1. Programme Educational Objectives (PEOs):

To enable the graduate students of Textile Technology and allied studies to

a. Enhance their knowledge related to the theory of colouration and textile wet processes
b. Enhance their knowledge on advances in textile chemical processes
c. Design, conduct and interpret the results of the textile experiments
d. Design new processes and products
e. Engross in life-long learning to keep abreast with emerging technologies

2. Programme Outcomes (POs):

Upon completion of the programme, the student shall be able to

1. Effectively teach the students at the undergraduate level
2. Innovate new process or product at the textile wet processing industry or textile research organizations.
3. Effectively carryout fundamental and applied research, and manage research and development activities in textile wet processing industry and research organizations
4. Manage textile wet processing industry and solve technological problems
5. Use the advanced techniques, skills, and modern tools necessary for practicing in the textile wet processing industry.
6. Communicate effectively and work in interdisciplinary groups.
7. Review, comprehend and report technological development.

3. PEO / PO Mapping

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**ANNA UNIVERSITY:: CHENNAI 600 025**
**AFFILIATED INSTITUTIONS**
**M.TECH.TXTILE TECHNOLOGY**
**(WITH SPECIALIZATION IN TXTILE CHEMISTRY)**
**REGULATIONS – 2017**
**CHOICE BASED CREDIT SYSTEM**
**I TO IV SEMESTERS CURRICULUM AND SYLLABUS**

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### Professional Core (PC)

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6
## Employability Enhancement Courses (EEC)

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OBJECTIVES

- To enable the students to study about the evaluation of sizing ingredients, dyestuff, chemicals and auxiliaries in dyeing, printing paste ingredients and finishing agents.

UNIT I

Evaluation of sizing ingredients which includes natural and synthetic adhesives, lubricants and miscellaneous additives such as deliquescent materials, antiseptics etc. Evaluation of desizing agents, chelating agents, enzymes etc.

UNIT II

Evaluation of dyestuff / pigments / dyestuff precursors: Purity, strength and characteristics.

UNIT III

Evaluation of chemicals and auxiliaries used in dyeing such as Dye fixing agents, dispersing agents, leveling agents, antifoaming agents, carriers and accelerants and miscellaneous chemicals and auxiliaries.

UNIT IV

Evaluation and testing of printing paste ingredients such as thickeners, humectants / hygroscopic agents, Carriers / Accelerators / swelling agents, wetting agents / surface active agents, solvents / solution aids / dispersing agents, oxidizing agents and oxygen carriers, reducing / resisting / discharging agents, cross-linking agents and catalysts used in pigment printing and miscellaneous chemicals.

UNIT V

Evaluation of finishing agents like stiffening/filling agents, cross linking agents, fluorescent brightening agents, softening agents, water repelling gents, flame retarding agents, antistatic agent, soil releasing agents, anti-pilling agents, rot proofing, mildew proofing agent.

TOTAL : 60 PERIODS

OUTCOMES

- Upon completion of this course the student shall be able to know about the evaluation of sizing ingredients, dyestuff, chemicals and auxiliaries in dyeing, printing paste ingredients and finishing agents.

REFERENCES:

OBJECTIVES

- To enable the students to study about the mechanism of Preparatory process
- To enable the students to study about elements of dye chemistry
- To enable the students to study about Printing methods & styles and the
- Necessity of Finishing

UNIT I DE-SIZING 12

UNIT II BLEACHING 12

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

OUTCOMES

- Upon completion of this course the student shall be able to know the mechanism
- Preparatory process & Elements of dye chemistry
- Printing methods, styles & Necessity of Finishing

TOTAL: 60 PERIODS

REFERENCES


TY5103
FIBRE SCIENCE
L T P C
3 0 0 3

OBJECTIVES
- To enable the students to study about
- the modern concepts of fiber structure and its mechanical properties, molecular theory of moisture on fiber properties, optical properties and structural characterization of fibers

UNIT I
Modern concepts of fiber structure, Generalized Hook’s Law, Component of Stress and strain. Linear visco-elastic behavior of fibers.

UNIT II

UNIT III
Study of molecular theory of moisture hysteresis, 2 and 3 phase moisture adsorption theories. Heat of sorption in textile fibers. Effect of moisture on mechanical properties of fibers.

UNIT IV
Study of optical properties, thermal, frictional, electrical, Di-electric and static properties of fibers.

Unit V
Physical methods of structural characterization of fibers, viz., DGC, TEM, SEM, WAXS, SAXS, IRS, NMR, DSC and DTA.

TOTAL: 45 PERIODS

OUTCOMES
- Upon completion of this course the student shall be able to know the modern concepts of fiber structure and its mechanical properties
- Molecular theory of moisture on fiber properties
- Optical properties and structural characterization of fibers

REFERENCE BOOKS:

TY5104

COLOURATION AND FINISHING TECHNOLOGY

L T P C

4 0 0 4

OBJECTIVES

- To enable the students to study about
- the mechanism of Preparatory process, dyeing techniques and theory, Printing & finishing methods and the effluent treatment process

UNIT I

MECHANISM OF PREPARATORY PROCESSES


UNIT II

DYEING TECHNIQUES

Exhaust and Padding Principle. Low liquor applications. Use of microwave, ultrasonic waves, Apparel dyeing.

UNIT III

DYEING THEORY


UNIT IV

PRINTING


FINISHING

Mechanism of Softening, Easy-care and durable press finishes of cellulosics, water repellent, soil-release, flame-retardant, anti-static, anti-pilling, insect resist and mite protection finishes.

UNIT V

EFFLUENT TREATMENT


TOTAL: 60 PERIODS

OUTCOMES

- Upon completion of this course the student shall be able to know the mechanism
• Preparatory process & dyeing techniques, theories
• Printing methods, finishing & effluent treatment processes

REFERENCES:


TX5151 STATISTICAL APPLICATIONS IN TEXTILE ENGINEERING L T P C
4 0 0 4

OBJECTIVES:

• This course is designed to provide a solid foundation on topics in statistics that can be used to determine the capability of a textile material to meet the specified requirements by subjecting the item to a set of physical, chemical, environmental or operating actions, and conditions. It is framed to address the issues in textile engineering using statistical applications such as probability distributions, estimation theory, testing of hypothesis, analysis of variance, non-parametric tests and design an analysis of experiments.

UNIT I PROBABILITY DISTRIBUTION AND ESTIMATIONS 12

Applications of Binomial, 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 12

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 12

Analysis of variance for different models – Non - parametric tests - Sign test - Rank test - Concordance test.
UNIT IV  PROCESS CONTROL AND CAPABILITY ANALYSIS  12

Control charts for variables and attributes - Basis, Development, Interpretation, Sensitizing rules, Average run length - Process capability analysis.

UNIT V  DESIGN AND ANALYSIS OF EXPERIMENTS  12

$2^k$ full-factorial designs - Composite designs - Robust designs - Development of regression Models - Regression coefficients - Adequacy test - Process optimizations.

OUTCOMES:
After completing this course, students should demonstrate competency in the following topics:

- Applications of distributions and estimation of parameters
- Use statistical tests in testing hypotheses on data.
- List the guidelines for designing experiments, recognize the key historical figures in Design of Experiments, conduct statistical tests and analyze the results.
- Analyze the significance of sampling and its techniques and different models using ANOVA
- Design and interpret the process control charts
- Analyze the experiments by applying suitable non-parametric tests

The students should have the ability to use the appropriate and relevant, fundamental and applied mathematical and statistical knowledge, methodologies and modern computational tools.

REFERENCES:


TY5111  FABRIC PROCESSING AND ANALYSIS LABORATORY  L T P C  0 0 4 2

OBJECTIVES
To train the students in identification of dyes and fabric processing and analysis

1. Identification of dyes.
2. Activity of textile enzymes
3. Blend dyeing of textile substrates
4. Measurement of Unknown dye concentration in dye bath
5. Determination of Colour parameters for a given Fabric
6. Analysis of residual formaldehyde content in fabric
7. Analysis of aryl amines in dyes
8. Pentachloro phenol testing on fabrics
9. Analysis of heavy metals in fabrics
OUTCOMES
Upon completing this practical course, the student would be able to
- Identify dyes and its concentration in dye bath, determine colour parameters in a fabric and analyse the processed fabrics.

EQUIPMENT LIST
1. Micropipette - 6 no.
2. UV – Vis Spectrophotometer - 1 no.
3. Atmospheric Pressure sample dyeing machine (different types) - 2 no.
4. High pressure sample dyeing machine (different types) - 2 no.
5. GC/MS system or LC/MS system (preferable) - 1 no.
6. Atomic absorption spectrometer (preferable) - 1 no.

TY5201 ADVANCED FINISHING TECHNOLOGY

OBJECTIVES
- To enable the students to study about
- the importance of finishing, concept of flame proof and retardancy, soil release and antipilling finish, mechanical finishing and other techniques in finishing

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
Detail study about mechanical finishing of textile materials like calendaring, compacting, Sanforising, Beach finishing. Object of Heat setting. Various methods of heat setting and mechanism of heat

UNIT V

Mechanism in the weight reduction of PET by using alkali; micro encapsulation techniques in finishing process. Detail study of the process to produce silk like Polyester. Felting of wool. Study about cationic, reactive and silicon emulsion softeners. Brief study about stiffening of textile materials

TOTAL: 45 PERIODS

OUTCOMES

• Upon completion of this course the student shall be able to know the importance of finishing
• Concept of flame proof and retardancy, soil release and anti pilling finish
• Mechanical finishing and other techniques in finishing

REFERENCES


UNIT I

Advances in fiber dyeing machine - Advances in cheese dyeing machine - importance of winding in yarn dyeing — calculation of winding density — various yarn dyeing defects caused by cheese dyeing machine - detailed maintenance schedule for cheese dyeing machines.

UNIT II

Advances in Beam dyeing - Advances in soft flow dyeing machines, Advances in jet dyeing machines — Developments in jiggers, Continuous dyeing machineries & its developments — Various dyeing defects caused by the above machineries.

UNIT III

Hydro extractor, Rope opener RF dryer, Yarn dryer, Knitted fabric dryer, Hot flue dryer, Stenter & its type. Sanforising machine, Compacting machines, Beach finishing machines.
UNIT IV


UNIT V

Garment dyeing machines, Tumble dryer, Fusing machines, Backfilling machine, Importance of maintenance of processing machineries, Machineries used for foam application. Preparation of screens for Rotary Printing machines.

OUTCOMES

- Upon completion of this course the student shall be able to know about advances in fibre, cheese and other dyeing machines
- Dryer and other finishing machines
- Working principle of different printing machines and garment dyeing machines

REFERENCES


TY5203 TEXTILE EFFLUENT MANAGEMENT

OBJECTIVES

- To enable the students to study about the pollution monitoring and control, Wastewater characteristics, identification and reduction of pollution sources in textile wet processing, health, safety and waste management in textile industry

UNIT I

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

Wastewater characteristics; wastewater treatment - objectives, methods and implementation considerations; recycling of effluents.

UNIT III

Identification and reduction of pollution sources in textile wet processing; pollution control in man made fibre industry; analysis of textile processing effluents – colour, odour, pH, totalsolids, 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
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
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.

TOTAL: 45 PERIODS

OUTCOMES
- Upon completion of this course the student shall be able to know about pollution monitoring and control.
- Wastewater characteristics and identification and reduction of pollution sources in textile wet processing.
- Health, safety and waste management in textile industry.

REFERENCES

OBJECTIVES
To enable the students to learn about the
- Important characteristics of the fabric responsible for its comfort properties and
- Different phenomena which take place in the fabric related to the comfort properties of the fabric.
UNIT I  CONCEPT OF CLOTHING  12
Need and selection of clothing - definition of comfort - components of clothing comfort - Subjective perception of comfort: Psycho-Physiological factors of clothing - Aesthetic concepts of clothing - Various aspects of clothing comfort: thermal comfort - sensorial comfort - body movement comfort. Comfort variables: Thermal and non-thermal comfort variables

UNIT II  THERMAL MANAGEMENT IN CLOTHING  12

UNIT III  MOISTURE MANAGEMENT IN CLOTHING  12
Moisture transport - Liquid water transfer: wicking and water absorption - Principles of moisture vapour transfer - Evaluation of moisture vapour transmission - Factors affecting heat and mass transfer through fabrics- Parameters expressing heat and mass transmission- Air permeability and measurement.

UNIT IV  COMFORT PROPERTIES OF FIBERS, YARNS AND FABRICS  12

UNIT V  COMFORT PROPERTY OF CLOTHING  12

TOTAL: 60 PERIODS

OUTCOME
Upon completion of this course, the student shall be able to

• Understand different phenomena such as wetting, wicking and, heat and moisture interaction and
• Correlate the property of the fabric with comfort to the wearer.

REFERENCES:
OBJECTIVES

- To enable the students to know about
- Ways to improve the absorbency, whiteness of fabric by various preparatory processes, development of simultaneous dyeing & finishing process and Transfer printing process for Natural Synthetics

LIST OF EXPERIMENTS

2. Solvent scouring of cotton fabric
5. Transfer printing of polyester
6. Transfer printing of Cotton
8. Dyeing of P/C blend using single bath method
9. Denim washing

OUTCOMES

Upon completion of this course the student shall be able to know about the
- Combined preparatory & Dyeing processes
- Eco friendly finishing processes
- Method of Transfer printing for cotton & PET

LIST OF EQUIPMENTS REQUIRED

1. Dye bath - 1 no.
4. Miniature Kier - 1 no.
5. Padding Mangle - 1 no.
6. Vacumm ironing and steam iron box - 1 no.
7. Steamer - 1 no.
8. Garment Washing machine - 1 no.
9. High temperature dyeing machine - 1 no.
10. Curing Chamber - 1 no.

TOTAL : 60 PERIODS
OBJECTIVES

- To enable the students to study about evolution of digital printing, digital image and colour management, pre treatments for inkjet printing, quality evaluation and special printing techniques

UNIT I

Ink jet printing—evolution of digital printing, Comparison with conventional printing techniques, theoretical foundations for inkjet technologies—Continuous and drop on demand technologies

UNIT II

Digital image design, editing and data storage systems, Pixel and image formation in digital printers, Digital colour management—Colour gamut and rendering intent, Colour communication.

UNIT III

Pretreatment of substrates for inkjet printing; Ink jet heads; Inks used for printing—dye fibre interaction, surface energy of inks, dye ink formulation; fixation procedures for inks on substrates; washing of ink jet prints; heat and sublimation printing.

UNIT IV

Quality evaluation of textile substrates used for ink jet printing and inks used for inkjet printing, advantages and limitation in inkjet printing, technoeconomics of ink jet printing.

UNIT V

Special printing techniques—Developments in Photo printing, Blast printing with Indigo, Developments in Xerox printing and Laser printing for fancy effects; Yarn printing; printing of carpets, velvets and knits; Ecofriendly alternatives for auxillaries used in conventional printing

TOTAL : 45 PERIODS

OUTCOMES

- Upon completion of this course the student shall be able to know about evolution of digital printing, digital image and colour management
- Pre treatments for inkjet printing
- Quality evaluation and special printing techniques

REFERENCES

OBJECTIVES

- To enable the students to learn about fluid flow and its related aspects with respect to melt and solution spinning.

UNIT

Basic modes of deformation, Startup deformation, Step strain, Oscillatory shear; Linear responses-Elastic Hookean solids, Viscous Newtonian liquids and non Newtonian fluids; Viscoelastic responses - Boltzmann superposition principle, Maxwell model ; Classical rubberelasticity.

UNIT II

Viscosity-Effect of Pressure, temperature, activation energy, molecular weight and molecular weight distribution on viscosity, crosslinking, crystallinity branching, copolymerization, fillers, plasticizers and shear rate dependence of viscosity

UNIT III

Laminar flow through various profiles, flow analysis - power law, turbulent flow analysis, turbulence dumpling.; rheological models for extensional viscosity; Flow in coni-cylindrical dies – pressure drop due to shear, extensional flow and pressure drop at die entry, flow in wedge shaped die; Swelling due to shear stresses and swelling due to tensile stresses.

UNIT IV

Shear rheometry- Linear displacement, Sliding plate rheometer, Co-cylinder axial sliding rheometer; Rotational motion - Parallel disks, Cone-plate and. Cone-partitioned plate; Rheo-optical methods- Flow birefringence, Scattering (X-ray, light, neutron), Spectroscopy (NMR, fluorescence, IR, Raman, dielectric)

UNIT V

Rheological behaviour of important thermoplastics, Applications of rheology to polymer processing.

OUTCOMES

Upon completion of this course, the student shall be able to

- Characterize rheological behaviour of fluids and
- Analyse the effect of molecular parameters on the fluid flow.

REFERENCES


TOTAL: 45 PERIODS
OBJECTIVES
To enable the students to learn about
- Costing of textile products
- Different sources of finance, cost of capital and investment appraisal techniques
- Financial statements

UNIT I
Goals and functions of finance; types of costs; costing – concepts, classification; preparation of cost sheet; costing of yarn, fabric and garments; breakeven analysis

UNIT II
Investment appraisal; Payback period method, Accounting Rate of Return; DCF methods - IRR, NPV, PI; depreciation - concept, methods

UNIT III
Capital structure; sources of finance-debt, equity; cost of capital; working capital management; estimation of working capital

UNIT IV
Tools of financial analysis and control – profit and loss account, balance sheet; financial ratio analysis; analysis of operating and financial leverage; dividend policy; illustrations for spinning mill, composite mill and garment industry

OUTCOMES
Upon completion of this course, the student shall be able to
- Calculate the cost of yarn, fabric and garment
- Identify the sources for capital and calculate cost of capital
- Calculate depreciation and carryout investment appraisal
- Interpret and analyze financial statements

TOTAL: 45 PERIODS

REFERENCES

TY5071 ENZYME TECHNOLOGY FOR TEXTILE PROCESSING L T P C

OBJECTIVES
To enable the students to learn about
- Enzymes, types and kinetics of enzyme reaction on textile fibres
- Application of enzymes on different fibres and
- Treatment of enzyme effluents.

UNIT I ENZYMES
Nomenclature and classification of enzymes; characteristic features of enzymes; modifiers of enzyme activity - activators and inhibitors; specificity of enzyme action; extraction and purifications of enzymes.

UNIT II ENZYME KINETICS
Kinetics of single-substrate enzyme-catalysed reactions; Basics of kinetics of multi-substrate enzyme-catalysed reactions.

UNIT III ENZYMES FOR COTTON FIBRE
Chemistry and structure of cotton fibre; enzymes in pretreatment of cotton substrates – desizing, scouring, bleaching and bio finishes.

UNIT IV ENZYMES FOR OTHER FIBERS
Enzymes for processing and functionalizing protein fibres; enzymatic modification of polyester, polyamide, polyacrylonitrile and cellulose acetate fibres.

UNIT V ENZYMES IN EFFLUENT TREATMENT
Enzyme technology and biological remediation, Enzyme decolourisation and decolouration by biosorption and enrichment cultures.

TOTAL : 45 PERIODS

OUTCOMES
Upon completion of this course, the student shall be able to
- Give the rationale for selecting enzymes for particular processing and
- Appreciate limitations of existing processing operations using chemicals.
REFERENCES

OBJECTIVES
To enable the students to learn about
- Advanced spinning technology for manufacturing high performance fibres, their properties and applications

UNIT I ADVANCED SPINNING TECHNOLOGY 9
Advances in conventional fibre forming process; gel spinning; liquid crystal spinning; electro-spinning

UNIT II HIGH PERFORMANCE FIBRES FOR INDUSTRIAL APPLICATIONS 9
Manufacturing, properties and applications of glass fibres, basalt fibres; carbon fibres, high performance polyethylene fibres; ceramic fibres

UNIT III HIGH PERFORMANCE FIBRES FOR MEDICAL APPLICATIONS 13
Manufacturing, properties and applications of alginate fibres; chitosan fibres; regenerated silk and wool protein fibres; synthetic biodegradable fibres

UNIT IV SPECIALITY FIBRES 14
Hollow and profile fibres; blended and bi-component fibres; film fibres and functionalized fibres for specific applications; manufacturing, properties and applications of chemical and thermal resistant fibres

TOTAL: 45 PERIODS

OUTCOMES
Upon completion of this course, the student shall be able to
- Understand the method of producing high performance fibres
- Select a high performance fibres for right type of end uses

REFERENCES
OBJECTIVES

- To enable the students to study about
- basic concepts of Nano Technology, preparation, characterization and application of various particles on textile substrates and principle and factors involved in electrospinning

UNIT I
Nano Technology: definition and basic concepts, particle size, nano particles; Different types of process: Top down approach, bottom up approach; Synthesis of nano materials used in textiles.

UNIT II
Preparation, characterization, and application of silver, iron, ZnO, TiO2, MgO, SiO2 & Al2O3. Indium-tin oxide on textile substrates

UNIT III
Preparation, Characterisation and application of Ceramic, Carbon black, Clay, and Cellulose Nanowhiskers; Self- assembled nanolayer films; Nano structuring of polymers with cyclodextrins,

UNIT IV
Preparation, Characterization and properties of CNT, application of CNT in polymer and textiles. Effect of process conditions upon CNT structure and properties

UNIT V
Principle of electrospinning. Factors involved in electrospinning of nanofibres; methods to produce nanoyarns; Ecological considerations of nanoparticles and nanofibres

TOTAL: 45 PERIODS

OUTCOMES
Upon completion of this course, the student shall be able to know about
- Basic concepts of Nano Technology preparation,
- Characterization and application of various particles on textile substrates
- Principle and factors involved in Electrospinning

REFERENCES:
OBJECTIVES
To enable the students to know about the

- Various techniques in textile wet processing
- Theory and application of various instruments in textile
- Fabric geometry general terms for different types of knits

UNIT I CHROMOTOGRAPHIC TECHNIQUES

UNIT II SPECTROSCOPY & COLOURIMETRY
Theory, deviations from Beer’s law, Instrumentation (Line diagram alone) - applications. Ultraviolet spectroscopy – Theory, Instrumentation & application. NMR spectroscopy – Quantum description, Instrumentation, chemical shift, applications & limitations.

UNIT III INFRARED SPECTROSCOPY
Theory, fundamental vibrations, overtone, Hook’s law, instrumentation, single & double beam spectrometers, application & limitations. Difference between Raman spectra and IR spectra. MASS SPECTROSCOPY: Theory, Interpretation, some examples, applications and limitations.

UNIT IV INSTRUMENTATION SYSTEMS

UNIT V CONTROL SYSTEM COMPONENTS
Stepper motors, hydraulic valves – Pneumatic switches, proximity switches & flapper valves – Programmable logic controllers (PLC) and their applications – Temperature controllers, pH meters – Control systems and components, used in Dyeing, Finishing, Drying and Printing machinery.

TOTAL: 45 PERIODS

OUTCOMES
- Upon completion of this course the student shall be able to know about the
- Need for different types of chromatographic techniques
- Instruments to measure the various parameter of textiles

REFERENCES

TX5094 TEXTILE REINFORCED COMPOSITES

OBJECTIVES
To enable the students to learn about
- Reinforcements, matrices used for the composites
- Manufacture and testing of composites and
- Mechanics of failure of composites

UNIT I REINFORCEMENTS
Manufacturing, properties and applications of Glass, Quartz, Boron, Silicon carbide, Carbon, HPPE and Aramid fibers.

UNIT II MATRICES
Preparation, Chemistry, Properties and applications of thermoplastic and thermoset resins- Unsaturated Polyester, Vinyl Ester, Epoxy, Phenolics, polyimides, polyureethanes, polyamides, Polypropylene, PEEK and Polycorbanate

UNIT III COMPOSITE MANUFACTURING
Composites manufacturing for both thermoplastics and thermosets- Hand layup, Filament Winding, Resin transfer moulding, prepgs and autoclave moulding, pultrusion, vacuum impregnation methods, compression moulding; post processing of composites and Composite design requirements

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

UNIT V MECHANICS
Micro mechanics, macro mechanics of single layer, macro mechanics of laminate, classical lamination theory, failure theories and prediction of interlaminar stresses using software

TOTAL: 45 PERIODS

OUTCOMES
Upon completion of this course, the student shall be able to
- Select different types of textile reinforcements and matrices for the manufacture of
composites for getting different characteristics and
- Evaluate the characteristics of composites

REFERENCES

TY5003 COLOUR SCIENCE L T P C
3 0 0 3

OBJECTIVES
- To enable the students to learn about colour description and colour measurement.

UNIT I
COLOUR AND COLOUR VISION
Definition of colour and its classification; Structure and function of the eye — Detail and study about eye and brain system; colour consistency tests for defective colour vision.

UNIT II
COLOUR DESCRIPTION
Arrangement of colour; visual attribution of colour; Beer-Lambert’s law; colour primaries and colour mixing; additive and subtractive colour mixing; colour specification; colour order systems – Munsel, Ostwald and CIE colour order systems.

UNIT III
COLOUR MEASUREMENT
Principles of colour measurement; Tristimulus values; CIE diagram; standard Illuminant; standard observer; spectral reflectance; graphical and numeric representations.

UNIT IV
COLOUR MATCHING
Definition; Manual colour matching; single constant Kubelka – Munk theory, spectral and tristimulus match; Metamerism; Concept of computer colour matching system. Application of CCM system to Textile processing; Advantages and Limitations of CCM system.

UNIT V

COLOUR DIFFERENCE AND COLOUR PREDICTION

Colour difference - Perceptibility and acceptability; methods of assessment of colour difference formula; Measurement of fluorescence – Visual, photoelectric colourimeter and Spectrophotometric; Characterisation of colour displays; colour mapping for two- dimensional texture image; texture effect on visual colour difference evaluation; colour synthesis for three-dimensional objects.

TOTAL : 45 PERIODS

OUTCOME

- Upon completion of this course, the student shall become knowledgeable about Fundamentals of colour measurement and Prediction of recipe for colour matching.

REFERENCES


TY5004 CHEMICAL PROCESSING OF SYNTHETIC AND BLENDED TEXTILES L T P C

OBJECTIVES

- To enable the students to study about various Preparatory processes for manmade fabrics
- To enable the students to study about dyeing of synthetic fibres and their blends
- To enable the students to study the about printing and finishing of synthetic fabrics

UNIT I PREPARATORY PROCESS AND MASS COLOURATION

UNIT II   DYEING OF PET, NYLON AND ACRYLIC

UNIT III  DYEING OF BLENDS

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-static, soil-release, soil-resistant, flame-retardant.

TOTAL: 45 PERIODS

OUTCOMES
Upon completion of this course the student shall be able to know
- Various Preparatory processes for manmade fabrics
- Dyeing of synthetic fibres and their blends
- Printing and finishing of synthetic fabrics

REFERENCES:

TX5074 PROJECT PLANNING AND MANAGEMENT

OBJECTIVES
- To enable the students to study about
  the introduction to project management, planning and budgeting process, scheduling and resource allocation, control and completion, project organization and conflict management
UNIT I
INTRODUCTION TO PROJECT MANAGEMENT: Project Management – Definition, Goal; Lifecycles; project selection methods; project formulation; project manager – roles, responsibilities and selection; project teams

UNIT II
PLANNING AND BUDGETING: Planning process – work break down structure, role of multidisciplinary teams; budgeting the project – Methods; cost estimating and improvement; budget uncertainty and risk management

UNIT III
SCHEDULING & RESOURCE ALLOCATION: PERT & CPM Networks, crashing; project uncertainty and risk management; simulation, Gantt charts, expediting a project – resource loading and leveling; allocating scarce resources, Goldratt’s Critical Chain

UNIT IV
CONTROL AND COMPLETION: Plan-Monitor-Control cycle; data collecting and reporting; project control; designing the control system; project evaluation, auditing and termination

UNITY
PROJECT ORGANISATION & CONFLICT MANAGEMENT: Formal organisation structure; Organisation design, types of project organizations; conflict – origin & consequences; managing conflict, team methods for resolving conflict.

TOTAL: 45 PERIODS

OUTCOMES
Upon completion of this course the student shall be able to know
- Introduction to project management, planning and budgeting process
- Scheduling and resource allocation
- Control, Completion, Project organization and Conflict management

REFERENCES

TY5005 SURFACE MODIFICATION OF TEXTILES

OBJECTIVES
- To enable the students to study about importance and application of surface modification of textile materials
• To enable the students to study about plasma technology and high energy radiation
• To enable the students to study about surface modification of textile by physical methods and by enzyme treatment and characterize it

UNIT I INTRODUCTION

UNIT II PLASMA SCIENCE AND TECHNOLOGY
Definition, generation, characterization, classification of plasma with special reference to cold plasma. Low pressure plasma versus atmospheric plasma. Microdischarge versus glow discharge. Corona, DBD, OAUGP.

HIGH ENERGY RADIATIONS

UNIT III SURFACE MODIFICATION OF TEXTILES BY PHYSICAL METHODS
Interaction of plasma and light with substrate and mechanisms of modifications. Plasma treatment for enhancement of hydrophilicity, hydrophobicity, shrink proofing of wool, enhancement in dyeing characteristics and for enhancement in pretreatments. Plasma induced polymerization. Plasma metallisation, plasma cleaning, UV &VUVirradiations, electron beam for irradiations for similar applications and for ablation.

UNIT IV ENZYME TREATMENT
Mechanism of specific interaction of enzymes with substrates. Surface modification of natural and synthetic fibres with enzymes - mechanism, characterization and challenges.

UNIT V CHARACTERISATION
Characterization of modified and unmodified textile substrates using FTIR, XPS, SEM, AFM, TEM. Surface characterization challenges.

TOTAL : 45 PERIODS

OUTCOMES
Upon completion of this course the student shall be able to know
• Importance and application of surface modification of textile materials
• Plasma technology and high energy radiation
• Surface modification of textile by physical methods and by enzyme treatment and characterize it

REFERENCES:

TX5072 DESIGN AND ANALYSIS OF TEXTILE EXPERIMENTS L T P C
3 0 0 3

OBJECTIVES

To make the students to learn about the

- Fundamentals of experimental design and
- Selection of suitable design and analysis of the results

UNIT I EXPERIMENTAL DESIGN FUNDAMENTALS 9
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 9
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, 2K 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

OUTCOME
Upon completion of this course, the student shall be able to

- Design the experiment suitable for a given study and
- Conduct statistical tests and analyze the results to arrive at the conclusions.
REFERENCES


TX5091 MEDICAL TEXTILES L T P C

3 0 0 3

OBJECTIVES
To enable the students to learn about
- Different types of biomaterials and
- Biomedical application of textile structures.

UNIT I
Biomaterials–introduction, types; natural, polymeric and biological biomaterials

UNIT II
Textile based healthcare and hygiene products; application of nano technology in medical hygiene textiles; advanced textile materials in healthcare; infection control and barrier materials; plasma treated barrier materials.

UNIT III
Bandages and pressure garments - elastic and non elastic compression bandages, support and retention bandages; bandaging textiles; evaluation of bandages; bandages for various end uses.

UNIT IV
Wound – types, healing process; requirements of wound dressing; wound care materials – types, advantages and limitations; Testing of wound dressings; advanced wound dressings

UNIT V
Implantable products; sutures – requirements, classifications, specifications, materials and their applications; vascular grafts, artificial ligaments, artificial tendons; scaffolds for tissue engineering; intelligent textiles for medical applications

OUTCOMES
Upon completion of this course, the student shall know the
- Types of materials available for biomedical applications
- Functional requirements of textile structures for specific end uses and
- Selection and characterization of textile materials used for biomedical applications.

TOTAL: 45 PERIODS

REFERENCES
TX5073 PROTECTIVE TEXTILES L T P C 3 0 0 3

OBJECTIVES:
To enable the students to understand about
- Functional requirements of protective clothing
- Selection of fibre, yarn and fabric for developing protective clothing
- Evaluation of protective clothing

UNIT I FIBRE REQUIREMENTS 9
Suitability and properties of high performance fibres for various protective clothing – chemical composition and physical structure

UNIT II YARN AND FABRIC REQUIREMENTS 9
Types of yarns; woven, knitted and non - woven fabric structures, methods of production, effect of structure on their performance

UNIT III CLOTHING CONSTRUCTION 9
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 Non-woven), coated / laminated in different places; use of inter lining and composites; 3D structures; high tech textiles – variable electronics; protective garments for industrial and apparel end uses

UNIT IV FINISHING OF PROTECTIVE CLOTHING 9
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 9
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
OUTCOMES:
Upon completion of the course, the students will be able to
- Select fibre, yarn and fabric for developing protective clothing for different applications
- Understand different types of finishes given to develop protective clothing
- Understand the evaluation of protective clothing

REFERENCES: