTILES

Fibre, yarn and fabric requirement for

- i) Industrial Textiles - Belts, Ropes, Tyre-cords, Coated abrasives
- ii) Automotive Textiles - Filter fabrics, Airbags, Seatbelts
- iii) Geotextiles – Applications in civil engineering
- iv) Agriculture Textiles – Crop covers, bird nets, soil mats and sacks
- v) Medical Textiles – Non-implantable, Implantable, hygiene products
- vi) Protective Textiles - Ballistic textiles, cold protective clothing, UV Protection, Clean room garments
- vii) Sports Textiles

UNIT X: MANAGEMENT OF TEXTILE INDUSTRY

- i) Industrial Engineering – Work study, method study, motion study, work measurement
- ii) Costing of yarn, fabric and garment; costing - elements, cost sheet, Balance sheet, P & L Account, ratio analysis
- iii) Depreciation, investment appraisal techniques
- iv) Management Tools – Lean, TQM, TPM, 5S, Kaizen, MIS, Supply chain management, six sigma, FMEA
- v) Industrial safety and industrial hygiene
- vi) Industrial relations and Labour laws
- vii) Energy conservation in textile industry

Note: Medium of Instruction: English Only