

Syllabus of  
UNDERGRADUATE DEGREE COURSE

# Textile Chemistry



Rajasthan Technical University, Kota  
Effective from session: 2021 – 2022



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## SYLLABUS

2<sup>nd</sup> Year - IV Semester: B.Tech. (Textile Chemistry)

### 4TC2-01: Chemistry of Dyes

Credit: 2

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

2L+0T+0P

End Term Exam: 2Hours

| SN | Contents   | Hours     |
|----|--|-----------|
| 1  | <b>Introduction:</b> Objective, scope and outcome of the course.   | 1         |
| 2  | Historical development of natural and synthetic dyes<br>Classification of dyes according to chemical constitution<br>Isolation of products for manufacturing of dye intermediates<br>Chemistry of benzene and naphthalene with their orientation rules | 6         |
| 3  | Methods of preparation of nitroso, nitro, azo dyes<br>Methods of preparation of pyrazolone, acridine, xanthine, ketoamine, anthraquinones, azines, thiazines, oxazines, indigo, thio indigo, alizarine and various dyes. (Reaction Based)              | 6         |
| 4  | Relation between- color and chemical constitution, substantively and chemical constitution. Chemistry of various types of pigments   | 5         |
| 5  | Chemistry of reactive, acid, basic, direct, sulphur, vat dyes, sulphurised vat colors, coupling of different naphthols Disperse dyes manufacture and purification  | 5         |
| 6  | Photo physical processes (Phosphorescence and fluorescence) following light absorption Fluorescent brightening agents and miscellaneous dyes Toxicity of dyes and intermediates  | 5         |
|    | <b>Total</b>   | <b>28</b> |

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### 4TC1-02/3TC1-02: Technical Communication

**Credit: 2**

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

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

**End Term Exam: 2Hours**

| SN           | Contents  | Hours     |
|--------------|---|-----------|
| 1            | <b>Introduction:</b> Objective, scope and outcome of the course.  | 1         |
| 2            | <b>Introduction to Technical Communication-</b> Definition of technical communication, Aspects of technical communication, forms of technical communication, importance of technical communication, technical communication skills (Listening, speaking, writing, reading writing), linguistic ability, style in technical communication.   | 3         |
| 3            | <b>Comprehension of Technical Materials/Texts and Information Design &amp; development-</b> Reading of technical texts, Reading and comprehending instructions and technical manuals, Interpreting and summarizing technical texts, Note-making. Introduction of different kinds of technical documents, Information collection, factors affecting information and document design, Strategies for organization, Information design and writing for print and online media. | 6         |
| 4            | <b>Technical Writing, Grammar and Editing-</b> Technical writing process, forms of technical discourse, Writing, drafts and revising, Basics of grammar, common error in writing and speaking, Study of advanced grammar, Editing strategies to achieve appropriate technical style, Introduction to advanced technical communication. Planning, drafting and writing Official Notes, Letters, E-mail, Resume, Job Application, Minutes of Meetings.                        | 8         |
| 5            | <b>Advanced Technical Writing-</b> Technical Reports, types of technical reports, Characteristics and formats and structure of technical reports. Technical Project Proposals, types of technical proposals, Characteristics and formats and structure of technical proposals. Technical Articles, types of technical articles, Writing strategies, structure and formats of technical articles.  | 8         |
| <b>Total</b> |   | <b>26</b> |

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2<sup>nd</sup> Year - IV Semester: B.Tech. (Textile Chemistry)

### 4TC1-03/3TC1-03: Managerial Economics And Financial Accounting

Credit: 2

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

2L+0T+0P

End Term Exam: 2Hours

| SN           | Contents   | Hours     |
|--------------|--|-----------|
| 1            | <b>Introduction:</b> Objective, scope and outcome of the course.   | 1         |
| 2            | <b>Basic economic concepts-</b><br>Meaning, nature and scope of economics, deductive vs inductive methods, static and dynamics, Economic problems: scarcity and choice, circular flow of economic activity, national income-concepts and measurement.  | 4         |
| 3            | <b>Demand and Supply analysis-</b><br>Demand-types of demand, determinants of demand, demand function, elasticity of demand, demand forecasting –purpose, determinants and methods, Supply-determinants of supply, supply function, elasticity of supply.  | 5         |
| 4            | <b>Production and Cost analysis-</b><br>Theory of production- production function, law of variable proportions, laws of returns to scale, production optimization, least cost combination of inputs, isoquants. Cost concepts-explicit and implicit cost, fixed and variable cost, opportunity cost, sunk costs, cost function, cost curves, cost and output decisions, cost estimation. | 5         |
| 5            | <b>Market structure and pricing theory-</b><br>Perfect competition, Monopoly, Monopolistic competition, Oligopoly.   | 5         |
| 6            | <b>Financial statement analysis-</b><br>Balance sheet and related concepts, profit and loss statement and related concepts, financial ratio analysis, cash-flow analysis, funds-flow analysis, comparative financial statement, analysis and interpretation of financial statements, capital budgeting techniques.   | 5         |
| <b>Total</b> |  | <b>25</b> |

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### 4TC3-04: Electronics & Microprocessor In Textile Machines

Credit: 2

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

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>Semiconductor Diodes:</b> Introduction, characteristics and their applications <ul style="list-style-type: none"><li>• Ideal diode, PN semiconductor diode, Diode equivalent circuits</li><li>• Zener diode, Light diodes</li></ul>  | 4     |
| 3  | <b>Field Effect Transistors:</b> <ul style="list-style-type: none"><li>• Introduction, Construction and characteristics of JFETS</li><li>• Transfer characteristics, BJT, their characteristics and applications.</li></ul> <b>Transistor Amplifiers:</b> <ul style="list-style-type: none"><li>• Classification of amplifiers, Biasing and compensation techniques</li><li>• R-C coupled amplifier, tuned amplifier, operational amplifier their characteristics and applications.</li><li>• Digital to analog and analog to digital conversion</li></ul>  | 6     |
| 4  | <b>Operational Amplifiers (OpAmp):</b> <ul style="list-style-type: none"><li>• Introduction, Block diagram, parameters of OpAmp IC 741</li><li>• OpAmp in inverting and non-inverting configuration,</li><li>• Some applications of OpAmp</li></ul> <b>Semiconductor Devices:</b> <ul style="list-style-type: none"><li>• Introduction of silicon controlled rectifier</li><li>• GTO, TRIAC, DIAC. Injunction transistors, IGBT</li></ul>   | 6     |
| 5  | <b>Cathode Ray Oscilloscope:</b> <ul style="list-style-type: none"><li>• Introduction, Cathode ray tube – theory and construction</li></ul> <b>Transducers:</b> <ul style="list-style-type: none"><li>• Introduction, resistive, Inductive, capacitive transducers.</li><li>• Construction and working principle of strain gauge, LVDT, RVDT</li><li>• Summing devices, measurement of linear displacement</li><li>• Pressure measuring using transducers</li><li>• Construction and working of thermocouple and thermistor, measurement of temperature using them.</li></ul> <b>Data Acquisition Systems:</b><br>Introduction, Components and uses | 7     |
| 6  | <b>Process control:</b> <ul style="list-style-type: none"><li>• Application of microprocessors in process control with special emphasis on textiles</li></ul>   | 4     |

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|              |   |           |
|--------------|---|-----------|
|              | <ul style="list-style-type: none"><li>• Minimum microprocessor based system requirement. Examples of process control from textile and garment manufacturing engineering</li></ul> |           |
| <b>Total</b> |   | <b>28</b> |

#### 4TC4-05: Theory of Dyeing

**Credit: 3**

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

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

**End Term Exam: 3 Hours**

| SN           | Contents   | Hours     |
|--------------|--|-----------|
| 1            | <b>Introduction:</b> Objective, scope and outcome of the course.   | 1         |
| 2            | Chemical bonds their role and involvement in dyeing of different textile materials. Role of chemical bonds in color fastness of dyes.  | 7         |
| 3            | Physical and Chemical principles involved in the application of Dyestuff e.g. Direct, Basic, Acid, Vat, Disperse, Azoic, Pigment dyes etc. to textile materials. Various isotherms               | 8         |
| 4            | Theories of dyeing e.g. Absorption, Electrochemical, Colloidal and Solid solution, free volume, static pore theory etc. Concept of solubility parameters, Thermodynamics and Kinetics of Dyeing. | 8         |
| 5            | Theories and concept of dyeing synthetic fibers viz. polyester, nylon, acrylic   | 8         |
| 6            | Mechanism of carrier in pet dyeing, Diffusion coefficient and its measurement  | 8         |
| <b>Total</b> |  | <b>40</b> |

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### 4TC4-06: Principles Of Textile Manufacturing – II

**Credit: 3**

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

**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>Weaving preparation:</b><br>Object and basic principles of working of winding, warping, drawing-in and sizing machines  | 7               |
| 3  | <b>Weaving mechanism:</b><br>Classification of weaving machines<br>Basic mechanism of a plain loom and passage of warp through loom<br>Plain tappet shedding motion, climax dobbie<br>Side lever under-pick motion, sley beat up motion<br>Cimmco semi positive let off motion<br>Five wheel and seven wheel take up motion<br>Introduction to non conventional looms e.g. Projectile, Rapier, Jet looms . | 8               |
| 4  | <b>Fabric Defects:</b><br>Brief introduction of basic defects like starting mark, box mark, broken pick, slack and tight selvage, missing end (chira), reed marks, stains, temple mark .<br>Brief introduction to set theory<br>Specification for standard woven fabric  | 8               |
| 5  | <b>Calculations:</b><br>Weight of warp, weft and fabric<br>Production of loom  | 8               |
| 6  | <b>Fabric Structure:</b><br>Methods of fabric presentation weave repeat unit drafts and lifting plan constructions<br>Construction of elementary weaves e.g. plain, twill, satin and sateen weaves<br>Plain weave derivatives, weaves constructed on twill bases namely Herring bone waved and broken twills   | 8               |
|    |  | <b>Total 40</b> |

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### 4TC4-07: Polymer & Extrusion

Credit: 3

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

3L+0T+0P

End Term Exam: 3 Hours

| SN | Contents  | Hours |
|----|---|-------|
| 1  | <b>Introduction:</b> Objective, scope and outcome of the course.  | 1     |
| 2  | <b>Introduction to polymer materials</b><br>Polymers and their classifications, polymeric materials as fibres, plastics and rubbers, fibrous polymers and their morphology, molecular weight of polymers, different types of molecular weight averages, polydispersity, molecular weight measurement methods.   | 7     |
| 3  | <b>Spinning processes</b><br>Introduction to melt spinning, melt spinning process, melt spinning variables and conditions for continuous spinning, fibre formation, spinning speed and its influence on structure and properties of final product, spin-draw processes.<br>Introduction to solution spinning (dry and wet spinning) processes and process variables,  | 8     |
| 4  | Dry spinning process and its dope preparation, fibre formation and spin stretch during dry spinning.<br>Wet spinning process and its dope preparation, coagulation process, fibre formation and spin stretch during wet spinning.<br>Salient features and comparative look on spinning processes.   | 6     |
| 5  | <b>Post spinning processes</b><br>Introduction of spin finish, role of spin finishes, properties of spin finishes, spin finish components, methods of spin finish application, spin finish requirements for staple fibres, filaments, yarns and other processes, problems encountered during spin finish application.<br>Introduction to drawing, drawing machines, the drawing behaviour of thermoplastic fibres, influence of drawing on structure and properties of fibres, draw warping.<br>Introduction to heat setting, nature of setting, heat setting behaviour of polyamide and polyester fibres, thermal healing, measurement of degree of set. | 10    |
| 6  | <b>Texturing</b><br>Principle of texturing and its need, various kinds of texturing processes and machines, structural geometry of textured yarn, process variables of false twist and air jet texturing, Stuffer box   | 8     |





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|  |           |
|--|-----------|
| crimping, gear crimping, knife edge crimping, hi-bulk acrylic yarns. |           |
| <b>Total</b>   | <b>40</b> |

### 4TC4-08: Textile Chemical Analysis – I

**Credit: 2**

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

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

**End Term Exam: 2 Hours**

| SN | Contents   | Hours     |
|----|--|-----------|
| 1  | <b>Introduction:</b> Objective, scope and outcome of the course.   | 1         |
| 2  | Quantitative estimation of bleaching agents, Reducing agents and acids and bases.  | 4         |
| 3  | Evaluation of textile chemicals, auxiliary's viz. detergents, wetting agent, cross linking agents, softeners, stiffeners and silicone emulsions qualitatively and quantitatively | 5         |
| 4  | Evaluation of dispersing agents, leveling agents, buffer agents and water softening agents qualitatively and quantitatively.   | 6         |
| 5  | Estimation of degree of heat setting by Iodine absorption method, CDT and Shrinkage measurement, Blend % of textile materials, Barium activity number of mercerized fabrics      | 8         |
| 6  | Method of identification of dyes<br>Quantitative estimation of dyes  | 4         |
|    | <b>Total</b>   | <b>28</b> |

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### PRACTICALS

#### 4TC4-21: TEXTILE CHEMICAL ANALYSIS LAB- I

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

**Max. Marks: 100(IA:60, ETE:40)**

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Estimation of strength of textile bleaching agents ,reducing agents. Evaluation of desizing agents wetting agents, dispersing agent, sequestering agents , leveling agents, silicon emulsion. Identification of dyes on the fibers. Dye purification. Nitrogen estimation, estimation of free and bound formaldehyde iodometrically.Measurement of barium activity number in mercerized fabrics, Degree of heat setting in Polyester fabrics . Shrinkage measurements in textile materials.

#### 4TC4-22: PRINCIPLES OF TEXTILE MANUFACTURING PRACTICAL - II

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

**Max. Marks: 100(IA:60, ETE:40)**

Winding, warping, sizing machines and drawing in. Passage of warp through plain power loom.  
Loom mechanism. Analysis of important particulars of fabrics made in plain, twill, satin/sateen weaves.

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### 4TC4-23: ANALYTICAL CHEMISTRY LAB

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

**Max. Marks: 100(IA:60, ETE:40)**

Analysis of soap- Total fatty matter, alkalinity, free acids and unsaponifiable matter in soap. Analysis of phenols and formaldehyde.

Saponification, Acid value and Iodine value of oils. Determination of flash point of oil.

Determination of viscosity of various substance used in textile manufacturing.

Chromatographic separation.

Effluent testing : Determination of some pollutant substances present in effluent from different industries i.e., carbonates , bi-carbonate, hydroxide, chlorine concentration, chemical oxygen demand etc by volumetric analysis.

Inorganic and organic preparations .

### 4TC8-00: SOCIAL OUTREACH, DISCIPLINE & EXTRA CURRICULAR ACTIVITIES

**Credit: 0.5**

**Max. Marks: 100**

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