

**DR. A.P.J ABDUL KALAM TECHNICAL
UNIVERSITY, LUCKNOW**



**PROPOSED STUDY & EVALUATION SCHEME
FOR
B.TECH. FOURTH YEAR
(TEXTILE CHEMISTRY)**

**ON
CHOICE BASED CREDIT SYSTEM (CBCS)
(Effective from session 2019-20)**

DR. APJ ABDUL KALAM TECHNICAL UNIVERSITY, LUCKNOW

DR. APJ ABDUL KALAM TECHNICAL UNIVERSITY, LUCKNOW
STUDY AND EVALUATION SCHEME
B. TECH TEXTILE CHEMISTRY

4th Year VII-SEMESTER

Effective from SESSION-2019-20

| S. No. | Subject Code | Subject Name | L-T-P | Th./Lab Marks | Sessional | | Total | Credit |
|------------------|------------------|---|-------|---------------|-----------|-----|-------------|-----------|
| | | | | ESE | CT | TA | | |
| Theory | | | | | | | | |
| 1 | | OPEN ELECTIVE COURSE -1 | 3-0-0 | 70 | 20 | 10 | 100 | 3 |
| 2 | RTT070 RTC070 | DEPARTMENTAL ELECTIVES-3 Non Woven Technology/ Waste Management & Pollution Control | 3-0-0 | 70 | 20 | 10 | 100 | 3 |
| 3 | RTT075 RTC075 | DEPARTMENTAL ELECTIVES-4 Theory of Textile Structure / Coating of Textiles | 3-1-0 | 70 | 20 | 10 | 100 | 4 |
| 4 | RTC701 | Technology of Finishing-II | 3-1-0 | 70 | 20 | 10 | 100 | 4 |
| 5 | RTC702 | Textile Chemicals and Quality Testing | 3-0-0 | 70 | 20 | 10 | 100 | 3 |
| Practical | | | | | | | | |
| 6 | RTC751 | Technology of Finishing-II Lab | 0-0-2 | 50 | | 50 | 100 | 1 |
| 7 | RTC752 | Textile Chemicals and Quality Testing Lab | 0-0-2 | 50 | | 50 | 100 | 1 |
| 8 | RTC753 | Industrial Training | 0-0-2 | | | 100 | 100 | 2 |
| 9 | RTC754 | PROJECT-1 | 0-0-2 | | | 200 | 200 | 3 |
| | TOTAL | | | 450 | 100 | 450 | 1000 | 24 |

DEPARTMENTAL ELECTIVES-3

1. RTT070 Non Woven Technology
2. RTC070 Waste Management & Pollution Control

DEPARTMENTAL ELECTIVES-4

1. RTT075 Theory of Textile Structure
2. RTC075 Coating of Textiles

DR. APJ ABDUL KALAM TECHNICAL UNIVERSITY, LUCKNOW
STUDY AND EVALUATION SCHEME
B. TECH TEXTILE CHEMISTRY

4th Year VIII-SEMESTER

Effective from SESSION-2019-20

| S. No. | Subject Code | Subject Name | L-T-P | Th./Lab Marks | Sessional | | Total | Credit |
|------------------|------------------------------|---|--------|---------------|-----------|-----|-------------|-----------|
| | | | | ESE | CT | Ta | | |
| 1 | | OPEN ELECTIVE COURSE -2 | 3-0-0 | 70 | 20 | 10 | 100 | 3 |
| 2 | RTT080/ RTC080/ RTT083 | DEPARTMENTAL ELECTIVES-5 Technical Textiles /Advances in Chemical Processing / Textured Yarn Technology | 3-1-0 | 70 | 20 | 10 | 100 | 4 |
| 3 | RTC085/ RTC086/ RTT087 | DEPARTMENTAL ELECTIVES-6 Process House Planning & Management/ Garment Processing/ Evaluation of Textile Materials | 3-0-0 | 70 | 20 | 10 | 100 | 3 |
| Practical | | | | | | | | |
| 4 | RTC851 | SEMINAR | 0-0-3 | | 100 | | 100 | 2 |
| 5 | RTC852 | PROJECT-2 | 0-0-12 | 350 | | 250 | 600 | 12 |
| | TOTAL | | | 560 | 60 | 380 | 1000 | 24 |

DEPARTMENTAL ELECTIVES-5

1. RTT080 Technical Textiles
2. RTC080 Advances in Chemical Processing
3. RTT083 Textured Yarn Technology (NPTEL/MOOCs)

DEPARTMENTAL ELECTIVES-6

1. RTC085 Process House Planning & Management
2. RTC086 Garment Processing
4. RTT087 Evaluation of Textile Materials (NPTEL/MOOCs)

7th SEMESTER, B. TECH TEXTILE CHEMISTRY

DEPARTMENTAL ELECTIVE-3

RTT070: Non Woven Technology

Unit 1: National and international scenario on non-woven fabric production, Concept about felts and non woven, Classification of non-woven fabrics, fibres for non-woven fabrics, Felt Manufacturing process

Total Lectures Required =9

Unit 2: Various method of web formation, web characteristics and their influence on properties of non-woven fabrics, (3) Non woven fabric by Needle punch, Description of needle punching machine, effect of process variables on properties of needle punch fabric

Total Lectures Required =9

Unit 3: Non-woven fabric by hydro entanglement,Description of hydro entanglement machine, effect of process variables on properties of hydro entanglementnon woven fabric, Non-woven fabric by adhesive bonding, mechanical bonding, Melt blown process of non-woven fabric manufacturing

Total Lectures Required =8

Unit 4: Non-woven fabric by Stitch bonding, Non-woven fabric by chemical bonding, Non-woven fabric by bonding with thermoplastic adhesives, Non-woven fabric by Spun laced, Effect of process variables on properties of stitch bonding, chemical bonding spun laced non-woven fabrics.

Total Lectures Required =8

Unit 5: Flocked fabric, Laminates, latest development in non-woven industry: ultrasonic bonding, Infra-red bonding, bonding by bi-component fibres. Application of various non woven fabrics

Total Lectures Required =8

Grand total of Lectures required= 42

Reference & Text Books

1. Non Woven – N.N. Banarjee
2. Non woven – NCUTE
3. Knittingtechnology : Spencer

RTC070: Waste Management & Pollution Control (L T P 3-0-0)

Unit 1: Toxicity of intermediates, dyes, processing aids- bleaching, dyeing, printing and finishing auxiliaries etc, Analytical methods for various pollutants, Formaldehydes,

Pentachlorophenol, Biological Oxygen Demand (BOD), Chemical Oxygen demand (COD)

Total number of lectures required = 8

Unit 2: Environmental impact assessment, Definition & need, Introduction to environmental impact assessment methodology, Unit process, waste minimization and recycling

Total number of lectures required = 8

Unit 3: Textile effluent and their characterization, Methods of effluent treatment, Disposal of effluents, reuse of water in a process house.

Total number of lectures required = 8

Unit 4: Source of water: factors contributing water pollution and their effect, water pollution parameters, physical, biological, chemical standards for quality of treated water. Effluent treatment methods and control, basic principles, Unit Operations (Sedimentation, precipitation, filtration and incineration), specific pollutants.

Total number of lectures required = 8

Unit 5: Pollution of air, causes, effect, monitoring and control, Source of noise pollution, its effect and control, Legislation- salient provisions of water act, Air act, Environment pollution act.

Total number of lectures required = 8

Grand total of lectures required = 40

Reference Books:

1. Basic course in environmental studies- S. Deswal & Anupama Deswal
2. Environment Impact Assessment by Carter L.W.- Mc Graw Hill Publications

DEPARTMENT ELECTIVE

RTT075: Theory of Textile Structure (L T P 3-1-0)

Unit 1: Classification of yarns, Yarn geometry- idealized yarn geometry, relationship of yarn number and twist factor, packing of fibres in a yarn, ideal packing, hexagonal close packing and radial packing, packing factor and its measurement, yarn diameter, method of measurement of twist contraction.

Total Lectures required = 10

Unit 2: Fibre migration: mean fibre position, amplitude of migration and frequency of migration, mechanism of migration, spinning-in coefficient and fibre extent. estimation of strength of blended yarn

Total Lectures required =6

Unit 3: Mechanism of staple fibre yarns, translation of fibre properties into yarn properties, twist and strength relationship, limit of twist, spinability of textile fibres, relation with end-breakage rate. **Total Lectures required =9**

Unit 4: Elements of fabric geometry, cloth setting theories, flexible and rigid thread model, Pierce's equation and later modifications.

Total Lectures required =7

Unit (5): Relation of fabric properties to simple geometry, crimp interchange in woven fabric, crimp balance equation, Fabric cover, cover factor and their significance, relation between cover and weight per unit area of fabric, Theoretical treatment of fabric deformation in tension

Total Lectures required =10

Grand total of lectures required = 42

Text Books and Reference material:

1. Textile Yarn- B.C. Goswami, J.G. Martindale, F.L. Scardine
2. Textile structure- J.W.S. Hearle, S. Backer, Grossberg.
3. Pierce's geometry- Textile Institute

RTC075: Coating of Textiles(L T P 3-1-0)

Unit-1: Polymeric materials for coating- (Rubbers: natural and synthetic, Polyvinyl chloride, Polyurethane, Acrylic polymers and its dough preparation for coating, Adhesive treatment
Total lecture required=7

Unit-2: Coating Methods: Knife coating , Roller coating transfer coating , Rotary screen printing (2) calendaring, lamination, melt coating (2)
Total lecture required=7

Unit-3: Physical properties of coated fabric (2) Rheology of coating pastes (1), Rheological Behaviors of fluids, pastes (1) hydrodynamic analysis of coating (2) factors effecting for degradation of coated fabric (2).

Total lecture required=8

Unit-4: Coating for foul weather protection, (1) Impermeable cloth (1) breathable cloth (1) Non Apparel cloth (1), Coating for Chemical protection (1) Thermo chromic coating (1) Temperature Adaptable coating (1) Camouflage nets (1) Metal and conducting polymer-coated fabrics (2) Radiation cured coating (1)

Total lecture required=8

Unit-5: Test methods for coated fabrics, Coating per unit areawt/area , Degree of fusion/curing of coating- (1) blocking, Abrasion resistance (1) Test for colour- Fastness to dry and wet rubbing, Resistance to water penetration (3) Air permeability (1) water vapour permeability (1) low temperature bend test (1) low temperature impact test (1) Adhesion test

Total lecture required=9

Grand Total lecture required=39

Reference Books:

1. Coating & Laminated Textiles by Water Fung
2. Coated Textile by A.K. Sen
3. Coated Fabric technology Vol 1-3 Technomic publication
4. Coated & laminated Fabric by AATCC symposium

RTC701: Technology of Finishing-II (L T P 3-1-0)

Unit – 1: Water proofing and water repelling, testing of water repellency, mechanism of water repelling, area of use.

Total lecture required = 8

Unit – 2: Principle & mechanism of flame Retardancy, Flame Retardancy of cotton, polyester and P/C blends. Testing methods for evaluation of flame retardancy.

Total lecture required= 8

Unit – 3: Finishing of woolen fabrics- Moth proofing, permanent set & testing. Anti felting

Total lecture required=-7

Unit – 4: Finishing of Synthetic fibres/fabric – Heat setting, Delusturing, antistatic, soil resistance finishes Finishing of synthetics fabrics e.g. 100% Polyester, Nylons, acrylics and their blends with cotton, viscose, wool.

Total lecture required=10

Unit - 5: Nano Finishes:- Various types of nano finishes, Characterization and their application in textiles: e.g. soil release, water repellent, fire retardant, stain repellent, anti microbial, UV protection nano finishes.

Total lecture required =9

Grand total of lectures required: 42

Reference Books:

1. Introduction to textile finishing by J.T. Marsh
2. Chemical Processing of Synthetic Fibres & Blends by Datye& Vaidya

3. Chemical finishing of textiles by W D Schindler and P J Hauser- Woodhead Publishing Ltd
4. Textile Finishing by V.A. Shenai

4. Chemical Finishing, GaPS, Published by NITRA

RTC702: Textile Chemicals and Quality Testing (L T P 3-1-0=4)

Unit 1: Introduction to textile chemical testing – aim and scope, Quantitative chemical analysis of textile fibres and their blends, Quantitative estimation of bleaching agents and dyes.

Total lecture required -8

Unit 2: Colour fastness of dyes on textiles (wash, light, rubbing, hot press, perspiration) using National and International standards (BIS, AATCC, ISO). Evaluation of Wet treatments

Total lecture required -7

Unit 3: Estimation of mechanical and chemical degradation of cotton, wool, silk and polyester (aldehyde and carboxyl group estimation in cellulose, amino group estimation of protein fibres, fluidity/viscosity measurement, critical dissolution time, etc).

Total lecture required -9

Unit 4: Evaluation of various chemicals, auxiliaries used in wet processing plants, Analysis of fresh water and effluent, Measurement of viscosity of chemical ingredients, printing paste, instruments used in chemical analysis.

Total lecture required -8

Unit 5: Process and quality control in wet processing, Industrial practices for their maintenance, Check points and evaluation of all wet pretreatments, dyeing, printing and finishing.

Total lecture required -10

Grand total of lectures required : 42

| <u>Title</u> | <u>Author</u> |
|--|--------------------------|
| 1. Analytical Methods for a Textile laboratory | JW Weaver |
| 2. Technology of Textile Processing | VA Shenai |
| 3. Pretreatment of textile materials for dyeing and printing Published by NITRA | Prof. (Dr.) M.S. Parmar, |
| 4. AATCC Technical Manual Vol.-76 | |

Lab syllabus

RTC751 Technology of Finishing-II Lab

Water repellency treatment on fabric and analysis of water repellency of treated fabric, Application of Flame retardant agents on textiles and their analysis using vertical, horizontal and inclined (45°) methods, Application of softeners on textiles, Application anti crease finishes on textiles and evaluation, application soil release finishes on textiles and evaluation, moth proofing.

RTC752: Textile Chemicals and Quality Testing Lab

Quantitative analysis of textile fibres and their blends. Strength analysis of hydrogen peroxide, Strength analysis of sodium carbonate and Strength analysis of sodium hydroxide, Identification of dyes, Colourfastness properties

RTC753 Industrial Training

Students shall carry out industrial training as a part of their curriculum after the completion of their 3rd year for one month. After this their performance shall be evaluated during 7th semester by taking viva of each and every student.

RTC754 Project-1

Students will carry out minor project during seventh semester as a part of curriculum as per AKTU guidelines.

8TH SEMESTER B. TECH TEXTILE CHEMISTRY

DEPARTMENTAL ELECTIVES-5

RTT080: Technical Textiles

Unit (1): Introduction to technical textile, types of technical textiles, textiles used in industry such as filtration, filter fabric construction- woven, needle felt & knitted filter fabric, finishing treatment of filter fabric, thermal and chemical properties of filter fabric, essential requirements of good filter fabric. Application of nano technology and nano materials for the improved filtration.

Total Lectures required =8

Unit (2): Manufacture and properties of protective textiles- water proof/coated and water repellent, antimicrobial, flame retardant, chemical resistance, Nuclear and biological resistance, mechanical resistance such as bullet proof, cut proof, stab proof

Total Lectures required =9

Unit (3): Medical textiles, fibres used, classification of medical textiles- non-implantable material wound dressings, bandages, plasters, etc, Extra-corporal devices – Artificial kidney, liver lung, implantable material- suture, soft tissue implant, Orthopedic implants, Cardiovascular implants, Healthcare/ hygiene products, medical cost, surgical gown, face mast etc.

Total Lectures required =8

Unit (4): Smart textiles, brief introduction of smart textiles, classification of smart textiles, passive smart textiles, active smart textiles, brief discussion of smart shirt, smart suit, musical jacket, space suit etc. automotive textiles: type cord, seat belt, air bag, seat upholstery, carpets, headliners, helmets etc, Agro textile: Shade net, green house film, Mulch net, crop cover, anti hail and bird protection net, finishing net etc.

Total Lectures required =9

Unit (5): Introduction of geo textile, classification of geo textiles, functions of geo textile-soil reinforcement, drainage (fluid transmission), filtration, separation, erosion control/ absorption, objective of geo textiles, manufacturing of geo textile, essential properties of geo textiles- Mechanical determinants, Hydraulic determinants, durability determinants

Total Lectures required =8

Grand total of lectures required = 42

Text Books and Reference material:

1. Hand book of technical textiles- A.R. Horrocks& S.C. Anand
2. Smart fibre, fabrics and clothing Tao X
3. Shears Handbook of Industrial TextilesI

RTC080: Advances in Chemical Processing (L T P 3-1-0)

Unit 1- Developments in pretreatment: Quick response pretreatment, continuous open width processing, use of environment friendly chemicals, application of enzymes. Other developments like solvent scouring, combined preparatory processes

Total Lectures required =9

Unit 2- Developments in dyeing and dyes: New forms of dyes, i.e. encapsulated, polymeric, pearl and granular forms. New direct, reactive and disperse dyes. Dyeing of microfibre fabrics. Continuous dyeing, right-first-time approach, Super critical CO₂ dyeing.

Total Lectures required =10

Unit 3-Developments in printing: Automated colour kitchens, Kerosene substitutes, Novel printing techniques like Ink Jet printing, Xerox printing, Ink, machinery and process for Digital printing.

Total Lectures required =7

Unit 4- Developments in finishing: Zero formaldehyde easy-care finishes and use of Polycarboxylic acids, polysiloxanes based softeners, restriction on use of some Fire retardants . Breathable water-proof fabrics. Finishing of microfibre fabrics.

Total Lectures required =8

Unit 5- Plasma technology; Effect and application on textiles, E-Control processing; Eco-friendly processing of textiles. Eco conformance certifications – OekoTex (Confidence in Textiles), GOTS, REACH, etc.

Total Lectures required =8

Grand total of lectures required: 42

Text Books and Reference material:

- 1- Plasma technologies for textiles – R Shishoo, Woodhead Publishing Ltd
- 2- Coloration Technology
- 3- Review of Progress in Coloration
- 4- AATCC Review
- 5- Pretreatment of textile materials for dyeing and printing - Prof. (Dr.) M.S. Parmar, Published by NITRA

RTT083: Textured Yarn Technology

Unit 1- Introduction to texturing, General principles involved in the manufacture of textured yarns, Bulked yarns

Total Lectures required =9

Unit 2- Mechanisms of setting and texturing, Thermo-mechanical texturing, Characterization and optimization, Influence of material and process parameters, Influence of process parameters

Total Lectures required =10

Unit 3-Influence of process parameters , Draw Texturing, Simultaneous draw texturing with POY, Draw Texturing Machines & Process Parameters, Draw Texturing : Effect of Process Parameters

Total Lectures required =7

Unit 4- Draw Texturing : Positorque System, Friction Draw Texturing, Air-Jet Texturing

Total Lectures required =8

Unit 5-Air-Jet Texturing : Effect of Process parameters, Air-Texturing Jets, Interlacement: need and jet design, Bulked continuous filament yarns, Hi-bulk yarns, Texturing of spun yarns, Solvent texturing.

Total Lectures required =8

Grand total of lectures required: 42

DEPARTMENTAL ELECTIVES-6

RTC085: Process House Planning & Management (L T P 3-0-0)

Unit-1:Elements of project report for setting up of process house.

- a.) Land (site and location of its development)
- b.) Construction of building types
- c.) Plant machinery (preparatory, dyeing, printing, finishing)
- d.) Miscellaneous and allied aspects

Total Lectures required= 8

Unit-2:: Importance of effluent management: their effect in environment, -Tolerance limit enforced by state pollution Boards & its purpose, Characteristics of process waste streams-process, process, possible pollutants & nature of waste water, methods of disposal of industrial waste (from dye house & print house specially), Water energy (steam) Source & its conservation, -Steam and water consumption, Reutilization of water

Total Lectures required=9

Unit-3: Balancing of machines for a complete process house, Layout of different machines of a process house, Factors affecting plan layout. Handling of dyes & chemicals –methods & precautions, Maintenance, Objective and various types of maintenance in process house.

Total Lectures required=7

Unit-4: Costing (1), introduction to cost terms and purposes , elements of costing (1). Cost volume, profit analysis, Master budget, flexible budget, cost allocation, process costing, waste cost in process house, labour and material cost, wage system in process house, Predetermining dyeing, finishing and printing cost, economic and technical feasibility Viability evaluation of a project

Total Lectures required= 9

Unit (5) Calculation regarding payback period and Breakeven point (1) Types of staff organization (2). Staff organization system in textile mills, Management Information system (MIS)

Total Lectures required= 7

Grand total of lectures required: 40

Reference Books

- 1- Dye house management, Colour Publication, Bombay
- 2-Health hazards in Textile mills by NITRA
- 3-Energy Conservation in Textile WET Processing by Dr.M.L. Gulrajani, Mahajan publication, Ahemdabad.
- 4-Modern TextileManagement-J.BRattan, Abhishek Publication, Chandigarh.
- 5-Water and effluents in textile by ATIRA.
- 6-Economy, energy and environment in textile wet processing by S.S. Trivedi
- 7-Occupational Health and Safety inn Textile mills by V.A.Shenai,Sevak Publication, Mumbai
8. Pre-treatment of textile materials for dyeing and printing - Prof. (Dr.) M.S. Parmar, Published by NITRA

RTC086: Garment Processing (L T P 3-0-0)

Unit 1: Introduction to Garment processing - Importance of garment processing- Advantages and limitations of garment processing – Characteristics of various fibers used in garment, manufacturing with respect to garment processing. Major issues in Garment processing

Total lecture required -7

Unit 2 :Garment Dyeing: Concepts of garment stage and pre garment stage dyeing- General precautions forgarment dyeing – flow chart for garment dyeing - Various machinery used for Garment, dyeing like paddle dyeing machine, drum dyeing machine, Drying of garment dyed goods – Various drying machinery like Hydroextractor, Tumble, dryer, RF dryer, Problems in Garment dyeing and its remedies.

Total lecture required -10

Unit 3: Garment Printing: Special print recipes for garments – Khadi– Metallic – Flock – Plastizol – Reflective – Pearl – Fluorescent – High density printing. Puff Printing – Foil Printing – Plastic, Printing of Garments with Photochromatic and Thermo chromatic dyes, Garment Printing Machinery, Table printing- Multi arm flatbed printing machine for Garments, Transfer printing

Total lecture required -9

Unit 4:Garment Finishing: Classification – Flow chart, Fragrance finish – UV protection finish - Cool finish - thermo cat finish – water resistant breathable finishes

Total lecture required -7

Unit 5: Garment Washing:Introduction – Various wash down effect - Stone washing – Various stone washing effects, enzyme wash.Other novel wash down effectslike Acid wash, Antique wash, Denim Hand Sand /Scraping- Sand Blasting – Ball Blasting - Whiskering – Ozone Fading – Back Staining- causes and remedies, Laundering, its objective – Laundering procedure for garments made up of various fibers like cotton, linen, wool, silk and manmade textiles – various laundering equipment

Total lecture required -10

Grand total of lectures required =43

References Books:

1. Dinkar Mahajan- Know All About Denim- Mahajan Publishers Private Limited,Ahmadabad.
2. Chemical Finishing of textiles by W D Schindler and P J Hauser
3. Textile finishing by Derek Heywood
4. Chemical after treatments of textiles by Mark, Atlas & Wooding
5. Textile Finishing by A J Hall
6. Denim: A Fabric for all by Dr M.S.Parmar, S.S.Satsangi and Dr Jaiprakash, NITRA Publication

RTT087: Evaluation of Textile Materials (NPTL/MOOCs)

Unit (1): Evaluation of Textile Materials, Sampling Methods & Sample Size, Sampling Methods & Sample Size: Practical Statistics, Evaluation of Fibre Length.

Total Lectures required =9

Unit (2) Evaluation of Fibre Fineness, Evaluation of Cotton Fibre Maturity, Evaluation of Yarn Twist

Total Lectures required =9

Unit (3): Evaluation of Cotton Fibre Properties:(HVI & AFIS), Evaluation of Linear Density of Textile Materials, Evaluation of Moisture in Textiles, Evaluation of Yarn & Fabric Hairiness

.Total Lectures required =9

Unit (4): Evaluation of Tensile Properties of Textile Materials, Evaluation of Tensile Properties of Textile Materials-1, Evaluation of Tensile Properties of Textile Materials-2, Evaluation of Tensile Properties of Textile Materials-3,4,5

Total Lectures required =9

Unit (5): Evaluation of Yarn Evenness-1-5 Evaluation of Bursting & Tear Strength of Fabrics, Evaluation of Pilling & Abrasion Properties of Fabrics, Evaluation of Low Stress Mechanical Properties of Textile Materials

RTC851: Seminar

RTC852: Project-2

Students will carry out major project during eighth semester as a part of curriculum as per AKTU guidelines.