Syllabus of
UNDERGRADUATE DEGREE COURSE

B.Tech. V Semester

Textile Engineering

Rajasthan Technical University, Kota
Effective from session: 2022 – 2023

RAJASTHAN TECHNICAL UNIVERSITY, KOTA
SYLLABUS

3rd Year - V Semester: B.Tech. : Textile Engineering

5TE3-01: PRACTICAL APPLICATIONS OF STATISTICS

Credit: 2   **Max. Marks: 100(IA:30, ETE:70)**
2L+0T+0P   **End Term Exam: 3 Hours**

SN	Contents	Hours
1	**Introduction**- Objective, scope and outcome of the course.	1
2	**Introduction to Statistics** – Population, sample, Random and assignable variation, Continuous and discrete variable, Patterns in Data, Need for probability.	5
3	**Some standard probability distributions** – Geometric distribution, Binomial Distribution, Poisson's distribution Normal distribution, **Sampling distribution-** Repeated sampling, The Central limit theorem, Point and Interval estimation, Confidence limits.	5
4	**Some standard significance tests -** Hypothesis testing, Test for single mean and difference between two means, Independent and Matched samples, The case of small and large sample.	5
5	**Analysis of discrete and ranking data** – Chi-square distribution, Rank correlation and Coefficient of Concordance.	5
6	**Quality Control Charts**- X bar and R chart, P and NP charts, C chart, Analysis of Variance, Correlation and Regression. Introduction to six sigma.	5
	Total	26

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RAJASTHAN TECHNICAL UNIVERSITY, KOTA
SYLLABUS

3rd Year - V Semester: B.Tech. : Textile Engineering

5TE4-02: MECHANISMS OF YARN MANUFACTURING – III

Credit: 3
3L+0T+2P

Max. Marks: 100(IA:30, ETE:70)
End Term Exam: 3 Hours

SN	Contents	Hours
1	**Introduction-** Objective, scope and outcome of the course.	1
2	**Combing** Object of combing Systems of lap preparation Study of sliver lap, ribbon lap and super-lap machines Configuration of fibre feed and its effect on the quality of product, noil percentage and fractionation efficiency of comber	9
3	**Comber** Types of combers Detailed study of the Nasmith and modern comber Timing and setting of comber Control of comber waste Calculation pertaining to draft, production and noil percentage Introduction to the recent developments in combing	10
4	**Speed frame** Objects of speed frame Conventional and modern roving processes Mechanisms involved in drafting, twisting and winding Different types of drives, Cone drums and multimotor drive Differential motions and their working principles	10
5	Building motions, their objects and types, working principle of English type and modern builder motions Drafting systems Processing parameters for different rovings Common defects in roving packages, their causes and remedies Calculations pertaining to gearing, constants, drafts, tpi and production Twist multiplier and roving twist Introduction to the changes to be made on roving frame to run man-made fiber. Introduction to the recent developments in simplex	10
	Total	40

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3rd Year - V Semester: B.Tech. : Textile Engineering

5TE4-03: MECHANISMS OF FABRIC MANUFACTURING – III

Credit: 3 **Max. Marks: 100(IA:30, ETE:70)**
3L+0T+2P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	**Introduction-** Objective, scope and outcome of the course.	1
2	Objects, size ingredients, Sizing machine passage, Properties of size paste, Cylinder drying, hot air drying. Size box and its developments, Calculation of concentration, Viscosity and speed of sizing machine. Dyeing –cum Sizing machine for denim fabric.	9
3	Factors affecting size take up, Looming process, Accessories like reed, healds and drop pins. Manual drawing-in , semi auto and fully auto drawing-in, Knotting-in process and it developments.	10
4	**Jacquard shedding** Classification of jacquards Single Lift Single Cylinder, Double Lift Single Cylinder, Double Lift Double Cylinder Shed forming element, drive & timing of above Machine. Self twilling, pressure harness, cross border jacquard, card cutting operation for mechanical jacquard, Electronic jacquard, Warp stop motion & its setting.	10
5	Modern development in terry structure. Automatic weft replacement device on loom, Pirn changing, Shuttle changing, setting & timing of above mech. Introduction to shuttle less weaving machine, projectile, rapier with reference to picking.	10
	Total	**40**

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RAJASTHAN TECHNICAL UNIVERSITY, KOTA
SYLLABUS

3rd Year - V Semester: B.Tech. : Textile Engineering

5TE4-04: TEXTILE TESTING – I

Credit: 3　　　　　　　　　　　　　　**Max. Marks: 100(IA:30, ETE:70)**
3L+0T+4P　　　　　　　　　　　　　**End Term Exam: 3 Hours**

SN	Contents	Hours
1	**Introduction-** Objective, scope and outcome of the course.	1
2	**Introduction to textile testing** Aim and scope, Sampling techniques, General requirements, squaring, cut squaring and Zoning methods for sampling of raw material, Sampling techniques for yarn and fabrics for specific tests, Moisture relations of textiles, Terms and definitions. Relation between Relative Humidity and regain of textile materials, Equilibrium regain hysteresis. Official regain and concept of current invoice weight.	7
3	**Measurement of fibre physical characteristics** Fibre length, fineness, maturity and foreign matter of cotton and other fibres, Principle, construction, operation and calibration of equipment in common use for measurement of above properties. Grading of different cottons.	8
4	**Measurement of yarn properties** Yarn numbering systems, Conversion methods. Measurement of yarn number. Twist in spun, continuous filament and ply yarns.	8
5	**Measurement of fabric properties** Serviceability, wear and abrasion, Definitions, methods for measuring abrasion resistance and evaluation of results, Fabric creasing and crease recovery testing, Thickness, Weight, Crimp. Shrinkage, Wettability, Shower-proofness, Water- proofness, Flame-resistance.	8
6	**Thermal Comfort and Fabric hand properties** Air permeability, Thermal and moisture transmission properties, Objective hand evaluation and tailor ability assessment of the fabric.	8
	Total	40

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3rd Year - V Semester: B.Tech. : Textile Engineering

5TE4-05: STRUCTURE AND PROPERTIES OF FIBRES

Credit: 3   **Max. Marks: 100(IA:30, ETE:70)**
3L+0T+0P   **End Term Exam: 3 Hours**

SN	Contents	Hours
1	**Introduction-** Objective, scope and outcome of the course.	1
2	**Structure of fibres**: morphology and order in fibre structure, theories of fine structure of fibres methods of determination of molecular structures (crystallinity and orientation, crystal size), by using infrared spectroscopy, X-ray diffraction methods, electron (TEM & SEM), optical microscopy and density gradient tube.	7
3	**Mechanical properties**: Mechanism of deformation in fibres, the effects of variability, principles of elasticity and visco-elasticity, stress-strain behaviour of textile fibre, The study of time dependence, creep and stress-relaxation behaviour of fibres. Structural effect on extension behaviour, Simple spring and dashpot models simulating to textile fibres. Bending and torsional rigidity in fibres.	8
4	**Moisture properties**: Absorption in fibres, hysteresis, swelling phenomenon, heats of sorption, quantitative analysis of moisture absorption, Pierce's theory. **Thermal properties**: Molecular motions and transition phenomenon. First order and second order transition phenomenon, thermal characterisation of fibres by using DTA, DSC and TGA, thermal expansion behaviour concept of heat setting and pleating specific heat of fibres – theoretical and actual.	8
5	**Optical properties**: Polarization and refractive index, refraction, birefringence and its measurement, absorption and dichroism, reflection and lustre.	8
6	**Electrical properties**: Di-electric properties and its measurement, effect of variables on dielectric constant. Electrical resistance and its measurement, electrical resistance of different fibres, effect of moisture, impurities and temperature on electrical resistance. Static electricity and measurement of static charge in fibres, charge generation and its leakage. **Frictional properties**: nature and measurements, frictional properties of wool.	8
	Total	40

RAJASTHAN TECHNICAL UNIVERSITY, KOTA
SYLLABUS

3rd Year - V Semester: B.Tech. : Textile Engineering

5TE4-06: KNITTING TECHNOLOGY

Credit: 2　　　　　　　　　　　　　　　**Max. Marks: 100(IA:30, ETE:70)**
2L+0T+0P　　　　　　　　　　　　　　　**End Term Exam: 3 Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	Introduction and basics of knitting, differences between woven and knitted fabrics, classification of knitting machines, differences between weft knitting and warp knitting machines, basic elements of knitting – needles, sinkers and cams. Type of needles used in knitting process - Latch, Beard and Compound needle. Their parts and basic knitting cycle. Knit, Tuck and Float Stitches- their formation in machine and applications.	5
3	Basic weft knitted structures - Plain, Rib, Interlock, Purl - their formation on knitting machines, their applications and properties. Straight bar frame, flat and circular knitting machine.	5
4	Knitted fabric structure – conventions for representations of construction, single jersey and double jersey structures and their derivatives. Production calculations of weft knitting machines Quality requirements for knitting yarn, knitted fabric faults, their causes and remedies. Knitted fabric geometry – tightness factor.	5
5	Introduction and basics of warp knitting – process of loop formation, swinging and shogging motion, pattern control mechanism. Tricot warp knitting machine – knitting elements, knitting cycle, properties and applications of tricot warp knitted fabrics. Raschel warp knitting machine - knitting elements, knitting cycle, properties and applications ofraschel warp knitted fabrics.	5
6	Warp knit constructions – atlas, locknit, reverse locknit, sharkskin, queenscord,etc. and conventions for representations of construction. Applications of warp knitted fabrics in technical textiles. Warp knitting calculations- run-in, structure ratio, geometry of warp knitted fabrics.	5
	Total	**26**

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5TE4-21 SPINNING PRACTICAL – III

Credit: 1   **Max. Marks: 100(IA:60, ETE:40)**
0L+0T+2P   **End Term Exam: 2 Hours**

Contents
Lap former and comber. Study of constructional details of machines. Various controls, change places, etc. Common faults and remedies. Calculations pertaining to gearing: speeds, constants, drafts and production. Practice in handling, operating speed frame, Study of constructional details of simplex machinery, Builder Motion; various controls, change place etc. Common roving faults and their remedies. Calculations pertaining to gearing: speeds, constants, drafts, tpi and production.

5TE4-22 WEAVING PRACTICAL –III

Credit: 1   **Max. Marks: 100(IA:60, ETE:40)**
0L+0T+2P   **End Term Exam: 2 Hours**

Contents
Jacquard shedding , automatic cap & shuttle change mechanism, Jacquard card cutting warping machine-drive, traverse, beaming brake mechanism. Automatic weft replacement device on loom, Pirn changing, Shuttle changing, setting & timing of above mechanism. Practice in handling and operating multi cylinder sizing machine. Practice in drawing in of warp threads. Practice in handling and operating machine.

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5TTE-23 TEXTILE TESTING PRACTICAL – I

Credit: 2   **Max. Marks: 100(IA:60, ETE:40)**
0L+0T+4P   **End Term Exam: 2 Hours**

Contents
Measurement of fiber length and its distribution , fineness, maturity, moisture content and strength using conventional methods and instruments. Fibre diameter and its variability, Measurement of Hank of sliver roving, and count of yarn and their variability. Single yarn strength and elongation, lea strength measurement by conventional instruments. Twist of yarn. Crimp of fabric. Use of statistical techniques for evaluation of experimental results.

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Syllabus of
UNDERGRADUATE DEGREE COURSE

B.Tech. VI Semester

Textile Engineering

Rajasthan Technical University, Kota
Effective from session: 2022 – 2023

RAJASTHAN TECHNICAL UNIVERSITY, KOTA

SYLLABUS

3rd Year - VI Semester: B.Tech. : Textile Engineering

6TE3-01: MECHANICS OF TEXTITE MACHINES

Credit: 2   **Max. Marks: 100(IA:30, ETE:70)**
2L+0T+0P   **End Term Exam: 3 Hours**

SN	Contents	Hours
1	**Introduction-** Objective, scope and outcome of the course.	1
2	**Mechanics of Scutcher and Speed frame** Designing of cone drums for scutcher and speed frame Roller weighting at different stages of spinning Inertia of a carding machine Epicyclic wheel trains used in textile machinery, Differential motion used in speed frames	5
3	**Mechanics of Spinning Machine** The physics and theory of spinning balloons. Yarn tension in ring spinning Power requirements for operating various motions and for machines as a whole, at various stages of spinning	5
4	**Mechanics of winding** Winding rate, relationship between bobbin diameter and winding rate, relationship between bobbin diameter and spindle speed Angle of wind and coil angle, Wind and traverse ratio Drum-driven packages , develop the surface of cheeses Gain in winding , linear gain, revolution gain, Cone-winding **Tension in winding** Tension generators to control yarn tension. Yarn tension and its measurement	5
5	**Mechanics for Textile Machine** Warp tension and its measurement Simple harmonic motion, displacement, velocity and acceleration Determination of Tappet lift . Design of cam and tappet profile for textile machinery Velocity of shuttle during acceleration and retardation, calculation for velocity of shuttle.	5
6	**Mechanics for Weaving Machine** An expression for sley eccentricity. Kinematics of sley I, e. displacement, velocity and acceleration of sley sword pin, Force, torque, power required to drive the sley Kinematics of sedding i.e. an expression for shed opening at shuttle front Power requirements for operation of various motions and for machine a whole, at various stages of weaving	5
	Total	26

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6TE4-02: MECHANISMS OF YARN MANUFACTURING – IV

Credit: 3   **Max. Marks: 100(IA:30, ETE:70)**

3L+0T+4P   **End Term Exam: 3 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	1
2	**Objective of ring frame:** Principle and mechanism involved in drafting, twisting and winding **Yarn twist:** Terminology, twist levels. Concept of twist multiplier,. Propagation of twist. Yarn contraction due to twisting Calculations pertaining to gearing, constants, drafts and production of ring frame	7
3	**Types of build:** Builder motions warp, filling and combined builds for common package sizes Limitations to large package spinning. Types of rings and travelers and their common uses. Rising and falling lappets. Balloon control rings. Systems of waste collection at ring frame and types of spinning wastes. Limitations in ring spinning and factors responsible for loss in efficiency. Yarn faults and their remedies. Introduction to the recent developments in ring spinning. Concepts of average mill count and 20's conversion. Reason and remedies of end breaks on ring- frame. Changes to be done in ring frame to run man-made fibre.	12
4	**Objects of doubling :** System of doubling (dry and wet). Study of ring doublers. Two for one twister. Calculations pertaining to gearing constants and production.	6
5	**Fancy yarns:** Objects and production of fancy yarns. Ply cable and core spun yarns Sewing threads and tyre cords	6
6	**Objects of yarn reeling and doubling:** Types of reeling construction and working of reel. Yarn bundling. Introduction to Rotor, Air- jet and Friction Spinning.	8
	Total	40

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6TE4-03: MECHANISMS OF FABRIC MANUFACTURING – IV

Credit: 3 **Max. Marks: 100(IA:30, ETE:70)**
3L+0T+4P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	1
2	**Projectile Weaving Machine:** Basic principle of projectile weaving machine. Sequence of weft insertion i.e.: weft supply system, feeding of yarn to projectile. Toggle-Torsion bar picking mechanism. Cam driven shedding (Rotatory dobby, card cutting, card reading, card welding and card pasting). Double cam Beat-up. Weaving machine timing. Positive let-off mechanisms like, Electronic let off, their advantages. Positive continuous take up mechanisms like Sulzer take-up, Picanol take-up and their advantages. Different selvedges: Tucked-in, leno, fused. Their mechanism of formation, their characteristics and uses	14
3	**Air-jet Weaving Machine:** Principle of weft insertion. Sequence of weft insertion i.e.: weft supply system, feeding of yarn to main nozzle. Picking mechanism. Problems in air-jet weaving machine, its remedies. Nozzle parameters affecting characteristics of air-jet, Quality of air required. Weaving machine timings Air drag force, factors affecting air drag force. Blowing sequence of relay nozzles and timing control Manufacturing of Denim fabric..	6
4	**Water-jet Weaving Machine:** Principle of weft insertion. Path of yarn on weaving machine. Sequence of weft insertion i.e.: weft supply system, feeding of yarn to main nozzle. Picking mechanism, Nozzle pump design. Problems encountered. Drying of fabric on weaving machine. Quality of water required	6
5	**Rapier Weaving Machine**: Classification of rapier Weaving Machine. System of weft insertion and number of rapiers. Sequence of weft insertion i.e.: weft supply system, feeding of yarn to rapier. Picking mechanism. Driving mechanism for flexible and rigid rapiers. Weaving machine timing ,Velocity and time calculations. Modern developments in shuttle less weaving	6
6	**Multiphase Weaving**:- Introduction, Classification, Methods to form warp wise and weft wise sheds, methods of picking, methods of beat up, limitations of multiphase weaving, applications, features of modern multiphase weaving machines e.g. M 8300. **Circular Weaving:-** Introduction, Classification as per number of shuttles, shedding, picking, beating, cloth collection, supply of warp yarn, stop motions for warp and weft, productivity. Technical features of Circular weaving machines, (Sterlings, Lohiya) **Triaxial Weaving**: Structure and Properties of triaxial woven fabrics, applications, weaving equipment for triaxial weaving.	7
	Total	40

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Rajasthan Technical University, Kota

6TE4-04: TEXTILE TESTING – II

Credit: 3 **Max. Marks: 100(IA:30, ETE:70)**
3L+0T+4P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	**Mechanical behavior of textiles** Terms and definitions, expressing the results, quantities and units Introduction to visco-elasticity, creep and relaxation phenomenon Mechanical conditioning and recovery properties of textile	7
3	**Experimental methods** Principle of CRL, CRT and CRE type Tensile testing machines- various Instruments Factors affecting the results of tensile experiments Evaluation and interpretation of tensile experiments Evaluation and interpretation of tensile test results Tension winding test for yarns	8
4	**Fabric testing** Tensile, tearing and bursting strength tests Principle and operation of equipment, fabric bending, shearing and draping properties: terminology, quantities and units, Experimental method	8
5	**Evenness testing of yarns** Nature and cause of irregularities Principle and methods of evenness testing ,evaluation and interpretation	8
6	**Yarn faults** Classification Measurement Causes and their remedies Irregularities of drafted material: random, quasi-periodic and periodic irregularities of addition of irregularities, effect of doubling on irregularity Causes of irregularity: influence of raw material, process and machine variables on irregularity	8
	Total	**40**

Office of Dean Academic Affairs
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6TE4-05: MAN MADE FIBER PRODUCTION

Credit: 3   **Max. Marks: 100(IA:30, ETE:70)**
3L+0T+0P   **End Term Exam: 3 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	1
2	Historical background, growth and production of manmade fibres in world and India.	2
3	**Synthetic fibres**: The raw material preparation, polymerization techniques and manufacturing processes of polyesters, polyamides, acrylics, modified acrylics, polyolifins polymers and their fibre manufacturing practices, structure, properties and application areas.	15
4	**Regenerated cellulosic fibres**: The raw material preparation, methods of fibre manufacturing and production techniques of regenerated cellulosic fibres such as viscose rayon and modified viscose rayons, lyocell (Tencel), acetate rayon, their structure, properties and application areas.	8
5	**Regenerated protein fibres** The raw material preparation, fibre manufacturing methods of regenerated protein fibres such as casein, ardil, vicara.	4
6	Introduction to elastomeric, inorganic, high performance and other speciality fibres such as polyurathane, aramids, ordered polyester, ultra high molecular weight polyethylene, carbon, glass	10
	Total	40

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6TE4-06: ENGINEERING OF TEXTILE STRUCTURES

Credit: 3   **Max. Marks: 100(IA:30, ETE:70)**
3L+0T+0P   **End Term Exam: 3 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	1
2	**Yarn geometry** Idealized yarn geometry, Relationship of yarn number and twist factor, Actual structure of Ring, Rotor and Air-jet yarns	5
3	**Packing of fiber in yarn** Ideal packing, hexagonal close packing and to other forms, Packing factor and its measurement Yarn diameter	5
4	**Methods of measurement of twist contraction** Limit of twist, Fiber migration, Mechanism of migration, Condition for migration to occur, Frequency of migration, Migration in blended yarns	5
5	**Translation of fibers properties into yarn properties** Extension of continuous filament yarn for small strains and large strains, Prediction of breakage **Mechanics of staple fibre yarns** The practical and experimental studies, Mechanics of staple fibre yarns, Hambureger model and later modifications, Spin ability of and and torsional behavior of Fibres and yarns	12
6	**Fabric geometry & Properties** Cloth setting theories, Fabric cover and fractional cover, Crimp balance equation, Fabric cover and fabric weight relationship, Peirce's concept of fabric geometry, Flexible and elastic threads model, Graphical solutions, Latest modifications Translation of fiber and yarn properties into fabric properties, viz. tensile, tearing, abrasion, bending, shearing, Creasing & shearing Introduction about FAST and KAWABATA Instrument Design of textile structures for certain functional end uses	12
	Total	40

Office of Dean Academic Affairs
Rajasthan Technical University, Kota

6TE4-21 SPINNING PRACTICAL - IV

Credit: 2   **Max. Marks: 100(IA:60, ETE:40)**
0L+0T+4P   **End Term Exam: 2 Hours**

Contents
Practice in handling, operating, setting and gauging ring frame and doubling frame. Study of constructional details of machinery; various controls, change place etc. Common yarn faults and their remedies. Calculations pertaining to gearing: speeds, constants, drafts, tpi and production.

6TE4-22 WEAVING PRACTICAL – IV

Credit: 2   **Max. Marks: 100(IA:60, ETE:40)**
0L+0T+4P   **End Term Exam: 2 Hours**

Contents
Study of constructional details of projectile weaving and Air-Jet machines their drive, passage yarn to fabric, colour selection mechanism. Study of constructional details of knitting machines.

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6TE4-23 TEXTILE TESTING PRACTICAL – II

Credit: 2   **Max. Marks: 100(IA:60, ETE:40)**
0L+0T+4P   **End Term Exam: 2 Hours**

Contents
Use of microscopes for testing of yarns for appearance, and diameter. Measurement of evenness by conventional and modern testing instruments. Classification of yarn faults, hairiness of yarn interpretation of results and construction of X& R Charts.
Fabric testing for dimensions, construction, weight, thickness, stiffness, crease, drape, busting, cover, shrinkage and air permeability.
Strength testing of fibre, yarn fabric using modern instruments.
Fabrics testing for load elongation, tensile, bursting and tearing strength , abrasion, flexural rigidity, crease recovery and draping qualities of fabrics.

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