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
PROGRAM EDUCATIONAL OBJECTIVES:

Bachelor of Textile Technology curriculum is designed to prepare the undergraduates to

I. Have attitude and knowledge for the successful professional and technical career
II. Have strong foundation in basic sciences, engineering, management, mathematics and computational platforms
III. Have knowledge on the theory and practices in the field of Textile manufacturing technology and allied areas
IV. Engross in life-long learning to keep themselves abreast of new developments, and practice and inspire high ethical values and technical standards

PROGRAM OUTCOMES:

The Textile Technology Graduates will have the ability to

1. Identify, formulate, review literature and critically analyze the technological problems in the textile industry to reach substantiated conclusion
2. Apply knowledge of mathematics, sciences, engineering and textile technology to get solution for the technological problems in textile industry
3. Design and develop the solutions to the technological and managerial problems in textile industry with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations
4. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions to the technological problems in textile industry
5. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools for managing textile manufacturing companies with an understanding of the limitations
6. Apply reasoning gained through the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the profession
7. Understand the impact of the developed solutions in societal and environmental contexts, and demonstrate the knowledge for sustainable development
8. Understand ethical and professional responsibilities

9. Function effectively as an individual, and as a member or leader in diverse teams in the profession

10. Communicate effectively on complex engineering activities with the engineering community and with society at large. Able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. 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

12. Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES:

The Textile Technology Graduates will have the ability to

1. Understand and apply the technical knowledge for managing textile manufacturing industry
2. Be a successful entrepreneur and textile clothing designer.
3. Design and develop novel textile products and textile manufacturing processes
### Mapping of Programme Educational Objective with Programme Outcomes

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| 51. | Industrial Training* | 3 | 2 | 2.6 | 2.8 | 2 | 2 | 2.4 | 2.4 | 2.3 | 2.2 | 2.6 | 2.8 | 2.4 | 2 |
| 52. | Project work | 3 | 3 | 3 | 3 | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 1 | 3 | 2 | 3 |

**PROFESSIONAL**

<p>| PROFESSIONAL | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | PSO1 | PSO2 | PSO3 |</p>
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## ANNA UNIVERSITY, CHENNAI
### UNIVERSITY DEPARTMENTS
#### B. TECH. TEXTILE TECHNOLOGY
##### REGULATIONS – 2015
###### CHOICE BASED CREDIT SYSTEM
##### CURRICULA AND SYLLABI I – VIII SEMESTERS

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**HUMANITIES AND SOCIAL SCIENCES (HS)**

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COURSE DESCRIPTION:
This course aims at developing the language skills necessary for the first year students of Engineering and Technology.

OBJECTIVES:
• To develop the four language skills – Listening, Speaking, Reading and Writing.
• To improve the students’ communicative competence in English.
• To teach students the various aspects of English language usage.

CONTENTS
UNIT I  GREETING AND INTRODUCING ONESELF 12
Listening- Types of listening – Listening to short talks, conversations; Speaking – Speaking about one’s place, important festivals etc. – Introducing oneself, one’s family/ friend; Reading – Skimming a passage– Scanning for specific information; Writing- Guided writing - Free writing on any given topic ( My favourite place/ Hobbies/ School life, writing about one’s leisure time activities, hometown, etc.); Grammar – Tenses (present and present continuous) -Question types - Regular and irregular verbs; Vocabulary – Synonyms and Antonyms.

UNIT II  GIVING INSTRUCTIONS AND DIRECTIONS 12
Listening – Listening and responding to instructions; Speaking – Telephone etiquette - Giving oral instructions/ Describing a process – Asking and answering questions; Reading – Reading and finding key information in a given text - Critical reading - Writing –Process description( non-technical)- Grammar – Tense (simple past& past continuous) - Use of imperatives – Subject – verb agreement – Active and passive voice; Vocabulary – Compound words – Word formation – Word expansion ( root words).

UNIT III  READING AND UNDERSTANDING VISUAL MATERIAL 12
Listening- Listening to lectures/ talks and completing a task; Speaking –Role play/ Simulation – Group interaction; Reading – Reading and interpreting visual material; Writing- Jumbled sentences – Discourse markers and Cohesive devices – Essay writing (cause & effect/ narrative); Grammar – Tenses (perfect), Conditional clauses –Modal verbs; Vocabulary –Cause and effect words; Phrasal verbs in context.

UNIT IV  CRITICAL READING AND WRITING 12
Listening- Watching videos/ documentaries and responding to questions based on them; Speaking–informal and formal conversation; Reading –Critical reading (prediction & inference); Writing–Essay writing ( compare & contrast/ analytical) – Interpretation of visual materials; Grammar – Tenses (future time reference); Vocabulary – One word substitutes (with meanings) – Use of abbreviations & acronyms – Idioms in sentences.

UNIT V  LETTER WRITING AND SENDING E-MAILS 12
Listening- Listening to programmes/broadcast/ telecast/ podcast; Speaking – Giving impromptu talks, Making presentations on given topics- Discussion on the presentation; Reading –Extensive reading; Writing- Poster making – Letter writing (Formal and E-mail) ; Grammar – Direct and Indirect speech – Combining sentences using connectives; Vocabulary –Collocation;

TEACHING METHODS:
Interactive sessions for the speaking module.
Use of audio – visual aids for the various listening activities.
Contextual Grammar Teaching.
EVALUATION PATTERN:
Internals – 50%
End Semester – 50%  
TOTAL: 60 PERIODS

LEARNING OUTCOMES:
- Students will improve their reading and writing skills
- Students will become fluent and proficient in communicative English
- Students will be able to improve their interpersonal communication

TEXTBOOK:

REFERENCES:
COURSE OBJECTIVES

- The goal of this course is for students to gain proficiency in calculus computations. In calculus, we use three main tools for analyzing and describing the behavior of functions: limits, derivatives, and integrals. Students will use these tools to solve application problems in a variety of settings ranging from physics and biology to business and economics.

- To make the student acquire sound knowledge of techniques in solving ordinary differential equations that model engineering problems.

- To familiarize the student with functions of several variables. This is needed in many branches of engineering.

- To acquaint the student with mathematical tools needed in evaluating multiple integrals and their usage.

UNIT I  DIFFERENTIAL CALCULUS  12
Representation of functions - New functions from old functions - Limit of a function - Limits at infinity - Continuity - Derivatives - Differentiation rules - Polar coordinate system - Differentiation in polar coordinates - Maxima and Minima of functions of one variable.

UNIT II  FUNCTIONS OF SEVERAL VARIABLES  12

UNIT III  INTEGRAL CALCULUS  12
Definite and Indefinite integrals - Substitution rule - Techniques of Integration - Integration by parts, Trigonometric integrals, Trigonometric substitutions, Integration of rational functions by partial fraction, Integration of irrational functions - Improper integrals.

UNIT IV  MULTIPLE INTEGRALS  12

UNIT V  DIFFERENTIAL EQUATIONS  12

TOTAL : 60 PERIODS

COURSE OUTCOMES
- CO1: Understanding of the ideas of limits and continuity and an ability to calculate with them and apply them.
- CO2: Improved facility in algebraic manipulation.
- CO3: Fluency in differentiation.
- CO4: Fluency in integration using standard methods, including the ability to find an appropriate method for a given integral.
- CO5: Understanding the ideas of differential equations and facility in solving simple standard examples.
TEXT BOOKS

REFERENCE BOOKS
OBJECTIVE:

- To introduce the concept and different ways to determine moduli of elasticity and applications.
- To instill the concept of sound, reverberation, noise cancellation, and ultrasonic generation, detection and applications.
- To inculcate an idea of thermal properties of materials, heat flow through materials and quantum physics.
- To promote the basic understanding of interferometers, principles and applications of lasers, optical fibers and sensors.
- To establish a sound grasp of knowledge on the basics, significance and growth of single crystals.

UNIT I  PROPERTIES OF MATTER


UNIT II  ACOUSTICS AND ULTRASONICS


UNIT III  THERMAL AND MODERN PHYSICS


UNIT IV  APPLIED OPTICS


UNIT V  CRYSTAL PHYSICS

Single crystalline, polycrystalline and amorphous materials – Single crystals: unit cell, crystal systems, Bravais lattices, detectives and planes in a crystal, Miller indices - interplanar distance for a cubic crystal - coordination number and packing factor for SC, BCC, FCC, HCP and diamond structures - structure and significance of NaCl, CsCl, ZnS and graphite - crystal imperfections: point defects, line defects – Burger vectors, dislocations and stacking faults – Growth of single crystals: Bridgman and Czochralski methods.
OUTCOME:
CO1: The students will understand different moduli of elasticity, their determination and applications.
CO2: The students will gain knowledge on the properties of sound, noise cancellation, and production, detection and applications of ultrasonics
CO3: The students will acquire sound knowledge on thermal expansion and thermal conductivity of materials. Further they will gain an idea of quantum physics.
CO4: The students will gain knowledge on interferometers, lasers and fiber optics
CO5: The students will secure knowledge on the basics of crystal structures and their significance. Further they gain basic ideas of growing single crystals.

TEXTBOOKS:

REFERENCES:
COURSE OBJECTIVES

- To develop an understanding about fundamentals of polymer chemistry.
- Brief elucidation on surface chemistry and catalysis.
- To develop sound knowledge photochemistry and spectroscopy.
- To impart basic knowledge on chemical thermodynamics.
- To understand the basic concepts of nano chemistry.

UNIT I  POLYMER CHEMISTRY  9
Introduction: Functionality-degree of polymerization. Classification of polymers- natural and synthetic, thermoplastic and thermostetting. Types and mechanism of polymerization: addition (free radical, cationic, anionic and living); condensation and copolymerization. Properties of polymers: Tg, tacticity, molecular weight-weight average, number average and polydispersity index. Techniques of polymerization: Bulk, emulsion, solution and suspension.

UNIT II  SURFACE CHEMISTRY AND CATALYSIS  9

UNIT III  PHOTOCHEMISTRY AND SPECTROSCOPY  9

UNIT IV  CHEMICAL THERMODYNAMICS  9
Second law: Entropy-entropy change for an ideal gas, reversible and irreversible processes; entropy of phase transitions; Free energy and work function: Helmholtz and Gibbs free energy functions; Criteria of spontaneity; Gibbs-Helmholtz equation; Clausius Clapeyron equation; Maxwell relations-Van’t Hoff isotherm and isochore. Chemical potential; Gibbs-Duhem equation- variation of chemical potential with temperature and pressure.

UNIT V  NANO CHEMISTRY  9

TOTAL : 45 PERIODS

COURSE OUTCOMES

CO1: Will be familiar with polymer chemistry, surface chemistry and catalysis.
CO2: Will know the photochemistry, spectroscopy and chemical thermodynamics.
CO3: Will know the fundamentals of nano chemistry.

TEXT BOOKS


REFERENCE BOOKS
OBJECTIVES
• To develop in students, graphic skills for communication of concepts, ideas and design of engineering products and expose them to existing national standards related to technical drawings.

CONCEPTS AND CONVENTIONS (NOT FOR EXAMINATION) 1
Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning.

UNIT I PLANE CURVES AND FREE HANDSKETCHING 14
Basic Geometrical constructions, Curves used in engineering practices-Conics – Construction of ellipse, parabola and hyperbola by eccentricity method – Construction of cycloid – construction of involutes of square and circle – Drawing of tangents and normal to the above curves. Visualization concepts and Free Hand sketching: Visualization principles – Representation of Three Dimensional objects – Layout of views- Free hand sketching of multiple views from pictorial views of objects

UNIT II PROJECTION OF POINTS, LINES AND PLANE SURFACES 14
Orthographic projection- principles-Principal planes-First angle projection-Projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes- Determination of true lengths and true inclinations by rotating line method and trapezoidal method and traces Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.

UNIT III PROJECTION OF SOLIDS 14
Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to both the principal planes by rotating object method and auxiliary plane method.

UNIT IV PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES 14
Sectioning of solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other – obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids cylinders and cones. Development of lateral surfaces of solids with cut-outs and holes.

UNIT V ISOMETRIC AND PERSPECTIVE PROJECTIONS 15
Principles of isometric projection – isometric scale –Isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions and miscellaneous problems. Perspective projection of simple solids-Prisms, pyramids and cylinders by visual ray method and vanishing point method.

COMPUTER AIDED DRAFTING (DEMONSTRATION ONLY) 3
Introduction to drafting packages and demonstration of their use.

L=45+T=30, TOTAL: 75 PERIODS

OUTCOMES:
On Completion of the course the student will be able to
CO1: Perform free hand sketching of basic geometrical shapes and multiple views of objects.
CO2: Draw orthographic projections of lines, Planes and Solids
CO3: Obtain development of surfaces.
CO4: Prepare isometric and perspective views of simple solids.
TEXT BOOK:

REFERENCES:

Publication of Bureau of Indian Standards:

Special points applicable to University Examinations on Engineering Graphics:
1. There will be five questions, each of either or type covering all units of the syllabus.
2. All questions will carry equal marks of 20 each making a total of 100.
3. The answer paper shall consist of drawing sheets of A3 size only. The students will be permitted to use appropriate scale to fit solution within A3 size.
4. The examination will be conducted in appropriate sessions on the same day.
PHYSICS LABORATORY: (Any Seven Experiments)

OBJECTIVE:

- To inculcate experimental skills to test basic understanding of physics of materials including properties of matter, thermal and optical properties.
- To induce the students to familiarize with experimental determination of velocity of ultrasonic waves, band gap determination and viscosity of liquids.

1. Torsional pendulum - Determination of rigidity modulus of wire and moment of inertia of disc
2. Non-uniform bending - Determination of young’s modulus
3. Uniform bending – Determination of young’s modulus
4. Lee’s disc Determination of thermal conductivity of a bad conductor
5. Potentiometer-Determination of thermo e.m.f of a thermocouple
6. Laser- Determination of the wave length of the laser using grating
7. Air wedge - Determination of thickness of a thin sheet/wire
8. a) Optical fibre - Determination of Numerical Aperture and acceptance angle
   b) Compact disc- Determination of width of the groove using laser.
10. Ultrasonic interferometer – determination of the velocity of sound and compressibility of Liquids
11. Postal office box - Determination of Band gap of a semiconductor.
13. Viscosity of liquids - Determination of co-efficient of viscosity of a liquid by Poiseuille’s flow

TOTAL: 30 PERIODS

OUTCOME:
Upon completion of the course, the students will be able

CO1: To determine various moduli of elasticity and also various thermal and optical properties of materials.
CO2: To determine the velocity of ultrasonic waves, band gap determination and viscosity of liquid

CHEMISTRY LABORATORY:

(Minimum of 8 experiments to be conducted)

1. Estimation of HCl using Na₂CO₃ as primary standard and Determination of alkalinity in water sample.
2. Determination of total, temporary & permanent hardness of water by EDTA method.
3. Determination of DO content of water sample by Winkler’s method.
4. Determination of chloride content of water sample by argentometric method.
5. Estimation of copper content of the given solution by Iodometry.
6. Determination of strength of given hydrochloric acid using pH meter.
7. Determination of strength of acids in a mixture of acids using conductivity meter.
8. Estimation of iron content of the given solution using potentiometer.
9. Estimation of iron content of the water sample using spectrophotometer (1, 10-Phenanthrol ine/thiocyanate method).
10. Estimation of sodium and potassium present in water using flame photometer.
12. Pseudo first order kinetics-ester hydrolysis.
14. Determination of CMC.
15. Phase change in a solid.

TOTAL: 60 PERIODS

TEXTBOOKS
COURSE OBJECTIVES

To provide exposure to the students with hands-on experience on various Basic Engineering Practices in Civil, Mechanical, Electrical and Electronics Engineering.

GROUP – A (CIVIL & ELECTRICAL)

1. CIVIL ENGINEERING PRACTICES

PLUMBING
- Basic pipe connections involving the fittings like valves, taps, coupling, unions, reducers, elbows and other components used in household fittings. Preparation of plumbing line sketches.
- Laying pipe connection to the suction side of a pump.
- Laying pipe connection to the delivery side of a pump.
- Practice in connecting pipes of different materials: Metal, plastic and flexible pipes used in household appliances.

WOOD WORK
- Sawing, planing and making joints like T-Joint, Mortise and Tenon joint and Dovetail joint.

STUDY
- Study of joints in door panels and wooden furniture
- Study of common industrial trusses using models.

2. ELECTRICAL ENGINEERING PRACTICES

- Basic household wiring using Switches, Fuse, Indicator and Lamp etc.,
- Stair case light wiring
- Tube – light wiring
- Preparation of wiring diagrams for a given situation.
- Study of Iron-Box, Fan Regulator and Emergency Lamp

GROUP – B (MECHANICAL AND ELECTRONICS)

3. MECHANICAL ENGINEERING PRACTICES

WELDING
- Arc welding of Butt Joints, Lap Joints, and Tee Joints
- Gas welding Practice.
- Basic Machining - Simple turning, drilling and tapping operations..
- Study and assembling of the following:
  a. Centrifugal pump
  b. Mixie
  c. Air Conditioner.

DEMONSTRATION ON FOUNDRY OPERATIONS.

4. ELECTRONIC ENGINEERING PRACTICES

- Soldering simple electronic circuits and checking continuity.
- Assembling electronic components on a small PCB and Testing.
- Study of Telephone, FM radio and Low Voltage Power supplies.

TOTAL : 30 PERIODS
COURSE OUTCOMES

CO1: Ability to fabricate carpentry components and to lay pipe connections including plumbing works.
CO2: Ability to use welding equipments to join the structures
CO3: Ability to do wiring for electrical connections and to fabricate electronics circuits.
MATHEMATICS – II

MA7251
(Common to all branches of B.E. /B.Tech. Programmes in II Semester)

COURSE OBJECTIVES
- To develop the use of matrix algebra techniques this is needed by engineers for practical applications.
- To acquaint the student with the concepts of vector calculus, needed for problems in all engineering disciplines.
- To develop an understanding of the standard techniques of complex variable theory so as to enable the student to apply them with confidence, in application areas such as heat conduction, elasticity, fluid dynamics and flow the of electric current.
- To make the student appreciate the purpose of using transforms to create a new domain in which it is easier to handle the problem that is being investigated.

UNIT I MATRICES 12

UNIT II VECTOR CALCULUS 12
Gradient and directional derivative – Divergence and Curl – Irrotational and Solenoidal vector fields – Line integral over a plane curve – Surface integral - Area of a curved surface - Volume integral - Green’s, Gauss divergence and Stoke’s theorems – Verification and application in evaluating line, surface and volume integrals.

UNIT III ANALYTIC FUNCTION 12
Analytic functions – Necessary and sufficient conditions for analyticity - Properties – Harmonic conjugates – Construction of analytic function - Conformal mapping – Mapping by functions \( w = z + c, \frac{1}{z}, z^2 \) - Bilinear transformation.

UNIT IV COMPLEX INTEGRATION 12

UNIT V LAPLACE TRANSFORMS 12

TOTAL : 60 PERIODS

COURSE OUTCOMES
Upon successful completion of the course, students should be able to:
- CO1: Evaluate real and complex integrals using the Cauchy integral formula and the residue theorem
- CO2: Appreciate how complex methods can be used to prove some important theoretical results.
- CO3: Evaluate line, surface and volume integrals in simple coordinate systems
CO4: Calculate grad, div and curl in Cartesian and other simple coordinate systems, and establish identities connecting these quantities.
CO5: Use Gauss, Stokes and Greens theorems to simplify calculations of integrals and prove simple results.

TEXT BOOKS

REFERENCE BOOKS
OBJECTIVES
- To enable students acquire proficiency in technical communication.
- To enhance their reading and writing skills in a technical context.
- To teach various language learning strategies needed in a professional environment.

CONTENTS

UNIT I  ANALYTICAL READING  12
Listening- Listening to informal and formal conversations; Speaking – Conversation Skills(opening, turn taking, closing )-explaining how something works-describing technical functions and applications; Reading –Analytical reading, Deductive and inductive reasoning; Writing- vision statement–structuring paragraphs.

UNIT II  SUMMARISING  12
Listening- Listening to lectures/ talks on Science & Technology; Speaking –Summarizing/ Oral Reporting, Reading – Reading Scientific and Technical articles; Writing- Extended definition –Lab Reports – Summary writing.

UNIT III  DESCRIBING VISUAL MATERIAL  12
Listening- Listening to a panel discussion; Speaking – Speaking at formal situations; Reading – Reading journal articles - Speed reading; Writing-data commentary-describing visual material-writing problem-process- solution-the structure of problem-solution texts- writing critiques.

UNIT IV  WRITING/ E-MAILING THE JOB APPLICATION  12
Listening- Listening to/ Viewing model interviews; Speaking –Speaking at different types of interviews – Role play practice (mock interview); Reading – Reading job advertisements and profile of the company concerned; Writing- job application – cover letter –Résumé preparation.

UNIT V  REPORT WRITING  12
Listening- Viewing a model group discussion; Speaking –Participating in a discussion - Presentation; Reading – Case study - analyse -evaluate – arrive at a solution; Writing– Recommendations- Types of reports (feasibility report)- designing and reporting surveys- – Report format.- writing discursive essays.

TEACHING METHODS:
Practice writing
Conduct model and mock interview and group discussion.
Use of audio – visual aids to facilitate understanding of various forms of technical communication.
Interactive sessions.

EVALUATION PATTERN:
Internals – 50%
End Semester – 50%

TOTAL:60 PERIODS

LEARNING OUTCOMES
CO1: Students will learn the structure and organization of various forms of technical communication.
CO2: Students will be able to listen and respond to technical content.
CO3: Students will be able to use different forms of communication in their respective fields.
TEXTBOOK:

REFERENCES:
OBJECTIVE:
- To make the students understand the basics of phase diagrams and various materials preparation techniques
- To equip the students to have a knowledge on different types of electron theory, basics of quantum mechanics and about superconductors
- To introduce the physics of semiconducting materials and applications of semiconductors in device fabrication
- To familiarize the students with the theory and applications of magnetic and dielectric materials
- To provide the students a sound platform towards learning about advanced materials and their applications.

UNIT I  PREPARATION OF MATERIALS  9

UNIT II  ELECTRICAL AND SUPERCONDUCTING MATERIALS  9

UNIT III  SEMICONDUCTING MATERIALS  9

UNIT IV  DIELECTRIC AND MAGNETIC MATERIALS  9

UNIT V  NEW MATERIALS AND APPLICATIONS  9

TOTAL: 45 PERIODS

OUTCOME:
On completion of the course, the students will be able to
CO1: Acquire knowledge of phase diagram, and thin film and nanomaterial preparation
   techniques
CO2: Familiarize with conducting materials, basic quantum mechanics, and properties and
   applications of superconductors.
CO3: Gain knowledge on semiconducting materials based on energy level diagrams, its
   types, temperature effect. Also, fabrication methods for semiconductor devices will
   be understood.
CO4: Realize with theories and applications of dielectric and ferromagnetic materials
CO5: Familiarize with ceramics, composites, metallic glasses, shape memory alloys,
   biomaterials and their important applications.

REFERENCES:
   (2014).
OBJECTIVE

- The students should be conversant with
  - boiler feed water requirements, water treatment techniques,
  - Applications of oil and its properties, principles of different chemical analysis.
  - Different kinds of preparations of important chemicals.

UNIT I       WATER TECHNOLOGY


UNIT II       OILS, FATS, SOAPS & LUBRICANTS

Chemical constitution, chemical analysis of oils and fats – free acid, saponification and iodine values, definitions, determinations and significance. Soaps and detergents - cleaning action of soap. Lubricants - definition, characteristics, types and properties – viscosity, viscosity index, carbon residue, oxidation stability, flash and fire points, cloud and pour points, aniline point. Solid lubricants – graphite and molybdenum disulphide.

UNIT III      CHEMICAL ANALYSIS – AN ANALYTICAL INSIGHT


UNIT IV       DYE CHEMISTRY

Witt’s theory and modern theory of colors – synthesis of methyl red, methyl orange, congo red, malachite green, p-rosaniline, phenolphthalein, fluorescence, eosin dyes.

UNIT V        CHEMICALS AND AUXILIARIES


TOTAL: 45 PERIODS

OUTCOME

CO1: Will be familiar with boiler feed water requirements, water treatment techniques.
CO2: Will know the oil and its properties, principles of different chemical analysis.
CO3: Will know the preparations of important chemicals.

TEXT BOOKS


REFERENCE BOOKS

OBJECTIVE:
The objective of this course is to inculcate in the student the ability to analyze any problem in a simple and logical manner and to predict the physical phenomena and thus lay the foundation for engineering applications.

UNIT I  STATICS OF PARTICLES  12

UNIT II  EQUILIBRIUM OF RIGID BODIES  12

UNIT III  DISTRIBUTED FORCES  16
Centroids of lines and areas – symmetrical and unsymmetrical shapes, Determination of Centroids by Integration , Theorems of Pappus-Guldinus, Distributed Loads on Beams, Center of Gravity of a Three-Dimensional Body, Centroid of a Volume, Composite Bodies , Determination of Centroids of Volumes by Integration.
Moments of Inertia of Areas and Mass - Determination of the Moment of Inertia of an Area by Integration , Polar Moment of Inertia , Radius of Gyration of an Area , Parallel-Axis Theorem , Moments of Inertia of Composite Areas, Moments of Inertia of a Mass - Moments of Inertia of Thin Plates , Determination of the Moment of Inertia of a Three-Dimensional Body by Integration.

UNIT IV  FRICTION  8

UNIT V  DYNAMICS OF PARTICLES  12
Kinematics - Rectilinear Motion and Curvilinear Motion of Particles.

OUTCOMES:
- Upon completion of this course, students will be able to construct meaningful mathematical models of physical problems and solve them.

TEXT BOOK

REFERENCES


OBJECTIVES:
• To learn programming using a structured programming language.
• To provide C programming exposure.
• To introduce foundational concepts of computer programming to students of different branches of Engineering and Technology.

UNIT I  INTRODUCTION
Introduction to Computers – Computer Software – Computer Networks and Internet - Need for logical thinking – Problem formulation and development of simple programs - Pseudo code - Flow Chart and Algorithms.

UNIT II  C PROGRAMMING BASICS

UNIT III  ARRAYS AND STRINGS

UNIT IV  POINTERS
Macros - Storage classes –Basic concepts of Pointers– Pointer arithmetic - Example Problems - Basic file operations

UNIT V  FUNCTIONS AND USER DEFINED DATA TYPES

OUTCOMES
At the end of the course, the student should be able to:
CO1:Write C program for simple applications
CO2: Formulate algorithm for simple problems
CO3: Analyze different data types and arrays
CO4: Perform simple search and sort.
CO5: Use programming language to solve problems.

TEXTBOOKS:

REFERENCES:
OBJECTIVE
- To make the student acquire practical skills in the wet chemical and instrumental methods for quantitative estimation of nitrite in water, cement, oil, coal, Phenol

LIST OF EXPERIMENTS
1. Determination of Redwood / Saybolt numbers, kinematic viscosity and viscosity index of lubricating oils
2. Determination of flash point, fire point, cloud and pour point of oils
3. Determination of acid value, iodine value of oils and saponification value.
4. Determination of COD of water samples
5. Determination of total, temporary & permanent hardness of water by EDTA method. Estimation of HCl using Na₂CO₃ as primary standard and determination of alkalinity in water sample.
6. Determination of purity of washing soda and strength of a commercial acid
7. Estimation of available chlorine in hypochlorite solution
8. Estimation of strength of hydrogen peroxide
10. Determination of Calorific value using Bomb calorimeter

TOTAL: 60 PERIODS

OUTCOME
CO1: Familiarization with equipment like viscometers, flash and fire point apparatus etc
CO2: Familiarization of methods for determining COD
CO3: Familiarization of a few simple synthetic techniques for soap

TEXT BOOKS
OBJECTIVES
- To understand the basic programming constructs and articulate how they are used to develop a program with a desired runtime execution flow.
- To articulate where computer programs fit in the provision of computer-based solutions to real world problems.
- To learn to use user defined data structures.

LIST OF EXPERIMENTS
1. Search, generate, manipulate data using MS office/ Open Office
2. Presentation and Visualization – graphs, charts, 2D, 3D
3. Problem formulation, Problem Solving and Flowcharts
4. C Programming using Simple statements and expressions
5. Scientific problem solving using decision making and looping.
6. Simple programming for one dimensional and two dimensional arrays.
7. Solving problems using String functions
8. Programs with user defined functions
9. Program using Recursive Function
10. Program using structures and unions.

TOTAL: 60 PERIODS

OUTCOMES
At the end of the course, the student should be able to:
- CO1: Write and compile programs using C programs.
- CO2: Write program with the concept of Structured Programming
- CO3: Identify suitable data structure for solving a problem
- CO4: Demonstrate the use of conditional statement.

LABORATORY REQUIREMENTS FOR BATCH OF 30 STUDENTS
30 Systems with C compiler
OBJECTIVES:

- To make the students acquire a sound knowledge in statistical techniques that model engineering problems.
- The Students will have a fundamental knowledge of the concepts of probability.

UNIT I  RANDOM VARIABLES  12
Discrete and continuous random variables – Moments – Moment generating functions – Binomial, Poisson, Geometric, Uniform, Exponential, Gamma, Weibull and Normal distributions - Functions of a random variable.

UNIT II  TWO-DIMENSIONAL RANDOM VARIABLES  12
Joint distributions – Marginal and conditional distributions – Covariance – Correlation and Linear regression – Transformation of random variables – Central limit theorem (for independent and identically distributed random variables).

UNIT III  TESTS OF SIGNIFICANCE  12

UNIT IV  DESIGN OF EXPERIMENTS  12
Completely randomized design – Randomized block design – Latin square design - $2^2$ - factorial design - Taguchi’s robust parameter design.

UNIT V  STATISTICAL QUALITY CONTROL  12
Control charts for measurements ($\bar{X}$ and R charts) – Control charts for attributes (p, c and np charts) – Tolerance limits - Acceptance sampling.

TOTAL: 60 PERIODS

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

CO1 analyze the performance in terms of probabilities and distributions achieved by the determined solutions
CO2 To be familiar with some of the commonly encountered two dimensional random variables and be equipped for a possible extension to multivariate analysis
CO3 To apply the basic principles underlying statistical inference(estimation and hypothesis testing)
CO4 To demonstrate the knowledge of applicable large sample theory of estimators and tests
CO5 To obtain a better understanding of the importance of the methods in modern industrial processes.

TEXT BOOKS:

REFERENCES:
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<th>Course Outcomes</th>
<th>Statement</th>
<th>Program Outcome</th>
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<td>Analyze the performance in terms of probabilities and distributions achieved by the determined solutions</td>
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<tr>
<td>CO2</td>
<td>To be familiar with some of the commonly encountered two dimensional random variables and to be equipped for a possible extension to multivariate analysis</td>
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<tr>
<td>CO3</td>
<td>To apply the basic principles underlying statistical inference (estimation and hypothesis)</td>
<td>2 2 1 3 1 - - - - - 2 2 1 - -</td>
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<td>CO4</td>
<td>To demonstrate the knowledge of applicable large sample theory of estimators and tests</td>
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<td>CO5</td>
<td>To obtain a better understanding of the importance of the methods in modern industrial processes.</td>
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</table>

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively.
OBJECTIVES:
To impart knowledge on
• Electric circuit laws, single and three phase circuits and wiring
• Working principles of Electrical Machines
• Various electronic devices and measuring instruments

UNIT I  ELECTRICAL CIRCUITS  9
Basic principles involved in power generation, transmission and distribution, Ohms Law, Kirchoff’s Law, steady state solution of DC circuits, Thevinin’s Theorem, Norton’s Theorem, Superposition Theorem.

UNIT II  AC CIRCUITS  9
Introduction to AC circuits – waveforms and RMS value – power and power factor, single phase and three-phase balanced circuits, housing wiring, industrial wiring, materials of wiring.

UNIT III ELECTRICAL MACHINES  9
Principles of operation and characteristics of DC machines. Transformers (single and three phase), Synchronous machines, three phase and single phase induction motors.

UNIT IV ELECTRONIC DEVICES & CIRCUITS  9

UNIT V MEASUREMENTS & INSTRUMENTATION  9
Introduction to transducers: pressure, temperature, position, electrical measurements, Classification of instruments – moving coil and moving iron Ammeter and Voltmeter – multimeters – dynamometer type Wattmeter – three-phase power measurements – energy meter – megger – instrument transformers (CT and PT )

TOTAL : 45 PERIODS

OUTCOMES:
Upon completion of this course, the student shall be able to understand
CO1: To be able to understand the concepts related with electrical circuits and wiring.
CO2: To be able to understand AC circuits and single and three phase balanced circuits
CO3: Capable of understanding the operating principle of DC machines, single and three phase induction motors
CO4: To be able to understand the working principle of electronic devices and circuits
CO5: To be able to understand the transducer and various instruments

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<td>To be able to understand the concepts related with electrical circuits and wiring.</td>
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<td>CO2</td>
<td>To be able to understand AC circuits and single and three phase balanced circuits</td>
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<tr>
<td>CO3</td>
<td>Capable of understanding the operating principle of DC machines, single and three phase induction motors</td>
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<td>CO4</td>
<td>To be able to understand the working principle of electronic devices and circuits</td>
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<td>CO5</td>
<td>To be able to understand the transducer and various instruments</td>
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<td>Overall CO</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 understand the
- Various polymerization techniques
- Fibre forming polymer characteristics and evaluation techniques
- Processing of regenerated fibres
- Need of various additives in polymer processing

UNIT I
Introduction to natural and synthetic polymers; terms and fundamental concepts; step- growth polymerization, Carother’s equation, functionality, crosslinking; PET manufacturing; chain growth polymerization, free radical polymerization, kinetics of free-radical initiation, termination, chain transfer, Mayo’s equation, cage effect, auto acceleration inhibition and retardation

UNIT II
Polypropylene manufacturing; acrylic manufacturing; atom transfer radical polymerization, ionic polymerization, ring opening polymerization; Nylon-6 manufacturing; co-polymerization and its importance; copolymer equation, reactivity ratio, tailor making of copolymer properties; techniques of chain polymerization; bulk, solution, emulsion, micro emulsion and suspension polymerization; chemical modification of fibres; polymer solution, Flory’s theory; Interaction parameter

UNIT III
Molecular weight and its distribution by: end group analysis, osmometry, light scattering, ultra centrifugation, gel permeation chromatography, intrinsic viscosity; spectroscopic methods of polymer characterization using FT-IR, UV-VIS and NMR spectroscopy, DTA, TGA and DSC

UNIT IV
Compounding of polymers - fillers, plasticizers, antioxidants, UV stabilizers, colouring agents and flame retardants; polymer processing - compression, moulding, injection, extrusion, calendaring and film casting; preparation and properties of polyesters, polyamides, epoxy and silicone polymers; conductive polymers, super absorbent polymers.

UNIT V
Recycling, remoulding, depolymerisation, incineration, biodegradable polymers

OUTCOMES:
Upon completion of this course, the student shall be able to understand
CO1: Techniques of polymerisation
CO2: Methods of polymerisation
CO3: Characterisation of polymers
CO4: Production and properties of polymers
CO5: Recycling and reuse of polymers

TOTAL: 45 PERIODS

REFERENCES
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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 understand the theory of various operations carried out at different stages of pre-spinning processes and the construction of machinery used for preparatory

UNIT I  INTRODUCTION  5
Sequence of spinning machinery for producing carded, combed and blended yarns in short staple and long staple spinning system; linear density systems for textile materials conversions; influence of characteristics of raw material – fibre fineness, length, strength, elongation, stiffness, fibre friction, cleanliness on yarn quality and machine performance; spinnability

UNIT II  GINNING AND BLOWROOM MACHINERY  9
Description and working of different types of gins; ginning performance on yarn quality; objectives, principle and description of opening, cleaning and blending machines used in blowroom; chute feed; cleaning efficiency, production calculations.

UNIT III  CARDING MACHINE  9
Objectives and principle of carding; detailed study of flat card; autolevelling; card clothing and its maintenance; production calculation

UNIT IV  COMBER  9
Objectives and detailed study of comber preparatory machines; objectives and principles of combing; sequence of combing operation; combing efficiency and production calculation

UNIT V  DRAWFRAME AND ROVING MACHINE  13
Tasks of drawing machine; drafting systems used in modern drawing machines; autolevelling; draft and production calculation; objectives of roving machine; working of roving machine; bobbin builder mechanism; draft, twist and production calculations; safety measures at pre-spinning processes – equipments used, safety practices

TOTAL: 45 PERIODS

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

- CO1: Processes involved in the conversion of fibre to yarn
- CO2: Functioning of ginning and blowroom machinery
- CO3: Functioning of carding machines
- CO4: Functioning of comber preparatory and comber
- CO5: Functioning of drawframe and roving frame

REFERENCES

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</table>

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively.
OBJECTIVES:
- To enable the students to understand the theory of preparation of yarn for fabric formation and functioning of various preparatory machines

UNIT I  BASICS OF WINDING
Objects of winding; principles of cheese and cone winding machines; uniform build of yarn package; types of drums – half accelerated and fully accelerated drums; control of balloons; Classification of yarn faults and its removal; concepts in yarn clearing – mechanical, optical and electronic clearers; knotters and splicers

UNIT II  PROCESS CONTROL IN WINDING
Faults in wound packages, their causes and remedies; winding synthetic and blended yarns; weft winding; winding for colouration; quality of knots and splices; study of modern automatic winders. Winding performance; productivity; maintenance; quality control; material handling

UNIT III  WARPING AND SIZING
Objectives of warping, material flow in beam warping and creels used in warping machines; sectional warping machines; objectives of sizing; sizing materials and recipe used for different types of fibres; size preparation equipment; sizing machines; sizing filament yarns; concept of single end sizing, combined dyeing and sizing. Control concepts in modern sizing; energy conservation in sizing; Sizing defects and production calculations

UNIT IV  PROCESS CONTROL IN WARPING AND SIZING
Process control in warping (production calculation, machine and labour productivity, control of end breaks, quality and hard waste in warping); Control systems used in sizing machine

UNIT V  DRAWING-IN
Need for drawing-in operation; manual and automatic drawing- in, leasing, knotting and pinning machines; selection and care of reeds, healds and drop pins, control of cross ends and extra ends and calculations; safety measures at pre-weaving processes – equipments used, safety practices

OUTCOMES:
Upon completion of this course, the student shall know about
- CO1: Objectives of working principle of winding machines
- CO2: The machine and process parameters in winding
- CO3: Objectives and working of warping and sizing machines
- CO4: The process control in warping and sizing
- CO5: Drawing – in and denting process

TOTAL: 45 PERIODS

REFERENCES

## 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.
OBJECTIVES:
To enable the students to understand the
- Structure and morphology of textile fibres
- Physical characteristics textile fibres

UNIT I  STRUCTURE OF FIBRES 12
Classification of fibres; study of morphological structures of fibers; physical properties of fibres. order and disorder in fibre structure; molecular conformations – planar zig-zag, helical, lamellar, and sphrulite conformations.

UNIT II  STRUCTURE INVESTIGATION TECHNIQUES 6
Transmission and Scanning electron microscopes-principle; construction and working; X-ray diffraction techniques – estimation of crystallinity; Infrared radiation and dichroism techniques; chemical element and group identification by transmittance and optical density methods, molecular orientation estimation

UNIT III  MOISTURE ABSORPTION CHARACTERISTICS 12
Theories of moisture sorption; Moisture absorption behavior of natural and man-made fibres; influence of fibre structure, humidity and temperature on the moisture absorption; conditioning of fibres – mechanism of conditioning and factors influencing conditioning. Moisture diffusion in fibres. Heat of sorption – integral and differential, their relation; factors influencing heat of sorption - measurement of heat of sorption

UNIT IV  TENSILE AND ELONGATION CHARACTERISTICS OF FIBRES 18
Tensile characteristics – study of strength, elongation, work of rupture, initial modulus, work factor and yield point – determination of yield point. Stress-strain relations of natural and manmade fibres - influence of fibre structure, humidity and temperature on tensile characteristics. Time effects- Study of creep phenomena. Elastic recovery and its relation to stress and strain of fibres; mechanical conditioning of fibres and its influence on elastic recovery. Load cycling and extension cycling-their effect on elastic recovery. Introduction about torsional and flexural rigidity of fibers

UNIT V  OPTICAL, FRICTIONAL, AND THERMAL CHARACTERISTICS 12
Reflexion and Lustre-objective and subjective methods of measurement - refractive index and its measurement - birefringence, factors influencing birefringence - Absorption and dichroism Friction – static, limiting and kinetic friction, its measurement, comparison of fibres, directional friction in wool – friction. Thermal transitions of fibres - thermal conductivity, thermal expansion and contraction, Tg, melting; static electricity in textile fibres

OUTCOME:
Upon completion of this course, the student shall be able to understand the
- CO1: Structure and properties of fibres
- CO2: Method of investigation of structure of fibres
- CO3: Moisture properties of fibres
- CO4: Tensile and elongation properties of fibres
- CO5: Optical, thermal and frictional characteristics of fibres

REFERENCES
### 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 train the students in performing various tests on electrical drives, sensors and circuits.

LIST OF EXPERIMENTS:
1. Load test on separately excited DC shunt generator
2. Load test on DC shunt moor
3. Load test on S Transformer
4. Load test on Induction motor
5. Regulation of 3 Alternator
6. Study of CRO
7. Logic gates
8. Operational amplifiers
9. Time constant of RC circuit
10. Characteristics of LVDT
11. Calibration of Rotometer
12. RTD and Thermistor
13. Flapper Nozzle system

TOTAL: 60 PERIODS

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

CO1: Able to perform test on DC shunt generator and DC shunt moor
CO2: Able to load test on transformer and induction motor
CO3: Understand the CRO
CO4: Able to understand time constant of RC circuit and Characteristics of LVDT
CO5: Able to execute test on RTD and Thermistor
### Course Articulation Matrix:

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<td>Able to load test on transformer and induction motor</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

- Get practical experience in the pre spinning machines
- Learn material passage in the machine and identify the parts of machine
- Do production, draft and twist calculations.

LIST OF EXPERIMENTS
1. Construction details of blow room machines and material passage
2. Cleaning efficiency and production calculations in blow room
3. Construction details of carding machine and the material passage
4. Draft and production calculations in carding machine
5. Wire point specifications and settings in carding machine
6. Construction details of drawing machine, material passage, draft and production calculations
7. Construction details of comber and material passage
8. Combing cycle, draft and production calculations
9. Construction details of roving machine, material passage
10. Draft, Twist and production calculations in roving machine
11. Study of builder mechanism of roving machine
12. Determination of degree of openness of fibre at blow room
13. Determination of neps present in the card and comber web

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

CO1: Understand the material passage in the spinning preparatory machines and draw gearing diagram,

CO2: Identify the components of blow room, carding machine, draw frame, comber and speed frame

CO3: Calculate draft, twist and production rate

CO4: Calculate degree of cleaning in blowroom, card and comber

TOTAL: 60 PERIODS
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<th>Course Outcomes</th>
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<td>Identify the components of blow room, carding machine, draw frame, comber and speed frame</td>
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<td>Calculate degree of cleaning in blowroom, card and comber</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 provide the mathematical foundations of numerical techniques for solving linear system, eigenvalue problems, interpolation, numerical differentiation and integration and the errors associated with them;
- To demonstrate the utility of numerical techniques of ordinary and partial differential equations in solving engineering problems where analytical solutions are not readily available.

UNIT I SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS 12

UNIT II INTERPOLATION AND APPROXIMATION 12
Interpolation with unequal intervals - Lagrange interpolation – Newton’s divided difference interpolation – Cubic Splines - Interpolation with equal intervals - Newton’s forward and backward difference formulae – Least square method - Linear curve fitting.

UNIT III NUMERICAL DIFFERENTIATION AND INTEGRATION 12

UNIT IV INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS 12

UNIT V BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS 12
Finite difference methods for solving two-point linear boundary value problems - Finite difference techniques for the solution of two dimensional Laplace’s and Poisson’s equations on rectangular domain – One dimensional heat-flow equation by explicit and implicit (Crank-Nicholson) methods - One dimensional wave equation by explicit method.

TOTAL: 60 PERIODS

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

CO1 Demonstrate understanding of common numerical methods and how they are used to obtain approximate solutions.
CO2 Apply numerical methods to obtain approximate solutions to mathematical problems.
CO3 Derive numerical methods for various mathematical operations and tasks, such as interpolation, differentiation, integration, the solution of linear and nonlinear equations, and the solution of differential equations.
CO4 Analyse and evaluate the accuracy of common numerical methods.
CO5 Boundary value problems in ordinary and partial differential equations
TEXT BOOKS:

REFERENCES:
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<td>Demonstrate understanding of common numerical methods and how they are used to obtain approximate solutions.</td>
<td>P O 1 P O 2 P O 3 P O 4 P O 5 P O 6 P O 7 P O 8 P O 9 P O 10 P O 11 P O 12 P S O 1 P S O 2 P S O 3</td>
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<td>Apply numerical methods to obtain approximate solutions to mathematical problems.</td>
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<tr>
<td>CO3</td>
<td>Derive numerical methods for various mathematical operations and tasks, such as interpolation, differentiation, integration, the solution of linear and nonlinear equations, and the solution of differential equations.</td>
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<td>Analyse and evaluate the accuracy of common numerical methods.</td>
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<td>Boundary value problems in ordinary and partial differential equations</td>
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AIM
To give them knowledge on structural, Mechanical properties of Beams, columns

OBJECTIVES
• The students will be able to design the support column, beams, pipelines, storage tanks and reaction columns and tanks after undergoing this course. This is precursor for the study on process equipment design and drawing.

UNIT I STRESS, STRAIN AND DEFORMATION OF SOLIDS

UNIT II TRANSVERSE LOADING ON BEAMS

UNIT III DEFLECTIONS OF BEAMS
Double integration method – Macaulay’s method – Area – moment theorems for computation of slopes and deflections in beams.

UNIT IV STRESSES IN BEAMS

UNIT V TORSION AND COLUMNS

TOTAL : 45 PERIODS

OUTCOMES:
Upon completion of this course, the student shall be able to understand
CO1: Stress, Strain and Deformation of Solids
CO2: Transverse Loading on Beams
CO3: Deflections of Beams
CO4: Stresses in Beams
CO5: Torsion and Columns

TEXT BOOKS

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<tr>
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<th>Program Outcome</th>
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<td>CO1</td>
<td>Stress, Strain and Deformation of Solids</td>
<td>PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 PSO1 PSO2 PSO3</td>
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<td>CO5</td>
<td>Torsion and Columns</td>
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</table>

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
- Basics of weaving machine and important motions of looms
- Selection and control of process variables during fabric formation

UNIT I  INTRODUCTION TO WEAVING
Yarns quality requirements for high speed automatic shuttle looms and shuttle less loom; warp and weft preparation for high speed looms; principle of weaving with hand and power looms, passage of material, motions in loom – primary, secondary and auxiliary motions, plain power loom driving, timing of motions.

UNIT II  SHEDDING MOTIONS
Shed geometry and shedding requirement; types of shed; shedding mechanisms - positive and negative; principles of tappet, dobby and jacquard shedding mechanisms; reversing mechanisms; limitations of various shedding mechanisms; conventional and modern dobby and jacquard mechanism.

UNIT III  WEFT INSERTION AND BEAT UP
Shuttle picking and checking mechanisms, shuttle flight and timing; weft feeder – types, principles of weft insertions in shuttle less looms; mechanism of weft insertion by projectile, rapier loom and jet looms – air and water; multi-phase weaving systems; kinematics of sley, sley eccentricity; beat up mechanism in modern looms

UNIT IV  SECONDARY AND AUXILIARY MOTIONS LOOMS
Take up and let-off motions used in plain power looms; cloth formation, weaving condition-factors and control; warp protector and warp and weft stop motion; plain power loom accessories; automatic weft replenishment in shuttle looms – pирн changing and shuttle changing looms; mechanisms involved in automatic pирн changing – feelers, cutters, design of shuttle, three try motions; multi shuttle looms- box changing principle, automatic pирн changing in multi shuttle loom; weft arrival control and automation in shuttle less looms; selvedges in shuttle less looms; quick style change.

UNIT V  PROCESS CONTROL & SPECIAL WEAVING PROCESS
Techno economics of shuttle less loom weft insertion systems; loom monitoring and control, loom stoppages and efficiency; fabric defects and value loss; fabric shrinkage in the loom - causes and control; fabric engineering; filament weaving – silk & texturised yarns; principles and mechanisms in weaving - pile fabrics, tapes and tri-axial fabrics; safety measures to be taken at weaving industry.

OUTCOMES:
Upon completion of this course, the student shall be able to understand the
- CO1: Basics of weaving operation
- CO2: Working of tappet, dobby and Jacquard shedding mechanism
- CO3: Principle of weft insertion in shuttle and shuttleless weaving and working of beat up mechanism
- CO4: Secondary and auxiliary motions
- CO5: Control of process variables at loom and understand the principle of producing special fabrics

REFERENCES
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</table>

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively.
OBJECTIVES:
To enable the students to understand the
- Theory of yarn formation by different spinning systems
- Construction of yarn spinning machines

UNIT I RING SPINNING
Principle of yarn formation in ring spinning machines; working of ring spinning machine; cop building; design features of important elements used in ring spinning machine; draft, twist and production calculations in ring spinning machine; end breakage rate – causes and remedies

UNIT II CONDENSED YARN SPINNING
Condensed yarn spinning – principle, different methods, properties; comparison with ring spun yarn

UNIT III YARN PLYING
Merits of plying of yarns; methods followed for plying – TFO, ring twisting; selection of twist level for plying; calculation of resultant count of plied yarns; types of fancy yarns, method of production

UNIT IV ROTOR SPINNING
Principle of open end spinning; principle of yarn production by rotor spinning system; design features of important elements used in rotor spinning; comparative study on properties of rotor yarn

UNIT V OTHER SPINNING SYSTEMS
Friction and air-jet spinning methods – principle of yarn production, raw material used, structure, properties and applications; principle of yarn production by self-twist, air vortex, core, wrap and other spinning systems; safety measures at spinning machines – equipments used, safety practices

OUTCOMES:
Upon completion of this course, the student shall be able to
- CO1: Understand the theory of formation of yarn by ring spinning system and construction of machine
- CO2: Understand the principle and method of production of condensed spun yarn
- CO3: Understand the concept and production of ply yarns and fancy yarns
- CO4: Understand the working of rotor spinning and design features of important elements
- CO5: Understand the working principle of friction, air vortex, air jet and other spinning systems

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<td>Understand the theory of formation of yarn by ring spinning system and construction of machine</td>
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<td>understand the concept and production of ply yarns and fancy yarns</td>
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<td>Understand the working principle of friction, air vortex, air jet and other spinning system</td>
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</table>

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively.
OBJECTIVES:
• To make the students understand different methods of production of manmade fibres and post spinning operations

UNIT I POLYMER RHEOLOGY
Transport phenomena in fibre manufacturing- heat and mass; polymer rheology-Newtonian and non-Newtonian fluids; necessary conditions of fibre forming polymer; melt instabilities.

UNIT II MELT SPINNING
Melt Spinning- polymer selection and preparation, equipments, testing of filament, properties and applications of polyester, polyamide and polypropylene fibres; process control

UNIT III SOLUTION SPINNING
Solution spinning- polymer selection and preparation, equipments, testing of filament, properties and applications of acrylic, polyurethane and regenerated cellulose fibres; process control

UNIT IV POST SPINNING OPERATIONS
Neck drawing, drawing systems, influence of drawing on structure and properties of fibres; types of heat setting, influencing parameters on heat setting, influence of heat setting on fibre behaviour; spin finish application; texturizing; process control

UNIT V ADVANCES IN FIBRE SPINNING
Liquid crystal spinning; gel spinning; profile fibres, hollow & porous fibres; speciality fibres-polyglycolic acid, polylactic acid, chitosan fibres preparation properties and applications; safety rules to be followed in fibre production industry

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of the course, the student shall know about the

CO1: Polymer Rheology
CO2: Melt spinning of polymers
CO3: Solution spinning of polymers
CO4: Post spinning operations carried out for the fibres/filaments produced
CO5: Advances in fibre spinning operation

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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 structures of woven fabric and design the structure for different applications

UNIT I
Basic weaves – plain, twill, satin, sateen and their derivatives – loom requirements

UNIT II
Ordinary and Brighten Honey Comb; Huck-a-Back and its modifications; Mock Leno; crepe weaves; colour theory – light and pigment theory; modification of colour; application of colours; colour and weave effects – loom requirements

UNIT II
Bedford cords - plain and twill faced, wadded; welts and piques, wadded piques; backed fabrics - warp and weft, reversible and non-reversible fabrics; extra warp and extra weft figuring - single and double colour – loom requirements

UNIT IV
Pile fabrics; warp pile - wire pile, terry pile, loose backed; weft pile – plain back and twill back velveteen, lashed pile, corduroy, weft plush – loom requirements

UNIT V
Double cloth, types of stitches; Damasks; Gauze and Leno principles – loom requirements; 3Dfabrics

TOTAL: 45 PERIODS

OUTCOMES:
Upon the completion of this course the student will be able to construct design, draft and peg plan and loom requirements for producing fabrics with

CO1: Plain, twill, satin and derivatives structures
CO2: Honey comb, crepe structures
CO3: Bedford cords, piques, backed fabrics, extra warp/weft figuring
CO4: Warp and weft pile structures
CO5: Double, damask, gauze and leno structures

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<td>CO5</td>
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| Overall CO      |                                                                           | 1   | 1   | 1.8 | -   | 2.8 | 1   | 1   | 1   | 2   | 1    | 1    | 1    | 2    |

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively.
OBJECTIVES:
To enable the students to understand the
- Identification of fibres by different methods
- Method of characterization of fibres

LIST OF EXPERIMENTS
1. Identification of natural, regenerated and synthetic fibres
2. Determination of density of various fibres by density gradient column
3. Determination of denier of synthetic fibres by gravimetric method
4. Determination of Moisture Regain and Moisture content of fibres
5. Determination of wax content and spin finish of natural and synthetic fibres
6. Identification of fibres and Determination of the blend proportion of
   a. Natural/ regenerated cellulose
   b. Cellulose/ protein fibres
   c. Cellulose/polyester fibres
   d. Natural cellulose/ regenerated cellulose/polyester
7. Analysis of thermal transitions of various fibres by Thermo gravimetric method.
   Comparison of low melting point and high melting point fibres and also its glass transition temperature
8. Analysis of end groups of polymers and fibres by using FTIR spectrometer
9. Sample preparation by wet spinning and determination of its properties
   a. Viscose
   b. Acrylic
10. Analysis of XRD patterns of various fibres and determination of crystallinity index

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

CO1: Identify the fibres using solubility test
CO2: Identify the fibres using burning test
CO3: Identify the fibres using microscopic characterization
CO4: Determination of linear density, density and moisture properties of fibres
CO5: Analyze the results of TGA, FTIR spectrometer and X-ray diffractometer

TOTAL: 30 PERIODS
## Course Articulation Matrix:

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<td>Identify the fibres using microscopic characterization</td>
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<td>Determination of linear density, density and moisture properties of fibres</td>
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</table>

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively.
OBJECTIVES:
- To enable the students to understand the material passage in the spinning machines, important parts of machines, draft, twist and production calculations
- To train the students to handle machine and operate them practically

LIST OF EXPERIMENTS
1. Construction details of ring spinning machine and material passage
2. Draft, Twist and production calculations in ring spinning machine
3. Study of builder mechanism of ring spinning machine
4. Selection of ring travellers
5. Construction details of rotor spinning machine and material passage
6. Draft, Twist and production calculations in rotor spinning machine
7. Production of carded web using miniature card
8. Production of sliver using miniature drawing machine
9. Production of different yarn samples using ring spinning machine
10. Production of different yarn samples using rotor spinning machine

TOTAL: 30 PERIODS

OUTCOMES:
Upon completion of this course, the student shall be able to
CO1: Calculate draft, twist and production rate of ring and rotor spinning machine
CO2: Understand the formation of yarn by ring and rotor spinning system
CO3: Produce yarn using ring and rotor spinning system
### Course Articulation Matrix:

<table>
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<tr>
<th>Course Outcomes</th>
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<th>PO1</th>
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<td>Calculate draft, twist and production rate of ring and rotor spinning 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
OBJECTIVES:
To enable the students to analyse different fabrics for structure and constructional details

LIST OF EXPERIMENTS
1. Visualization of commercially available woven, knitted and nonwoven fabrics
2. Analysis of construction details of the following fabric structure
   i. Plain and its derivatives
   ii. Twill and its derivatives
   iii. Satin (Regular and irregular)
   iv. Sateen (Regular and irregular)
   v. Honeycomb (ordinary and Brighton)
   vi. Huck-a-back
   vii. Extra warp and extra weft figuring
   viii. Pile fabrics (warp and weft)
   ix. Backed fabrics
   x. Gauze and Leno
   xi. Double cloth
   xii. Crepe
   xiii. Tapestry
   xiv. Mock-leno
   xv. Bedford cord.
   xvi. Single jersey
   xvii. Double jersey structures
3. Analysis of blend composition in the yarn of the fabric
4. Analysis of finish on the fabric

OUTCOMES:
Upon completion of this practical course, the student will be able to
   CO1: Analyze the woven and knit fabrics and determine the constructional details
   CO2: Draw design of the woven fabric structure,
   CO3: Draw draft plan of the woven fabric structure
   CO4: Draw peg plan of the woven fabric structure
   CO5: Analyze of blend composition and finish on the fabric
### Course Articulation Matrix:

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<th>PO2</th>
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<tr>
<td>CO1</td>
<td>Analyze the woven and knit fabrics and determine the constructional details</td>
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<td>Draw design of the woven fabric structure,</td>
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<td>Draw draft plan of the woven fabric structure</td>
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<td>Draw peg plan of the woven fabric structure</td>
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<td>Analyze of blend composition and finish on the fabric</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 understand the
- Fundamentals of knitting
- Types of knitting processes in detail
- Functioning of different components of knitting machine

UNIT I INTRODUCTION
Reasons for the growth of the knitting industry; comparison of fabric properties - woven, knits and bonded fabrics; classification of knitting processes – weft knit & warp knit; yarn quality requirements for knitting; preparation of staple yarns for weft and warp knitting

UNIT II FUNDAMENTALS OF KNITTING
General definitions and principles of knitting; types of knitting needles – Bearded, Latch & Compound needle; elements of knitted loop structure

UNIT III WEFT KNITTING
Basic weft knitted structures and their production - plain, rib, interlock and purl; fundamentals of formation of knit, tuck and float stitches; factors affecting the formation of loop; effect of loop length and shape on fabric properties; analysis of various types of weft knitted structure; weft knitted fabric geometry; basic principles and elements of flat knitting machines; different types of flat knitting machines- manual, mechanical and computer controlled; production of various weft knitted structures using flat knitting machines;

UNIT IV WEFT KNITTING MACHINES
Construction, characteristics and working of circular knitting machines used for the production of basic structures; production of derivatives of weft knitted structures; needle control in circular knitting machines; quality control in knitted fabric production; production calculation; safety measures to be taken at knitting industry; process control in weft knitting.

UNIT V WARP KNITTING
Basic principles; elements of warp knitted loop – open loop, closed loop; warp knitting elements-chain link, chain links for simple patterns, guide bar movement mechanism; Tricot and Rachel warp knitting machines; principles of double needle bar patterning, terry pile fabric production; let off system; run in value based on the lapping diagram; take up system; theoretical concepts of warp knitted loop configuration; uses of warp knitted fabrics in technical applications.

TOTAL: 60 PERIODS

OUTCOMES:
Upon completion of this course, the student shall know the
- CO1: Type of knitting processes, yarn requirements for knitting
- CO2: Principle of knitting in different types of knitting machines
- CO3: Basic weft knitted structures, flat knitting process
- CO4: Functioning of weft knitting machines
- CO5: Functioning of warp knitting machines

REFERENCES
## 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.
OBJECTIVES:
To enable the students to learn about chemical structure of fibres, pre-treatments involved in the wet processing of textiles and finishing treatment of textile fabrics

UNIT I
Chemical structure of fibres; action of chemicals on fibres; natural and added impurities in textiles; singeing and desizing of natural and synthetic fibres and its blends; heat setting.

UNIT II
Scouring, bleaching and mercerization of cotton, bio-scouring of cotton; carbonization, scouring and bleaching of wool; degumming of silk

UNIT III
Loose stock machine; hank and package processing machines; yarn singeing machine; woven and knitted fabric singeing machines; stretching devices; shearing and raising machines; kiers; mangles; jigger; winch; jet and soft flow machines; yarn mercerizer, chain and chainless mercerizers; continuous scouring and bleaching machines; washing ranges, hydro extractors; detwisters; dryers; stenters

UNIT IV
Calendaring, crease proofing, shrink proofing and softening; wool finishing.

UNIT V
Water and oil repellent finishes; fire retardant finish; antibacterial finish; Application of Nanotechnology in finishing; assessment of finishes; safety measures to be taken at the textile chemical processing industry.

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of this course, the student shall have the knowledge of
CO1: Chemical structure and action of chemicals
CO2: Necessity and requirements of pretreatments in wet processing of textiles
CO3: Machines for dyeing
CO4: Finishing machines after dyeing
CO5: Various finishing treatments on fabric

REFERENCES
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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 understand and apply process and quality control measures during spinning of yarn

UNIT I       LEVELLING 9
Different levelling methods adopted in the pre spinning machines; assessment and control of autoleveling; influence of the uniformity of the intermediate products on the yarn quality; effect of machines and processing parameters on product uniformity; importance of fibre-mix homogeneity on yarn quality; types and levels of mixing in the preparatory processes; assessment of fibre-blend variations.

UNIT II      NEP AND HOOK REMOVAL 9
Causes of nep and hook formation in the fibre-opening processes; improving the removal of neps in the carding and combing machines; fibre hook straightening during the preparatory operations; measurement of nep and hooklevel

UNIT III     WASTE CONTROL 9
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; cleaning efficiency

UNIT IV      PRODUCTION CONTROL 9
Factors affecting the production limits of the spinning machinery; achieving maximum production in the given machinery; new concepts in achieving higher production in the spinning machinery; role of machinery maintenance and humidity control on production efficiency; computation of the productivity indices.

UNIT V       YARN QUALITY ANALYSIS & MAN-MADE FIBRE PROCESSING 9
Analysis and control of within length and between length variations and spectrogram; yarn faults classifications; causes and remedies for yarn faults and defects; optimum processing conditions required for man-made fibres like polyester, viscose in the spinning machinery.

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: Neps and hooks removal during the preparatory processes
CO3: Control of waste during spinning
CO4: Importance of humidity control and machinery maintenance
CO5: Analysis of yarn quality and special measures to be taken while processing manmade fibres

TOTAL: 45 PERIODS

REFERENCES
### 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.
OBJECTIVES:
The students shall understand the principle and method of working of equipments used for testing of fibres and yarns.

UNIT I INTRODUCTION
Definition of quality; importance of quality assessment; method of developing quality and productivity norms; selection of samples for quality assessment – random and biased samples, squaring technique and zoning technique for fibre selection; yarn sampling - use of random numbers; sampling for various types of yarn tests.

UNIT II FIBRE LENGTH AND STRENGTH ANALYSIS
Fibre testing, the fibre quality index and spinnability; fibre length and length uniformity- measuring techniques; tensile strength testing modes – CRT, CRE, CRL and ARL; fibre strength, importance, relation to yarn strength; measurement techniques.

UNIT III FIBRE FINENESS, MATURITY AND TRASH ANALYSIS
Fibre fineness – definition, comparison of various fibres, its importance in yarn manufacture, measurement techniques; cotton fibre maturity, estimation by microscopic method, maturity ratio and index, estimation by other methods – optical, air flow differential dyeing, its importance in spinning; fibre trash – influence on quality, measurement, principle and estimation microdust for rotor spinning; high volume instrument for total fibre quality measurement.

UNIT IV YARN COUNT, TWIST AND STRENGTH
Yarn numbering systems-Indirect and direct systems, count conversions; count measuring systems; twist in single and ply yarns, twist directions, twist factor, twist and yarn strength; twist measurement and breaking twist angle measurement; single yarn strength; lea count- strength product (CSP) and Corrected Count Strength Product (CCSP).

UNIT V YARN MASS EVENNESS AND SURFACE QUALITY
Yarn mass evenness parameters, measurement; Yarn fault classification; Yarn Appearance; yarn abrasion resistance – importance and measuring technique; yarn hairiness – importance and assessment techniques; yarn friction– static and dynamic friction, methods of measurement.

OUTCOMES:
Upon completion of this course, the student shall be able to understand the
- CO1: Importance of quality and methods of sampling for fibre and yarn testing
- CO2: Fibre length and strength testing analysis
- CO3: Testing procedure and principle for fibre fineness, maturity and trash
- CO4: Yarn numbering systems, principle and test procedures for determining the yarn strength and twist
- CO5: Importance and measuring techniques for yarn evenness and surface quality

TOTAL: 45 PERIODS

REFERENCES
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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 the
- Fundamentals of bonded fabrics
- Different method of web formation and bonding

UNIT I  FUNDAMENTALS OF BONDED FABRICS  5
Definitions and classification of bonded fabrics; fibres, fibre preparations and their characteristics for the production of bonded fabrics, uses; methods of bonded fabric production

UNIT II  WEB FORMATION WITH STAPLE FIBRES  9
Production of staple-fibre web by dry and wet methods; influence of web laying methods on fabric properties; quality control of web

UNIT III  MECHANICAL, CHEMICAL AND THERMAL BONDING  13
Bonded fabric production by mechanical bonding - needling, stitching, water jet consolidation; thermal Bonding technologies; chemical bonding – binder polymers and bonding technologies

UNIT IV  POLYMER – LAID WEB AND FABRIC FORMATION  9
Manufacture of Spun bonded fabrics, fibre orientation in spun bonded fabrics and characterization of filament arrangement; manufacture of melt blown fabrics – fibre formation and its attenuation; effect of processing parameters on fabric characteristics

UNIT V  FINISHING AND APPLICATION OF BONDED FABRICS  9
Dry and Wet finishing; characterisation, structure - property relationship in bonded fabrics; End uses of bonded fabrics; safety measures to be taken at the nonwoven industry; process control in the manufacture of bonded fabrics.

TOTAL: 45 PERIODS

OUTCOMES:
- Upon completion of the course the student will be able to understand the
  CO1: Fundamentals of bonded fabric production
  CO2: Basics of nonwoven web formation techniques
  CO3: Mechanical, Chemical and thermal bonding methods to produce nonwovens and their end uses
  CO4: Production of spun bonded and melt blown nonwoven fabrics.
  CO5: Understand the finishing and characterization of bonded fabrics.

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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 practically understand the mechanisms of loom and knitting machines

LIST OF EXPERIMENTS
1. Analysis of Yarn faults
2. Control of production, package density, yarn faults in cone / cheese winding machine
3. Determination of depth of shed and heald shaft movements in tappet shedding mechanism
4. Preparation of pattern card for dobbi shedding mechanism and way in which adjust the depth of shed
5. Study of jacquard shedding mechanism
6. Power required to insert the weft through shuttle in over and under picking mechanism
7. Study of picking mechanism in shuttleless loom
8. Control of sley eccentricity and Beat-up force in weaving
9. Study of let-off mechanisms
10. Determination of pick space through 5 and 7 wheel take-up mechanisms
11. Study of weft replenishment mechanism in shuttle looms
12. Method of achieving the required colour patterns in 4 X 1 drop box motion
13. Study of warp protector mechanism
14. Study of plain, rib and interlock circular knitting machines
15. Study of flat knitting machines

OUTCOMES:
Upon completion of this practical course, the students will be able to
CO1: Test and analyze the yarn faults
CO2: Understand the primary mechanism and its control
CO3: Understand the secondary mechanism and its control
CO4: Understand the auxiliary motion
CO5: Understand the mechanism of knitting machines

TOTAL:60 PERIODS
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<td>Understand the auxiliary motion</td>
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<td>Understand the mechanism of knitting machines</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 practically determine the properties of fibres and yarns

LIST OF EXPERIMENTS
Determination of
1. Fibre fineness
2. Fibre length
3. Fibre maturity
4. Fibre trash content
5. Bundle fibre strength
6. Roving, sliver and yarn linear density
8. Single yarn strength
9. Yarn lea strength
10. Yarn single and ply yarn twist
11. Yarn impact strength
12. Yarn to yarn abrasion
13. Unevenness of yarn
14. Assessment of yarn appearance
15. Testing of synthetic filaments
16. Classification of yarn faults

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

CO1: Measure fiber characteristic
CO2: Measure the linear density of the strands
CO3: Measure the strength characteristic of yarn
CO4: Measure twist and surface characteristic
CO5: Classification of yarn faults

TOTAL: 45 PERIODS
## 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 understand the theory of dyeing and printing of woven fabrics, knitted fabrics and garments

UNIT I COLOUR SCIENCE 9
Theories of colour measurement, Beer–Lambert’s law and Kubelka-Munk theory and their application in colour assessment and colour matching; whiteness and yellowness indices.

UNIT II THEORY OF DYEING 9
Dyeing equilibrium; dye-fibre interaction; adsorption isotherm; dye affinity; heat of dyeing; half r dyeing time.

UNIT III DYEING 13
Basic characteristics of dyes and pigments; classification of dyes and principle of application of dyes; Chemistry and technology of application of direct, reactive, disperse, acid and basic dyes; processing of denims; determination of fastness properties.

UNIT IV PRINTING 9
Methods and styles of printing; printing machines; constituents of printing paste; printing with direct, reactive, acid and disperse dyes; printing with pigments

UNIT V KNITS AND GARMENTS 5
Dimensional stabilization of tubular and open width knits; garment dyeing and printing; garment washing

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of the course, the students will know about
- CO1: Theory of colour
- CO2: Theory of dyeing
- CO3: Different classes of dyes and method of dyeing
- CO4: Methods and styles of printing
- CO5: Chemical processing of knits and garments

REFERENCES
Course Articulation Matrix:

<table>
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<tr>
<th>Course Outcomes</th>
<th>Statement</th>
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<td>Methods and styles of printing</td>
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<td>CO5</td>
<td>Chemical processing of knits and garments</td>
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</table>

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively.
OBJECTIVES:

- To enable the students to understand the basics of pattern making, cutting and sewing
- To expose the students to various problems & remedies during garment manufacturing

UNIT I
Anthropometry, mass-production, mass-customization; pattern making, grading

UNIT II
Marker planning, spreading & cutting; Different types of seams and stitches; single needle lock stitch machine - mechanism and accessories; needle – functions, special needles, needle size, numbering, needlepoint; sewing thread-construction, material, thread size, packages

UNIT III
Raw material, in process and final inspection, labels, linings, interlinings, wadding, lace, braid, elastic, hook and loop fastening, shoulder pads, eyelets and laces, zip fasteners, buttons

UNIT IV
Garment pressing - categories and equipment, packing; care labeling of apparels

TOTAL: 60 PERIODS

OUTCOME:
Upon completion of the course, the students will know about

CO1: Anthropometry, pattern making and grading
CO2: Marker planning, spreading, cutting, types of seams and stitches, function of needles
CO3: Components and trims used in garments
CO4: Garment pressing, packing and care labelling

REFERENCES
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<th>Statement</th>
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<th>PO2</th>
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<td>Garment pressing, packing and care labelling</td>
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</table>

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
- Mechanics of elements of textile machinery
- Design of cams, cone drums and other important elements used in the textile machinery

UNIT I
Equations of forces, motion and energy; energy stored in rotating masses.

UNIT II
Clutches and brakes – types, application in textile machines; gears, gear trains; power transmission – different modes, advantages and limitations, applications

UNIT III
Differential and variable speed drives – principles, application in textile machines; design of cone drums – piano feed regulation, roving machine builder mechanism;

UNIT IV
Friction – calculations; bearings, design of drive transmitting shafts, balancing of rotating masses; principles of pneumatic controls used in textile machinery

UNIT V
Design of winder drums; kinematics of shedding; design of tappets; beat up force, sley eccentricity; power for picking

TOTAL: 45 PERIODS

OUTCOMES
Upon completion of the course students will
- CO1: Understand basics of linear and rotary motions
- CO2: Have knowledge on clutches and brakes
- CO3: Be able to design the cone drums, piano feed regulation and builder mechanisms
- CO4: Be able to understand the design aspects of machine elements for specific requirements
- CO5: Be able to design cams, tappets and understand kinematics of shedding and picking

REFERENCES
## Course Articulation Matrix:

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<td>Be able to design the cone drums, piano feed regulation and builder mechanisms</td>
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<td>Be able to understand the design aspects of machine elements for specific requirements</td>
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<td>Be able to design cams, tappets and understand kinematics of shedding and picking</td>
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</table>

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 the constructional details of fabrics, evaluation of fabric properties and their importance.

UNIT I  CONSTRUCTION CHARACTERISTICS  9
Basic fabric particulars – Measurement of ends and picks per inch, count of warp and weft, determination of the type of weave, measurement of length, width, thickness and density (GSM); warp and weft crimp measurements for spun and filament yarn fabrics, the cover factor calculations; fabric sampling techniques.

UNIT II  STRENGTH CHARACTERISTICS  9
Tensile strength measurement – ravelled strip test and grab test, mechanical and electronic measuring systems; tear strength – importance, measuring systems; bursting strength and its measurement; ballistic impact strength; Universal tensile tester - principle and operation.

UNIT III  SURFACE CHARACTERISTICS  9
Fabric stiffness – principle of measurement of flexural rigidity; drapeability – measurement of drape coefficient; crease recovery - measurement techniques; wrinkle recovery assessment using standard grades; principle and functioning of air permeability testers; water repellency, contact angle and fabric shrinkage testing; fabric abrasion resistance – measuring technique; fabric pilling resistance – methods of determination.

UNIT IV  LOW STRESS AND FUNCTIONAL CHARACTERISTICS  5
Fabric bending hysteresis testing; shear hysteresis measurements; fabric compression and decompression behaviour; fabric surface roughness and friction measurements; fabric tensile hysteresis measurements; fabric flame resistance testing methods; moisture and thermal characteristics.

UNIT V  FABRIC INSPECTION AND GARMENT QUALITY  13
Fabric inspection – manual, semi-automatic and automatic inspection systems; classification of fabric defects; independent product quality certification, acceptable quality level, MIL standards and final inspection; quality assessment of garments - cutting, sewing, pressing, finishing and packaging defects.

OUTCOMES:
Upon completion of this course, students would be able to understand
CO1: Construction characteristics of fabric
CO2: Different measuring principles of strength characteristics of fabric
CO3: Principles, test procedure for surface characteristics of fabrics
CO4: Low stress and functional characteristics of fabric
CO5: Fabric inspection and quality assessment of garments

REFERENCES
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1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively
COURSE DESCRIPTION
This course aims to help the students acquire the employability skills necessary for the workplace situations. It also attempts to meet the expectations of the employers by giving special attention to language skills, presentation skills, group discussion skills and soft skills. This will be achieved through expert guidance and teaching activities focusing on employability skills.

COURSE OBJECTIVES
- To enhance the employability skills of students with a special focus on presentation skills, group discussion skills and interview skills
- To help them improve their reading skills, writing skills, and soft skills necessary for the workplace situations
- To make them employable graduates

CONTENTS
UNIT I READING AND WRITING SKILLS
Reading: skimming & scanning strategies – note making skills – interpreting visual material (charts & tables) – critical reading – fast reading necessary for reading letters & files - preparing job applications - writing covering letter and résumé - applying for jobs online - email etiquette – writing official letters (placing an order, letters to consumers, etc.) writing reports – collecting, analyzing and interpreting data

UNIT II SOFT SKILLS
Hard skills & soft skills – soft skills: self-management skills & people skills - training in soft skills - persuasive skills – sociability skills – interpersonal skills – team building skills – leadership skills – problem solving skills – adaptability - stress management – motivation techniques – life skills -

UNIT III PRESENTATION SKILLS
Preparing slides with animation related to the topic – organizing the material - Introducing oneself to the audience – introducing the topic – answering questions – individual presentation practice— present the visuals effectively – 5 minute presentation

UNIT IV GROUP DISCUSSION SKILLS
Participating in group discussions – understanding group dynamics - brainstorming the topic -- questioning and clarifying – GD strategies (expressing opinions, accepting or refusing others opinions, turn taking) – activities to improve GD skills – viewing recorded GD - mock GD

UNIT V INTERVIEW SKILLS

LEARNING OUTCOMES
At the ends of the course students have to acquire about,
CO1: Good reading and writing skills
CO2: Soft skills for workplace situation
CO3: Good presentation skill
CO4: Group discussion skill
CO5: Interview skill
REFERENCES:

EXTENSIVE READING

WEB RESOURCES
1. www.humanresources.about.com
2. www.careerride.com
### Course Articulation Matrix:

<table>
<thead>
<tr>
<th>Course Outcomes</th>
<th>Statement</th>
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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 train the students in pre-treatment, dyeing, printing and testing of textile materials

LIST OF EXPERIMENTS
2. Peroxide Bleaching of Cotton Yarn/Fabric.
3. Degumming of silk.
4. Identification of dyes.
5. Dyeing of Cotton using Reactive dyes
6. Dyeing of Cotton using Vat dye
7. Dyeing of polyester using disperse dyes.
8. Dyeing of polyester and cotton blend.
9. Determination of wash, light, perspiration and rubbing fastness of dyed fabrics
11. Determination of Whiteness and Yellowness index.
13. Water proof and Flame retardant finishing of cotton
15. Antimicrobial Finish Evaluation

TOTAL: 60 PERIODS

OUTCOME:
Upon completing this practical course, the student would be able to
CO1: Desize, scour, bleach, dye, print and finish the fabric with different types of chemicals and colourants
CO2: Evaluate the fabric for fastness and chemical process related properties
Course Articulation Matrix:

<table>
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<th>Course Outcomes</th>
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<td>Desize, scour, bleach, dye, print and finish the fabric with different</td>
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<td>types of chemicals and colourants</td>
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<td>Evaluate the fabric for fastness and chemical process related properties</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: (merged)
To make the students practically learn the various fabric evaluation procedures to determine the characteristics of fabric

LIST OF EXPERIMENTS
Determination of
1. Fabric tensile strength
2. Fabric bursting strength
3. Fabric tear strength
4. Fabric flexural rigidity and bending modulus
5. Drapability of fabrics
6. Fabric crease recovery
7. Fabric wrinkle recovery
8. Fabric abrasion resistance
9. Fabric pilling resistance
10. Fabric air permeability
11. Fabric compression and decompression characteristics
12. Fabric surface roughness and friction coefficient
13. Seam strength and seam slippage

OUTCOMES:
Upon completion of this course, the students will be able to measure

CO1: Fabric mechanical property
CO2: Fabric aesthetic property
CO3: Fabric surface characteristics
CO4: Fabric low stress property
CO5: Seam strength and seam slippage

TOTAL: 30 PERIODS
## Course Articulation Matrix:

<table>
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<th>Course Outcomes</th>
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<td>Fabric mechanical property</td>
<td>PO1  PO2  PO3  PO4  PO5  PO6  PO7  PO8  PO9  PO10  PO11  PO12  PSO1  PSO2  PSO3</td>
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<tr>
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<td>Fabric surface characteristics</td>
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<tr>
<td>CO4</td>
<td>Fabric low stress property</td>
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<tr>
<td>CO5</td>
<td>Seam strength and seam slippage</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 understand the
- Fundamentals of the yarn structure, measures of structural parameters and factors influencing them
- Geometry of woven, knitted and nonwoven fabrics and understand the deformation of fabric under stress

UNIT I GEOMETRY OF TWISTED YARNS
Idealized helical yarn structure; relationship between yarn parameters twist contraction; idealized packing; measurement of packing density and radial packing density of yarn;

UNIT II FIBRE MIGRATION
Ideal migration, tracer fibre technique, characterization of migration behaviour, mechanisms of migration, effect of various parameters on migration behaviour.

UNIT III MECHANICS OF CONTINUOUS FILAMENT AND STAPLE YARNS
Analysis of tensile behaviour of yarn – fibre strain and modulus; prediction of breakage; Analysis of tensile behaviour of spun yarn - deduction based on fibre obliquity and slippage; influence of fibre length, fineness and friction on tensile behaviour; strength prediction model for blended yarns

UNIT IV GEOMETRY OF FABRIC STRUCTURE
Geometry of Plain weaves; Peirce and Olofsson models; Jamming of threads; Balance of crimp; geometry of knitted structures; structure of felts and stitch bonded fabrics

UNIT V FABRIC DEFORMATION
Fabric deformation under tensile stress; prediction of modulus; other fabric deformation – compression, shear, bending and buckling; load-extension of warp knit fabrics; mechanical behaviour of needle felts

OUTCOMES:
Upon completion of the course the student will be able to explain
CO1. Explain the Ideal helical model of yarn, different structural parameters and measurement of packing density of yarn
CO2. Understand migration behavior of fibers and method of measuring migration of fibres in yarn
CO3. Understand the tensile behaviour of filament and spun yarns
CO4. Understand the models proposed for geometry of fabrics
CO5. Behaviour of fabric under deformation

REFERENCES
**Course Articulation Matrix:**

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<th>Course Outcomes</th>
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<tr>
<td>CO1</td>
<td>Explain the Ideal helical model of yarn, different structural parameters and measurement of packing density of yarn</td>
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<tr>
<td>CO2</td>
<td>Understand migration behavior of fibers and method of measuring migration of fibres in yarn</td>
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<td>CO3</td>
<td>Understand the tensile behaviour of filament and spun yarns</td>
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<td>Understand the models proposed for geometry of fabrics</td>
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<td>Behaviour of fabric under deformation</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 understand
- Basics of financial management that are required for the textile industry
- Determination of cost of yarn, fabric and garment

UNIT I
Costing - concepts; classification of costs; preparation of cost sheet; costing of yarn, fabric and garment; cost profit volume analysis, breakeven analysis

UNIT II
Depreciation – method of computing depreciation; techniques of investment analysis - payback period method, accounting rate of return, Discounted Cash Flow methods - IRR, NPV, PI

UNIT III
Capital structure; Sources and cost of capital; working capital management

UNIT IV
Tools for financial analysis and control- profit and loss account, balance sheet; financial ratio analysis - illustrations from textile unit

OUTCOMES:
Upon completion of the course, the students shall be able to
- CO1: Understand the concept of costing, preparation of cost sheet and determine the cost of yarn, fabrics and garments
- CO2: Carryout investment appraisal and calculate depreciation
- CO3: Understand different sources and cost of capital and management of working capital
- CO4: Analyze and interpret the financial statements of textile company

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<td>Understand types and methods of costing, and preparation of cost sheet</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 train the students in the field work so as to have a firsthand knowledge of practical problems related to textile technology in carrying out engineering tasks.

SYLLABUS:

The students individually undertake training in reputed textile industries during the summer vacation for a specified duration of four weeks. At the end of training, a detailed report on the work done should be submitted within ten days from the commencement of the semester. The students will be evaluated through a viva-voce examination by a team of internal staff.

OUTCOME:

On completion of the course, the student is expected to be able to:

CO1: Acquire Oral presentation skills in Textile field
CO2: Acquire Technical report writing abilities
CO3: Document various material, machine and process parameters
CO4: Analyze industry problems and their solutions
CO5: Understand organizational flow structure.
# Course Articulation Matrix

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<tr>
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<td>Acquire Technical report writing abilities</td>
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<td>CO3</td>
<td>Document various material, machine and process parameters</td>
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<tr>
<td>CO4</td>
<td>Analyze industry problems and their solutions</td>
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<td>Understand organizational flow structure</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 work on a specific technical topic in textile technology to acquire the skills of oral presentation and to acquire technical writing abilities for seminars and conferences.

SYLLABUS:
The students will work for two hours per week guided by a group of staff members. They will be asked to talk on any topic of their choice related to textile technology and to engage in dialogue with the audience. A brief copy of their talk also should be submitted. Similarly, the students will have to present a seminar of not less than fifteen minutes and not more than thirty minutes on the technical topic. They will also answer the queries on the topic. The students as audience also should interact. Evaluation will be based on the technical presentation and the report and also on the interaction during the seminar.

OUTCOME:
On completion of the course, the student is expected to be able to acquire/understand

CO1: Oral presentation skills
CO2: Technical report writing abilities
CO3: Industry related problems and their potential solutions
CO4: Sustainable solutions for textile industry
CO5: Leadership qualities
**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.
OBJECTIVES:

• To solve the identified problem based on the formulated methodology.
• To develop skills to analyze and discuss the test results, and make conclusions.

SYLLABUS:

The student should continue the phase I work on the selected topic as per the formulated methodology. At the end of the semester, after completing the work to the satisfaction of the supervisor and review committee, a detailed report should be prepared and submitted to the head of the department. The students will be evaluated through based on the report and the viva-voce examination by a panel of examiners including one external examiner.

TOTAL: 300 PERIODS

OUTCOME:

At the end of the course, the students will carryout project work in the area of

CO1: Spinning and weaving
CO2: Fibre science and processing
CO3: Knitting and Nonwovens
CO4: Nanotechnology application in textiles
CO5: Textile structural composites
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.
OBJECTIVES:
To enable the students understand the characteristics of textile materials and their selection for different applications viz., transport, sports, medical, protective and geo applications.

UNIT I
Design and characteristics required in textiles for transport applications; applications of textile reinforced composites in transport sector; quality requirement of yarns used in fishing industry like nets, ropes; conveyor belts, power transmission belts.

UNIT II
Design and characteristics required in textiles for medical and hygiene applications; antimicrobial, disposable and reusable products; textiles in sports wear

UNIT III
Garment design and choice of materials in protection from hazards due to mechanical, extreme climate, nuclear, biological, chemical and flame

UNIT IV
Use of geo textiles in filtration, drainage, separation and reinforcement application in construction; type of fibre and fabric to be used in such applications; evaluation of geo textiles; use of textile materials in permanent and temporary civil construction - tents, awnings, sound and thermal insulation; textile abrasives; textiles for aerosol filtration

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of the course, the students shall be able to understand the textile materials required for
- CO1: Transport applications
- CO2: Medical and hygiene applications
- CO3: Protective clothing
- CO4: Geotextiles and filtration

REFERENCES
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</table>

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 the
- Important characteristics of the fabric responsible for its comfort properties and
- Different phenomena which take place in the fabric related to the comfort properties of the fabric

UNIT I
Comfort – types and definition; human clothing system, comfort perception and preferences

UNIT II
Psychological comfort; neuro-physiological comfort-basis of sensory perceptions; measurement techniques - mechanical stimuli and thermal stimuli

UNIT III
Thermo physiological comfort – thermoregulatory mechanisms of the human body, role of clothing on thermal regulations

UNIT IV
Heat and moisture transfer – moisture exchange, wearer’s temperature regulations, effect of physical properties of fibres, behaviour of different types of fabrics

UNIT V
Fabric tactile and mechanical properties - fabric prickliness, itchiness, stiffness, softness, smoothness, roughness, and scratchiness; predictability of clothing comfort performance

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

CO1: Criteria for comfort of fabrics
CO2: Psychological and physiological comfort with respect to clothing
CO3: Thermo physiological comfort requirements of human and the role of clothing
CO4: The behavior of different fabric in relation to heat and moisture transfer
CO5: The low stress mechanical properties of fabric with respect to comfort to the wearer

TOTAL: 45 PERIODS

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<td>Thermo physiological comfort requirements of human and the role of clothing</td>
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<td>The behavior of different fabric in relation to heat and moisture transfer</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 about
- Various operations research (OR) methods that can be applied in the textile industry
- Expressing of problems arising in the textile industry in appropriate Operations Research formats
- Methods of solving such Operations Research problems

UNIT I
Introduction – History of Operations Research, Scope of Operation Research, applications and limitations; The linear programming problem – construction, solution by graphical method, the Simplex method and its extension by the Big M method; Sensitivity analysis; Application of the LP technique in the field of Textile technology.

UNIT II
The Transportation problem – construction, initial basic feasible solution – North West Corner rule, lowest cost entry method, Vogel’s Approximation Method; the optimality test - MODI method, stepping stone method; replacement analysis

UNIT III
The Assignment problem – construction, solution by Hungarian method, application in the textile industry; sequencing problems; integer programming – construction, solving by cutting plane method

UNIT IV
Decisions theory - decisions under assumed certainty, decision under risk, decision under uncertainty, illustrations from textile industry; simulation-theory, models, queuing system; inventory control - EOQ models-deterministic models –probabilistic models;

UNIT V
Project planning and control models: CPM, PERT – network representation, determining critical path, project duration; crashing of project duration; resource levelling

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of the course, the students will be able to
CO1: Design Operations Research problems from the cases arising in the Textile Industry and determine solution for linear programming problems
CO2: Construct and solve transportation problems and carryout replacement analysis
CO3: Construct and solve assignment, sequencing and integer program problems
CO4: Understand decision making under different condition and inventory control
CO5: Construct and solve project scheduling by PERT and CPM techniques and resource levelling

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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 understand about total quality management, different TQM tools and techniques and Quality standards
- To train the students to apply TQM tools in textile industry

UNIT I INTRODUCTION

UNIT II TQM PRINCIPLES

UNIT III TQM TOOLS & TECHNIQUES I

UNIT IV LEAN MANUFACTURING, QUALITY SYSTEMS

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

CO1: Understand the concept of quality
CO2: Understand the principles of TQM and its application in textile industry
CO3: Apply innovative tools to implement TQM in textile industry
CO4: Understand lean manufacturing and quality system in textile industry

REFERENCES BOOKS
### 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
OBJECTIVES:
To enable the students to learn about
- Molecular structure of the fibres and
- Characterization of fibres for physical and chemical properties.

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

UNIT II MOLECULAR STRUCTURE
Infrared, NMR, UV–visible Raman and mass spectroscopy

UNIT III THERMAL PROPERTIES
Thermal properties by differential scanning calorimetry, differential thermal analysis, thermo gravimetry, thermo-mechanical analyzer, dynamic mechanical and di-electric analysis

UNIT IV CHROMATOGRAPHIC TECHNIQUES
Chromatographic techniques – adsorption chromatography – TLC, GC, LC – HPLC, GPC – hyphenated techniques

UNIT V OTHER METHODS
Optical and electron microscopy; SEM, TEM, X-ray scattering from polymers, birefringence, crystallinity by density measurements,

TOTAL: 45 PERIODS

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

CO1. Molecular weight of the polymers and its measurement
CO2. Molecular structure of the polymers
CO3. Measurement and analysis of thermal properties of different polymers
CO4. Characterization of textile polymers using chromatographic techniques
CO5: Characterization of textile polymers for morphology, crystallinity

REFERENCES
# 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.
OBJECTIVES:
To enable the students to understand need for coating of textiles, different methods of coating of textile fabrics

UNIT I
Rubber-Natural and Synthetic, polyvinyl Chloride, polyurethanes, acrylic polymers; adhesive treatment, radiation-cured coatings; materials and trends; textile fibres-spinning, woven fabrics, knitted fabrics, nonwoven fabrics

UNIT II
Rheological behaviour of fluids; rheology of plastisols; hydrodynamic analysis of coating; clothing comfort, impermeable coating, breathable fabrics

UNIT III
Coating features, methods of coating- knife coating, roll coating, dip coating, transfer coating, rotary screen printing, calendaring, hot-melt coating; general characteristics- tensile strength, elongation, adhesion, tear resistance, weathering behaviour, microbiological degradation, yellowing

UNIT IV
Synthetic leather, architectural textiles, fluid containers, tarpaulins, automotive air bag fabrics, carpet backing; textile foam laminates for automotive interiors; flocking fabrics for chemical protection; thermochromic fabrics, temperature adaptable fabrics, camouflage nets metal and conducting polymer, coated fabrics

UNIT V
Test methods for coated fabric evaluation; environmental norms for the chemicals used in coating industry.

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of this course, the students would be able to understand
   CO1: Polymers used for coating
   CO2: Rheology of coated polymers
   CO3: Methods of coating of textiles
   CO4: Application of coated fabrics
   CO5: Testing of coated fabrics

REFERENCES
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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 different textile structures

UNIT I
Metals, ceramics, polymers used for biomedical applications – manufacture, features and limitations; cell-bio material interaction

UNIT II
Non-implantable materials: Wound dressing - requirements of wound dressing, types, properties and applications; bandages - types, evaluation and applications

UNIT III
Implantable biomedical devices: vascular grafts, sutures - types, properties and applications; extra-corporeal materials; scaffolds for tissue engineering

UNIT IV
Healthcare and hygiene products: surgical gowns, masks, respirators, wipes, antibacterial textiles, super absorbent polymers

UNIT V
Safety, Legal and ethical issues involved in using medical textile materials

TOTAL: 45 PERIODS

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

CO1: Different types of materials used for biomedical applications
CO2: Functional requirements, types and evaluation of wound dressings and bandages
CO3: Functional requirements and characterization of vascular grafts, sutures and scaffolds for tissue engineering applications
CO4: Textile material used for hygiene and health care applications
CO5: Standards for testing, safety and ethical issues related to medical textiles

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1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively
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**OBJECTIVES:**
To enable the students to learn about preparation of cost sheet, costing of yarn, fabric and garments

**UNIT I**
Cost accounting, elements of cost, classification of cost elements – examples from textile industry, methods of costing; cost sheet preparation

**UNIT II**
Cost profit volume analysis, breakeven analysis; standard costing, analysis of variance

**UNIT III**
Costing of yarn – material, labour, power and overhead expenses, allocation of overhead costs; costing of fabric; costing of garment

**UNIT IV**
Foreign exchange mechanisms, exchange rates; foreign exchange exposure management – risks, strategies to reduce risk; working capital management

**UNIT V**
Budget, types of budgets, budgeting and control in textile industry

**TOTAL: 45 PERIODS**

**OUTCOMES:**
Upon completion of this course, the student shall be able to
- **CO1** Understand fundamentals of costing and construct cost sheet
- **CO2** Understand the concepts of cost profit volume and even break analysis and method of standard costing
- **CO3** Determine cost of yarn, fabric and garment
- **CO4** Understand the foreign exchange mechanism and management of working capital
- **CO5** Understand the concepts of preparation of budget

**REFERENCES**
### Course Articulation Matrix:

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<th>Course Outcomes</th>
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<td>CO1</td>
<td>Understand fundamentals of costing and construct cost sheet                                                                           -</td>
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<tr>
<td>CO2</td>
<td>Understand the concepts of cost profit volume and even break analysis and method of standard costing                                      -</td>
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<tr>
<td>CO3</td>
<td>Determine cost of yarn, fabric and garment                                                                                               -</td>
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<tr>
<td>CO4</td>
<td>Understand the foreign exchange mechanism and management of working capital                                                           -</td>
<td>-</td>
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<tr>
<td>CO5</td>
<td>Understand the concepts of preparation of budget                                                                                         -</td>
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<td><strong>Overall CO</strong></td>
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</table>

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
- Technique for making composites
- Manufacture and testing of composites and
- Application of composites

UNIT I      INTRODUCTION
Fibre reinforced polymers materials, properties; resins - thermoset and thermo plastics, additives
release agents; composite material classification and its properties; reinforcement – matrix
interface wettability

UNIT II      PREPREGS AND PREFORMS
Introduction; manufacturing techniques, property requirements; textile preforms - weaving, knitting
and braiding; geometrical aspects- fibre orientation, volume fraction, weight fraction and voids.

UNIT III     TECHNIQUES FOR MANUFACTURE OF COMPOSITES
Introduction, manufacturing processes – open mould process, closed mould process and
continuous process; metal matrix composites, ceramic matrix composites – types, importance and
processing

UNIT IV      MECHANICAL PROPERTIES OF TEXTILE COMPOSITES
Testing of reinforced plastics – tensile, flexural, impact, interlaminar shear and compression
properties

UNIT V       APPLICATION OF POLYMER COMPOSITES
Composites - application in aerospace, construction industry, and sports products; electrical,
polymer composite for biomedical and vibration damping

OUTCOMES:
Upon completion of this course, the student shall
CO1. Understand the basics of composites
CO2. Know about preforms, pre-pegs and their geometrical aspects
CO3. Know different methods of composite making
CO4. Know evaluation of characteristics of composites
CO5. Select different types of composites for different applications

REFERENCES
## Course Articulation Matrix:

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<td>Understand the basics of composites</td>
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<td>CO2</td>
<td>Know about preforms, pre-peg and their geometrical aspects</td>
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<tr>
<td>CO3</td>
<td>Know different methods of composite making</td>
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<tr>
<td>CO4</td>
<td>Know evaluation of characteristics of composites</td>
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<tr>
<td>CO5</td>
<td>Select different types of composites for different applications</td>
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<td><strong>Overall CO</strong></td>
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</table>

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively
OBJECTIVES:
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    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

UNIT V    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.

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of this course, the students shall be able to understand
CO1: Interaction between light and matter
CO2: Human colour vision
CO3: Colour order systems
CO4: Numerical Colour matching
CO5: Metamerism and colour difference assessment

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1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively.
OBJECTIVES:
- To provide an insight on the fundamentals of supply chain networks, tools and techniques.
- To train the students to new and recent developments in supply chains, e-business and information technology

UNIT I
Basic principles of supply chain management and logistics, supply chain models, supply chain for volatile market; supply chain drivers and metrics in apparel industries; roll of supply chain in the textile and apparel industries' financial stability.

UNIT II
Planning supply and demand in apparel production house, managing economies of scale, supply cycle and inventory levels; managing uncertainty in supply chain, safety pricing and inventory; make Vs buy decision, make Vs hire decision; geographical identification of suppliers, supplier evaluation, supplier selection, contract negotiations and finalisation.

UNIT III
Distribution network and design for global textile and apparel products, models of distribution – facility location and allocation of capacity, uncertainty on design and network optimisation; the role of transportation in supply chain, modes of transportation, characteristics of transportation, transport design options for global textile and apparel network, trade-off in transport design, risk management in transportation, transport decision in practice for textile and apparel industries.

UNIT IV
Coordination in supply chain- the bullwhip effect, forecasting, obstacles to coordination in supply chain; supply chain management for apparel retail stores, high fashion fad; supply chain in e-business and b2b practices

UNIT V
Import - Export management, documentation, insurance, packing and foreign exchange; methods of payments – domestic, international, commercial terms; dispute handling modes and channels; supply chain and Information system; Customer relationship management

OUTCOMES:
Upon completion of this course, the student shall have the
- CO1 Knowledge on the basic frame work of supply chain management
- CO2 Understanding the economics of demand cycle
- CO3 Understanding on the different distribution networks and its relevance with present apparel business conditions
- CO4 Understand on coordination of supply chain management
- CO5 understand supply chain management with apparel export and import

REFERENCES


### 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
OBJECTIVES:
To give the students an exposure on international market for textile products, regulations with respect to export and import of textiles

UNIT I
International markets for yarns, woven fabrics; international market for cotton, silk, jute, wool and other fibres; export and import of textiles by India – current status, promotional activities

UNIT II
International markets for carpets and home textiles – product types, market potential and statistics, India - current status and promotional activities, role of export promotional councils

UNIT III
International markets for woven piece goods, knitted garments, leather garments; statistics of international apparel market and trade; export incentives, role of AEPC, CII, FIEO, Textile Committee

UNIT IV
Marketing – strategies, global brand building; logistics & SCM; role of export finances & EXIM banking, ECGC, Indian council of arbitration, FEMA; impact of foreign trade on Indian economy

UNIT V
Exim policy - customs act, acts relating to export/import of textile and apparel; Indian customs formalities - export documentation for excisable goods, import documentation, clearance of import goods; concepts - 100% export oriented units, export processing zones, special economic zones; duty drawback procedure; import/export incentives; licenses; case study

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of this course, the student shall have the knowledge on

CO1 International market for fibre, yarn and woven fabric
CO2 International market for carpets and home textiles
CO3 International market for woven, knitted and leather garments
CO4 Knowledge on marketing strategies and export finance
CO5 Indian EXIM policies and procedure

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1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively.
OBJECTIVES
• To emphasise into awareness on Engineering Ethics and Human Values.
• To understand social responsibility of an engineer.
• To appreciate ethical dilemma while discharging duties in professional life.

UNIT I  HUMAN VALUES  3

UNIT II  ENGINEERING ETHICS  9

UNIT III  ENGINEERING AS SOCIAL EXPERIMENTATION  9
Engineering as experimentation - engineers as responsible experimenters - codes of ethics – Importance of Industrial Standards - a balanced outlook on law – anticorruption- occupational crime -the challenger case study.

UNIT IV  ENGINEER’S RIGHTS AND RESPONSIBILITIES ON SAFETY  12

UNIT V  GLOBAL ISSUES  12
Multinational corporations - Environmental ethics - computer ethics - weapons development - engineers as managers-consulting engineers-engineers as expert witnesses and advisors -moral leadership-Sample code of conduct.

TOTAL : 45 PERIODS

OUTCOMES
Upon completion of this course, the student shall

CO1: Understand the human values and have the ability to perform with professionalism
CO2: Understand the ethics and its related theory
CO3: Understand the industrial standards and occupational crime
CO4: Understand their rights and responsibilities on safety, legal, ethical issues as it pertains to engineering profession.
CO5: Understand the global ethical issues

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 understand the concept and construction of smart fabrics, intelligent textiles and interactive garments

UNIT I
An overview on smart textiles, electrically active polymers materials- application of non-ionic polymer gel and elastomers for artificial muscles; heat storage and thermo regulated textiles and clothing, thermally sensitive materials, cross – linked polymers of fibre substrates as multifunctional and multi-use intelligent material; mechanical properties of fibre Bragg gratings, optical responses of FBG (Fibre Bragg grating) sensors under deformation; smart textile composites integrated with optic sensors

UNIT II
Adaptive and responsive textile structures, bio-processing for smart textiles and clothing, tailor made intelligent polymers for biomedical application

UNIT III
Smart fabrics – passive, active, very smart; classification of smart materials, concept of wearable computing, basic structure of fabric used for integrating different electronic sensors

UNIT IV
Smart interactive garments for combat training, hospital and patient care; smart garments in sports and fitness activities; smart garments for children; smart home textiles

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of this course, the students shall have the knowledge on
- CO1: Requirement of polymers and their properties used in smart textiles
- CO2: Knowledge on polymers and textiles for biomedical applications
- CO3: Construction of smart textiles
- CO4: Application of smart textiles

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1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively
OBJECTIVE:
To acquaint students of the basic production machinery and equipments used in garment construction

UNIT I  FABRIC INSPECTION, SPREADING AND CUTTING MACHINES  
Fabric inspection machinery; spreading machines – manual, semi automatic and fully automatic machines; mechanism of straight knife, rotary, band knife, die, laser, plasma, water jet and ultra sonic cutting machines; notches, drills and thread markers; computer interfaced cutting machines; fusing and molding machines; safety measures

UNIT II  SEWING MACHINES  
Lock stitch and chain stitch sewing machine – types, driving arrangement, function of elements, stitch formation, timing, settings and feed mechanism; needles-geometry and types; selection of machine and process parameters for different applications; Button fixing and button holing machine; safety measures

UNIT III  MULTI THREAD SEWING MACHINES  
Overlock, flatlock, feed-off the arm, zig-zag and embroidery machines-- driving arrangement, function of elements, stitch formation, timing, settings and feed mechanism; safety measures

UNIT IV  FINISHING MACHINES  
Pressing machineries – buck pressing, iron pressing, block or die pressing, form pressing, steamers; folding and packing machines; safety measures

OUTCOMES:
Upon completion of the course, the students would understand

CO1 - Fundamental principle and working of machines used for spreading and cutting
CO 2 - Stitch formation and other mechanisms of SNLS machine and chain stitch machine and principle of button fixing and button holing machines
CO 3 - Stitch formation and other mechanisms of overlock, flatlock and other special sewing machines
CO 4 - Different types of finishing machines used for garments

TOTAL: 45 PERIODS

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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 understand the requirements and production of sewing threads for different applications

UNIT I 13
Sewing threads – property requirements for different applications; ticket numbering; characterization of sewing threads; sewability of the thread, seam efficiency index

UNIT II 14
Types of sewing thread – spun threads, core spun threads, filament threads; production, properties and applications; fancy yarns – types and production; metallic yarns

UNIT III 13
Characteristics and application of high performance sewing threads - aramid threads, ceramic threads, polypropylene threads, polyethylene threads, polytetrafluoroethylene threads, fibreglass threads, other sewing threads – tencel, acrylic, linen, elastic, soluble; embroidery threads

UNIT IV 5
Sewing defects related to sewing threads – Assessment and control

TOTAL: 45 PERIODS

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

CO1 Characteristics of sewing thread
CO2 Production of sewing thread and fancy yarns
CO3 Understand the characteristics of high performance sewing threads
CO4 Testing and quality assurance of sewing threads

REFERENCES
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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
- Basics of industrial engineering
- Different tools of industrial engineering and its application in apparel industry

UNIT I
Industrial Engineering - evolution, functions, role of industrial engineer; work study- introduction, procedure

UNIT II
Methods study – introduction, approach to method study; techniques of recording; method analysis techniques; principles of motion economy; method study in garment manufacture

UNIT III
Ergonomics - importance, division; ergonomic principles - designing of workplace, working processes, handling material, tools and environment; ergonomic conditions related to garment industry

UNIT IV
Work measurement– introduction; time study – equipment and procedure; standard data; work sampling techniques; incentive wage system; work measurement applied to garment industry; calculation of standard allowance minutes (SAM)

UNIT V
Site selection for garment industry; plant layout - types of layouts suitable for garment industry, methods to construct layout; line balancing

OUTCOMES:
Upon the completion of the course the student shall be able to understand
CO1: Fundamentals concepts of industrial engineering
CO2: Method study
CO3: Motion analysis
CO4: Work measurement and SAM
CO5: Concepts of line balancing and layout

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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 understand the selection of fibre, yarn, fabric and design of garments for different protective applications.

UNIT I    FIBRES, YARNS AND FABRICS FOR PROTECTIVE GARMENTS  13
Characteristic requirements of fibre, yarn and fabric for flame proof, heat resistant, ballistic resistance, electrical conduction, bacterial protection, radiation protection and radiation contamination protection.

UNIT II   CHEMICAL FINISHES FOR PROTECTIVE FABRICS  5
Mechanism, Chemistry, Materials and methods - Flame retardant, Liquid repellent, Antistatic, Antibacterial, UV protection and mite protection finishes.

UNIT III  PROTECTIVE FABRICS IN DIFFERENT APPLICATIONS  9
Protective fabrics used in the medical field and in hygiene; military combat clothing; protective fabrics against biological and chemical warfare; textiles for high visibility; antigravity suit.

UNIT IV   PROTECTIVE GARMENT CONSTRUCTION  9
Garment construction - method of construction of garments according to various protective end uses; use of accessories for protective garment; ergonomics of protective clothing.

UNIT V   EVALUATION OF PROTECTIVE TEXTILES  9
Standards and test method for protective fabric performance - flame retardant finishes, liquid repellent finishes, antistatic, liquid repellent, antibacterial, UV protection, mite protection; manikins-thermal manikins, segmented thermal manikins; evaporative resistance measurement-moisture permeability index, skin model; concept of dynamic manikins; permeation resistance test-index of penetration and index of repellency; liquid tight integrity and gas tight integrity.

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of the course, the students shall know the
CO1: Functional requirement of fibres, yarns and fabrics for different protective applications
CO2: Mechanism, materials and method of application of chemical finishes for protective textiles
CO3: Protective fabrics used for different applications
CO4: Construction of protective garments
CO5: Evaluation of protective textiles

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1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively.
OBJECTIVES:
To acquaint the students of the concepts of business, design merchandising, sourcing and export documentation

UNIT I     INTRODUCTION TO APPAREL BUSINESS    5
Apparel business practices; business operations in Asian countries. Business practices of Indian apparel export and retail houses.

UNIT II    MARKETING FOR APPAREL AND TEXTILE PRODUCTS    13
Marketing for the 21st century, core concepts and orientation towards market place, strategies and planning, market research and forecast, customers, consumer markets and business markets, market segments and brand building, brand positioning and competition

UNIT III   DESIGN MERCHANDISING        9
Concepts of merchandising, apparel product lines, dimensions of product change, determination and development of product line and product range. Creative design of garments and accessories, new product development and seasons of sale, costing, coordination and communication with the production house and export house

UNIT IV    SOURCING               9
Understanding the basics of sourcing, sourcing strategy and best sourcing practice in apparel and textile businesses, supply chain and demand chain understanding, sourcing negotiations, global co-ordination in sourcing, materials management and quality in sourcing, quick response and supplier partnership in sourcing, JIT technology.

UNIT V     EXPORT DOCUMENTATION AND POLICIES    9

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of this course, the student shall be able to
CO1: Understanding the international apparel business and role of Asian countries in the apparel and fashion trade
CO2: Applying the concepts of marketing and merchandizing in the apparel industry
CO3: Understand the manufacturing practices in apparel industry
CO4: Apply the concepts of sourcing in the apparel industry
CO5: Understand the apparel export and import procedure for international operations.

REFERENCES
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1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively.
OBJECTIVES:
- To provide students an exposure to disasters, their significance and types.
- To ensure that students begin to understand the relationship between vulnerability, disasters, disaster prevention and risk reduction.
- To gain a preliminary understanding of approaches of Disaster Risk Reduction (DRR).
- To enhance awareness of institutional processes in the country and.
- To develop rudimentary ability to respond to their surroundings with potential disaster response in areas where they live, with due sensitivity.

UNIT I  INTRODUCTION TO DISASTERS  9
Definition: Disaster, Hazard, Vulnerability, Resilience, Risks – Disasters: Types of disasters – Earthquake, Landslide, Flood, Drought, Fire etc - Classification, Causes, Impacts including social, economic, political, GE, health, psychosocial, etc.- Differential impacts- in terms of caste, class, gender, age, location, disability - Global trends in disasters: urban disasters, pandemics, complex emergencies, Climate change- Dos and Don’ts during various types of Disasters.

UNIT II  APPROACHES TO DISASTER RISK REDUCTION (DRR)  9
Disaster cycle - Phases, Culture of safety, prevention, mitigation and preparedness community based DRR, Structural- nonstructural measures, Roles and responsibilities of- community, Panchayati Raj Institutions/Urban Local Bodies (PRIs/ULBs), States, Centre, and other stakeholders- Institutional Processess and Framework at State and Central Level- State Disaster Management Authority(SDMA) – Early Warning System – Advisories from Appropriate Agencies.

UNIT III  INTER-RELATIONSHIP BETWEEN DISASTERS AND DEVELOPMENT  9
Factors affecting Vulnerabilities, differential impacts, impact of Development projects such as dams, embankments, changes in Land-use etc.- Climate Change Adaptation- IPCC Scenario and Scenarios in the context of India - Relevance of indienvironmental nous knowledge, appropriate technology and local resources.

UNIT IV  DISASTER RISK MANAGEMENT IN INDIA  9
Hazard and Vulnerability profile of India, Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management, Institutional arrangements (Mitigation, Response and Preparedness, Disaster Management Act and Policy - Other related policies, plans, programmes and legislation – Role of GIS and Information Technology Components in Preparedness, Risk Assessment, Response and Recovery Phases of Disaster – Disaster Damage Assessment.

UNIT V  DISASTER MANAGEMENT: APPLICATIONS AND CASE STUDIES AND FIELD WORKS  9
Landslide Hazard Zonation: Case Studies, Earthquake Vulnerability Assessment of Buildings and Infrastructure: Case Studies, Drought Assessment: Case Studies, Coastal Flooding: Storm Surge Assessment, Floods: Fluvial and Pluvial Flooding: Case Studies; Forest Fire: Case Studies, Man Made disasters: Case Studies, Space Based Inputs for Disaster Mitigation and Management and field works related to disaster management.

TOTAL: 45 PERIODS

OUTCOMES:
The students will be able to
- CO1 Differentiate the types of disasters, causes and their impact on environment and society.
- CO2 Assess vulnerability and various methods of risk reduction measures as well as mitigation.
- CO3 Draw the hazard and vulnerability profile of India, Scenarios in the Indian context.
- CO4 Disaster management in India.
- CO5 Disaster damage assessment and management.
TEXTBOOKS:

REFERENCES
1. Govt. of India: Disaster Management Act, Government of India, New Delhi, 2005
### 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.
OBJECTIVES:
• To sensitize the Engineering students to various aspects of Human Rights.

UNIT I

UNIT II

UNIT III
Theories and perspectives of UN Laws – UN Agencies to monitor and compliance.

UNIT IV
Human Rights in India – Constitutional Provisions / Guarantees.

UNIT V

TOTAL: 45 PERIODS

OUTCOME:
The students will be able to understand the

CO1: Basics of human rights
CO2: Evolution concepts of Human rights and its theories
CO3: Theories and perspectives of UN laws
CO4: Human rights in India
CO5: Human rights of weaker section people

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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 understand different types of finishes, method of application and characteristics of finished fabrics

UNIT I  9
Formaldehyde and non-formaldehyde based resin finishing, mechanism and types of resins deployed, methods of application, assessment of resins and finished goods.

UNIT II  9
Wetting and wicking; surface energy – concept, measurement and relevance to repellency; repellents applied to textile substrates; application of repellents by different techniques, assessment of the repellency in fabrics; detergency and soil release concepts, soil release agents, mechanism of soil retention & soil release, application of soil release finishes and its assessment; antistatic finishes mechanism, agents applied and its assessment.

UNIT III  9
Terminology related to flammability, flame retardant mechanisms, flame retarding chemicals for textile materials and testing of flame retardant finishes; mechanical finishes -calendaring, compacting, raising, sanforising, peach finishing, heat setting, foam finishing and various techniques for foam application, drawbacks of foam finishing.

UNIT IV  9
UV radiation; factors affecting UV protection; UV protection finishes; measurement of UV protection; antimicrobial finishes- classification, chemistry and application of antimicrobial finishes, evaluation of antimicrobial finishes.

UNIT V  9
Micro encapsulation techniques; softening finish; plasma finishing and application of nanotechnology in finishing

TOTAL : 45 PERIODS

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

    CO1: Crease proofing finish
    CO2: Water, antistatic and soil repellent finish
    CO3: Mechanical finishes and flame retardant finish
    CO4: UV protection and antimicrobial finish
    CO5: Advances in finishing

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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
- Various high performance fibres which are used as technical textiles
- Production of high performance fibres

UNIT I     LINEAR POLYMER FIBRES  9
Aramid fibres - polymer preparation, spinning, structure and properties and applications;
polyethylene fibres–manufacture, fibre characteristics, properties, yarn and fabric processing and applications

UNIT II     CARBON FIBRE  9
Manufacture of PAN-based, pitch-based carbon fibres - physical properties and applications

UNIT III     GLASS AND CERAMIC FIBRES  9
Glass fibres - fibre manufacture, properties; glass-fibre composites and other applications;
manufacture of ceramic fibres, siliconcarbide-based fibres, other non-oxide fibres, alumina-based fibres, other polycrystalline oxide fibres, single-crystal oxide fibres

UNIT IV     CHEMICAL AND THERMAL RESISTANCE FIBRES  12
Chlorinated fibres, fluorinated fibres, polyetherketones, polyphenylenesulphide, polyetherimide - properties and applications; thermo plastic and thermoset polymers, aromatic polyamides and polyaramids, semi carbonfibres, polybenzimidazole

UNIT V     SPECIALITY FIBRES  6
Specialty fibres - hollow and profile fibres; blended and bi-component fibres; super absorbent fibres

OUTCOMES:
Upon completion of the course, the students will have knowledge on manufacture and characteristics of
- CO1: Linear polymer fibres
- CO2: Carbon fibres
- CO3: Glass and ceramic fibres
- CO4: Chemical and thermal resistance fibres
- CO5: Speciality fibres

TOTAL: 45 PERIODS

TEXTBOOKS

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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 understand the method of production of yarn using long staple spinning system

UNIT I FIBRE CLEANING AND BLENDING
Impurities in the long-staple fibre like wool and their removal; methods adopted to process raw flax and jute; blending methods followed for long staple fibres

UNIT I FIBRE INDIVIDUALISATION
Fibre individualization in the carding machine; working principle and details of different type of carding machine-worsted carding, semi –worsted carding, woolen carding, flax carding and jute carding; card clothing and its maintenance; carding performance

UNIT I COMBING
Objective of combing; basic principles of combing; details of wol combing preparation and combing operation; worsted top finishing

UNIT IV DRAWING
Principle of long-staple drafting; effect of doubling; drafting irregularites; working details of worsted, semi worsted, jute and flax drawing; operating principle of roving machine

UNIT V YARN SPINNING
Mule spinning –drafting, twisting, backing-of, winding on; description of centrifugal spinning; flyer spinning; ring spinning – twisting, rings and travellers; condenser yarn spinning; cap spinning; open end spinning –general features of rotor and friction spinning as applicable to long-staple fibres; double-rove spinning; self-twist spinning system

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of this course, the students will be able to understand the process of

CO1: Fibre individualization, cleaning and the machineries required
CO2: Combing operation
CO3: Drawing operation
CO4: Yarn spinning
CO5: Alternative spinning

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OBJECTIVES
To enable the students understand the theory of 3D weaving and different methods of production

UNIT I INTRODUCTION
Introduction to composite; forms of textile reinforcements and composite properties; classification of 3D woven fabrics; 3D woven structural requirements for composite and non composite applications; stitched 3D fabric production machines; Angle-interlock structure.

UNIT II WOVEN MULTILAYER 3D FABRIC PRODUCTION
Multilayer 3D fabric – design concepts, production techniques, production issues, near net shape production techniques; woven 3D spacer fabrics - techniques in spacer fabric weaving, properties, application and limitations

UNIT III NON INTERLACED 3D FABRIC PRODUCTION
Non crimp fabrics - loom modifications required, various shedding techniques; weft insertion techniques; properties, application and limitations

UNIT IV ORTHOGONALLY INTERLACED 3D FABRICS PRODUCTION
3D shedding concept, shedding devices - dual direction shedding and other shedding devices; picking techniques; beat-up techniques; combined picking and beating up techniques – mechanisms; composite modular joint- types and weaving techniques; properties, application and limitations

UNIT V CIRCULAR AND MULTI AXIAL 3D WEAVING
Circular 3D weaving technique; Triaxial weaving; modification of Triaxial weaving- Quart-axial and extended weaving, loom arrangements; multilayer multi axial fabrics; other shedding devices; fabric properties, application and limitations

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of this course, the students would be able to understand
CO1: Types of 3D reinforcements used for making composites
CO2: Production of multilayer 3D fabrics and 3D spacer fabrics
CO3: Production of non-interlaced 3D fabric
CO4: Production of orthogonally interlaced 3D fabric
CO5: Circular and multi-axial 3D weaving

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<td>CO2</td>
<td>Production of multilayer 3D fabrics and 3D spacer fabrics</td>
<td>2</td>
</tr>
<tr>
<td>CO3</td>
<td>Production of non-interlaced 3D fabric</td>
<td>2</td>
</tr>
<tr>
<td>CO4</td>
<td>Production of orthogonally interlaced 3D fabric</td>
<td>2</td>
</tr>
<tr>
<td>CO5</td>
<td>Circular and multiaxial 3D weaving</td>
<td>2</td>
</tr>
<tr>
<td>Overall CO</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 introduce students the human anthropometrics from the scientific and technological viewpoint
- To equip students with comprehensive pattern making skills

UNIT I BASICS OF ANTHROPOMETRICS AND SIZING SYSTEM 9
Anthropometry measurements, human anatomy, landmark terms, perception of body appearance, its relation to clothing, clothing sizing systems, illusions created by clothing, body ideals-Eight head theory, body proportions, height and weight distribution.

UNIT II BODY MEASUREMENTS AND PATTERN TERMINOLOGIES 9
Important body measurements across all age groups, methods of measuring body dimensions, standard measurement chart-designation and control dimensions. Functions of pattern making tools, preparation of dress form, pattern grain line, balance line terms, notches, seam allowance, jog seam, dart points, pleats, flares, gather and true bias, trueing, blending.

UNIT III DRAFTING 9
Types of pattern making - drafting and draping methods; principles of pattern making, pattern details; basic blocks for men and women

UNIT IV PATTERNS FOR COLLARS AND SLEEVES 9
Collar classification and terms, basic shirt collar, peter pan collar, sailor collar, mandarin collar, built-up neck lines, cowls, sleeve cap, sleeve cuffs, puff, petal, lantern and leg-of-mutton sleeves

UNIT V FLAT PATTERN TECHNIQUES 9
Dart manipulation- single dart series-slash-spread technique, pivotal transfer technique; two dart series-slash spread and pivotal transfer technique; graduated and radiating darts; parallel, asymmetric and intersecting darts; types of added fullness and contouring principle

OUTCOMES:
On completion of the course students are expected to

CO1. Take cognizance of the significance of Anthropometric and the clothing sizing systems
CO2. Understand methods of taking body measurements
CO3. Be aware of drafting and draping methods of pattern preparation
CO4. Develop patterns for other garment components
CO5. Understand the principles of pattern making and dot manipulation

REFERENCES
**Course Articulation Matrix:**

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<td>Take cognizance of the significance of Anthropometric and the clothing sizing systems</td>
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<td>CO2</td>
<td>Understand methods of taking body measurements</td>
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<td>CO3</td>
<td>Be aware of drafting and draping methods of pattern preparation</td>
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<tr>
<td>CO4</td>
<td>Develop patterns for other garment components</td>
<td>2</td>
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<tr>
<td>CO5</td>
<td>Understand the principles of pattern making and dot manipulation</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 develop better understanding on pattern construction, grading and pattern alteration techniques to provide good fit

UNIT I  FOUNDATIONS FOR TOPS  9
Basic shirt foundation-front bodice draft, back bodice draft, sleeve draft, adding seam allowance and pattern information; kimono, raglan foundation; pattern for princess line foundation, strapless princess bodice foundation

UNIT II  FOUNDATIONS FOR BOTTOM WEAR  9
Pant foundation - front and back, waist band; jean foundation, pant derivatives;

UNIT III  PATTERNS FOR POCKET, PLACKET AND FACINGS  6
Pocket classification, plackets; facing patterns for cut-out necklines and armholes

UNIT IV  PATTERNS FOR KNITS, ACTION WEAR AND SWIMWEAR  12
Knit top foundations, bodysuit foundations and variations; swimwear–maillot, bikini, little-boy, and full-figure swim foundations; pattern for bias-cut dresses;

UNIT V  PATTERN ALTERATIONS AND GRADING  9
Pattern alteration - fit for bodice, trouser and skirt; grading process, grade rules and types of grading system

TOTAL: 45 PERIODS

OUTCOMES:
On completion of the course students are expected to

- CO1 Construct of top foundation
- CO2 Construct bottom wear foundation
- CO3 Construct the components such as pocket, placket and facings
- CO4 Construct action and swim wear foundation and knit pattern adaptation
- CO5 Carry on pattern alteration and grading

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<td>CO4</td>
<td>Construct action and swim wear foundation and knit pattern adaptation</td>
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<td>Carry on pattern alteration and grading</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 the study of nature and the facts about environment.
- To find and implement scientific, technological, economic and political solutions to environmental problems.
- To study the interrelationship between living organism and environment.
- To appreciate the importance of environment by assessing its impact on the human world; envision the surrounding environment, its functions and its value.
- To study the dynamic processes and understand the features of the earth’s interior and surface.
- To study the integrated themes and biodiversity, natural resources, pollution control and waste management.

UNIT I  ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY 14
Definition, scope and importance of environment – need for public awareness - concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers – energy flow in the ecosystem – ecological succession – food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) – Introduction to biodiversity definition: genetic, species and ecosystem diversity – biogeographical classification of India – value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – Biodiversity at global, national and local levels – India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity.
Field study of common plants, insects, birds
Field study of simple ecosystems – pond, river, hill slopes, etc.

UNIT II  ENVIRONMENTAL POLLUTION 8
Definition – causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards – soil waste management: causes, effects and control measures of municipal solid wastes – role of an individual in prevention of pollution – pollution case studies – disaster management: floods, earthquake, cyclone and landslides.
Field study of local polluted site – Urban / Rural / Industrial / Agricultural.

UNIT III  NATURAL RESOURCES 10
Forest resources: Use and over-exploitation, deforestation, case studies- timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. case studies – Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification – role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles.
Field study of local area to document environmental assets – river / forest / grassland / hill / mountain.
UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT


UNIT V HUMAN POPULATION AND THE ENVIRONMENT


TOTAL: 45 PERIODS

OUTCOMES:

CO1:To recognize and understand the functions of environment, ecosystems and biodiversity and their conservation.

CO2:To identify the causes, effects and environmental pollution and natural disasters and contribute to the preventive measures in the immediate society.

CO3:To identify and apply the understanding of renewable and non-renewable resources and contribute to the sustainable measures to preserve them for future generations.

CO4:To recognize different forms of energy and apply them for suitable applications in for technological advancement and societal development.

CO5:To demonstrate the knowledge of societal activity on the long and short term environmental issues and abide by the legal provisions, National and International laws and conventions in professional and personal activities and to identify and analyse effect of population dynamics on human value education, consumerism and role of technology in environmental issues.

TEXT BOOKS:


REFERENCES:


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<td>CO1</td>
<td>To recognize and understand the functions of environment, ecosystems and biodiversity and their conservation.</td>
<td>PO1 2 3 3 2 - - - 2 0 0</td>
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<tr>
<td>CO2</td>
<td>To identify the causes, effects and environmental pollution and natural disasters and contribute to the preventive measures in the immediate society.</td>
<td>2 1 1 - - 2 3 3 - - - - 2 0 0</td>
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<td>CO3</td>
<td>To identify and apply the understanding of renewable and non-renewable resources and contribute to the sustainable measures to preserve them for future generations.</td>
<td>1 1 1 - - 2 3 3 - - - - 2 0 0</td>
</tr>
<tr>
<td>CO4</td>
<td>To recognize different forms of energy and apply them for suitable</td>
<td>1 1 1 - - 3 3 3 - - - - 2 0 0</td>
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</tbody>
</table>
applications in for technological advancement and societal development.

<table>
<thead>
<tr>
<th>CO5</th>
<th>To demonstrate the knowledge of societal activity on the long and short term environmental issues and abide by the legal provisions, National and International laws and conventions in professional and personal activities and to identify and analyse effect of population dynamics on human value education, consumerism and role of technology in environmental issues.</th>
<th>-</th>
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</table>

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively.
OBJECTIVES:
- To understand the global trends and development methodologies of various types of products and services
- To conceptualize, prototype and develop product management plan for a new product based on the type of the new product and development methodology integrating the hardware, software, controls, electronics and mechanical systems
- To understand requirement engineering and know how to collect, analyze and arrive at requirements for new product development and convert them in to design specification
- To understand system modeling for system, sub-system and their interfaces and arrive at the optimum system specification and characteristics
- To develop documentation, test specifications and coordinate with various teams to validate and sustain up to the EoL (End of Life) support activities for engineering customer

UNIT I  FUNDAMENTALS OF PRODUCT DEVELOPMENT  

UNIT II  REQUIREMENTS AND SYSTEM DESIGN  

UNIT III  DESIGN AND TESTING  

UNIT IV  SUSTENANCE ENGINEERING AND END-OF-LIFE (EOL) SUPPORT  

UNIT V  BUSINESS DYNAMICS – ENGINEERING SERVICES INDUSTRY  

TOTAL: 45 PERIODS
OUTCOMES:
Upon completion of the course, the students will be able to:

- Define, formulate and analyze a problem
- Solve specific problems independently or as part of a team
- Gain knowledge of the Innovation & Product Development process in the Business Context
- Work independently as well as in teams
- Manage a project from start to finish

TEXTBOOKS:
1. Book specially prepared by NASSCOM as per the MoU.

REFERENCES:
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<th>PSO1</th>
<th>PSO2</th>
<th>PSO3</th>
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<tbody>
<tr>
<td>CO1</td>
<td>Define, formulate and analyze a problem</td>
<td>2</td>
<td>3</td>
<td>3</td>
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<tr>
<td>CO2</td>
<td>Solve specific problems independently or as part of a team</td>
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<td>Gain knowledge of the Innovation &amp; Product Development process in the Business Context</td>
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<tr>
<td>CO4</td>
<td>Work independently as well as in teams</td>
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<td>CO5</td>
<td>Manage a project from start to finish</td>
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UNIT I

Enterprise Resource Planning – principle, frame work, scope; application of ERP in textile manufacturing industry - business concepts, costing, order booking, MRP, purchase, production planning, production orders, inventory control, packing, shipping, scheduling, sample preparation and approval, business reports

UNIT II

ERP in textile processing – master creation, raw material receipt, batch creation, sample process and approvals, recipe creation, dyes and chemicals issue, production tracking, quality control, dispatch, invoice, machine repairs and maintenance, reports

UNIT III

ERP in retail management – style template, finished goods barcoding, stock taking, stock inward, retail order booking, stock allocation, scan and pack, dispatch, invoice, point of sale, reports

Total number of periods (Theory + Lab): 15+60

OUTCOME

Upon the completion of this course the students shall be able to

CO1: Understand the structure and carryout data entry using textile ERP software

CO2: Apply ERP concepts in textile chemical processing industry

CO3: Apply ERP concepts in Textile retail industry

TEXT BOOKS:


REFERENCES:

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