ANNA UNIVERSITY:: CHENNAI 600 025
NON-AUTONOMOUS COLLEGES AFFILIATED TO ANNA UNIVERSITY
REGULATIONS – 2021
M.TECH.TEXTURE TECHNOLOGY
(WITH SPECIALIZATION IN TEXTILE CHEMISTRY)
CHOICE BASED CREDIT SYSTEM
I TO IV SEMESTERS CURRICULA AND SYLLABUS
SEMESTER I

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**TOTAL** 22 0 10 32 25  

*Audit Course is Optional

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*Audit Course is Optional
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# LIST OF PROFESSIONAL ELECTIVE COURSES

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**TOTAL CREDITS 18**

### AUDIT COURSES - I (AC)

**REGISTRATION FOR ANY OF THESE COURSES IS OPTIONAL TO STUDENTS**

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### SUMMARY

**Name of the Programme:** M.TECH. TEXTILE TECHNOLOGY (WITH SPECIALIZATION IN TEXTILE CHEMISTRY)

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UNIT I MODIFICATION OF SURFACE TENSION
Auxiliaries: Importance and functions; Surfactants: Mode of action and classification of surfactants – cationic, anionic, nonionic and amphoteric surfactants.

UNIT II PREPARATORY PROCESS
Auxiliaries associated with De-sizing, scouring, Bleaching of cellulosic fibres, Protein fibres and synthetic fibres.

UNIT III DYEING PROCESS
Auxiliaries associated with Dyeing with Direct Dyes, Reactive, Vat, Azoic colors, Sulphur dyes, Acid dyes, Metal complex dyes, Basic and Disperse dyes.

UNIT IV PRINTING PROCESS
Auxiliaries associated with printing: Direct Style of Printing, Discharge style of Printing, Resist style of printing.

UNIT V FINISHING PROCESS
Auxiliaries used in Resin Finishing, Stiff finishing, soft finishing, Water repellent, Water Proof, Flame retardant, Soil release.

TOTAL: 60 PERIODS

REFERENCES:
8. Dr. N N Mahapatra., "Textile dyeing", Woodhead publishing India, 2018
UNIT II  BLEACHING  12
Mechanism of Bleaching - important Bleaching agents for Textile fibres and their chemical actions -chemistry of peroxide bleach and use of per-acetic acid for synthetic fibres – concept of full bleach and half bleach- Application of OBA to textile materials. Mercerization: Mechanism of Mercerization -influencing parameters on Mercerization quality of textile materials — methods of Mercerization –evaluation of Mercerization.

UNIT III  ELEMENTS OF DYE CHEMISTRY  12
Classification of dye stuffs according to their chemical constitution/ structure and specific applications VBT and MO Theory of colour - interaction of dye molecules with polymeric chains – Fick ‘s first and second Laws of diffusion – Adsorption theory – Study about natural dyes and their application to fibres like cotton, wool and silk.

UNIT IV  PRINTING  12

UNIT V  FINISHING  12

REFERENCES:
8. Mathews Kolanjikombil “Pretreatment of Textile Substrates”, Woodhead publishing India, 2019

TOTAL :60 PERIODS
UNIT IV VISCOELASTICITY
Deformation of elastic solid, viscoelasticity and its measurement, non-linear viscoelasticity, yield behavior of solids and breaking phenomena

UNIT V PROPERTIES OF FIBRES
Mechanical properties of natural and synthetic fibres; moisture sorption behavior of natural and synthetic fibres; Thermal, Frictional and optical properties of fibres

TOTAL: 45 PERIODS

REFERENCES:

MA4158 STATISTICAL APPLICATIONS IN TEXTILE ENGINEERING L T P C
4 0 0 4

COURSE OBJECTIVES:
- To understand the basics of random variables and point estimation with emphasis on the standard distributions.
- To apply the small and large sample tests through Tests of hypothesis.
- To understand the concept of analysis of variance and use it to investigate non-parametric model.
- To monitor a process and detect a situation when the process is out of control.
- To apply the concept of analysis of variance and use it to investigate factorial dependence.

UNIT I PROBABILITY DISTRIBUTION AND ESTIMATIONS
Applications of Binominal, Poisson, Normal, t, Exponential, Chi-square, F and Weibull distributions in textile engineering - Point estimates and interval estimations of the parameters of the distribution functions.

UNIT II HYPOTHESIS TESTING
Sampling distribution - Significance tests applicable to textile parameters – Normal test, t - test, Chi - square test and F - test - p-values - Selection of sample size and significance levels with relevance to textile applications - Acceptance sampling.

UNIT III ANALYSIS OF VARIANCE AND NON-PARAMETRIC TESTS
Analysis of variance for different models – Non-parametric tests - Sign test - Rank test - Concordance test.

UNIT IV PROCESS CONTROL AND CAPABILITY ANALYSIS
Control charts for variables and attributes - Basis, Development, Interpretation, Sensitizing rules, Average run length - Process capability analysis.
UNIT V DESIGN AND ANALYSIS OF EXPERIMENTS

TOTAL: 60 PERIODS

COURSE OUTCOMES:
At the end of the course, students will be able to
- Analyze the performance in terms of probabilities, distributions and point estimation achieved by the determined solutions.
- Apply the basic principles underlying statistical inference (estimation and hypothesis testing).
- Demonstrate the knowledge of applicable large sample theory of estimators and tests.
- Identify the applicable sample theory of estimators and tests.
- Obtain a better understanding of the importance of the methods in modern industrial processes.

REFERENCES:

RM4151 RESEARCH METHODOLOGY AND IPR L T P C 2 0 0 2

UNIT I RESEARCH DESIGN 6
Overview of research process and design, Use of Secondary and exploratory data to answer the research question, Qualitative research, Observation studies, Experiments and Surveys.

UNIT II DATA COLLECTION AND SOURCES 6
Measurements, Measurement Scales, Questionnaires and Instruments, Sampling and methods.
Data - Preparing, Exploring, examining and displaying.

UNIT III DATA ANALYSIS AND REPORTING 6
Overview of Multivariate analysis, Hypotheses testing and Measures of Association. Presenting Insights and findings using written reports and oral presentation.

UNIT IV INTELLECTUAL PROPERTY RIGHTS 6

UNIT V PATENTS 6

TOTAL:30 PERIODS
REFERENCES:

TY4111 PRODUCTION PROCESS LABORATORY

LIST OF EXPERIMENTS
2. Bleaching of cotton fabric in laboratory using different machines.
3. Dyeing of cotton fabric in laboratory model jigger using reactive dyes to match a given sample
5. Dyeing of knitted cotton fabric in laboratory model winch using reactive dyes and to determine their fastness properties.
7. Pigment printing woven fabric using table screen printing and determine the appropriate fastness properties.
8. Dry cleaning for different types of fabric using Garment washing Machine
9. Correction recipe predication from computer colour matching
10. Measurement of delta-E

TOTAL: 60 PERIODS

LIST OF EQUIPMENTS REQUIRED
1. Dye Bath
2. Miniature Jigger
3. Miniature Winch
4. Miniature Kier
5. Padding Mangle (Manual &Pneumatic)
6. Soft flow Dyeing machine
7. Infrared dyeing machine
8. High Temperature Dyeing Machine
9. Tumble Dryer
10. Table screen printing machine
11. Steamer

TX4161 ADVANCED TEXTILE TESTING LABORATORY

LIST OF EXPERIMENTS
1. Determination / Analysis of Molecular weight determination using GPC
2. Rheological studies using viscometer
3. Determination of MFI
4. Determination / Analysis of Birefringence measurement
5. Determination / Analysis of Creep and Stress relaxation of filament
6. Determination / Analysis of DSC Thermogram of different fibres
7. Determination / Analysis of Thermograms using TGA
8. Analysis - FTIR and NMR graphs
9. Determination/ Analysis of crystallinity by XRD
10. Determination of residual formaldehyde in fabrics
11. Evaluation of Flame retardant finish
12. Evaluation of Water repellant finish
13. Evaluation of conductivity of fabrics
14. Determination of surface tension of liquids
15. Determination/ Analysis of contact angle for porous substrates

TOTAL: 90 PERIODS

TY4201 TECHNOLOGY OF TEXTILE COLORATION

UNIT I COLOUR AND COLOUR VISION
Definition of colour and its classification – Structure and function of the eye – Detail study about rods and cones – Modeling the colour vision process – Tests for defective colour vision. Study about metamerism

UNIT II MODERN MEASUREMENT OF COLOUR
Detail study about colour measuring instruments like Spectro-photometer – Color eye – Derivation of KM equation and its application. Colour difference equations and application

UNIT III COMPUTER COLOUR MATCHING
Derivation the equation for Evaluation of depth and relative depth – Evaluation of fastness test results– Evaluation of whiteness and yellowness–Recipe formulation and correction. Development in CCM. Problem and solution to measure OBA treated materials

UNIT IV THE INFLUENCE OF FIBRE STRUCTURE ON DYEING
Dyeing properties related to the inherent physical structure of the fibre– The relationship between preparation and the physical properties of man-made fibres – The interaction between dyes & fibre forming polymers. Methods to find out nature of bonding in dyes materials. Study about four types of adsorption isotherms

UNIT V DYEING MODELS
Mechanisms of reactions of reactive groups – Kinetics of hydrolysation of reactive groups – Methods to avoid hydrolysation and to get better fixation. Methods to improve dye ability of textile materials such as crafting, cationisation, solvent treatment etc

TOTAL: 45 PERIODS

REFERENCES
5. Wyszecki.G., and W.S.Stile,'Colour science, concept and methods, Quantitative data
UNIT I

UNIT II
Concept of Flame proof & flame retardancy. Concept of pyrolysis, Flame retardant finishes for cotton, Concept of waterproof and water repellent Finishes, Durable water repellent finishes on cotton, Mildew proof finishes and Rot proof finishing.

UNIT III

UNIT IV

UNIT V
Mechanism in the weight reduction of PET by using alkali; microencapsulation techniques in finishing process, Detail study of the process to produce silk like Polyester. Felting of wool, Study about cationic, reactive and silicon emulsions ofteners. Brief study about stiffening of textile materials

LABORATORY
Application of finishing agent and characterization of fabrics
1. Formaldehyde and non formaldehyde finishing.
2. Flame proof & flame retardancy using THPC.
3. waterproof and water repellent
4. Soil Release and Antistatic agent
5. Weight reduction of PET using alkali
6. Felting of wool
7. Softeners & Stiffness

REFERENCES
UNIT I  REGULATORY BODY  6
Industrial policy of India; pollution monitoring and control; functions and activities of Ministry of environment; Central and State pollution control boards; environmental clearance and guidelines for industries; environment impact assessment; fiscal incentives for environmental protection; environmental auditing.

UNIT II  WASTE WATER TREATMENT  6
Waste water characteristics; waste water treatment- objectives, methods and implementation considerations; recycling of effluents.

UNIT III  CHARACTERISATION  6
Identification and reduction of pollution sources in textile wet processing; pollution control in man – made fiber industry; analysis of textile processing effluents – colour, odour, pH, total solids, suspended solids, total dissolved solids, BOD, COD, total alkalinity, chloride, sulphates, calcium and chromium; tolerance limits for effluents; bio-degradability of textile chemicals and auxiliaries.

UNIT IV  ECO FRIENDLY TEXTILE PROCESSING  6
Technical regulations on safety and health aspects of textile materials – banned dyes and chemicals; eco labeling, eco friendly textile processes - machines and specialty chemicals; natural dyes and environmental considerations.

UNIT V  WASTE MANAGEMENT  6
Need for solid and hazardous waste management in textile industry, types and sources of solid and hazardous wastes, storage, collection and transport of wastes, waste processing technologies, waste disposal, Waste recycling, circular economy, zero liquid discharge.

TOTAL: 30 PERIODS

LABORATORY
Measurement of
1. Water hardness
2. Colour of effluentt
3. pH
4. BOD and COD
5. Chromium content
6. Formaldehyde content on the fabric
7. Amines of banned dyes.
8. Mixed salt characterization (RO Reject Management System)

TOTAL: 30 PERIODS

REFERENCES

TY4211  PRODUCT DEVELOPMENT LABORATORY  L T P C
0 0 8 4

LIST OF EXPERIMENTS
Reverse engineering of textile products with an emphasis on testing protocols – Four each for a student

TOTAL: 120 PERIODS
LIST OF EQUIPMENTS REQUIRED
1. Dyebath - 1no.
4. Miniature Kier - 1no.
5. Padding Mangle - 1no.
6. Vacuum ironing and steam iron box - 1no.
7. Steamer - 1no.
8. Garment Washing machine - 1no.
9. High temperature dyeing machine - 1no.
10. Curing Chamber - 1no.

TY4311 PROJECT WORK I

OBJECTIVES
The course aims to enable the students to
- identify the problem/process relevant to their field of interest that can be carried out
- search databases and journals to collect and analyze relevant data
- plan, learn and perform experiments to find the solution
- prepare project report

TOTAL : 180 PERIODS

Individual students will identify a problem relevant to his/her field of study, collect and analyze literature, design, and carryout experiment, collect data, interpret the result and prepare the project report.

OUTCOMES:
At the end of the course the students will be able to
CO1 Identify the research/industrial problems
CO2 Collect and analyze the relevant literature
CO3 Design, conduct experiment and analyse the data
CO4 Prepare project report

TY4411 PROJECT WORK II

OBJECTIVES
The course aims to
- Train students to analyze the problem/ think innovatively to develop new methods/product/process
- make them understand how to find solutions/ create products economically and in an environmentally sustainable way
- enable them to acquire technical and experimental skills to conduct experiment, analyze the results and prepare project report
- enable them to effectively think about strategies to commercialize the product.

TOTAL : 360 PERIODS

Individual students will identify a problem relevant to his/her field of study, collect and analyze literature, design, and carryout experiment, collect data, interpret the result and prepare the project report.
COURSE OUTCOMES
At the end of the project the student will be able to
CO1 Formulate and analyze problems for developing new methods/solutions/processes.
CO2 Plan and conduct experiments to find solutions in a logical manner
CO3 Analyze the results, interpret and prepare project report/know the strategies for commercialization

TY4001 TEXTILE COSTING AND PROCESS OPTIMIZATION L T P C
3 0 0 3

UNIT I FUNDAMENTALS OF COSTING 9
Cost concept; Classification of cost, elements of cost.; Methods of costing: Unit and operating costing, preparation of cost sheet; Estimation of cost of production and component of total cost. Profit planning, job order, batch process, conversion cost. Inventory costing

UNIT II COSTING IN SPINNING INDUSTRY 9
Elements of cost – Ascertainment of Clean Cotton Cost – Cost Statements Quantity and value of total cotton/ Man-made fiber issued input, wastage and output in each processing cost center up to yarn stage- Net Mixing Cost- Waste multipliers for each cost center mixing wise Cost Centre wise conversion cost, Selling price of various wastes. Power cost estimation, Yarn realization statement, Decision making using Contribution per frame shift among various counts of yarn production.

UNIT III COSTING IN WEAVING INDUSTRY 9
Elements of cost Calculation of Yarn requirements for weaving –computation of value loss and net realization, Cost Statements– Cost centre wise conversion cost from winding to weaving, Sort wise cost of production of Grey Cloth sort wise stock accounting of Grey cloth, Cost of Sizing material, Cost of sales of cloth sold in grey stage and sales realization

UNIT IV COSTING IN KNITTING AND GARMENT INDUSTRY 9

UNIT V COST CONTROL AND COST REDUCTION 9
Introduction, Process of Cost Control and Cost Reduction, Cost Reduction Programme and its implementation, Methods and Techniques-Value analysis and Value Engineering, Just -In-Time (JIT), Activity Based Costing(ABC).

TOTAL : 45 PERIODS

REFERENCES:
6. Bhave P V and Srinivasan V, ”Cost accounting in textile mills”, ATIRA monograph, Ahmedabad,India, 1974
8. Shinn William, “Elements of Textile Costing” School of Textiles, North Corolina state,1965
UNIT I BASICS OF DYES
General survey of dyes; chemical structure of dyes, general properties of dyes, chromophores and dye classes for textile application

UNIT II DYES USED IN TEXTILES
Dyeing technology; standardization of textile dyes: dyes for cellulosic fibres, polyamides, polyesters and acrylic fibres; optical brightening agents: chemistry and evaluation of OBA

UNIT III FUNCTIONAL DYES
Functional dyes: dyes for leather; fur; paper; hair; food and inks – introduction, chemical structure and requirements

UNIT IV APPLICATION OF FUNCTIONAL DYES
Dyes used for imaging, invisible imaging, displays, electronic materials and biomedical applications; solar cells

UNIT V TOXICOLOGY AND HEALTH ASPECTS
Toxicity and environmental assessment; regulatory and legislative aspects

TOTAL: 45 PERIODS

REFERENCES:
8. Non-Textile Dyes, Freeman H. S.

UNIT I MOLECULAR WEIGHT
Polymer solution thermo dynamics; molecular weight and molecular dimensions by end group analysis, osmometry, light scattering, viscometry, gel permeation chromatography, high performance liquid chromatography

UNIT II MOLECULAR STRUCTURE CHARACTERISATION
Infrared, NMR, UV–visible, Raman spectroscopy, mass spectroscopy
UNIT III THERMAL PROPERTIES
Thermal properties by differential scanning calorimetry, differential thermal analysis, thermo gravimetry, thermo-mechanical analyzer, dynamic mechanical and dielectric analysis.

UNIT IV MICROSCOPY
Optical and electron microscopy; TEM, SEM, AFM, X-ray scattering from polymers, birefringence.

UNIT V OTHER PROPERTIES
Crystallinity by density measurements, surface area, pore volume measurements by B.E.T. method, porosimetry, surface energy measurements and particle size measurement.

REFERENCES:

TOTAL: 45 PERIODS

TY4002 CHEMICAL PROCESSING OF MANMADE FIBRES

UNIT I PREPARATORY PROCESSES

UNIT II DYEING

UNIT III BLENDED DYEING

UNIT IV PRINTING
Printing of synthetic and blended fabrics with different dye classes - Direct, resist and discharge styles of printing-Transfer printing of polyester and blends.

UNIT V FINISHING
Different functional and easy care finishes on synthetics and blends like anti-stat, soil-release, soil-resistant, flame-retardant.

TOTAL: 45 PERIODS
REFERENCES

TY4003 NON WOVEN AND SPECIALITY TEXTILES

UNIT I WEB FORMING AND BONDING 9

UNIT II STRUCTURE AND EVALUATION 9

UNIT III FABRIC PRODUCTION 9
Classification and Definition - Preparatory processes. Fabric Production – Conventional shuttle looms, Endless Tape Looms, Circular Hose Pipe looms. Shuttleless Looms – Catch thread and flat knitting edge looms; Multicolor Needle Jacquard looms.

UNIT IV UNCONVENTIONAL FABRICS 9
Production of Industrial Tapes, Elastic Tapes, Zip fastener tapes; Woven and printed labels. Stretch fabrics - classification and its production; Elastomeric stretch fabrics; Braided fabrics; - Tubular structures - Braiding Machine; Nets and Laces - Types and description of Lace Machines - Knitting of laces - Tricot Lace Machines. Flocked fabrics – The process of flocking.

UNIT V CARPETS 9

TOTAL: 45 PERIODS

REFERENCES
UNIT I

UNIT II

UNIT III

UNIT IV

UNIT V
Errors, Precision and Accuracy: Definitions, Significant figures – Types of Errors – Methods of expressing accuracy and precision , Confidence limits.

TOTAL: 45 PERIODS

REFERENCES:
References


Ty4005 Bio Processing of Textiles

Unit I Industrial Bio-Technology
Industrial microbial products—applications, primary metabolites and secondary metabolites, Enzymes & Proteins— sources and applications, cell and enzyme immobilization, Industrial plant products— production of enzymes and poly saccharides.

Unit II Environmental Bio-Technology
Detailed study about pollution and its control in textile processing industries. Waste treatment systems— Anaerobic & Aerobic systems, Bio-degradation— Micro organism in pollution control; Biomass production; waste as renewable sources of energy— Production of biogas production of hydrocarbon— Hydrogen fuel.

Unit III Enzymes Used in Textile Industry

Unit IV Evaluation of Enzyme Treated Fabrics
Weight loss, Whiteness index, Absorbency, Tensile strength, Handle of fabric and Abrasion resistance. SEM analysis and other structure related studies.

Unit V Bio-Processing in Textiles
Bio-bleaching, combined bio - processing, bio washing, bio polishing, Denim fading, antioxidour and antimicrobial finishes, biofinishing and other applications.

References

1. Betabet S. M. BTRA Seminar, Book of papers(Jan1994)

TY4006  HIGH PERFORMANCE FIBRES  L T P C
                               3 0 0 3

UNIT I  METHODS OF PRODUCTION  9
Fundamentals of high performance fibres; comparison of regular and high performance fibres; fibre forming process; manufacturing, properties and applications-aramid fibres, high performance polyethylene

UNIT II  INDUSTRIAL APPLICATION FIBRES  9
Manufacturing, properties and applications-glass fibres, basalt fibres; carbon fibres, ceramic fibres

UNIT III  BIODEGRADABLE FIBRES, PROTEIN FIBRES  9
Manufacturing, properties and applications-alginate fibres; chitosan fibres; regenerated protein fibres—silk, wool, casein, soy bean fibre; synthetic biodegradable fibres

UNIT IV  CHEMICAL RESISTANT FIBRES  9
Manufacturing, properties and applications of chemical resistance fibres—chlorinated fibres, fluorinated fibres, PPS, PEEK and PEI; thermal resistant fibres–semi carbon fibres, PBI, PBO

UNIT V  SPECIALTY FIBRES  9
Manufacturing, properties and applications-hollow fibres, profile fibres blended and bi-component fibres, film fibres; functionalization of fibres—methods and applications

TOTAL: 45 PERIODS

REFERENCES

TY4007  ECO-FRIENDLY DYES, CHEMICALS AND PROCESSING  L T P C
                               3 0 0 3

UNIT I  IMPACT OF TEXTILE PROCESS CHEMICALS ON ECOLOGY  9
Pollution - definition - Types - Impact of pollution on environment- Pollution capability of chemicals and products used in processing - pollution load at every stages of processing – Pollution associated with various colouration process - Need for eco-friendly processing- Important issues in exports- Red listed chemicals - Possible sources of contamination of various red listed chemicals-German Laws – Ban on amines and Azo dyes-List of banned amines and chemicals.

UNIT II  ECO STANDARDS  9
UNIT III  ECO TESTING  9
Toxic substances used in processing and safe alternatives- Principles and procedures involved in the estimation of pH, pesticides, Residual formaldehyde, carcinogenic dyes, chlorinated phenols, phthalates, organo tin and heavy metals, – Consequences of presence of above compounds in Textiles – permissible limits – eco testing of antimicrobial finish with triclosan.

UNIT IV  ECO FRIENDLY PROCESSING  9

UNIT V  CLEAN TECHNOLOGIES FOR FUTURE  9
Clean technology – Sustainable development – Ozone bleaching, RF drying, Microwave assisted dyeing, Ultrasound assisted processing, Supercritical CO2 dyeing, importance of energy & water conservation – Energy audit - Basics & application scope of Nano technology in textiles - Occupational diseases & safety measures in Textile units.

REFERENCES:

TOTAL: 45PERIODS
REFERENCES

TX4092 TEXTILE REINFORCED COMPOSITES

UNIT I REINFORCEMENTS 9
Introduction – composites –classification and application; reinforcements- fibres and its properties; preparation of reinforced materials and quality evaluation; preforms for various composites

UNIT II MATRICES 9
Preparation, chemistry, properties and applications of thermoplastic and thermoset resins; mechanism of interaction of matrices and reinforcements; optimization of matrices

UNIT III COMPOSITE MANUFACTURING 9
Classification; methods of composites manufacturing for both thermoplastics and thermosts-Hand layup, Filament Winding, Resin transfer moulding, prepregs and autoclave moulding, pultrusion, vacuum impregnation methods, compression moulding; post processing of composites and composite design requirements

UNIT IV TESTING 9
Fibre volume and weight fraction, specific gravity of composites, tensile, flexural, impact, compression, inter laminar shear stress and fatigue properties of thermoset and thermoplastic composites.

UNIT V MECHANICS 9
Micro mechanics, macro mechanics of single layer, macro mechanics of laminate, classical lamination theory, failure theories and prediction of inter laminar stresses using at ware

TOTAL: 45 PERIODS

REFERENCES
UNIT I  YARN DYEING MACHINES
Advances in continuous processing of cotton and wool materials—Advances in heating systems
hank and yarn dyeing machines (cheese and warp)—Importance of winding in yarn dyeing—
calculation of winding density—Detailed maintenance schedule for cheese dyeing machines.

UNIT II  FABRIC DYEING MACHINES
Advances in Beam dyeing—Advances in soft flow, overflow, jet dyeing machines—Developments
in jiggers,—Detail maintenance schedule for beam dyeing, jet dyeing and jiggers.

UNIT III  DRYING MACHINES
Detail study and developments in vertical drying ranges—RF dryer, yarn dryer, tubular & open
width knitted fabric dryer, Tumble dryer, devellat bed screen printing machines. Principle and
working of fully automatic flat bed screen printing Equipments in balloon padding, hydro extractor,
rope opener, maintenance schedule for the above machines. Heating systems for hot air stenters,
Clip & pin type of stenters: Jig stenters—over feeding system and its importance—Hot flue
dryer—float dryer—maintenance schedule for the above machines.

UNIT IV  PRINTING MACHINES
Developments in preparation of screens for roller, rotary, machine—with programmer line diagram
and its advantages—Developments in agers—Developments in garment printing machines—Various
practical problems & possible remedies, Transfer printing machines and dyeing.

UNIT V  FINISHING MACHINES
Developments in finishing machineries—Calenders, sanforising machine, Back-filling machine,
maintenance schedule for the above machineries. Shop floor problems & possible remedies in
finishing department, Sandblasting machine, Peach finishing, Raising, Shearing machines.

REFERENCES:
   Sons, NewYork, 1995
   2000.

UNIT I  EXPERIMENTAL DESIGN FUNDAMENTALS
Importance of experiments, experimental strategies, basic principles of design, terminology,
ANOVA, steps in experimentation, sample size, normal probability plot, linear regression model.

UNIT II  SINGLE FACTOR EXPERIMENTS
Completely randomized design, Randomized block design, Latin square design. Statistical
analysis, estimation of model parameters, model adequacy checking, pair wise comparison tests,
in respect of textile process, machine and quality parameters.
UNIT III MULTIFACTOR EXPERIMENTS 9
Two and three factor full factorial experiments, \(2^k\) factorial Experiments, Confounding and Blocking designs; application in textile experiments.

UNIT IV SPECIAL EXPERIMENTAL DESIGNS 9
Fractional factorial design, nested designs, Split plot design, Introduction to Response Surface Methodology, Experiments with random factors, rules for expected mean squares, approximate F-tests for textile applications.

UNIT V TAGUCHI METHODS 9
Steps in experimentation, design using Orthogonal Arrays, data analysis, Robust design- control and noise factors, S/N ratios, parameter design, case studies related to textile engineering.

TOTAL: 45 PERIODS

REFERENCES
TOTAL QUALITY MANAGEMENT

UNIT I
INTRODUCTION
- Introduction - Need for quality
- Evolution of quality
- Definitions of quality
- Dimensions of product and service quality
- Basic concepts of TQM
- TQM Framework
- Contributions of Deming, Juran and Crosby
- Barriertsto TQM
- Customer focus
- Customer orientation
- Customer satisfaction
- Customer complaints
- Customer retention

UNIT II
TQM PRINCIPLES
- Leadership
- Quality Statements
- Strategic planning
- Quality Councils
- Employee involvement
- Motivation
- Team and Teamwork
- Recognition and Reward
- Performance appraisal
- Continuous process improvement
- PDCA cycle
- Kaizen
- Supplier partnership
- Supplier selection
- Supplier Rating

UNIT III
TQM TOOL SAND TECHNIQUES I
- These ventraditional tools of quality
- New management tools
- Six sigma: Concepts, Methodology, applications to manufacturing, service sector including IT
- Benchmarking
- Reason to benchmark
- FMEA
- Stages, Types

UNIT IV
TQM TOOLS AND TECHNIQUES II
- Quality Circles
- Cost of Quality
- Quality Function Deployment (QFD)
- Taguchi quality loss function
- TPM: Concepts, improvement needs
- Performance measures

UNIT V
QUALITY MANAGEMENT SYSTEM
- Introduction
- Benefits of ISO Registration
- ISO 9000 Series of Standards
- Sector-Specific Standards
- AS 9100,
- TS16949 and TL 9000
- ISO 9001 Requirements
- Implementation
- Documentation
- Internal Audits
- Registration
- Environmental management SYSTEM
- Introduction
- ISO 14000 Series Standards
- Concepts of ISO 14001
- Requirements of ISO14001
- Benefits of EMS

OUTCOME:
Upon completion of this course the student shall be able to
- Understand the concept and importance of total quality management.
- Know about the principles of total quality management.
- Know about the tools and techniques in total quality management.
- Understand the quality circle and cost of quality.
- Understand the quality management system.
REFERENCES:

TX4091 SUSTAINABILITY IN TEXTILE INDUSTRY L T P C 3 0 0 3

UNIT I INTRODUCTION TO SUSTAINABILITY 9
Sustainability; Concepts and terminologies in sustainable approach; principles of sustainability;importance and application of sustainable approaches in textile industry

UNIT II SUSTAINABILITY IN TEXTILE INDUSTRY 9
Supply chain in textile industry; sustainable cotton, wool, and synthetic fibre production and processing

UNIT III SUSTAINABILITY IN PROCESSING 9
Enzyme biotechnology, plasma technology in textiles; waterless dyeing technologies, low liquor dyeing; sustainability in effluent treatment, water saving, zero hazardous chemicals.

UNIT IV RECYCLING 9
Textile recycling: polymer, fibre, yarn and fabric; consumer perception of recycled textile products

UNIT V ECO DESIGNING AND ECOLABELLING 9
Eco-design, building eco-design through supply chain; sustainability for credit rating; environmental management systems; standards for labelling, textile labels and environmental labelling; life cycle analysis of textiles

TOTAL: 45 PERIODS

REFERENCES
UNIT I FIBRE REQUIREMENTS
Suitability and properties of high performance fibres for various protective clothing – chemical composition and physical structure

UNIT II YARN AND FABRIC REQUIREMENTS
Types of yarns, woven, knitted and nonwoven fabric structures used for protective garments, methods of production, effect of structure on their performance

UNIT III CLOTHING CONSTRUCTION
Method of construction of garments according to various protective end uses like protection against cold, ballistic protection; use of different fabric type (knitted, woven, and nonwoven), coated, laminated in different places; use of inter lining and composites; 3D structures; high tech textiles—wearable electronics; protective garments for industrial and apparel end uses

UNIT IV FINISHING OF PROTECTIVE CLOTHING
Types of finishes - fire retardant finishes, water repellent finishes, anti - microbial finishes; chemical finishes against radiation and chemicals; method of application of finishes; protective finishes for health care garments

UNIT V QUALITY EVALUATION
Evaluation of protective fabrics - desirable properties of protective textiles, method of testing for thermal protective performance, abrasion and wear resistance, evaluation of resistance to mildew, ageing, sunlight, chemical, electrostatic and electrical resistivity, impact properties; ASTM standards for protective garments

TOTAL: 45 PERIODS

REFERENCES
AUDIT COURSES

AX4091 ENGLISH FOR RESEARCH PAPER WRITING L T P C 2 0 0 0

COURSE OBJECTIVES:
3. Teach how to improve writing skills and level of readability
4. Tell about what to write in each section
5. Summarize the skills needed when writing a Title
6. Infer the skills needed when writing the Conclusion
7. Ensure the quality of paper at very first-time submission

UNIT I INTRODUCTION TO RESEARCH PAPER WRITING 6
Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness

UNIT II PRESENTATION SKILLS 6

UNIT III TITLE WRITING SKILLS 6
Key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check

UNIT IV RESULT WRITING SKILLS 6
Skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions

UNIT V VERIFICATION SKILLS 6
Useful phrases, checking Plagiarism, how to ensure paper is as good as it could possibly be the first-time submission

TOTAL: 30 PERIODS

COURSE OUTCOMES
CO1 – Understand that how to improve your writing skills and level of readability
CO2 – Learn about what to write in each section
CO3 – Understand the skills needed when writing a Title
CO4 – Understand the skills needed when writing the Conclusion
CO5 – Ensure the good quality of paper at very first-time submission

REFERENCES:

AX4092 DISASTER MANAGEMENT L T P C 2 0 0 0

COURSE OBJECTIVES:
• Summarize basics of disaster
• Explain a critical understanding of key concepts in disaster risk reduction and humanitarian response.
• Illustrate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
• Describe an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
• Develop the strengths and weaknesses of disaster management approaches

UNIT I INTRODUCTION 6
Disaster: Definition, Factors and Significance; Difference between Hazard And Disaster; Natural and Manmade Disasters: Difference, Nature, Types and Magnitude.

UNIT II REPERCUSSIONS OF DISASTERS AND HAZARDS 6

UNIT III DISASTER PRONE AREAS IN INDIA 6
Study of Seismic Zones; Areas Prone To Floods and Droughts, Landslides And Avalanches; Areas Prone To Cyclonic and Coastal Hazards with Special Reference To Tsunami; Post-Disaster Diseases and Epidemics.

UNIT IV DISASTER PREPAREDNESS AND MANAGEMENT 6
Preparedness: Monitoring Of Phenomena Triggering a Disaster or Hazard; Evaluation of Risk: Application of Remote Sensing, Data from Meteorological And Other Agencies, Media Reports: Governmental and Community Preparedness.

UNIT V RISK ASSESSMENT 6
Disaster Risk: Concept and Elements, Disaster Risk Reduction, Global and National Disaster Risk Situation. Techniques of Risk Assessment, Global Co-Operation in Risk Assessment and Warning, People’s Participation in Risk Assessment. Strategies for Survival

TOTAL : 30 PERIODS

COURSE OUTCOMES:
CO1: Ability to summarize basics of disaster
CO2: Ability to explain a critical understanding of key concepts in disaster risk reduction and humanitarian response.
CO3: Ability to illustrate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
CO4: Ability to describe an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
CO5: Ability to develop the strengths and weaknesses of disaster management approaches

REFERENCES:
UNIT I  HISTORY OF MAKING OF THE INDIAN CONSTITUTION  
History, Drafting Committee, (Composition & Working)

UNIT II  PHILOSOPHY OF THE INDIAN CONSTITUTION  
Preamble, Salient Features

UNIT III  CONTOURS OF CONSTITUTIONAL RIGHTS AND DUTIES  

UNIT IV  ORGANS OF GOVERNANCE  
Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions.

UNIT V  LOCAL ADMINISTRATION  

UNIT VI  ELECTION COMMISSION  
Election Commission: Role and Functioning, Chief Election Commissioner and Election Commissioners - Institute and Bodies for the welfare of SC/ST/OBC and women.

TOTAL: 30 PERIODS

COURSE OUTCOMES:  
Students will be able to:

- Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
- Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
- Discuss the circumstances surrounding the foundation of the Congress Socialist Party (CSP) under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
- Discuss the passage of the Hindu Code Bill of 1956.

SUGGESTED READING  
1. The Constitution of India, 1950 (Bare Act), Government Publication.
UNIT I

1. குழலில் காக்க வாய் விளக்கக்கரிப்பு
   - சர்க்கை, தமிழ், பன்மை
2. எக்கார்கா (82)
   - தியலுக் குறிப்பிட்டு உருண்கம்
3. சொக்கிலும் பார்வார் வாய்க்கர
4. பூர்வ கார்கா (95,195)
   - பொருள் திகசரும் தடம்பார்

UNIT II

1. தனித்துக்காட்டு சிக்கை
   - அரசு ஆராய்ச்சி, ஆண்ட விளக்கம், மக்களில், மக்கள்
2. பிரிவு ஆராய்ச்சி - பன்மை பரிசம்
   - மாநவி, சிங்கியசதை, சுருக்கம், ஆசிரவத்காலம்

UNIT III

1. கரளுக்காக்க பரிசம்
   - வித்யாப்பியா விளக்கக்கர
2. செங்குகால சிக்கைமார்கா
   - வித்யாப்பியா ஜாகைப்பா

UNIT IV

1. சித்தருக்காந்தாப்பா
   - பதில்தொல்லாக்க சிக்கை, பூங்கள் பலைசையும் பரிசமை
2. வித்யாப்பியா விளக்கம்
3. சிக்கைக்கா (617, 618)
4. சித்தருக்காந்தாப்பா
5. பூங்கள்
6. எக்கார்கா (4)

குறிப்பிட்டு விளக்காலம்
- பந்தல், பன்மை
- பந்தல், பன்மை
- பந்தல், பன்மை
- பந்தல், பன்மை
- பந்தல், பன்மை
- பந்தல், பன்மை
UNIT V  நூற்றாண்டு தமிழில்

1. சுண்ணமண்டல் தமிழ்,
   - செம்புழி பாடல் புதிதம்
   - செப்புழி பாடல் விளக்கம்
   - பாலராஜ தங்கமிலம்
   - பாலராஜ தங்கமிலம்
   - மாதாம
2. பாலம் விளகி பட்டாச்சூடம் தமிழ் தங்கமிலம்
3. கேமான விளகி பட்டாச்சூடம் தமிழ் தங்கமிலம்
4. பாலம் விளகி பட்டாச்சூடம் விளகி வெளியெடுக்குளியா வெளியெடுக்குளியா தமிழ் தங்கமிலம்
5. விளகி தமிழ்
6. விளகி தமிழ்
7. விளகி தமிழ்

TOTAL : 30 PERIODS

தமிழ் தகவலியில் வைப்புகள் / புத்தகங்கள்

1. தமிழ் விளகிப் பல்கலைக்கழகம் (Tamil Virtual University)
   - www.tamilvu.org
2. தமிழ் விளகிப் புதிதம் (Tamil Wikipedia)
   - https://ta.wikipedia.org
3. வரிசா அதிகார விளகிப்
4. வரிசா விளகிப்
5. வரிசா விளகிப்
6. வரிசா விளகிப்
   - thamilvalarchithurai.com

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