DEPARTMENT OF TEXTILE TECHNOLOGY

Vision:

The Vision of the Department of Textile Technology, Anna University is to be recognized as a leader in textile and apparel technology education, research and application of knowledge and skills to benefit the society.

Mission:

The mission of the Department of Textile Technology, Anna University is

- To deliver the highest quality textile and apparel technologists with societal values.
- To carry out cutting-edge research and develop innovative technology for the benefit of society at national and international level.
- To inculcate a sense of highest ethical and professional standards among the students.
1. PROGRAM EDUCATIONAL OBJECTIVES(PEOs):

Master of Textile Technology curriculum is designed to prepare the graduates to

1. Have attitude and knowledge for the successful professional and technical career
2. Design and conduct experiments and interpret the results, Design new process and product for textile industry
3. Manage research and development activities in textile industry and research organizations and
4. Enhance their skills for managing textile manufacturing industry

2. PROGRAM OUTCOMES(POs):

The Textile Technology Post Graduates will have the ability to

1. Apply the knowledge gained through the post graduate programme to effectively teach the students at the undergraduate level
2. Effectively carryout fundamental and applied research
3. Develop new process or product at the textile industry
4. Develop new process or product at the textile research organizations
5. Apply the knowledge of textile technology to effectively manage textile industry
6. Effectively function as individual or as a part of a team to accomplish a stated goal.
7. Understand the professional and ethical responsibility
8. Communicate effectively with a wide range of audience
9. Learn independently and engage in life-long learning
10. Demonstrate knowledge and understanding of the engineering and management principles and apply these to one’s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments
3. **Mapping of Programme Educational Objective with Programme Outcomes**

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**ANNA UNIVERSITY, CHENNAI**

**UNIVERSITY DEPARTMENTS**

**M.TECH. TEXTILE TECHNOLOGY**

**REGULATIONS – 2019**

**CHOICE BASED CREDIT SYSTEM**

**CURRIULLA AND SYLLABI FOR I TO IV SEMESTER**

### SEMESTER I

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*Audit Course is Optional

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## Open Elective Courses [OEC]

(Out of 6 Courses one Course must be selected)

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AUDIT COURSES (AC)
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SUMMARY

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OBJECTIVE

To enable the students to learn the theory of various operations carried out at different stages of yarn spinning, which would be helpful them in understanding the influence of various parameters on quality and productivity of short staple yarn.

UNIT I FIBRE DISPERSION AND CLEANING 12
Necessity of fibre-individualization; fibre opening and cleaning in blow-room machinery; forces acting on the fibre during carding operation; the mechanism of fibre dispersion, fibre transfer, short fibre removal and trash removal; entanglement and disentanglement of fibres; the new approaches to improve fibre-dispersion in carding operation; mechanism of removal of short fibre and trash in comber.

UNIT II FIBRE STRAIGHTENING, NEPS REMOVAL 12
Theory of hook formation; measurement of fibre extent, influence of fibre extent on yarn quality; improvement of fibre-extent by carding, drafting and combing actions; generation of neps, neps removal in carding and combing

UNIT III ATTENUATION 12
Principle of roller drafting and its application in yarn production; ideal drafting; factors affecting drafting force, fibre dynamics during drafting, drafting irregularities and their causes and remedies; amount of draft and draft distribution on strand irregularity; the function of aprons in roller drafting; limitation of apron-drafting and the scope for improvement; mechanism of wire-point drafting and its application in yarn production; merits and demerits of wire-point drafting; comparison of wire-point drafting with roller drafting

UNIT IV TWISTING 12
Twisted yarn geometry, forces acting on fibre and yarn during twisting, effect of fibre helix angle on strength, parameters affecting optimum twist level; balloon and spinning triangle formation and their effects on yarn quality and productivity; fundamental requirement to create real twist in a strand, mechanism of twisting principles in ring spinning, separation of twisting and winding actions of yarn; ply twisting, twist balance; modified twisting principles - open end twisting, false twisting, air-jet twisting, air-vortex twisting, up-twisting, two-for-one twisting, hollow-spindle twisting; merits and demerits of modern twisting system.

UNIT V FIBRE BLENDING AND LEVELLING 12
Importance of achieving homogeneous blending in fibre-mix; types of mixing during spinning preparatory process; lateral and longitudinal fibre blending; analysis of fibre blend index values; process parameters of spinning machinery for processing blended material; influence of intermediate product uniformity on yarn uniformity; different methods of levelling adopted during spinning processes.

TOTAL: 60 PERIODS
OUTCOMES:
Upon completion of this course, the student shall have the knowledge on
CO1: Theory of opening and cleaning in spinning preparatory machinery
CO2: Theory of generation of hooks, neps and rectification
CO3: Wire and roller drafting, technology involved, their limitations and scope for improvement
CO4: Theory of twisting in different systems of yarn spinning
CO5: Fibre blending and leveling carried out at different stages of yarn production process

TEXT BOOKS

REFERENCES
7. Shaw J., "Short-staple Ring Spinning", Textile Progress, The Textile Institute, Manchester, 1982
## Course Articulation Matrix:

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<td>Fibre blending and leveling carried out at different stages of yarn production process</td>
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1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively
OBJECTIVE
To enable the students to learn about
- Advances in fabric formation and their structural features, characteristics and application

UNIT I WOVEN FABRICS 12

UNIT II KNITTED FABRICS 12
Advances in circular knitting – loop transfer, seam less knitting and sliver knitting techniques; 3-D knitted fabrics – circular and flat weft knit techniques, applications; spacer fabrics – weft and warp knit techniques, applications

UNIT III BRAIDED FABRICS 12
Principle and production of 3-D braided structures - Cartesian braiding, rotary braiding, and hexagonal; advances in track and column braiding - production of tubular and bifurcated structure; applications.

UNIT IV AUXETIC FABRICS 12
Introduction to auxetic materials – polymer, fiber and yarn; auxetic fabric structure; principle and production of woven, weft knit, warp knit and nonwoven auxetic fabrics; 3D auxetic fabrics; braided auxetic fabrics; applications

UNIT V SMART FABRICS 12
Definition and classifications; production and development of smart fibre and yarn; smart fabric structure and preparation - weaving, knitting and braiding technique; applications

TOTAL: 60 PERIODS

OUTCOMES
Upon completion of this course, the student shall be able to understand
- CO1: advancement in weaving and 3D weaving techniques
- CO2: advanced knit structures and techniques
- CO3: advancements in braiding techniques
- CO4: auxetic structures and their production methods
- CO5: smart fabric and their production methods

TEXT BOOKS

REFERENCES:
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<th>Course Outcomes</th>
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1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively
OBJECTIVES
To enable the students to learn about

- Fibre forming polymer characteristics and their related models and models describing fibre structure.
- Conducting of experiments to characterize the polymers and fibres

UNIT I
9
Synthetic fibre forming polymers, definition, terms and fundamental concepts of polymerization; molecular architecture in polymers-configuration and conformation, molecular weight and its influence on fibre formation

UNIT II
9
Glass transition temperature (Tg), factors affecting Tg, WLF equation; rubber elasticity; melting and crystallization, polymer solutions- solubility parameter and its significance to fibre spinning.

UNIT III
9
Newton’s law of viscosity, velocity distribution in flow systems Newtonian and non-newtonian fluids; mass transfer operations: Fick’s law of diffusion, solid-liquid extraction and drying operations with application to polymer chips.

UNIT IV
9
Deformation of elastic solid, viscoelasticity and its measurement, non-linear viscoelasticity, yield behavior of solids and breaking phenomena

UNIT V
9
Mechanical properties of natural and synthetic fibres; moisture sorption behaviour of natural and synthetic fibres; Thermal, Frictional an optical properties of fibres

TOTAL: 45 PERIODS

OUTCOMES
Upon completion of this course, the student shall

- CO1: Be able to understand the synthesis of polymers
- CO2: Be able to correlate the properties of polymers
- CO3: Be able to understand rheological characteristics
- CO4: Know about viscoelastic behavior of polymers
- CO5: Be able to correlate the properties of fiber

TEXT BOOKS
REFERENCES

## Course Articulation Matrix:

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<td>Understand the synthesis of polymers</td>
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<td>Correlate the properties of polymers</td>
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<td>Understand rheological characteristics</td>
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<td>CO4</td>
<td>Know about viscoelastic behaviour of polymer</td>
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<td>Able to correlate the properties of fibre</td>
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1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively.
OBJECTIVES
To make the students to learn about the
- Probability distributions, sampling and testing of hypothesis
- Process control using charts and process capability
- Design of experiments for textile applications and
- Modeling the probabilistic phenomena

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
2k full-factorial designs; composite designs; robust designs; development of regression models, regression coefficients; adequacy test; process optimizations.

TOTAL: 60 PERIODS

OUTCOMES
Upon completion of this course, the student shall be able to
- CO1: Understand the probability distribution
- CO2: Carryout hypothesis testing
- CO3: Carryout ANOVA and nonparametric tests
- CO4: Construct control charts for understanding the process
- CO5: Design the experiment, conduct statistical tests and analyse the results to arrive at the conclusion

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<td>Construct control charts for understand the process</td>
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<td>Design the experiment, conduct statistical tests and analyse the results to arrive at the conclusion</td>
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1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively.
COURSE OBJECTIVES:
To impart knowledge and skills required for research and IPR:
- Problem formulation, analysis and solutions.
- Technical paper writing / presentation without violating professional ethics
- Patent drafting and filing patents.

UNIT I    RESEARCH PROBLEM FORMULATION  6
Meaning of research problem- Sources of research problem, criteria characteristics of a good research problem, errors in selecting a research problem, scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, necessary instrumentations

UNIT II   LITERATURE REVIEW  6
Effective literature studies approaches, analysis, plagiarism, and research ethics.

UNIT III  TECHNICALWRITING /PRESENTATION  6
Effective technical writing, how to write report, paper, developing a research proposal, format of research proposal, a presentation and assessment by a review committee.

UNIT IV   INTRODUCTION TO INTELLECTUAL PROPERTY RIGHTS (IPR)  6

UNIT V    INTELLECTUAL PROPERTY RIGHTS (IPR)  6

COURSE OUTCOMES:
1. Ability to formulate research problem
2. Ability to carry out research analysis
3. Ability to follow research ethics
4. Ability to understand that today’s world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity
5. Ability to understand about IPR and filing patents in R & D.

TOTAL: 30 PERIODS
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REFERENCES:

OBJECTIVES:
To enable the students to learn about
  • Characteristics of textile materials and their related models to describe their properties.
  • Conducting of experiments to characterize the polymers and fibres

LIST OF EXPERIMENTS
1. Molecular weight determination using GPC
2. Rheological studies using Brookefield viscometer
3. Determination of MFI
4. Birefringence measurement
5. Creep and Stress relaxation of filament
6. DSC Thermogram analysis of different fibres
7. Thermal stability studies on fibres
8. Analysis - FTIR and NMR graphs
9. Determination 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 of contact angle for porous substrates

TOTAL: 90 PERIODS

OUTCOMES:
Upon the completion of this course the student will be able to

  CO1: Understand and analyze the characteristics of textile materials using advanced characterizing techniques
  CO2: Analyze the graphs, charts of TGA, FTIR spectrometer and X-ray Diffractometer
  CO3: Evaluate fabric finishes and nature of fabrics
  CO4: Determine the property of liquids
  CO5: Characterize the porous substrates
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1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively.
**OBJECTIVE**
To enable the students to learn about the moisture distribution in textiles during dyeing and printing applications.

**UNIT I  FUNDAMENTALS ON WETTING**
Surfacetension of liquids and theories on its measurements; equilibrium state of a liquid on a solid; solid-liquid interaction in immersion, penetration, adhesion, and spreading.

**UNIT II  CHARACTERIZATION OF WETTING**
Determination of wetting force and work of adhesion; measurement of contact angle using goniometry and tensiometry; critical assessment of the above techniques.

**UNIT III  WETTING OF FIBRES AND FABRICS**
Wettability assessment of fibres and filaments using goniometry and tensiometry; importance of wetting of fabrics and its assessment.

**UNIT IV  WICKING IN YARNS AND FABRICS**
Fundamentals of wicking; wicking in yarns and its measurement; wicking in fabrics from an infinite and finite reservoirs; studies on factors affecting wetting and wicking in fibres and fibrous assemblies; mathematical models of wetting and wicking.

**UNIT V  APPLICATION**
Areas of wetting and wicking of fibrous materials; role of wetting and wicking on comfort behaviour of textiles; significance of wetting and wicking in medical and hygiene products; usefulness of wetting and wicking in industrial and domestic products.

**OUTCOMES**
On completion of this course, the students shall have the knowledge on the

- **CO1**: Fundamentals of wetting and wicking
- **CO2**: Characterization of wetting
- **CO3**: Liquid-fibre interaction during of fiber and fabrics
- **CO4**: Surface energy of the fabric
- **CO5**: Application of wetting and wicking

**TEXTBOOKS**


**REFERENCES**

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<td>Liquid-fibre interaction during of fiber and fabrics</td>
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<td>Surface energy of the fabric</td>
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</tbody>
</table>

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively.
OBJECTIVES
To make the students to
- Understand different characteristics of yarns
- Understand testing of yarn
- Analyze the various reports generated during quality evaluation of yarns and
- Interpret the results obtained through these reports for process and quality control.

UNIT I  MASS VARIATION OF TEXTILE STRANDS  6
Depiction of mass variation of textile strands in time and frequency domain; interpretation and significance of U% and CV% for textile strands; irregularity index

UNIT II  VARIANCE LENGTH CURVE  6
Effect of specimen length and total length on mass variation measurements of textile strands; theory of construction of VL curve; analysis of variance length curves to understand and avoid the introduction of mass variation during the spinning operation

UNIT III  SPECTROGRAM  6
Determination of periodic mass variation in the form of spectrogram; determination of theoretical wave length from spectrum; comparison between normal and ideal spectrum; type of faults and their representation in spectrogram; interpretation of superimposed waves in spectrogram

UNIT IV  TENSILE PROPERTIES  6
Influence of testing factors on yarn tensile properties; measurement and application of yarn modulus; creep and stress relaxation of yarn; significance of estimating minimum yarn strength

UNIT V  YARN DEFECTS  6
Classification and analysis of yarn faults created by mass variation, their causes and remedies; yarn faults in fabrics - causes and remedies

LABORATORY:
Measurement and analysis of
1. U% of sliver, roving and yarn
2. Imperfections and hairiness of yarn
3. Tensile properties
4. Creep and stress relaxation
5. Yarn fatigue
Analysis of
6. Variance-length curve
7. Spectrogram
8. Yarn faults

OUTCOME:
On completion of this course, the students can
- CO1: Understand different methods of depicting mass variation of strand
- CO2: Analyze and interpret VL curve
- CO3: Analyze and interpret spectrogram in finding faulty machine elements
- CO4: Analyze the tensile values of strand
- CO5: Analyze classified faults and other faults present in the yarn and apply knowledge in reducing yarn faults

TOTAL: 30 PERIODS
TEXT BOOKS

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<td>CO5</td>
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1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively.
OBJECTIVES
To make the students understand
- Nature of fabric failure
- Analyzing low stress mechanical and comfort properties
- Fabric appearance and their properties

UNIT I MECHANICS OF FABRIC FAILURE 6
Mode of fabric failure – tensile, tear, abrasion, slippage, bursting and fatigue; influence of fibre and yarn characteristics, and fabric structure on fabric failure

UNIT II LOW STRESS MECHANICAL PROPERTIES 6
Analysis and interpretation of low stress mechanical properties measured using Kawabata Evaluation System - tensile, compression, bending, shear and buckling deformation; influence of low stress mechanical properties of fabrics on fabric handle, tailorability and sewability

UNIT III COMFORT PROPERTIES 6
Influence of fibre and yarn characteristics, and fabric structure on air permeability, water vapour permeability, resistance to penetration of liquid water, resistance to flow of heat; static electricity measurement and control; influence on comfort properties

UNIT IV FABRIC APPEARANCE AND OTHER PROPERTIES 6
Role of drape, formability, crease recovery, wrinkle recovery, pilling resistance, dimensional stability on fabric appearance; influence of fibre and yarn characteristics, and fabric structure on the above fabric properties

UNIT V PROPERTIES OF TECHNICAL TEXTILES 6
Selection of fibre, yarn and fabric for achieving flame resistance, impact resistance, absorbency, water resistance, filtration efficiency

TOTAL: 30 PERIODS

LABORATORY
1. Analysis of KES data
2. Measurement and analysis of air permeability, filtration efficiency of fabrics
3. Measurement and analysis of tensile and flexural properties of textile materials
4. Measurement and analysis of water vapour permeability and thermal conductivity characteristics

TOTAL: 30 PERIODS

OUTCOMES
Upon completion of this course, the student shall have the knowledge on the
- CO1: Mode of failure of fabrics and influencing parameters
- CO2: Kawabata evaluation system
- CO3: Fabric role on comfort
- CO4: Fabric properties and appearance
- CO5: Technical textile properties

TEXT BOOKS
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1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively.
OBJECTIVE:
To enable the students to test and analyze the given product that include identification of fibre, yarn and fabric specifications and method of production of same

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

TOTAL: 120 PERIODS

OUTCOMES:
Upon the completion of this course the student will be able to

- CO1: Identify the materials used in the product
- CO2: Carryout confirmative tests to identify specifications of materials used
- CO3: Suggest the production process required to make the product
### Course Articulation Matrix:

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<td>Identify the materials used in the product</td>
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<td>Carry out confirmative tests to identify specifications of materials used</td>
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1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively.
OBJECTIVES
To enable the students to learn the
- Theory of yarn formation by rotor, friction, air-jet, air vortex and other spinning systems and
- Effect of process parameters used in the spinning system on yarn quality and production

UNIT I    Rotor Spinning I
Principle of open end spinning; description of the working of the rotor spinning; requirements of the raw materials; preparation of the sliver for rotor spinning; yarn formation and its structure; yarn withdrawal and winding

UNIT II    Rotor Spinning II
Design of rotor, opening roller, transport tube, navel and their implications on production and yarn quality; developments in rotor spinning machine; production limits; process control; techno economic comparison with ring spinning; structure property relationship

UNIT III    Friction Spinning
Principle of yarn formation - DREF-2, DREF-3 spinning systems; developments in friction spinning systems, raw material requirement, theory of yarn formation, effect of process variables on yarn quality, application of these machines for different end products, economics; technological limitations; structure property relationship

UNIT IV    Air-Jet and Airvortex Spinning
Description of yarn production in air-jet spinning machine; structure and quality of the air-jet spun yarn, raw materials requirement, process variables; theory of yarn formation by Air vortex system, raw material requirement and structure; structure property relationship

UNIT V    Other Spinning Technologies
Production of yarn in PLYfil, self-twist, electrostatic, Bobtex spinning systems; working details of production of double-rove yarns, wrap yarns and core spun yarns; raw material requirement in these systems; economics of these methods of yarn production; yarn characteristics and their applications; structure property relationship

TOTAL: 45 PERIODS

OUTCOMES
Upon completion of this course, the student shall be able to understand the
- CO1: Theory of yarn formation in open end spinning and production of yarn in rotor spinning system
- CO2: Design of important elements of rotor spinning machine
- CO3: Theory of yarn formation in friction spinning system and structure of yarn
- CO4: Theory of yarn formation in air-jet and Air vortex spinning system and structure of yarns
- CO5: Principle of yarn production by other spinning systems and double rove spinning

TEXT BOOKS
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1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively.
OBJECTIVE:
To enable the students to understand and apply process and quality control measures during spinning of yarn to optimize the productivity and quality

UNIT I  LEVELLING
Quality measures and control of intermediate products to achieve required yarn count with minimum dispersion; different levelling methods adopted in the pre-spinning machines; assessment and control of auto levelling; importance of fibre-mix homogeneity on yarn quality; types and levels of mixing in the preparatory processes; assessment of fibre-blend variations, effect of blend variation on fabric quality

UNIT II  NEP AND HOOK REMOVAL
Causes of nep and hook formation, control measures; measurement of neps and hooks; factors influencing the removal of neps in the carding and combing machines; fibre hook straightening during the preparatory operations, factors

UNIT III  WASTE CONTROL
Waste determination and cleaning efficiency; control of waste in blowroom, card and combers; influence of machine and processing parameters on waste removal; controlling the lint content in waste; control of pneumafil waste, hard waste in ring frame; determination of yarn realization; centralized waste collection system

UNIT IV  PRODUCTION CONTROL
Balancing of machinery; factors affecting the production limits of the spinning machinery; new concepts in achieving higher production in the spinning machinery; computation of the productivity indices; automation, improving production and labour efficiency

UNIT V  HUMIDITY CONTROL AND MACHINERY MAINTENANCE
Effect of humidity, temperature and maintenance of machinery on production and quality of yarn, optimizing ambiance and humidity control; process conditions required for producing polyester, viscose and blended yarns; yarn defects – causes and remedies

TOTAL: 45 PERIODS

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

CO1: Quality control measures in terms of levelling of material
CO2: Control of neps and hooks
CO3: Factors influencing production rate and efficiency of spinning machines
CO4: Balancing of machinery, production and labour efficiency
CO5: Measures to be taken while processing manmade fibres, humidity control

TEXT BOOKS
REFERENCES

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1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively
OBJECTIVE:
To enable the students to understand different mechanisms of weft insertion, their advantages and limitations

UNIT I INTRODUCTION
Introduction to shuttleless weaving; advantages of shuttleless weaving, comparison with shuttle weaving; features of unconventional weaving; different selvedges: tucked-in, leno, fused, stitched, their mechanism of formation, their characteristics and uses; weft accumulator.

UNIT II PROJECTILE WEAVING MACHINE
Basic principle of projectile weaving; feeding of yarn to projectile; sequence of weft insertion; cam driven shedding; dwelling sley beat-up; torsion bar picking; energy utilization during picking.

UNIT III RAPIER WEAVING MACHINE
Classification based on type of rapier; system of weft insertion and number of rapiers; Sequence of weft insertion for Gabler and Dewas systems, their comparison; driving of flexible and rigid rapiers; asynchronized rapier timing; rapier buckling.

UNIT IV AIR-JET AND WATER-JET WEAVING MACHINES
Principle of weft insertion in air-jet weaving, air requirements; path of the yarn on loom; sequence of weft insertion; control of air stream by relay nozzle, confuser profile reed and suction; design of air jet nozzle, air drag force, factors affecting drag force; principle of weft insertion in water-jet weaving machine, path of the yarn on loom, quality of water required, sequence of weft insertion; design of water jet nozzle, merits and demerits of water jet weaving; fabric drying on loom

UNIT V MULTIPHASE WEAVING
Technological developments – models & features; functional description of multi-linear shed weaving – shed formation, filling insertion, beat-up, let-off, take-up and selvedge motion; characteristics of multi-linear shed weaving machine; circular and narrow fabric weaving

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of this course, the students will be able to know
- CO1: Overview of shuttles weaving technology
- CO2: Principle, concepts and features of projectile weaving machine
- CO3: Mechanisms of picking in rapier weaving machine
- CO4: Mechanisms of picking and merits and demerits of air jet, water jet
- CO5: Principle of fabric formation in multiphase weaving machine

TEXT BOOKS
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<td>Principle of fabric formation in multiphase weaving machine</td>
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</table>

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively
OBJECTIVE
To enable the students to learn about the structure of ideal and real yarn, migration of fibres in the yarn, breakage mechanism of yarn, mechanics of blended yarns and relationship between structure and property of yarns produced by different spinning systems.

UNIT I  YARN GEOMETRY  9
Elements of yarn geometry; helix geometry of yarn; yarn diameter, twist relationship; ideal packing of fibres in yarn; packing coefficient, estimation of packing density and radial packing density of yarn

UNIT II  MIGRATION OF FIBRES IN YARN  9
Twist contraction and retraction; geometry of folded yarns; migration characteristics in continuous filament and spun yarns; effect of various parameters on migration; measurement of fibre migration in yarn; effect of migration on tensile behavior and hairiness of the yarn

UNIT III  YARN MECHANICS  9
Analysis of breakage of yarn; effect of twist on strength and elongation at break of filament yarn; relationship between elongation at break of filament and yarn; prediction of breakage - continuous filament yarn; model - breakage of spun yarn, effect of twist

UNIT IV  BLENDED YARN MECHANICS  9
Blend irregularity; measurement of blending irregularity, effect on fabric properties; concept of elongation balance; effect of properties of constituent fibres and blend composition on behavior of blended yarns

UNIT V  STRUCTURE - PROPERTIES RELATIONSHIP  9
Structure - property relationship of yarns produced from different spinning systems; effect of fibre properties and geometrical configuration of yarn on properties of ring yarn; comparison of ring and compact spun yarn based on structure

TOTAL: 45 PERIODS

OUTCOMES
On completion of this course, student would understand
- CO1: Yarn geometry and packing density
- CO2: Migration of fibres in yarn
- CO3: Breaking mechanics of yarn
- CO4: Mechanics of blended yarn
- CO5: Structure and properties relationship of yarn

TEXT BOOKS

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1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively.
OBJECTIVE
To enable the students to learn about the theory of drafting process and drafting irregularities

UNIT I DRAFTING
Definition of ideal drafting, model; conditions required to achieve ideal drafting in a roller drafting system; deviations from ideal drafting during actual drafting; definition of drafting wave; condition for drafting wave formation during roller drafting; estimation of the magnitude of the irregularity caused by the occurrence of drafting wave.

UNIT II DRAFTING FORCE
Roller drafting - forces acting on a fibre during drafting at different positions in drafting zone; measurement of drafting force; factors affecting drafting force; methods to avoid drafting wave formation; role of apron in controlling drafting wave formation; limitations of apron in roller drafting system.

UNIT III OTHER DRAFTING IRREGULARITIES
Definition of roller slip; conditions for the formation of forward and backward slips in the roller drafting systems; measures to avoid roller slip occurrence, causes for roller nip movement, model; roller speed variation during drafting and their effect on irregularity formation; control of the irregularity formed due to these sources.

UNIT IV COMPARISON
Comparison of roller drafting system with wire point drafting system; application of wire point drafting in card and rotor spinning machine; comparison of roller drafting in drawframe, comber preparatory, comber, speed frame, ring frame and air-jet spinning system.

UNIT V COMPACT SPINNING
Spinning triangle – formation, factors affecting dimensions, effect on yarn quality; condensed yam spinning – principle, different methods.

TOTAL 45 PERIODS

OUTCOMES:
On completion of this course, student would understand
- CO1: Theory of ideal drafting and formation of drafting wave
- CO2: Drafting force its measurement and influence
- CO3: Different causes for irregularities in textile strand
- CO4: Comparison of wire and roller drafting system and the drafting systems used in different spinning machinery
- CO5: Compact spinning, principle and different methods

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1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively
OBJECTIVE
To enable the students to learn about the principle of twist insertion in different spinning systems

UNIT I FUNDAMENTALS OF TWISTING
Mechanics of imparting strength to a staple-fibre strand by twisting; meaning of twist multiplier and the basis of selection of required twist; principle of false twisting; fundamental requirements to create real twist in the strand.

UNIT II TWISTING IN RING SPINNING
Principle of twist insertion in ring spinning; limitations of ring twisting; mechanics of balloon formed during twisting, yarn tension; influence of twisting on spinning triangle size and the subsequent effect on yarn quality and spinning performance; design features of rings and travelers used for twisting different types of yams.

UNIT III TWISTING IN OPEN-END SPINNING
Principle of twist insertion in open-end spinning; application of this principle in rotor spinning and friction spinning machines; advantages of this method of twisting over ring twisting method; comparison of yarn tension developed during twisting in these two machines.

UNIT IV TWISTING IN AIR-JET AND AIR-VORTEX SPINNING
Principle of twist formation in air-jet, air vortex spinning; the merits and demerits of these methods of twisting; factors influencing twist insertion

UNIT V TWO-FOR-ONE TWISTING
Principle of two-for-one twisting; twisting of yarns in double-rove fed spinning machines; operating principle involved in the twisting of core spun yarns, wrap-spun yarns; self-twist spinning; electrostatic spinning

TOTAL 45 PERIODS

OUTCOMES
Upon completion of this course, the student shall able to understand
CO1: Fundamentals of twisting
CO2: Theory of twisting at ring frame
CO3: Twisting principle of open end spinning and application in rotor and friction spinning systems
CO4: Twisting in air-jet and air-vortex spinning
CO5: Principle and method of twisting in two for one twisting system and other spinning systems

TEXT BOOKS:
REFERENCE:

4. Lord P.R., Yarn Production: Science, Technology and Economics, The Textile Institute, Manchester, 1999
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OBJECTIVE
To enable the students to learn about the manufacturing of nonwovens and their properties

UNIT I INTRODUCTION 9
Recapitulation of web preparation by dry and wet method and bonding by mechanical, thermal and chemical methods; brief outline of nonwoven manufacture by spun bonding and melt blown processes

UNIT II WEB QUALITY 9
Effect of web quality on nonwoven quality; mechanisms of web forming machines and processes to achieve uniformity in web; process control tools used for maintaining web quality

UNIT III NEEDLE PUNCHED NONWOVENS 9
Design of needles and its effect on needle punched fabric structure and quality; type of fibres and its characteristics which affect fabric quality; horizontal and vertical structure in needle punched fabrics, and their contribution to fabric properties; needle machine parameters that affect fabric structure and properties

UNIT IV HYDRO-ENTANGLED, THERMAL AND CHEMICAL BONDED NONWOVENS 9
Effect of water jets on fibres, effect of water pressure, number of manifolds and nozzles, and type of web support systems used in spun laced nonwoven production on fabric structure and properties; effect of type of heat transfer method on thermal bonded nonwoven structure and properties; effect of process and material variables on the structure and properties of thermal and chemical bonded nonwovens

UNIT V MELT BLOWN AND SPUN BONDED NONWOVENS 9
Effect of material and process variables like type of polymer, molecular weight, polymer and air temperature, collector distance, primary and secondary air pressure in melt-blown nonwoven production on fabric structure and quality; factors affecting the structure of spun bonded fabrics and properties

TOTAL: 45 PERIODS

OUTCOMES
Upon completion of the course the student will be able to

- CO1: Know overview of nonwovens
- CO2: Understand the optimization of process in web preparation
- CO3: Process variables in needle punched nonwoven manufacture
- CO4: Process control in hydro entangling, thermal and chemical bonding
- CO5: Process control in melt blown and spun bonded fabrics

TEXT BOOKS

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1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively.
OBJECTIVE
To enable the students to learn about geometry of fabric, mechanics of fabric deformation fabrics

UNIT I GEOMETRY OF CLOTH STRUCTURE 13
Geometry of plain and non-plain weaves; Peirce and Olofsson models; crimp ratio and thread spacing; jamming of threads; crimp interchange, balance of crimp.

UNIT II FABRIC DEFORMATION 9
Fabric deformation under tensile stress; prediction of modulus; tensile properties in bias direction

UNIT III OTHER FABRIC DEFORMATION 9
Compression, shear, bending and buckling; fabric handle; spirality and skewness formation and control

UNIT IV KNITTED FABRIC STRUCTURES 9
Geometry of weft and warp knitted structures, influence of friction on knit geometry; load extension of warp knit fabrics; biaxial stress behavior of plain-knit fabrics

UNIT V NONWOVEN STRUCTURES 5
Structure of felts; mechanical behavior of needle felts; structure of stitch bonded fabrics

TOTAL: 30 PERIODS

OUTCOMES:
Upon completion of the course, the student will be able to

CO1: Understand the geometry of woven cloth
CO2: Know fabric deformation under tensile stress
CO3: Understand the mechanics of other fabric deformations
CO4: Know the mechanics of knitted fabric structure
CO5: Understand the structure of nonwovens

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1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively.
OBJECTIVE
To enable the students to learn about characterization of polymers used in the production of textile fibres

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.

TOTAL: 45 PERIODS

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

CO1: Determine the molecular weight using various techniques
CO2: Interpret molecular structure obtained from various analytical instruments
CO3: Determine the thermal properties using various instruments
CO4: Understand microscopy
CO5: Understand the properties of textile polymers

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OBJECTIVE:
To enable the students to understand the theory of colour and measurement of colour

UNIT I LIGHT-MATTER INTERACTION 9
Electromagnetic spectrum – the optical region, interaction of light with matter a) Transparent case–Beer’s Law and Lambert’s Law b) Opaque case – reflection absorption and scattering, the concept of “Radiative Transfer Theory” and its simplification into the Kubelka – Munk model

UNIT II HUMAN COLOUR VISION 9
Colour sensation – physiological and psychological mechanism of colour vision; colour vision theories; defects in colour vision; colour vision tests; additive and subtractive colour mixing and confusion in colour perception

UNIT III COLOUR ORDER SYSTEMS 9
Description of colour, various colour order systems, CIE numerical system for colour definition and its components – illuminants, the versions of the standard observer, the colour scales, chromaticity diagram.

UNIT IV METAMERISM AND COLOUR DIFFERENCE ASSESSMENT 9
Metamerism – types and its assessment, metamerism in textile materials; colour differences – visual assessment, standard conditions, methods and problems, assessment of colour difference, non-linearity of subjective perception of colour, need for specific colour difference systems, setting up of objective pass/fail standards.

UNIT V NUMERICAL COLOUR MATCHING 9
Reflectance and K/S value, relationship between dye concentrations and a) reflectance values and b) K/S values, reflectance and K/S curves of dyed samples; CIE model for computer colour matching and the calculation of colour recipes; non CIE models for colour matching, limitations of computer colour matching

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of this course, the students shall be able to know about
  CO1: Light matter interaction using various theories and laws
  CO2: Colour vision theories, tests and colour mixing
  CO3: Concepts of colour and colour order system
  CO4: Concepts of Metamerism, colour difference assessment
  CO5: Numerical colour matching

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OBJECTIVES

- Enzymes, types and kinetics of enzyme reaction on textile fibres
- Application of enzymes on different fibres and

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-catalyzed reactions; basics of kinetics of multi-substrate enzyme-catalyzed 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 bio sorption and enrichment cultures

TOTAL: 45 PERIODS

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

CO1: Classification, characteristics and activity of enzymes
CO2: Kinetics of single and multi-substrate enzyme
CO3: Activity of enzyme on cotton fibres
CO4: Activity of enzyme on protein and synthetic fibres
CO5: Application of enzymes for effluent treatment

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OBJECTIVE
To enable the students to learn about advanced spinning technology for manufacturing high performance fibres, their properties and applications

UNIT I
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
Manufacturing, properties and applications - glass fibres, basalt fibres; carbon fibres, ceramic fibres

UNIT III
Manufacturing, properties and applications - alginate fibres; chitosan fibres; regenerated protein fibres – silk, wool, casein, soy bean fibre; synthetic biodegradable fibres

UNIT IV
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
Manufacturing, properties and applications - hollow fibres, profile fibres blended and bi-component fibres, film fibres; functionalization of fibres – methods and applications

TOTAL: 45 PERIODS

OUTCOMES
Upon completion of this course, the student shall be able to understand
CO1: Method of producing high performance fibres
CO2: High performance fibres for industrial applications
CO3: Manufacturing of biodegradable and protein fibres and their properties
CO4: Manufacturing of chemical resistant fibres and their properties
CO5: Manufacturing of specialty fibres and their properties

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OBJECTIVE
To enable the students to learn about pollutants from textile chemical processing industry, treatment and Government regulations

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, 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
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 know about

- CO1: Pollution control policies and Government regulations
- CO2: Method of treatment of waste water from processing industry
- CO3: Managing pollutants as per Government regulations
- CO4: Eco labeling, eco friendly textile processes
- CO5: Solid and hazardous waste management in textile industry

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1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively
OBJECTIVE
To enable the students to learn the production and applications of coated and laminated textile and their testing

UNIT I POLYMERS USED IN COATING
Natural Latex & synthetic rubbers, synthetic polymers: polyurethanes, poly (vinyl chloride), polyacrylate elastomers, silicone elastomers, poly (Tetrafluoroethylene), polyethylene, chlorinated and chlorosulphonated polyethylenes, foams for laminates; textile substrate for coating

UNIT II METHODS OF COATING
Knife coating, roll coating, dip coating, transfer coating, gravure coating, rotary screen printing, calendaring, hot melt coating, foam coating, lamination by adhesives, welding.

UNIT III END USES OF COATING I
Breathable textiles, microporous coatings and films, hydrophilic coatings, smart temperature responsive breathable coatings; synthetic leather, architectural textiles, fluid containers, tarpaulins, automotive applications, carpet backing, flocking, fusible interlinings.

UNIT IV END USES OF COATING II
Thermochromic fabrics, temperature adaptable fabrics, fabrics for chemical protection, camouflage nets, high visibility garments, intumescent coating, metal and conducting polymer coated fabrics, coating with hydrogel and shape memory polymers

UNIT V CHARACTERIZATION OF COATED TEXTILES
Tensile strength, elongation, adhesion, tear resistance, weathering behavior, microbiological degradation, yellowing, testing standards

TOTAL: 45 PERIODS

OUTCOMES
Upon completion of this course the student shall know

CO1: Different kinds of polymers used for coating and laminating
CO2: Different methods of coating and laminating
CO3: Application of coated and laminated textiles in different industry
CO4: Characterization of coated textiles

TEXT BOOKS

REFERENCES
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1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively.
OBJECTIVE
To enable the students to learn the concepts of sustainability and its importance in textile industry

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

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

OUTCOMES
Upon completion of this course the student shall be able to understand the
CO1: Concept of sustainability and importance
CO2: Sustainability in textile fibre production
CO3: Sustainability in in dyeing of textiles
CO4: Importance of recycling in textile industry
CO5: Eco-labelling and eco-designing

TEXT BOOKS

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1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively.
OBJECTIVES
To enable the students to learn about
- Different types of biomaterials and
- Biomedical application of textile products

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

UNIT III
Bandages and pressure garments - elastic and non-elastic compression bandages, support and retention bandages; 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; ethical issues, clearance; disposal of medical products

TOTAL: 45 PERIODS

OUTCOMES
Upon completion of this course, the student shall know the

- CO1: Types of materials used for biomedical applications
- CO2: Health care and hygiene products
- CO3: Different types of bandages
- CO4: Wound dressing construction, testing
- CO5: Implantable products, scaffolds for tissue engineering, ethical issues

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1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively.
OBJECTIVES:
To enable the students to learn about

- Functional requirements of protective clothing
- Selection of fibre, yarn and fabric for developing protective clothing
- Evaluation of protective clothing

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-bacterial 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

OUTCOMES:
Upon completion of the course, the students will be able to understand
CO1: Properties of fibres required for protective clothing
CO2: Selection of fibre, yarn and fabric for developing protective clothing for different applications
CO3: Protective clothing construction
CO4: Different types of finishes given to develop protective clothing
CO5: Evaluation of protective clothing

TEXT BOOKS
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1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively
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
Introduction – composites – classification and application; reinforcements- fibres and its properties; preparation of reinforced materials and quality evaluation; preforms for various composites

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

UNIT III COMPOSITE MANUFACTURING
Classification; methods of composites manufacturing for both thermoplastics and thermosets- Hand layup, Filament Winding, Resin transfer moulding, prepregsand 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, inter laminar 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 inter laminar stresses using at ware

TOTAL: 45 PERIODS

OUTCOMES
Upon completion of this course, the student shall be able to
- CO1: Understand different types of textile reinforcements
- CO2: Understand different types of matrices
- CO3: Understand manufacturing of composites
- CO4: Evaluate the properties of thermoset and thermoplastic composite
- CO5: Mechanics of composites failure

TEXT BOOKS

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1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively.
OBJECTIVES
To enable the students to learn about
- Textiles used for civil construction and transportation applications and their functional requirements and
- Evaluation of textile materials used for civil construction and transportation applications.

UNIT I  GEO TEXTILES I
Geo textile – definition, types, functions; types of fibers and fabrics used in geo textiles; applications of natural fibers in geo-textiles; joining of geo- textiles

UNIT II  GEO TEXTILES II
Usage of geo-synthetics in civil engineering applications as filters, reinforcement, separation and drainage medium; material specifications and design criteria of geo-synthetics for specific applications

UNIT III  ARCHITECTURE TEXTILES
Fiber and fabric property requirements for architecture textiles; coated textiles; Tents, Awnings and Canopies; Inflatable structures – high pressure and low pressure inflatable structures; textile for roofing applications; acoustic and heat insulation textiles; floor and wall covering, scaffolding nets

UNIT IV  TRANSPORTATION TEXTILES
Quality and design of textile materials used in automobiles – tire cord, filter, air bag, belt, seat cover, noise insulation; design and development of textile reinforced composites in automobile and aeronautic industry.

UNIT V  EVALUATION
Evaluation of textile material used in civil construction and transportation industry in terms of performance, construction survivability and durability

TOTAL: 45 PERIODS

OUTCOMES
Upon completion of this course, the student shall be able to
CO1: Understand the requirements of textiles used for civil construction and transportation applications and
CO2: Understand geo synthetics in civil engineering applications
CO3: Design the textiles for the architectural applications
CO4: Design of textile materials for automobile industry
CO5: Evaluation of textiles to be used for civil construction and transportation industry

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OBJECTIVE
To enable the students to learn about the principles of filtration and textile materials used for filtration process

UNIT I BASIC PRINCIPLES
Filtration and separation, contaminants, surface and depth filtration; filter ratings and filter test, dust collection – theory and principles, practical implications, cleaning mechanisms; fabric design and selection considerations; filter media: introduction, absorbent, adsorbent and biological filter media, paper and fabrics, woven wire and screens, constructed filter cartridges, membranes, packed beds; types of filters.

UNIT II TEXTILE FILTERS & FINISHING TREATMENTS
Fabric construction - woven fabrics, needle felts, knitted fabrics; heat setting, singeing, raising, calendaring, chemical treatments, special surface treatments

UNIT III LIQUID AND OIL FILTRATION
Water filters, waste water treatments, surface treatment chemicals; oil and hydraulic systems; engine filters, oil-water separators, oil cleaning and hydraulic systems. gas filtration-introduction, engine filters, oil-water separators, oil cleaning, hydraulic systems

UNIT IV TEXTILE FILTER IN SOLID-LIQUID SEPARATION
Introduction, fabric design/selection consideration, filtration equipment, considerations; yarn types and fabric constructions - monofilaments, multi filaments, fibrillated tape (split film) yarns, staple-fibre yarns, yarn combinations; fabric constructions and properties - plain weave, twill weaves, satin weaves, duplex and semi duplex weaves, link fabrics, needle felts

UNIT V GAS FILTRATION
Introduction, indoor air quality, fume and vapour emissions, dust collectors, machine air intake filters, vehicle cabin filters, compressed air filtration, pneumatic systems, sterile air and gas filters, respiratory air filters

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of this course, the student shall be able to understand
CO1: Principles of filtration
CO2: Fabric construction and finishing treatments of filtration textiles
CO3: Concepts of liquid and oil filtration
CO4: Concepts of solid liquid separation
CO5: Types of Gas filters

TEXT BOOKS

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OBJECTIVES
To enable the students to learn about
- Important characteristics of fabric that are responsible for its comfort properties and
- Different phenomena which take place in the fabric related to the comfort properties of
  the fabric.

UNIT I  FABRIC HAND  9
Definition and concept of fabric hand; elements relating to fabric hand; development of fabric
hand evaluation - subjective evaluation of fabric hand; objective evaluation of fabric hand - The
El Mogahzy–Kilinc hand method. effects of fibre and yarn properties on fabric hand.

UNIT II  CHARACTERISTICS OF POROUS MATERIALS  9
Geometrical characterization of single fibres; structural analysis of fibrous materials with fibre
orientations; determination of the fibre orientation; characterization of porous fibrous materials;
pore distribution in a fibrous material

UNIT III  MOISTURE VAPOUR TRANSFER AND INTERACTIONS  9
Mass transfer by diffusion; moisture vapour transfer – principle of moisture diffusion, methods of
measurement of moisture vapour transfer; concept of moisture management tester; effect of
fibre, yarn and fabric parameters on moisture vapour transfer

UNIT IV  HEAT TRANSFER AND INTERACTIONS  9
Thermal conduction in fibrous materials – thermal conduction analysis; Effective thermal
conductivity (ETC) for fibrous materials; prediction of ETC by thermal resistance networks,
volume averaging method and homogenization method; structure of plain weave woven fabric
composites and the corresponding unit cell

UNIT V  PHYSIOLOGICAL COMFORT  9
Neurophysiological comfort – basis of sensory perceptions, measurement techniques –
mechanical stimuli and thermal stimuli; fabric tactile and mechanical properties – fabric
prickliness, itchiness, stiffness, softness, smoothness, roughness, and scratchiness;
predictability of clothing comfort performance.

TOTAL: 45 PERIODS

OUTCOMES
Upon completion of this course, the student shall be able to understand
- CO1: Fabric hand and its comfort parameters
- CO2: Permeability and porous nature of fibrous assemblies
- CO3: Moisture vapour transfer phenomenon
- CO4: Heat transfer phenomenon
- CO5: Fabric properties with respect to comfort and correlate the property of the fabric
  with comfort to the wearer.

TEXT BOOKS
1. Hassan M. Behery, “Effect of Mechanical and Physical Properties on Fabric Hand”,

REFERENCES
   Progress, 32:2
2. Pan N. and Gibson P., Thermal and moisture transport in fibrous materials Wood
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1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively.
OBJECTIVES
To enable the students to
- recall the basics of dyes and their use in textile industry
- define functional dyes and recognize their use
- understand the application of functional dyes
- know the importance of toxicity and health aspects of dyes

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

OUTCOMES
Upon completion of this course the student shall be able to understand
- CO1: Chemical structure and properties of dyes
- CO2: Dyes used in textiles
- CO3: Functional dyes, their chemical structure and requirements
- CO4: Applications of the functional dyes in different industries
- CO5: Toxicity and health issues

TEXT BOOKS
REFERENCES

6. Non-Textile Dyes, Freeman H. S.
## Course Articulation Matrix:

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1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively.
OBJECTIVE
To enable the students to learn various finishes applied on the textile fabrics for different applications.

UNIT I THEORY OF DYEING
Dyeing equilibrium; dye-fibre interaction; adsorption isotherm; dye affinity; heat of dyeing; half dyeing time

UNIT II INK JET PRINTING
Concept and methods of inkjet printing; colour separation; selection of dyes and developments in inks; techno-economical features

UNIT III COATING
Coating polymers and auxiliaries, coating techniques and coated fabric assessment.

UNIT IV ENZYMES IN PROCESSING I
Enzymes – classifications of enzymes and nomenclature of enzymes, synthesis of enzymes, enzyme kinetics

UNIT V ENZYMES IN PROCESSING II
Substrates and their structure, scaling of enzyme production, textile processing enzymes

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of this course, the student shall be able to know about
CO1: Theories and concepts of dyeing
CO2: Concepts of ink jet printing
CO3: Different coating techniques
CO4: Overview of enzymes and enzymes usage in chemical processing

TEXT BOOKS

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1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively.
OPEN ELECTIVE COURSES (OEC)

OE5091 BUSINESS DATA ANALYTICS

OBJECTIVES:
- To understand the basics of business analytics and its life cycle.
- To gain knowledge about fundamental business analytics.
- To learn modeling for uncertainty and statistical inference.
- To understand analytics using Hadoop and Map Reduce frameworks.
- To acquire insight on other analytical frameworks.

UNIT I OVERVIEW OF BUSINESS ANALYTICS


Suggested Activities:
- Case studies on applications involving business analytics.
- Converting real time decision making problems into hypothesis.
- Group discussion on entrepreneurial opportunities in Business Analytics.

Suggested Evaluation Methods:
- Assignment on business scenario and business analytical life cycle process.
- Group presentation on big data applications with societal need.
- Quiz on case studies.

UNIT II ESSENTIALS OF BUSINESS ANALYTICS


Suggested Activities:
- Solve numerical problems on basic statistics.
- Explore chart wizard in MS Excel Case using sample real time data for data visualization.
- Use R tool for data visualization.

Suggested Evaluation Methods:
- Assignment on descriptive analytics using benchmark data.
- Quiz on data visualization for univariate, bivariate data.

UNIT III MODELING UNCERTAINTY AND STATISTICAL INFERENCE


Suggested Activities:
- Solving numerical problems in sampling, probability, probability distributions and hypothesis testing.
- Converting real time decision making problems into hypothesis.

Suggested Evaluation Methods:
- Assignments on hypothesis testing.
- Group presentation on real time applications involving data sampling and hypothesis testing.
UNIT IV  ANALYTICS USING HADOOP AND MAPREDUCE FRAMEWORK


Suggested Activities:
- Practical – Install and configure Hadoop.
- Practical – Use web based tools to monitor Hadoop setup.
- Practical – Design and develop MapReduce tasks for word count, searching involving text corpus etc.

Suggested Evaluation Methods:
- Evaluation of the practical implementations.
- Quizzes on topics like HDFS and extensions to MapReduce.

UNIT V  OTHER DATA ANALYTICAL FRAMEWORKS

Overview of Application development Languages for Hadoop – PigLatin – Hive – Hive Query Language (HQL) – Introduction to Pentaho, JAQL – Introduction to Apache: Sqoop, Drill and Spark, Cloudera Impala – Introduction to NoSQL Databases – Hbase and MongoDB.

Suggested Activities:
- Practical – Installation of NoSQL database like MongoDB.
- Practical – Demonstration on Sharding in MongoDB.
- Practical – Install and run Pig
- Practical – Write PigLatin scripts to sort, group, join, project, and filter data.
- Design and develop algorithms to be executed in MapReduce involving numerical methods for analytics.

Suggested Evaluation Methods:
- Mini Project (Group) – Real time data collection, saving in NoSQL, implement analytical techniques using Map-Reduce Tasks and Result Projection.

TOTAL: 45 PERIODS

OUTCOMES:

On completion of the course, the student will be able to:
- Identify the real world business problems and model with analytical solutions.
- Solve analytical problem with relevant mathematics background knowledge.
- Convert any real world decision making problem to hypothesis and apply suitable statistical testing.
- Write and Demonstrate simple applications involving analytics using Hadoop and MapReduce
- Use open source frameworks for modeling and storing data.
- Apply suitable visualization technique using R for visualizing voluminous data.

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OBJECTIVES:
- Summarize basics of industrial safety
- Describe fundamentals of maintenance engineering
- Explain wear and corrosion
- Illustrate fault tracing
- Identify preventive and periodic maintenance

UNIT I INTRODUCTION
Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1948 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and firefighting, equipment and methods.

UNIT II FUNDAMENTALS OF MAINTENANCE ENGINEERING
Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment.

UNIT III WEAR AND CORROSION AND THEIR PREVENTION

UNIT IV FAULT TRACING
Fault tracing-concept and importance, decision tree concept, need and applications, sequence of fault finding activities, show as decision tree, draw decision tree for problems in machine tools, hydraulic, pneumatic, automotive, thermal and electrical equipment's like, i. Any one machine tool, ii. Pump iii. Air compressor, iv. Internal combustion engine, v. Boiler, vi. Electrical motors, Types of faults in machine tools and their general causes.

UNIT V PERIODIC AND PREVENTIVE MAINTENANCE
Periodic inspection-concept and need, degreasing, cleaning and repairing schemes, overhauling of mechanical components, overhauling of electrical motor, common troubles and remedies of electric motor, repair complexities and its use, definition, need, steps and advantages of preventive maintenance. Steps/procedure for periodic and preventive maintenance of: i. Machine tools, ii. Pumps, iii. Air compressors, iv. Diesel generating (DG) sets, Program and schedule of preventive maintenance of mechanical and electrical equipment, advantages of preventive maintenance. Repair cycle concept and importance

OUTCOMES:
- CO1: Ability to summarize basics of industrial safety
- CO2: Ability to describe fundamentals of maintenance engineering
- CO3: Ability to explain wear and corrosion
- CO4: Ability to illustrate fault tracing
- CO5: Ability to identify preventive and periodic maintenance

TOTAL: 45 PERIODS
OE5093                          OPERATIONS RESEARCH                          LT P C
                                                                                     3 0 0 3

OBJECTIVES:

- Solve linear programming problem and solve using graphical method.
- Solve LPP using simplex method
- Solve transportation, assignment problems
- Solve project management problems
- Solve scheduling problems

UNIT I    LINEAR PROGRAMMING                           9
Introduction to Operations Research – assumptions of linear programming problems - Formulations of linear programming problem – Graphical method

UNIT II   ADVANCES IN LINEAR PROGRAMMING              9
Solutions to LPP using simplex algorithm- Revised simplex method - primal dual relationships – Dual simplex algorithm - Sensitivity analysis

UNIT III  NETWORK ANALYSIS – I                        9
Transportation problems -Northwest corner rule, least cost method, Voges’s approximation method - Assignment problem -Hungarian algorithm

UNIT IV   NETWORK ANALYSIS – II                       9
Shortest path problem: Dijkstra’s algorithms, Floyds algorithm, systematic method -CPM/PERT

UNIT V    NETWORK ANALYSIS – III                     9
Scheduling and sequencing - single server and multiple server models - deterministic inventory models - Probabilistic inventory control models

TOTAL: 45 PERIODS

OUTCOMES:

CO1: To formulate linear programming problem and solve using graphical method.
CO2: To solve LPP using simplex method
CO3: To formulate and solve transportation, assignment problems
CO4: To solve project management problems
CO5: To solve scheduling problems

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OE5094  COST MANAGEMENT OF ENGINEERING PROJECTS

OBJECTIVES:
- Summarize the costing concepts and their role in decision making
- Infer the project management concepts and their various aspects in selection
- Interpret costing concepts with project execution
- Develop knowledge of costing techniques in service sector and various budgetary control techniques
- Illustrate with quantitative techniques in cost management

UNIT I   INTRODUCTION TO COSTING CONCEPTS
Objectives of a Costing System; Cost concepts in decision-making; Relevant cost, Differential cost, Incremental cost and Opportunity cost; Creation of a Database for operational control.

UNIT II  INTRODUCTION TO PROJECT MANAGEMENT
Project: meaning, Different types, why to manage, cost overruns centres, various stages of project execution: conception to commissioning. Project execution as conglomeration of technical and nontechnical activities, Detailed Engineering activities, Pre project execution main clearances and documents, Project team: Role of each member, Importance Project site: Data required with significance, Project contracts.

UNIT III PROJECT EXECUTION AND COSTING CONCEPTS
Project execution Project cost control, Bar charts and Network diagram, Project commissioning: mechanical and process, Cost Behavior and Profit Planning Marginal Costing; Distinction between Marginal Costing and Absorption Costing; Break-even Analysis, Cost-Volume-Profit Analysis, Various decision-making problems, Pricing strategies: Pareto Analysis, Target costing, Life Cycle Costing.

UNIT IV  COSTING OF SERVICE SECTOR AND BUDGETERY CONTROL
Just-in-time approach, Material Requirement Planning, Enterprise Resource Planning, Activity-Based Cost Management, Benchmarking; Balanced Score Card and Value-Chain Analysis, Budgetary Control: Flexible Budgets; Performance budgets; Zero-based budgets.

UNIT V   QUANTITATIVE TECHNIQUES FOR COST MANAGEMENT
Linear Programming, PERT/CPM, Transportation problems, Assignment problems, Learning Curve Theory.

TOTAL: 45 PERIODS
OUTCOMES

CO1 – Understand the costing concepts and their role in decision making
CO2 – Understand the project management concepts and their various aspects in selection
CO3 – Interpret costing concepts with project execution
CO4 – Gain knowledge of costing techniques in service sector and various budgetary control techniques
CO5 - Become familiar with quantitative techniques in cost management

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REFERENCES:
2. Charles T. Horngren and George Foster, Advanced Management Accounting, 1988

OE5095 COMPOSITE MATERIALS

OBJECTIVES:
- Summarize the characteristics of composite materials and effect of reinforcement in composite materials.
- Identify the various reinforcements used in composite materials.
- Compare the manufacturing process of metal matrix composites.
- Understand the manufacturing processes of polymer matrix composites.
- Analyze the strength of composite materials.

UNIT I INTRODUCTION
Definition – Classification and characteristics of Composite materials - Advantages and application of composites - Functional requirements of reinforcement and matrix - Effect of reinforcement (size, shape, distribution, volume fraction) on overall composite performance.

UNIT II REINFORCEMENTS
Preparation-layup, curing, properties and applications of glass fibers, carbon fibers, Kevlar fibers and Boron fibers - Properties and applications of whiskers, particle reinforcements - Mechanical Behavior of composites: Rule of mixtures, Inverse rule of mixtures - Isostrain and Isostress conditions.

UNIT III MANUFACTURING OF METAL MATRIX COMPOSITES
UNIT IV MANUFACTURING OF POLYMER MATRIX COMPOSITES

UNIT V STRENGTH
Laminar Failure Criteria-strength ratio, maximum stress criteria, maximum strain criteria, interacting failure criteria, hygrothermal failure. Laminate first play failure-insight strength; Laminate strength-ply discount truncated maximum strain criterion; strength design using caplet plots; stress concentrations.

OUTCOMES:
- CO1 - Know the characteristics of composite materials and effect of reinforcement in composite materials.
- CO2 – Know the various reinforcements used in composite materials.
- CO3 – Understand the manufacturing processes of metal matrix composites.
- CO4 – Understand the manufacturing processes of polymer matrix composites.
- CO5 – Analyze the strength of composite materials.

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REFERENCES:
OBJECTIVES:
- Interpret the various types of wastes from which energy can be generated
- Develop knowledge on biomass pyrolysis process and its applications
- Develop knowledge on various types of biomass gasifiers and their operations
- Invent knowledge on biomass combustors and its applications on generating energy
- Summarize the principles of bio-energy systems and their features

UNIT I  INTRODUCTION TO EXTRACTION OF ENERGY FROM WASTE 9
Classification of waste as fuel – Agro based, Forest residue, Industrial waste - MSW – Conversion devices – Incinerators, gasifiers, digestors

UNIT II  BIOMASS PYROLYSIS 9
Pyrolysis – Types, slow fast – Manufacture of charcoal – Methods - Yields and application – Manufacture of pyrolytic oils and gases, yields and applications.

UNIT III  BIOMASS GASIFICATION 9

UNIT IV  BIOMASS COMBUSTION 9
Biomass stoves – Improved chullahs, types, some exotic designs, Fixed bed combustors, Types, inclined grate combustors, Fluidized bed combustors, Design, construction and operation - Operation of all the above biomass combustors.

UNIT V  BIO ENERGY 9
Properties of biogas (Calorific value and composition), Biogas plant technology and status - Bio energy system - Design and constructional features - Biomass resources and their classification - Biomass conversion processes - Thermo chemical conversion - Direct combustion - biomass gasification - pyrolysis and liquefaction - biochemical conversion - anaerobic digestion - Types of biogas Plants – Applications - Alcohol production from biomass - Bio diesel production -Urban waste to energy conversion - Biomass energy programme in India.

TOTAL: 45 PERIODS

OUTCOMES:
CO1 – Understand the various types of wastes from which energy can be generated
CO2 – Gain knowledge on biomass pyrolysis process and its applications
CO3 – Develop knowledge on various types of biomass gasifiers and their operations
CO4 – Gain knowledge on biomass combustors and its applications on generating energy
CO5 – Understand the principles of bio-energy systems and their features

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REFERENCES:
OBJECTIVES

- Teach how to improve writing skills and level of readability
- Tell about what to write in each section
- Summarize the skills needed when writing a Title
- Infer the skills needed when writing the Conclusion
- 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

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

TOTAL: 30 PERIODS

REFERENCES

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
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

UNIT III DISASTER PRONE AREAS IN INDIA
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
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
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

OUTCOMES

CO1: Ability to summarize basics of disaster
CO2: Ability to explain 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

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REFERENCES

AX5093 SANSKRIT FOR TECHNICAL KNOWLEDGE

OBJECTIVES
- Illustrate the basic sanskrit language.
- Recognize sanskrit, the scientific language in the world.
- Appraise learning of sanskrit to improve brain functioning.
- Relate sanskrit to develop the logic in mathematics, science & other subjects enhancing the memory power.
- Extract huge knowledge from ancient literature.

UNIT I ALPHABETS
Alphabets in Sanskrit

UNIT II TENSES AND SENTENCES
Past/Present/Future Tense - Simple Sentences

UNIT III ORDER AND ROOTS
Order - Introduction of roots

UNIT IV SANSKRIT LITERATURE
Technical information about Sanskrit Literature

UNIT V TECHNICAL CONCEPTS OF ENGINEERING
Technical concepts of Engineering-Electrical, Mechanical, Architecture, Mathematics

TOTAL: 30 PERIODS

OUTCOMES
- CO1 - Understanding basic Sanskrit language.
- CO2 - Write sentences.
- CO3 - Know the order and roots of Sanskrit.
- CO4 - Know about technical information about Sanskrit literature.
- CO5 - Understand the technical concepts of Engineering.

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REFERENCES
1. “Abhyaspustakam” – Dr. Vishwas, Samskrita-Bharti Publication, New Delhi
2. “Teach Yourself Sanskrit” Prathama Deeksha-Vempati Kutumbhashstri, Rashtriya Sanskrit Sansthanam, New Delhi Publication
OBJECTIVES
Students will be able to
- Understand value of education and self-development
- Imbibe good values in students
- Let the should know about the importance of character

UNIT I

UNIT II

UNIT III

UNIT IV

OUTCOMES
Students will be able to
- Knowledge of self-development.
- Learn the importance of Human values.
- Developing the over all personality.

Suggested reading
OBJECTIVES
Students will be able to:
- Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
- To address the growth of Indian opinion regarding modern Indian intellectuals’ constitutional
- Role and entitlement to civil and economic rights as well as the emergence nation hood in the early
- To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.

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:
Fundamental Rights, Right to Equality, Right to Freedom, Right against Exploitation, Right to Freedom of
Religion, Cultural and Educational Rights, Right to Constitutional Remedies, Directive Principles of State
Policy, Fundamental 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:
District’s Administration head: Role and Importance, • Municipalities: Introduction, Mayor and role of
Elected officials and their roles, CEO Zila Pachayat: Position and role. Block level: Organizational
Hierarchy(Different departments), Village level: Role of Elected and Appointed officials, Importance of
grass root democracy.

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

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 origin of the framework of argument that informed the conceptualization
of social reform sliding 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.
OBJECTIVES
Students will be able to:
- Review existing evidence on there view topic to inform programme design and policy
- Making under taken by the DfID, other agencies and researchers.
- Identify critical evidence gaps to guide the development.

UNIT I INTRODUCTION AND METHODOLOGY:
Aims and rationale, Policy background, Conceptual framework and terminology - Theories of learning, Curriculum, Teacher education - Conceptual framework, Research questions - Overview of methodology and Searching.

UNIT II THEMATIC OVERVIEW
Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries - Curriculum, Teacher education.

UNIT III EVIDENCE ON THE EFFECTIVENESS OF PEDAGOGICAL PRACTICES
Methodology for the in depth stage: quality assessment of included studies - How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy? - Theory of change - Strength and nature of the body of evidence for effective pedagogical practices - Pedagogic theory and pedagogical approaches - Teachers' attitudes and beliefs and Pedagogic strategies.

UNIT IV PROFESSIONAL DEVELOPMENT
Professional development: alignment with classroom practices and follow up support - Peer support - Support from the head teacher and the community - Curriculum and assessment - Barriers to learning: limited resources and large class sizes

UNIT V RESEARCH GAPS AND FUTURE DIRECTIONS
Research design – Contexts – Pedagogy - Teacher education - Curriculum and assessment - Dissemination and research impact.

OUTCOMES
Students will be able to understand:
- What pedagogical practices are being used by teachers in formal and informal classrooms in developing countries?
- What is the evidence on the effectiveness of pedagogical practices, in what conditions, and with what population of learners?
- How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?
Suggested reading

AX5097 STRESS MANAGEMENT BY YOGA L T P C
2 0 0 0

OBJECTIVES
- To achieve overall health of body and mind
- To overcome stress

UNIT I
Definitions of Eight parts of yoga (Ashtanga)

UNIT II
Yam and Niyam - Do’s and Don’t’s in life - i) Ahinsa, satya, astheya, bramhacharya and aparigraha, ii) Ahinsa, satya, astheya, bramhacharya and aparigraha.

UNIT III
Asan and Pranayam - Various yog poses and their benefits for mind & body - Regularization of breathing techniques and its effects - Types of pranayam

TOTAL: 30 PERIODS

OUTCOMES
Students will be able to:
- Develop healthy mind in a healthy body thus improving social health also
- Improve efficiency

SUGGESTED READING
1. ‘Yogic Asanas for Group Training - Part I” Janardan Swami Yoga Bhya Mandal, Nagpur
2. “Rajayoga and conquering the Internal Nature” by Swami Vivekananda, Advaita Ashrama (Publication Department), Kolkata
OBJECTIVES

- To learn to achieve the highest goal happily
- To become a person with stable mind, pleasing personality and determination
- To a waken wisdom in students

UNIT I

Neetishatakam-holistic development of personality - Verses- 19,20,21,22 (wisdom) - Verses- 29,31,32 (pride & heroism) – Verses- 26,28,63,65 (virtue) - Verses- 52,53,59 (dons) - Verses- 71,73,75,78 (dos)

UNIT II

Approach to day to day work and duties - Shrimad BhagwadGeeta: Chapter 2-Verses 41, 47, 48 - Chapter 3-Verses 13, 21, 27, 35 Chapter 6-Verses 5,13,17,23, 35 - Chapter 18-Verses 45, 46, 48.

UNIT III

Statements of basic knowledge - Shrimad BhagwadGeeta: Chapter 2-Verses 56, 62, 68 Chapter 12 - Verses 13, 14, 15, 16,17, 18 -Personality of role model - shrimadbhayagwadgeeta - Chapter2-Verses 17, Chapter 3-Verses 36,37,42 - Chapter 4-Verses 18, 38,39 Chapter18 – Verses 37,38,63

TOTAL: 30 PERIODS

OUTCOMES

Students will be able to

- Study of Shrimad- Bhagwad- Geeta will help the student in developing his personality and achieve the highest goal in life
- The person who has studied Geeta will lead the nation and man kind to peace and prosperity
- Study of Neetishatakam will help in developing versatile personality of students.

Suggested reading

1. Gopinath, Rashtriya Sanskrit Sansthanam P, Bhartrihari’s Three Satakam, Niti-sringar-vairagya, New Delhi,2010