

Syllabus of  
UNDERGRADUATE DEGREE COURSE

**B.Tech. V Semester**

Textile Chemistry



Rajasthan Technical University, Kota  
Effective from session: 2019 – 2020



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## SYLLABUS

3<sup>rd</sup> Year - V Semester: B.Tech. : Textile Chemistry

### 5TC3-01: PRACTICAL APPLICATIONS OF STATISTICS

Credit: 2

Max. Marks: 100(IA:20, ETE:80)

2L+0T+0P

End Term Exam: 2 Hours

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

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# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## SYLLABUS

3<sup>rd</sup> Year - V Semester: B.Tech. : Textile Chemistry

### 5TC4-02: ENERGY AND WATER CONSERVATION IN TEXTILE WET PROCESSING

**Credit: 3**

**Max. Marks: 150(IA:30, ETE:120)**

**3L+0T+0P**

**End Term Exam: 3 Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	Different forms of energy use Efficiency of energy utilization and energy conservation Sources of energy including non-conventional sources	9
3	Conservation of water and steam in chemical processing of textiles Electrical energy saving.	10
4	Study of different wastages in chemical processing of textiles Energy audits Process control in wet processing Study of boilers and improvement in efficiency	10
5	RF driers Minimum application technique Foam finishing Vacuum system	10
	<b>Total</b>	<b>40</b>

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# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## SYLLABUS

3<sup>rd</sup> Year - V Semester: B.Tech. : Textile Chemistry

### 5TC4-03: TEXTILE CHEMICAL ANALYSIS II

**Credit: 3**

**Max. Marks: 150(IA:30, ETE:120)**

**3L+0T+2P**

**End Term Exam: 3 Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	Color fastness to light, washing, rubbing, sublimation, perspiration End groups analysis in polyester and Nylon, oligomer content and spin finishes.	8
3	Water quality for dyeing, effect of contaminants on textile wet processing, Water effluents testing.	8
4	Hardness, solid content dissolved and suspended, pH, Color, Chloride, fluoride, Chemical oxygen demand (COD), Bio-chemical oxygen demand (BOD), Oil and grease content	8
5	Analysis of damage to fibers by heat, light, oxidation and reduction. Fluidity measurement	7
6	Estimation of desizing efficiency by various methods. Chromatographic separation of dyes, Paper chromatography, thin layer chromatography, Gas chromatography	8
	<b>Total</b>	<b>40</b>

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# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## SYLLABUS

3<sup>rd</sup> Year - V Semester: B.Tech. : Textile Chemistry

### 5TC4-04: TEXTILE TESTING – I

Credit: 3

Max. Marks: 150(IA:30, ETE:120)

3L+0T+4P

End Term Exam: 3 Hours

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	<b>Introduction to textile testing</b> 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	<b>Measurement of fibre physical characteristics</b> 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	<b>Measurement of yarn properties</b> Yarn numbering systems, Conversion methods. Measurement of yarn number. Twist in spun, continuous filament and ply yarns	8
5	<b>Measurement of fabric properties</b> 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	<b>Thermal Comfort and Fabric hand properties</b> Air permeability, Thermal and moisture transmission properties, Objective hand evaluation and tailor ability assessment of the fabric.	8
	<b>Total</b>	<b>40</b>

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# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## SYLLABUS

3<sup>rd</sup> Year - V Semester: B.Tech. : Textile Chemistry

### 5TC4-05: STRUCTURE AND PROPERTIES OF FIBRES

Credit: 3

3L+0T+0P

Max. Marks: 150(IA:30, ETE:120)

End Term Exam: 3 Hours

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	<b>Structure of fibres:</b> 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	<b>Mechanical properties:</b> 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	<b>Moisture properties:</b> Absorption in fibres, hysteresis, swelling phenomenon, heats of sorption, quantitative analysis of moisture absorption, Pierce's theory. <b>Thermal properties:</b> 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	<b>Optical properties:</b> Polarization and refractive index, refraction, birefringence and its measurement, absorption and dichroism, reflection and lustre.	8
6	<b>Electrical properties:</b> 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. <b>Frictional properties:</b> nature and measurements, frictional properties of wool.	8
	<b>Total</b>	<b>40</b>

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# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## SYLLABUS

3<sup>rd</sup> Year - V Semester: B.Tech. : Textile Chemistry

### 5TC4-06: KNITTING TECHNOLOGY

**Credit: 2**

**Max. Marks: 100(IA:20, ETE:80)**

**2L+0T+0P**

**End Term Exam: 2 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 of raschel 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
	<b>Total</b>	<b>26</b>

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# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## SYLLABUS

3<sup>rd</sup> Year - V Semester: B.Tech. : Textile Chemistry

### 5TC4-21 TEXTILE CHEMICAL ANALYSIS LAB- II

**Credit: 1**  
**OL+OT+2P**

**Max. Marks: 50(IA:30, ETE:20)**  
**End Term Exam: 2 Hours**

Contents
Fastness of dyes e.g. fastness to light, washing, rubbing, perspiration, sublimation International standards viz. AATCC, ASTM, BIS, ISO. Effluent water analysis-estimation of COD, BOD, oil and grease, iron, sulphide, chloride content etc in effluent water. Methylene blue and Copper number test.

### 5TC4-22 TEXTILE TESTING PRACTICAL – I

**Credit: 2**  
**OL+OT+4P**

**Max. Marks: 100(IA:60, ETE:40)**  
**End Term Exam: 2 Hours**

Contents
Measurement of fiber length and its distribution, fineness, maturity, moisture content and strength using conventional methods and instruments. Fiber 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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# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## SYLLABUS

3<sup>rd</sup> Year - V Semester: B.Tech. : Textile Chemistry

### 5TC4-23 COLOUR AND DESIGN PRACTICAL

**Credit: 1**  
**OL+OT+2P**

**Max. Marks: 100(IA:30, ETE:20)**  
**End Term Exam: 2 Hours**

Contents
Colour, its nature and color perception in relation to the object, observer and light source. Dimensions and Attributes of color combination. Physical and Psychological aspects of color. Texture and its determinants. Application of computer aided design to textile Printing, Color separation, color reduction, marker preparation, Screen preparation Introduction to traditional Indian textiles and study of their Printing principles.

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Syllabus of  
UNDERGRADUATE DEGREE COURSE

**B.Tech. VI Semester**

Textile Chemistry



Rajasthan Technical University, Kota  
Effective from session: 2019 – 2020



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## SYLLABUS

3<sup>rd</sup> Year - VI Semester: B.Tech. : Textile Chemistry

### 6TC3-01: CHEMISTRY OF SURFACTANTS

**Credit: 2**

**2L+0T+0P**

**Max. Marks: 100(IA:20, ETE:80)**

**End Term Exam: 2 Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	Detailed classification of textile auxiliaries, various anionic, cationic and nonionic agents General methods of preparation and specific uses in textile processing auxiliaries. scouring, bleaching, mercerizing, dyeing and printing auxiliaries	5
3	Physical principles involved in detergency and wetting, HLB numbers Principles of action of auxiliaries based on surface active agents	5
4	Surface activity, wetting, dispersing, stripping agents and levelling agents Emulsification theory and emulsifying agents.	5
5	Different softening agents and their application Optical brightening agents and their application.	5
6	Sequestering agents and their utility in processing Eco friendly auxiliaries	5
	<b>Total</b>	<b>26</b>

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# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## SYLLABUS

3<sup>rd</sup> Year - VI Semester: B.Tech. : Textile Chemistry

### 6TC4-02: TECHNOLOGY OF DYEING

**Credit: 3**

**Max. Marks: 150(IA:30, ETE:120)**

**3L+0T+0P**

**End Term Exam: 3 Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	Study of various methods of dyeing Various form of the dyes and their application.	7
3	Principle and methods of dyeing natural and regenerated fibers with various classes of dyes e.g. Direct, Reactive, Vat, Sulphur, Basic, Acid and Azoic dyes. Application of Pigments	12
4	Dyeing with natural dyes and mordants Dyeing of Denim fabrics, Dyeing of loose stocks and fibers Faults in dyeing and remedial measures	6
5	Dyeing of Synthetic fibre Polyester , Nylon, Acrylic and its blends with natural fibre. Diffeent dyeing techniques of Polyester fibre.	6
6	Jigger, Winch, Soft flow machines, Padding Mangles Development in dyeing machines	8
	<b>Total</b>	<b>40</b>

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# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## SYLLABUS

3<sup>rd</sup> Year - VI Semester: B.Tech. : Textile Chemistry

### 6TC4-03: TECHNOLOGY OF TEXTILE PRINTING

Credit: 3

Max. Marks: 150(IA:30, ETE:120)

3L+0T+4P

End Term Exam: 3 Hours

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	Principle of printing Printing paste ingredients viz. various thickeners and other chemicals Method of printing such as block, screen, roller printing Preparation of Screen for manual, flat bed and rotary screen printing machines Engraving of design on roller	14
3	Styles of printing viz. Direct, Discharge, Resist etc. on natural fibers Styles of printing viz. Direct, Discharge, Resist etc. on synthetic and their blends After treatment of printing material Machines used for printing, dyeing, ageing, Steaming, Curing	6
4	<b>Novelty printing process</b>  Transfer printing of synthetic and cotton Flock printing Garment printing	6
5	Pigment printing Various type of pigments, binders, catalysts, emulsion thickening Replacement of kerosene Faults in printing and their prevention	6
6	Ink jet printing Application of printing CAD software, design preparation, colour reduction, colour separation, screen preparation.	7
	<b>Total</b>	<b>40</b>

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# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## SYLLABUS

3<sup>rd</sup> Year - VI Semester: B.Tech. : Textile Chemistry

### 6TC4-04: TEXTILE TESTING – II

Credit: 3

Max. Marks: 150(IA:30, ETE:120)

3L+0T+4P

End Term Exam: 3 Hours

SN	Contents	Hours
1	<b>Introduction:</b> Objective, scope and outcome of the course.	1
2	<b>Mechanical behavior of textiles</b> 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	<b>Experimental methods</b> 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	<b>Fabric testing</b> 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	<b>Evenness testing of yarns</b> Nature and cause of irregularities Principle and methods of evenness testing ,evaluation and interpretation	8
6	<b>Yarn faults</b> 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
	<b>Total</b>	<b>40</b>

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# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## SYLLABUS

3<sup>rd</sup> Year - VI Semester: B.Tech. : Textile Chemistry

### 6TC4-05: MAN MADE FIBER PRODUCTION

Credit: 3

Max. Marks: 150(IA:30, ETE:120)

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	<b>Synthetic fibres:</b> 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	<b>Regenerated cellulosic fibres:</b> 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	<b>Regenerated protein fibres</b> 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
	<b>Total</b>	<b>40</b>

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# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## SYLLABUS

3<sup>rd</sup> Year - VI Semester: B.Tech. : Textile Chemistry

### 6TC4-06: ENGINEERING OF TEXTILE STRUCTURES

Credit: 3  
3L+0T+0P

Max. Marks: 150(IA:30, ETE:120)  
End Term Exam: 3 Hours

SN	Contents	Hours
1	<b>Introduction:</b> Objective, scope and outcome of the course.	1
2	<b>Yarn geometry</b> Idealized yarn geometry, Relationship of yarn number and twist factor, Actual structure of Ring, Rotor and Air-jet yarns	5
3	<b>Packing of fiber in yarn</b> Ideal packing, hexagonal close packing and to other forms, Packing factor and its measurement Yarn diameter	5
4	<b>Methods of measurement of twist contraction</b> Limit of twist, Fiber migration, Mechanism of migration, Condition for migration to occur, Frequency of migration, Migration in blended yarns	5
5	<b>Translation of fibers properties into yarn properties</b> Extension of continuous filament yarn for small strains and large strains, Prediction of breakage <b>Mechanics of staple fibre yarns</b> 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	<b>Fabric geometry &amp; Properties</b> 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
	<b>Total</b>	<b>40</b>

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# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## SYLLABUS

3<sup>rd</sup> Year - VI Semester: B.Tech. : Textile Chemistry

### 6TC4-21: TEXTILE PRINTING LAB – I

**Credit: 2**  
**OL+OT+4P**

**Max. Marks: 100(IA:40, ETE:60)**  
**End Term Exam: 3 Hours**

Contents
Printing of cotton with various methods viz. blocks, roller and screen by using various classes of dyes. Printing of cotton fabric with different styles e.g. Direct, Discharge, Resist style etc. Printing of woolen and silk fabrics.

### 6TC4-22: FABRIC DYEING LAB

**Credit: 2**  
**OL+OT+4P**

**Max. Marks: 100(IA:40, ETE:60)**  
**End Term Exam: 3 Hours**

Contents
Dyeing of cotton and rayon with direct, sulphur, vat, reactive and azoic dyes etc. Dyeing of wool and silk with acid, premetallised and chrome dyes. After treatment to improve the fastness properties. Dyeing of compound shades. Application of natural colors on cotton, wool and silk. Dyeing of various synthetic fibers e.g. polyester, nylon, acrylic and blends with various classes of dyes.

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# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## SYLLABUS

**3<sup>rd</sup> Year - VI Semester: B.Tech. : Textile Chemistry**

### **6TC4-23: TEXTILE TESTING PRACTICAL – II**

**Credit: 2**  
**OL+OT+4P**

**Max. Marks: 100(IA:40, ETE:60)**  
**End Term Exam: 3 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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