**SYLLABUS**

###  FOR

**FOUR-YEAR B. TECH PROGRAMME**

**IN**

**TEXTILE ENGINEERING**

**DEPARTMENT OF TEXTILE ENGINEERING**

**ODISHA UNIVERSITY OF TECHNOLOGY AND RESEARCH**

#  (FORMERLY COLLEGE OF ENGINEERING & TECHNOLOGY)

**(An Autonomous and Constituent College of BPUT, Odisha) Techno Campus, MahalaxmiVihar, Ghatikia,**

**Bhubaneswar-751029, Odisha, INDIA** [**www.cet.edu.in**](http://www.cet.edu.in/)

**Ph. No.: 0674-2386075 (Off.), Fax: 0674-2386182**

**Department of Textile Engineering (NBA Accredited)**

**Vision**

**To become a nationally acclaimed department for providing quality technical education in textile engineering and chemical processing.**

**Mission**

* To provide excellent technical education in textile engineering andchemical processing.
* To provide relevant industrial exposure and placement to ourstudents.
* To develop attitude, skill and ethical values in students, that will enable themto meet socio economic challenges.

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| **Programme Educational Objectives (PEOs)** |
| **PEO1:** | To produce human resources having technical competencies so that they can excel in professional career and/or higher education by acquiring knowledge and skill in design, analysis, mathematical computing and engineering principles. |
| **PEO2:** | To acquaint the students with real life problems through internship, collaborative programmes with industry,project works so as to enable them toinnovateprogrammatic, creative and economic solutions for real life problems in professional career. |
| **PEO3:** | To produce graduates, who are flexible and adaptable in the workplace and to possessthe capacity to embrace new opportunities of emerging technology, and embrace leadership and all affording sustainable engineering career. |
| **PEO4:** | To enable students to exhibit professionalism, ethical attitude, communication skills, team work in their profession and adapt to current trends by engaging in lifelonglearning. |

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| **Programme Outcomes (POs)** |
| **PO1:** | An ability to apply knowledge of mathematics, science, and engineering; |
| **PO 2:** | An ability to design and conduct experiments, as well as to analyze and interpret datausing techniques, hardware and software tools for modern engineering applications: |
| **PO 3:** | An ability to design a system, component, or process to meet desired needs; |
| **PO 4:** | An ability to function in multi-disciplinary teams; |
| **PO 5:** | An ability to identify, formulate, and solve Textile engineering problems; |
| **PO 6:** | An ability to use the techniques, skills, and modern engineering tools necessary for |

**Abbreviations Used:L = Lectures, P = Practical or Laboratory, T = Tutorial**

## IA = Internal Assessment , PA = Practical Assessment, EA = End-Semester Assessment

|  |  |
| --- | --- |
|  | textile engineering practice. |
| **PO 7:** | An ability to communicate effectively; |
| **PO 8:** | An ability in applying the communicative language skills and professional knowledgeto earn job opportunities in leading textile organizations. |
| **PO 9:** | An ability to recognize the need for and an ability to do research and to engage in life-long learning; |
| **PO10:** | An ability in learning professional, managerial, ethical and environmental basedprinciples to become good citizen of our nation. |
| **PO11:** | An ability to understand the impact of engineering solutions in a global and societalcontext. |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Programme Educational Objectives (PEOs)** | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
| **PEO 1:**To produce human resources having technical competencies so that they can excel in professional career and/or higher education by acquiring knowledge andskillindesign,analysis,mathematicalcomputing and engineering principles. | √ | **√** | **√** |  |  | **√** |  |  |  |  |  |
| **PEO 2:**To acquaint the students with real life problems through internship, collaborative programmes with industry, project works etc. so as to enable them to innovate programmatic, creative and economic solutions for real life problems inprofessional career. |  |  |  |  | **√** |  |  |  | **√** | **√** |  |
| **PEO 3:**To produce graduates, who are flexible and adaptable in the workplace and to possess the capacity to embrace new opportunities of emerging technologies, and embrace leadership and allaffordingsustainable engineering careers. |  |  |  |  |  |  | **√** | **√** |  |  |  |
| **PEO 4:** To enable students to exhibit professionalism, ethical attitude, communication skills, team work in theirprofession and adapt to current trends by engaging in lifelong learning. |  |  |  | **√** |  |  |  |  |  |  | **√** |

**Abbreviations Used:L = Lectures, P = Practical or Laboratory, T = Tutorial**

## IA = Internal Assessment , PA = Practical Assessment, EA = End-Semester Assessment

**1st SEMESTER**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Sl.****No.** | **Subject Type** | **Subject Code** | **Subject Name** | **Teaching Hours/Wee k** | **Credit** | **Maximum Marks** |
| **L** | **T** | **P** | **IA** | **EA** | **PA** | **Total** |
| 1 | Basic ScienceCourse | UBSPH101 | Physics | 3 | 1 | 0 | 4 | 30 | 70 | 0 | 100 |
| 2 | Basic ScienceCourse | UBSMH102 | Mathematics-I | 3 | 1 | 0 | 4 | 30 | 70 | 0 | 100 |
| 3 | Engineering ScienceCourse | UESEE103 | Basic Electrical Engineering | 3 | 1 | 0 | 4 | 30 | 70 | 0 | 100 |
| 4 | Basic ScienceCourse | ULCPH101 | Physics Lab | 0 | 0 | 3 | 1.5 | 0 | 0 | 100 | 100 |
| 5 | Engineering ScienceCourse | ULCEE102 | Basic Electrical Engineering Lab | 0 | 0 | 2 | 1 | 0 | 0 | 100 | 100 |
| 6 | Engineering ScienceCourse | ULCME105 | Workshop\Basic ManufacturingPractices Lab | 1 | 0 | 4 | 3 | 0 | 0 | 100 | 100 |
| **7** | Engineering ScienceCourse | UESIE102 | BASIC ELECTRONICS ENGINEERING | 2 | 0 | 0 | 2 | 30 | 70 | 0 | 100 |
| **8** | Engineering ScienceCourse | ULCIE102 | BASIC ELECTRONICS ENGINEERING LAB | 0 | 0 | 2 | 1 | 0 | 0 | 100 | 100 |
|  |  |  | **Total** |  |  |  | **20.5** |  |  |  | **800** |
| **7** | **Mandatory Course** |  | **Induction Programme** |  |  |  | **0** |  |  |  |  |

**2nd SEMESTER**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Sl.****No.** | **Subject Type** | **Subject Code** | **Subject Name** | **Teaching Hours/Week** | **Credit** | **Maximum Marks** |
| **L** | **T** | **P** | **IA** | **EA** | **PA** | **Total** |
| 1 | Basic ScienceCourse | UBSCH201 | Chemistry | 3 | 1 | 0 | 4 | 30 | 70 | 0 | 100 |
| 2 | Basic ScienceCourse | UBSMH202 | Mathematics- II | 3 | 1 | 0 | 4 | 30 | 70 | 0 | 100 |
| 3 | Engineering ScienceCourse | UESCS203 | Programming for Problem Solving | 3 | 0 | 0 | 3 | 30 | 70 | 0 | 100 |
| 4 | Humanities &SocialSciences | UHSMH205 | English | 2 | 0 | 0 | 2 | 30 | 70 | 0 | 100 |
| 5 | Basic ScienceCourse | ULCCH201 | Chemistry Lab | 0 | 0 | 3 | 1.5 | 0 | 0 | 100 | 100 |
| 6 | Engineering ScienceCourse | ULCCS202 | Programming for Problem SolvingLab | 0 | 0 | 4 | 2 | 0 | 0 | 100 | 100 |
| 7 | Engineering ScienceCourse | ULCME203 | Engineering Graphics andDesign Lab | 1 | 0 | 4 | 3 | 0 | 0 | 100 | 100 |
| 8 | HS | ULCMH204 | English Lab | 0 | 0 | 2 | 1 | 0 | 0 | 100 | 100 |
|  |  |  | **Total** |  |  |  | **20.5** |  |  |  | **800** |
|  **9** | **Summer Internship programme (4 to 8 weeks) is mandatory as per AICTE rule** |

**3rdSEMESTER**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Sl. No****.** | **Subject Type** | **Subject Code** | **Subject Name** | **Teaching****Hours/Week** | **Credit** | **Maximum Marks** |
| **L** | **T** | **P** | **I****A** | **E****A** | **PA** | **Tota****l** |
| 1 | Core Course | UPCTE301 | Fibre Science &Technology-I | 3 | 0 | 0 | 3 | 30 | 70 | 0 | 100 |
| 2 | CoreCourse | UPCTE302 | Yarn Manufacture-I | 3 | 0 | 0 | 3 | 30 | 70 | 0 | 100 |
| 3 | Core Course | UPCTE303 | Fabric Manufacture-I | 3 | 1 | 0 | 4 | 30 | 70 | 0 | 100 |
| 4 | Engg.Science Course | UESCE304 | Engineering.Mechani cs | 3 | 0 | 0 | 3 | 30 | 70 | 0 | 100 |
| 5 | Basic ScienceCourse | UBSMH30 1 | Mathematics-III | 3 | 1 | 0 | 4 | 30 | 70 | 0 | 100 |
| 6 | Humanitie s Science Course | UHSMH307 | Engineering Economics | 3 | 0 | 0 | 3 | 30 | 70 | 0 | 100 |
| 7 | LabCourse | ULCTE301 | Yarn Manufacture-I Lab | 0 | 0 | 3 | 1.5 | 0 | 0 | 100 | 100 |
| 8 | LabCourse | ULCTE302 | Fabric Manufacture-I Lab | 0 | 0 | 3 | 1.5 | 0 | 0 | 100 | 100 |
|  |  |  | **Total** |  |  |  | **23** |  |  |  | **800** |

**4th SEMESTER**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Sl.****No.** | **Subject Type** | **Subject Code** | **Subject Name** | **Teaching****Hours/Week** | **Credit** | **Maximum Marks** |
| **L** | **T** | **P** | **IA** | **EA** | **PA** | **Total** |
| 1 | Core Course | UPCTE401 | Fibre Science &Technology – II | 3 | 0 | 0 | 3 | 30 | 70 | 0 | 100 |
| 2 | Core Course | UPCTE402 | YarnManufacturing – II | 3 | 1 | 0 | 4 | 30 | 70 | 0 | 100 |
| 3 | Core Course | UPCTE403 | FabricManufacturing – II | 3 | 0 | 0 | 3 | 30 | 70 | 0 | 100 |
| 4 | Engg.ScienceCourse | UESIE411 | Basic Electronics | 3 | 0 | 0 | 3 | 30 | 70 | 0 | 100 |
| 5 | Humanities ScienceCourse | UHSMH406 | Organizational Behavior | 3 | 0 | 0 | 3 | 30 | 70 | 0 | 100 |
| 6 | LabCourse | ULCTE401 | Fibre Science & Technology Lab | 0 | 0 | 3 | 1.5 | 0 | 0 | 100 | 100 |
| 7 | Lab Course | ULCTE402 | Yarn Manufacture-IILab | 0 | 0 | 3 | 1.5 | 0 | 0 | 100 | 100 |
| 8 | Lab Course | ULCTE403 | FabricManufacture-II Lab | 0 | 0 | 3 | 1.5 | 0 | 0 | 100 | 100 |
| 9 | MandatoryCourse | UMCCE401 | EnvironmentalScience | 2 | 0 | 0 | 0 | 30 | 70 | 0 | 100 |
|  |  |  | **Total** |  |  |  | **20.5** |  |  |  | **900** |
| **10** | **Summer Internship programme (4 to 8 weeks) is mandatory as per AICTE rule** |

**5th SEMESTER**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Sl.****No.** | **Subject Type** | **Subject Code** | **Subject Name** | **Teaching****Hours/Week** | **Credit** | **Maximum Marks** |
| **L** | **T** | **P** | **IA** | **EA** | **PA** | **Total** |
| 1 | Core Course | UPCTE501 | Textile ChemicalProcessing – I | 3 | 0 | 0 | 3 | 30 | 70 | 0 | 100 |
| 2 | CoreCourse | UPCTE502 | YarnManufacturing-III | 3 | 0 | 0 | 3 | 30 | 70 | 0 | 100 |
| 3 | Core Course | UPCTE503 | FabricManufacturing- III | 3 | 0 | 0 | 3 | 30 | 70 | 0 | 100 |
| 4 | Core Course | UPCTE504 | Fabric Structureand Design | 3 | 0 | 0 | 3 | 30 | 70 | 0 | 100 |
| 5 | Programme Elective-I | i) UPETE501 ii)UPETE502 | 1. Technical Textile
2. Textile Finishing and ClothingCare
 | 3 | 0 | 0 | 3 | 30 | 70 | 0 | 100 |
| 6 | Open Elective-I |  | To be choosen from the list given below | 3 | 0 | 0 | 3 | 30 | 70 | 0 | 100 |
| 7 | Lab Course | ULCTE501 | Textile ChemicalProcessing- I Lab | 0 | 0 | 3 | 1.5 | 0 | 0 | 100 | 100 |
| 8 | Lab Course | ULCTE502 | Yarn and Fabric ManufacturingLab-III | 0 | 0 | 3 | 1.5 | 0 | 0 | 100 | 100 |
| 9 | Lab Course | ULCTE503 | Fabric Structure&Design Lab | 0 | 0 | 3 | 1.5 | 0 | 0 | 100 | 100 |
|  |  |  | **Total** |  |  |  | **22.5** |  |  |  | **900** |

**6th SEMESTER**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Sl.****No.** | **Subject Type** | **Subject Code** | **Subject Name** | **Teaching****Hours/Week** | **Credit** | **Maximum Marks** |
| **L** | **T** | **P** | **IA** | **EA** | **PA** | **Total** |
| 1 | Core Course | UPCTE601 | Textile ChemicalProcessing- II | 3 | 0 | 0 | 3 | 30 | 70 | 0 | 100 |
| 2 | Core Course | UPCTE602 | Testing ofTextile Materials | 3 | 0 | 0 | 3 | 30 | 70 | 0 | 100 |
| 3 | Programme Elective-II | (i)UPETE601 (ii)UPETE602 | (i) Garment Manufacturing Technology (ii)High Performance Fibres | 3 | 0 | 0 | 3 | 30 | 70 | 0 | 100 |
| 4 | Programme Elective-III | (i)UPETE603 (ii)UPETE604 | (i) Knitting and Nonwoven Technology (ii)Textile Mill Planning and Organization | 3 | 0 | 0 | 3 | 30 | 70 | 0 | 100 |
| 5 | Open Elective-II |  | To be choosen from the list given below | 3 | 0 | 0 | 3 | 30 | 70 | 0 | 100 |
| 6 | Lab Course | ULCTE601 | Textile Chemical Processing - IILab | 0 | 0 | 3 | 1.5 | 0 | 0 | 100 | 100 |
| 7 | Lab Course | ULCTE602 | Testing ofTextile Materials Lab | 0 | 0 | 3 | 1.5 | 0 | 0 | 100 | 100 |
| 8 | Lab Course | ULCTE603 | CAD &Knitting and NWLab | 0 | 0 | 4 | 2 | 0 | 0 | 100 | 100 |
|  |  |  | **Total** |  |  |  | **20** |  |  |  | **800** |
| **9** | **Summer Internship Programme (4 to 8 weeks) is mandatory as per AICTE rule** |

**7th SEMESTER**

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| --- | --- | --- | --- | --- | --- | --- |
| **Sl.** | **Subject Type** | **Subject Code** | **Subject** | **Teaching** | **Credit** | **Maximum Marks** |
| **No.** |  |  | **Name** | **Hours/Week** |  |  |
| **L** | **T** | **P** | **IA** | **EA** | **PA** | **Total** |
| 1 | Programme Elective-IV | (i)UPETE701 (ii)UPETE702 | 1. Process Control in Textile

Manufacturing1. Sustainability in Textile Manufacturing
 | 3 | 0 | 0 | 3 | 30 | 70 | 0 | 100 |
| 2 | Programme Elective-V | (i)UPETE703 (ii)UPETE704 | 1. Theory of Textile Structure
2. Advanced ChemicalProcessing
 | 3 | 0 | 0 | 3 | 30 | 70 | 0 | 100 |
| 3 | Programm e Elective- VI | (i)UPETE705 (ii)UPETE706 | 1. Intelligent and functional Textiles
2. Apparel production Planning Controlling &Scheduling
 | 3 | 0 | 0 | 3 | 30 | 70 | 0 | 100 |
| 4 | Open Elective-III |  | To be choosen from the list given below | 3 | 0 | 0 | 3 | 30 | 70 | 0 | 100 |
| 5 | Humanities ScienceCourse | UHSMH701 | Entrepreneurship Development | 3 | 0 | 0 | 3 | 30 | 70 | 0 | 100 |
| 6 | ProjectCourse | UPRTE701 | Minor Project Course | 0 | 0 | 8 | 4 | 0 | 0 | 100 | 100 |
| 7 | Seminar | USETE701 | Seminar | 0 | 0 | 2 | 1 | 0 | 0 | 100 | 100 |
|  |  |  | **Total** |  |  |  | **20** |  |  |  | **700** |

**8th SEMESTER**

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| --- | --- | --- | --- | --- | --- | --- |
| **Sl. No****.** | **Subject Type** | **Subject Code** | **Subject Name** | **Teaching****Hours/Week** | **C****re di****t** | **Maximum Marks** |
| **L** | **T** | **P** | **IA** | **E****A** | **PA** | **Tota****l** |
| 1 | Project Course | UPRTE801 | Project Course / Internship | 0 | 0 | 24 | 12 | 0 | 0 | 100 | 100 |
| 2 | Core Course | UPCTE801 | Comprehensive Viva Voce | 0 | 0 | 2 | 1 | 0 | 0 | 100 | 100 |
|  |  |  | **Total** |  |  |  | **13** |  |  |  | **200** |

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| **OPEN ELECTIVE OFFERED BY OTHER BRANCHES TO "TEXTILE ENGINEERING"** |
| **OPEN ELECTIVE - I (5TH SEM)** |
| **Sl. No** | **Branch** | **Subject Code** | **Subject** |
| 1 | ELECTRICAL ENGINEERING | UOEEE501 | Industrial Electrical Systems |
| 2 | MECHANICAL ENGG. | UOEME501 | Thermodynamics and Heat Transfer |
| UOEME502 | Applied Thermal Engineering |
| 3 | INSTRUMENTATION & ELECTRONICS ENGG. | UOEIE501 | Digital Communication |
| 4 | COMPUTER SCIENCE ENGG | UOECS504 | Real-Time Systems |
| UOECS505 | Advance Algorithms |
| UOECS506 | Parallel & Distributed Systems |
| 5 | INFORMATION TECHNOLOGY | UOEIT501 | Data Structure |
| 6 | BIOTECHNOLOGY | UOEBT501 | Physiology for Engineers |
| 7 | FASHION TECHNOLOGY | UOEFT501 | Fundamental Techniques of Apparel Design |
| 8 | CIVIL ENGINEERING | UOECE501 | Fluid Mechanics |
| **OPEN ELECTIVE - II (6TH SEM)** |
| **Sl. No** | **Branch** | **Subject Code** | **Subject** |
| 1 | ELECTRICAL ENGINEERING | UOEEE601 | Renewable Energy Systems |
| 2 | MECHANICAL ENGG. | UOEME601 | Basic Manufacturing Process |
| 3 | INSTRUMENTATION & ELECTRONICS ENGG. | UOEIE601 | MICRO ELECTRO MECHANICAL SYSTEM (MEMS) |
| 4 | COMPUTER SCIENCE ENGG | UOECS609 | Cambinatorics & Graph Theory |
| UOECS610 | Human Computer Interaction. |
| 5 | INFORMATION TECHNOLOGY | UOEIT601 | Object Oriented Programming using C++ |
| 6 | BIOTECHNOLOGY | UOEBT601 | Introduction to Biopharmaceutical Technology |
| 7 | FASHION TECHNOLOGY | UOEFT601 | Visual Art and Illustration Techniques |
| 8 | CIVIL ENGINEERING | UOECE601 | Mechanics of Solids |
| **OPEN ELECTIVE - III (7TH SEM)** |
| **Sl. No** | **Branch** | **Subject Code** | **Subject** |
| 1 | ELECTRICAL ENGINEERING | UOEEE701 | Control System Design |
| 2 | MECHANICAL ENGG. | UOEME701 | Mechanics of Solids |
| 3 | INSTRUMENTATION & ELECTRONICS ENGG. | UOEIE701 | Satellite Communication |
| 4 | COMPUTER SCIENCE ENGG | UOECS709 | Big Data Analytics |
| UOECS710 | Information Retrieval |
| UOECS711 | Machine Learning |
| 5 | INFORMATION TECHNOLOGY | UOEIT701 | Java Programming |
| 6 | BIOTECHNOLOGY | UOEBT701 | Computational Biology |
| 7 | FASHION TECHNOLOGY | UOEFT701 | Fashion Photography |
| 8 | CIVIL ENGINEERING | UOECE701 | Composite Materials |

**Suggested Open Electives for Other Branches:**

|  |  |  |
| --- | --- | --- |
| Open Elective-I | UOETE501 | Textile Structural composite |
| Open Elective-II | UOETE601 | Clothing Science and Technology |
| Open Elective-III | UOETE701 | Specialty Yarn and Fabric |

**Physics(3-1-0)**

#### **Course Outcomes:**

At the end of this course, students will demonstrate the ability to

1. Enhance the fundamental knowledge in Physics and its application relevant to various streams of Engineering andTechnology.
2. Understand interaction of light with matter through interference, diffraction and be able to distinguish ordinary light with a laser light and to realize propagation of lightpolarization.
3. Understand various crystal systems and their structures elaborately through opticalfibers.
4. Understand basic knowledge of quantummechanics.

#### **Module 1: (16 Hours)**

Classical Dynamics: Newton’s laws of motion, generalized coordinates, constraints, Principle of virtual work,D’Alembert’sPrinciple,Lagrangian,Actionprinciple,Lagrangeequationofmotion(noderivation) and its application to Simple Harmonic oscillator and simplependulum.

General properties of Matter: Stress, Strain, Hooks’ law, Young’s modulus.

Oscillation & Waves: Simple Harmonic Oscillation, damped harmonic oscillation, forced oscillator, resonance, coupled oscillation, concept of wave and wave equation.

Optics: Concept of interference, two source interference pattern, Biprism, Michelson Interferometer & measurementofwavelength.Diffraction:Huygensprinciple,Fresnel&Fraunhoferdiffraction,Zoneplate, Plane diffraction grating (formulaonly).

#### **Module 2: (12 Hours)**

Solid State Physics: Crystalline and amorphous solid, unit cell, Miller Indices, Reciprocal lattice, Bragg’s law, Brillouin’s zone, concept of fermions, Maxwell-Boltzmann, Fermi-Dirac and Bose-Einstein distribution function (only statement and formula), Concept of Fermions and Bosons. Classification of materials: metals, semiconductor and insulator in terms of band theory.

LASER and Fibre Optics: Principle and application, stimulated emission, population inversion, Lasing material (solid and gas), He-Ne laser, Rubi- LASER, Application of LASER (Engineering Application), Principle of optical fibre and its application to communication.

#### **Module 3: (12 Hours)**

Electromagnetism: Student will be familiarized with some basics used in vector calculus prior to development of Maxwell’s electromagnetic wave equations. No proof of theorems and laws included in this unit expected- statement and interpretation should sufficient.

1. Vector calculus: gradient of scalar field, divergence, curl of vector field (Only Physical significance) Gauss divergence theorem, Stoke’s theorem, Green’s theorem (Only Statements) and applications.
2. Gauss’s law of electrostatics in free space and in a medium and application (Only statements) electric displacement (D) magnetic Induction (B), Amperes circuital law (Only statements), displacement current,Faraday’slawofelectromagneticinduction(Onlystatements),BiotSavartsLaw(Onlystatements), Maxwell’s four electromagnetic equations, Wave equation for E and B fields in vacuum, Electromagnetic energy, Poynting vector (noderivation).

Quantum Physics: Elementary concepts of quantum physics formulation to deal with physical systems.

1. Need for Quantum Physics-Historical overviews, Particle aspects of radiation- Black body radiation, photoelectric effect, Compton scattering, pair production. (No derivations), Wave aspect of particles-matterwave,deBroglieHypothesis,HeisenbergUncertaintyprinciples-Statement,Interpretation and application to H-atom, Harmonic oscillator to calculate ground stateenergy.
2. Basic features of Quantum mechanics- Transition from deterministic to probabilistic, States of system-Wavefunction,probabilitydensity,superpositionprinciple,observablesandoperators,expectation values. Schrodinger equation- Time dependent and time independent, wavepackets.

#### **Text Books:**

1. L. Maharana, P. K. Panda, S. N. Dash, B. Ojha, Lectures in Engineering Physics,Pearson.

#### **Reference Books:**

1. An Introduction to Mechanics -D. Klippner & R. Kolenkow,TMH
2. Concepts of Modern Physics - ArthurBeiser.
3. Electricity & Magnetism -E. M.Purecell
4. Engineering Physics by D. K. Bhattacharya and Poonam Tandon, Oxford UniversityPress
5. Engineering Physics by D. R. Joshi, Mc GrawHill
6. Introduction to Electrodynamics- David J. Griffiths, PHIPublication
7. Optics- A. K.Ghatak
8. Physics-I for engineering degree students- B. B. Swain and P. K.Jena.
9. Quantum Mechanics -Powel &Craseman.
10. Quantum Physics -Gasiorowicz

## Basic ElectricalEngineering(3-1-0)

This is a foundation course aimed to expose the students the basic and under- lying principles ofElectrical circuits, Electro-mechanical energy conversion andMeasurements.

#### **Course Outcomes**

At the end of this course, students will be able to:

1. Understand and analyse basic electric and magneticcircuits.
2. Analysis of Transient condition in DCcircuit.
3. Understand the basic of various types of electrical machines andmeasurements.
4. Explain the under-laying principle of generation, transmission and distribution of the electrical power.

#### **Module 1: (10 Hours)**

Fundamentals of Electric Circuits: Fundamentals of electrical circuit, Ohm’s law, Kirchhoff’s laws, series and parallel connections, Electric Power and sign conventions, circuit elements and their characteristics. Practical voltage and current sources. Source Conversion.

ResistiveNetworkAnalysis:nodevoltageandmeshcurrentmethods,supernodeandsupermeshmethods, delta-starandstar-deltaconversions,superpositionprinciple,Thevenin’sandNorton’stheorems.maximum powertransfer.

#### **Module 2: (10 Hours)**

Single phase AC circuits: Single phase emf generation, Representation of sinusoidal waveforms, average, effective, peak and rms values, j operators, phasor concept, Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel) Instantaneous Power in AC Circuits, Real power, reactive power, apparent power, Power Factor, Power triangle, Complex Power.

Three-phase AC circuits: Three phase emf generation, Delta-star and star- delta conversions, voltage and currentrelationsinstaranddeltaconnections.solutionofthethreephasecircuitswithbalancedvoltageand balanced load conditions, phasor diagram, measurement of power in three phasecircuits.

Transient Analysis: Writing differential equations for circuits, DC steady state solutions of first order circuits.

#### **Module 3: (10 Hours)**

ElectricalMeasuringinstruments:Introduction,PMMCAmmetersandVoltmeterswithextensionofrange, Moving-Iron Ammeters and Voltmeters, Dynamometer type Wattmeter, Energymeter.

Magneticcircuits:MMF,flux,reluctance,inductance.ReviewofAmpereLaw,BiotSavartLaw.Magnetic field, Electricity and Magnetism, B-H characteristics and hysteresis loss, series and parallel magnetic circuits.

Transformers:Construction,operatingprinciple,emfequationandturnsratio.Typesoftransformer,phasor diagrams for no loadoperation.

#### **Module 4: (10 Hours)**

DCMachines:PrincipleofOperationofgeneratorandmotor,EMFequation,TorqueEquation,methodsof excitation. Speed equation of d.c. motor, speed control of d.c. shuntmotor.

Induction motor: construction of AC inductor machines, Revolving magnetic flux, torque and slip, synchronous speed.

Power Systems: Brief idea about various generating plants (Thermal, Hydel, and Nuclear), Transmission and Distribution of Electric Energy.

#### **Text Books:**

1. Electrical & Electronic Technology, E. Huges, Pearson, 9thEdition.
2. Electrical Engineering Fundamentals, Vincent Del Toro, 2nd Edition,PHI.

#### **Reference Books**:

1. C. L. Wadhwa,” Electrical Engineering”, New Age International Publishers, 2ndEdition.
2. Basic Electrical Engineering, A. Fitzgerald, D. E. Higginbotham and A. Grabel, TMH, 5thEd.

**English(2-0-0)**

**Course Outcome**

At the end of this course, students will be able to:

1. Equipped with the theory and practice ofcommunication.
2. Equipped with both theoretical vocabulary and basic tools which will help them develop as better communicators.

Select literary texts and establish how these texts contribute to the afore- mentionedobjectives

#### **Module 1: (08 Hours)**

Introduction to Communication:

Importance of Communication in English, the process of communication and factors that influence the process of communication: Sender, receiver, channel, code, topic, message, context, feedback, ’noise’. Principles of Communication. Barriers to Communication & Communication Apprehension, Verbal (Spoken and Written) and non-verbal communication, Body language and its importance in communication.

#### **Module 2: (07 Hours)**

Phonetics and Functional Grammar:

Sounds of English: Vowels (Monophthongs and Diphthongs), Consonants, Syllable division, stress (word, contrastive stress) & intonation, MTI and problem sounds, Review of Parts of Speech, Subject and Predicate, Tense, Voice Change, Idioms and Phrasal Verbs.

(Note:Thisunitshouldbetaughtinasimple,non-technical,applicationorientedmanner,avoidingtechnical terms as fast aspossible.)

**Module 3: (05 Hours)** Reading Literature:

Prose:

* Stephen Leacock: My Financialcareer.
* Mahatma Gandhi: from My Experiments withTruth.
* O’Henry: The Last Leaf.

Poetry:

* Nissim Ezekiel:Professor.
* Jack Prelutsky: Be glad your nose is on yourface.
* Maya Angelou: Still I rise(Abridged).

**PhysicsLab(0-0-3)**

##### ***List of Experiments***

***(At least 10 experiments should be done)***

**Experiment List:**

1. Determination of Young’s modulus by Searle’s method / Bending ofbeams.
2. Determination of Rigidity modulus by staticmethod.
3. Determination of surface tension by capillary risemethod.
4. Determination of acceleration due to gravity by Bar / Kater’spendulum.
5. Verification of laws of vibration of string usingsonometer.
6. Determination of wavelength of light by Newton’s ringapparatus.
7. Determination of grating element of a diffractiongrating.
8. Determination of wavelength of laser source by diffraction ratingmethod.
9. Determination of wavelength using MichelsonInterferometer.
10. Plotting of characteristic curve of a PN junctiondiode.
11. Plotting of characteristic curves ofBJT.
12. Determination of unknown resistance using MeterBridge.
13. Determine of reduction factor of the given tangentgalvanometer.
14. Determination of horizontal component of earth’s magnetic field by using tangentgalvanometer.
15. Determination of Hall coefficient using Hallapparatus.

## Basic Electrical EngineeringLab(0-0-2)

##### ***List of Experiments***

***(At least 10 experiments should be done)***

**Course Outcomes**

 At the end of the course the students are able to:

1. Learn about the working of different measuring instruments for measuring power, power factor, energyetc.
2. Verify different NetworkTheorems
3. Draw the Open Circuit Characteristics of dc generator andTransformer
4. Visualize the constructional details of differentmachines

**Experiment List:**

1. Basic safety precautions. Introduction and use of measuring instruments - voltmeter, ammeter, wattmeter, Rheostat, multi-meter,oscilloscope.
2. Connection and measurement of power consumption of an Incandescent, fluorescent, LED and CFL lamp and determination of power factor.
3. Power and power factor measurements in three phase system by two wattmetermethod.
4. Verification of super position, Thevenin and Norton’stheorem.
5. Plotting of B-H curve of different magnetic material and calculation of hysteresisloss.
6. Testing of a single-phase energy meter at different powerfactor.
7. Calculation of power and power factor in series R-L-C circuit excited by single-phase AC supply and draw the phasor diagram.
8. Determination of open circuit characteristics (OCC) of DC shuntgenerator.
9. Measuring the steady-state and transient time-response of R-L, R-C, and R-L-C circuits to a step change involtage.
10. Observationoftheno-loadcurrentwaveformofatransformeronanoscilloscopeandmeasurement of primary and secondary voltages and currents, and power at differentload.
11. Demonstration of cut-out sections of machines: dc machine (commutator- brush arrangement), induction machine (squirrel cage rotor), synchronous machine (field winding - slip ringarrangement).

## Workshop/Basic ManufacturingPractices(1-0-4)

#### **Module 1: (05 Hours)**

Engineering materials: Classification of Engineering materials. Mechanical properties of Steel,Aluminum andPlastics.

Safety precautions in workshop.

Fitting: Knowledge of hand tools: V-block, Marking Gauge, Files, Hack Saw, Drills, Taps, Types of fitting.

#### **Module 2: (05 Hours)**

Welding: Study of electric arc welding tools & equipments, Models: Butt Joint, Lap Joint, T joint & L- joint.

Machining: Introduction to different machine tools: Lathe machine, Shaper machine and milling machine.

Brief introduction to other basic manufacturing processes like foundry, sheet metal operation and forming processes.

#### **Text Books:**

1. Elements of Workshop Technology, Vol. I and II by Hajrachoudhary, KhannaPublishers.
2. Workshop Technology by W. A. J. Chapman, VivaBooks.
3. Workshop Manual by Kannaiah/ Narayana,Scitech.

**EnglishLab(0-0-2)**

##### ***List of Experiments***

***(All the experiments should be done)***

**Course Outcome:**

At the end of the course the students are able to:

1. Acquaintedwiththeirstrengthandweaknessinexpressingthemselves,theirinterestsandacademic habits.
2. ImproveskillsofLSRW(Listening,Speaking,ReadingandWriting)throughmutualconversation and activities related to theseskills.
3. Promote the creative and imaginative practices before theteacher-trainer.

Lab sessions will give a platform for the students to indulge in activities based on the first two modules of theorytaughtintheclassroom.Allthelabclasseswillbedividedinsuchamannerthatallthefouraspects of language (LSRW) arecovered.

#### **Experiment List:**

1. Speaking: Ice-breaking and Introducing each other, Writing: Happiest and saddest moment of my life.
2. Listening: Listening practice (ear training): News clips, Movie clips, Presentation, Lecture or speech by a speaker, Speaking:Debate.
3. Reading: Reading comprehension, Writing: Creative writing (Short story: Hints to be given by teacher).
4. Reading:TopicsofGeneralawareness,CommonerrorsinEnglishusage,Writing:Constructionof different types ofsentences.
5. Speaking: Practice of vowel and consonant sounds, Writing: Practice of syllabledivision.
6. Speaking: My experience in the college/ or any other topic as per the convenience of the student, Writing: Phonemic transcription practice.
7. Listening: Practice of phonetics through ISIL system and also with the help of a dictionary, Speaking: Role-play ingroups.
8. Speaking: Practice sessions on Stress and Intonation, Writing: Practice sessions on Grammar (Tense and voicechange).
9. Speaking: Extempore, Writing: Framing sentences using phrasal verbs andidioms.
10. Watching a short English Movie, Writing: Critical analysis of themovie.

End-termAssignment:Studentsarerequiredtomakeaprojectofatleast5pagesonatopiconthefollowing broad streams: Technology, General awareness, Gender, Environment, Cinema, Books and the like. The assignment should involve data collection, analysis andreporting.

**Basic Electronics Engineering**

**Module 1: (12 Hours)**

**Semiconductor Diodes:**

Semiconductor materials- intrinsic and extrinsic types, Ideal Diode, Terminal characteristics of diodes ( p-n junction under open circuit condition, p-n junction under forward bias and reverse bias condition)p-n junction in breakdown region, Diode small signal model, Zener diode and applications , Rectifier Circuits ( Half wave, Full wave centre tap and bridge rectifiers )

**Bipolar Junction Transistors (BJTs):**

Physical structure and operation modes**,** Active region operation of transistor**,**  D.C. analysis of transistor circuits**,**  Transistor as an amplifier**,**

**Module 2: (12 Hours)**

**BJT Biasing and Modeling:**

Biasing the BJT: fixed bias, emitter feedback bias and voltage divider bias**,** Basic BJT amplifier configuration: common emitter, common base andcommon collector amplifiers

**Field Effect Transistor:**

JFET-types, Operations and their Characteristics ,MOSFETs- types, Operations and their Characteristics

**Feedback Amplifiers and Oscillators:**

Types of feedback, Advantages of Negative feedback, Barkhausen criterion, RC oscillators (phase shift, Wien bridge), LC oscillators (Hartley)

**Extra (To be taught in Department level)**

Transistor as a switch: cut-off and saturation modes, High frequency model of BJT amplifier.

**Operation Amplifier (Op-amps):**

Ideal Op-amp, Differential amplifier: differential and common mode operation, common mode rejection ratio (CMRR), Practical op-amp circuits: inverting amplifier, non -inverting amplifier, weightedsummer, integrator, differentiator

**Reference Books:**

1. A. S. Sedra and K. C. Smith, *Microelectronic Circuits: Theory and Applications*, 7th edition. Oxford, 2017.

2. B. Razavi, *Fundamentals of Microelectronics*, 2nd edition. Wiley-India, 2014.

3. R. L. Boylestad and L. Nashelsky, *Electronic Devices and Circuit Theory*, 11th edition. Pearson, 2013.

4. T. C. Carusone, D. Johns, and K. Martin, *Analog Integrated Circuit Design*, 2nd edition. Wiley-India, 2013.

5.  P. R. Gray, P. J. Hurst, S. H. Lewis, and R. G. Meyer, *Analysis and Design of Analog Integrated Circuits*, 5th edition. Wiley-India, 2009.

6. D. A. Neamen, *Electronic Circuits: Analysis and Design*, 3rd edition. Tata McGraw-Hill, 2008.

**Basic Electronics Laboratory Experiment List**

***List of Experiments***

***(At least 5 Experiments Should be done)***

|  |  |  |
| --- | --- | --- |
| **Sl No.** | **Name of the Experiment** | **Week** |
| 1 | Familiarization with electronic components&equipment’s (Active & Passive, Multi-meters, CROs and function generators) | 1 |
| 2 | Study of the characteristics of P-N junction diode and finding dynamic resistance. | 2 |
| 3 | Construction of half-wave rectifier and full wave rectifier circuits & study of their output waveforms by CRO and calculation of efficiency and ripple factor. | 3 |
| 4 | Study of the output characteristics of a Common Emitter Transistor | 4 |
| 5 | Design, setup and plot the frequency response of Common Source JFET/MOSFET amplifier and obtain the bandwidth. | 5 |
| 6 | Study of the characteristics of Zener diode. | 6 |
| 7 | Construction of clipper circuits & study of their output waveforms of positive clipper, negative clipper and two level clipper by CRO. | 7 |
| 8 | Construction of clamper circuits & study of their output waveforms of positive clamping, negative clamping by CRO. | 8 |

**Mathematics-I(3-1-0)**

#### **Course Outcomes**

On successful completion of this course, the students will be able to:

1. Applytheprinciplesofdifferentialcalculustosolveavarietyofpracticalproblemsinengineering and appliedsciences.
2. Possess fundamental understanding of Fourier series and be able to give Fourier expansions of a function,
3. Apply the principles of vector calculus to solve a variety of basic problems in engineering and appliedscience,
4. Solve a variety of first order and higher order differential equations selecting from a variety of techniques covered in thesyllabus.

#### **Module 1: (10 Hours)**

Calculus:Asymptote,Curvature,Convergenceofsequenceandseries,testsforconvergence,powerseries, Taylor’s series, Fourierseries.

Partialdifferentiation,Taylor’stheoremforfunctionoftwovariables,MaximaandMinimaforfunctionof twovariables.

#### **Module 2: (10 Hours)**

Vector differential calculus: vector and scalar functions and fields, Derivatives, Curves, tangents and arc length, gradient, divergence, curl.

Vector integral calculus: Line Integrals, Green Theorem, Surface integrals, Gauss theorem and Stokes Theorem.

#### **Module 3: (10 Hours)**

Differential Equation: Differential Equation: First order differential equations, Separable Equation, Exact differentialequation,lineardifferentialequation,Bernoulli’sequationandapplicationtoElectricalcircuits.

Lineardifferentialequationofsecondandhigherorder,Homogeneousequationwithconstantco-efficient, Euler-Cauchy equations, Solution by undetermined co-efficient, Solutions by variation of parameters, Modelling of electriccircuits.

#### **Module 4: (10 Hours)**

Series solution of differential equations, Power series method, Legendre equation and Legendre polynomials.

Laplace transformation and its use in getting solution to differential equations, Convolution, Integral Equations.

#### **Text Books:**

1. Differential Calculus by Santi Narayan and Mittal, Chapters 14, 15Publication.
2. Advanced Engineering Mathematics by E. Kreyszig, Tenth Edition,Wiley.
3. Higher Engineering Mathematics by B. V. Raman, McGraw HillsEducation.

#### **Reference Books:**

1. Engineering Mathematics by Pal and S. Bhunia, OxfordPublication.
2. Ordinary and Partial Differential equations by J. Sinha Roy and S. Padhy, KalyaniPublishers.
3. Advance Engineering Mathematics by P. V. O’Neil,Cengage.

**Chemistry(3-1-0)**

#### **Course Outcomes**

At the end of this course, students will be able to:

1. Understand the basics of molecularinteractions.
2. Idea about organometallic and their catalyticapplications.
3. Understand basics of fuels and corrosionchemistry.

#### **Module 1: (10 Hours)**

QuantumChemistryandSpectroscopy:Basicconceptsandpostulatesofquantummechanics.Introduction to Schrodinger Wave Equation, Particle in a box: Energy levels, quantum numbers and selectionrule.

Spectroscopy: Lambert Beer’s Law, Principles and applications of UV-Visible Molecular Absorption Spectroscopy; Chromophores, applications to colorimetry. Effect of conjugation on chromophores, Absorption by aromatic systems, introductory idea on Rotational and Vibrational Spectroscopy Principles and application to diatomic molecules.

The phase rule: Statement of Gibb’s phase rule and explanation of the terms involved, Phase diagram of onecomponentsystem-waterandsulfursystem,Condensedphaserule,Phasediagramoftwocomponent system - Eutectic Bi-Cdsystem

#### **Module 2: (10 Hours)**

Organometallics: Introduction to organometallics, EAN rule; classification, nomenclature and characteristics of organometallic compounds. Applications of organometallic compounds and catalyst in alkene isomerization hydrogenation and hydroformylation (detail mechanisms are to be excluded).

#### **Module 3: (10 Hours)**

Fuels: Classification of fuels, calorific value. (Determination by Dulong’s formula), G. C. V. and N. C. V. Liquid fuels: Classification of petroleum, refining of petroleum, Cracking, Knocking and anti-knocking, cetane and octane numbers. Unleaded petrol, synthetic petrol, power alcohol. Gaseous Fuel: Producer gas, Water gas, LPG, CNG, Kerosene gas, Combustion calculation.

#### **Module 4: (10 Hours)**

Corrosion: Electrochemical theory of corrosion, galvanic series, Types of corrosion; Differential metal corrosion, Differential aeration corrosion (Pitting and water line corrosion), Stress corrosion (caustic embrittlementinboilers),Factorsaffecting,Metalcoatings-GalvanizingandTiming,Corrosioninhibitors, cathodicprotection.

#### **Text Books:**

1. Text Book in Applied Chemistry by A. N. Acharya and B. Samantaray, PearsonIndia.
2. Introductory to Quantum Chemistry by A. K. Chandra, 4th Edition, McGraw HillEducation.
3. Fundamentals of Molecular & Spectroscopy by Banwell, Tata McGraw HillEducation.
4. Physical Chemistry by Gordon M. Barrow,McGraw-Hill
5. Engineering Chemistry, 12th Edition, Author: Wiley India Editorial Team PublishersWiley.
6. Engineering Chemistry: Fundamentals and Applications. Shikha Agarwal. Cambridge University Press.
7. Engineering Chemistry, Jain and Jain, Dhanpat RaiPublication.

#### **Reference Books:**

1. Inorganic Chemistry by Donald A. Tarr, Gary Miessler, Pearson India, ThirdEdition.
2. Quantum Chemistry by Ira N. Levine, Pearson 7thEdition.
3. Molecular Spectroscopy, Ira N. Levine, John Wiley andSons
4. Modern Spectroscopy - A Molecular Approach, by Donald McQuarrie and John Simon,published by University ScienceBooks.
5. Inorganic Chemistry by W. Overton, Rounk and Armstrong, Oxford University Press, 6thedition.

**Programming for ProblemSolving (3-0-0)**

#### **Module 1: (10 Hours)**

Introduction to Programming, Introduction to components of a computer sys- tem (disks, memory, processor, where a program is stored and executed, operating system, compilers etc.)

IdeaofAlgorithm:stepstosolvelogicalandnumericalproblems.RepresentationofAlgorithm:Flowchart/ Pseudo code with examples, From algorithms to programs; source code, variables (with data types) variables and memory lo- cations, Syntax and Logical Errors in compilation, object and executable code, Arithmetic expressions andprecedence

#### **Module 2: (07 Hours)**

Conditional Branching and Loops, Arrays (1-D, 2-D), Character arrays and Strings, Functions (including using built in libraries), Parameter passing in functions, call by value, passing arrays to functions: idea of call by reference, Recursion, as a different way of solving problems.

#### **Module 3: (07 Hours)**

Structure & Unions, defining structures and Array of Structures, Pointers, Idea of pointers, Defining pointers, Pointers to functions, Double pointers.

#### **Module 4: (06 Hours)**

Dynamicmemoryallocation,useofmalloc(),calloc(),realloc(),free().Storageclasses:local,global,static & register variables. File handling: reading & writing to afile.

#### **Text Books:**

1. Byron Gottfried, Schaum’s Outline of Programming with C, McGrawHill.
2. E. Balaguruswamy, Programming in ASI C, Tata McGrawHill.

#### **Reference Books:**

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India.

**ChemistryLab(0-0-3)**

##### List of Experiments

***(At least 10 experiments should be done)***

**Experiment List:**

1. Determination of amount of sodium hydroxide and sodium carbonate in amixture.
2. Determination of total hardness of water by EDTAmethod.
3. Estimation of calcium in calcium inlimestone.
4. Determination of percentage of available chlorine in a sample of bleachingpowder.
5. Preparation ofPhenolphthalein.
6. Acid-Base Titration byPotentiometry.
7. Preparation of buffer solution and determination of pH of a buffersolution.
8. Standardization of KMnO4 using sodium oxalate. Determination of ferrous iron in Mohr’s salt by potassiumpermanganate.
9. Determination of partition coefficients of iodine between benzene andwater.
10. Determination of rate constant of acid catalyzed hydrolysisreaction.
11. Determination of concentration of a colored substance byspectrophotometer.
12. Determination of dissolved oxygen in a sample ofwater.
13. Determination of Viscosity of a lubricating oil by Red Woodviscometer.
14. Determination of Flash point of a given oil by Pensky-Marten’s flash pointapproach.
15. Determination of Critical Micelle concentration (CMC) of an ionic surfactant (Both cationic and anionic).

## Programming for Problem Solving Lab (0-0-4)

##### **List of Experiments**

***(At least 10 experiments should be done)***

**Experiment List:**

1. Familiarization with programmingenvironment.
2. Simple computational problems using arithmeticexpressions.
3. Problems involving if-then-elsestructures.
4. Iterative problems e.g., sum ofseries.
5. 1-D Arraymanipulation.
6. Matrix problems, Stringoperations.
7. Simplefunctions.
8. Programming for solving Numerical methods problems(1).
9. Programming for solving Numerical methods problems(2).
10. Recursivefunctions.
11. Pointers andstructures.
12. Fileoperations.

**Engineering Graphics and Design (1-0-4)**

#### **Module 1: (05 Hours)**

Introduction: Introduction to Engineering Drawing, Drawing Instruments and their uses, Dimensioning, Scale, types of lines, Lettering. (1 sheet)

Orthographic Projection: Introduction to Projection, Projection types or methods (First angle and Third angle)

PlaneofProjection,Referenceline,orthographicProjectionofPoints(pointslocatedinallfourquadrants), Projection of Straight lines (first and third quad- rant only), traces of lines. (1sheet)

Orthographic Projection of Plane Surfaces in various positions (Triangle, Square, Rectangle, Rhombus, Pentagon, hexagon and Circle), Traces of a Plane. (1 sheet)

Introduction to Solids and Types of Solids, Orthographic Projection of Solids in different Positions. (1 sheet)

#### **Module 2: (05 Hours)**

Sections and Development of Lateral Surface of Solids: Sectional view (half section and full section), development of surfaces of right regular prisms, pyramids, cylinders and cones. (1 sheet)

Isometric Projection: Introduction, Isometric Scale, Isomeric projection of cube, right regular prism, cylinders and cones. (1 sheet)

Applications: Orthographic and sectional view of Machine components (Screw Thread, nut and bolt). (1 Sheet)

Auto CAD: Introduction to Auto CAD. Fundamental concepts.

#### **Text Books:**

1. Machine Drawing by N. D. Bhatt, V. M. Panchal, Charotar PublishingHouse.
2. Machine Drawing by N. D. Junarkar, PearsonEducation.
3. Machine Drawing with AutoCAD by Goutam Pohit and Goutam Ghosh, PearsonEducation.

Machine Drawing includes AutoCAD by Ajeet Singh, Tata McGrawHill

**Mathematics-II(3-1-0)**

***Course Outcome:***

On successful completion of this course, the students will be able to:

1. Use the basic concepts of vector and matrix algebra, including linear dependence / independence, basisanddimensionofasubspace,rankandnullityforanalysisofmatricesandsystemsoflinearequations,
2. Apply linear algebra techniques to solve various engineeringproblems,
3. Select appropriate numerical methods to apply to various types of problems in engineering and science in consideration of the mathematical operations involved, accuracy requirements, and available computational re-sources,
4. Compare different numerical methods with respect to accuracy and efficiency of thesolution.

#### **Module 1: (10 Hours)**

Matrices, vectors: addition and scalar multiplication, matrix multiplication: Linear systems of equations, linear independence, rank of a matrix, determinants, Cramer’s rule, inverse of a matrix, Gauss elimination and Gauss-Jordan elimination.

Vector space, linear dependence of vectors, basis, dimension.

#### **Module 2: (10 Hours)**

Linear transformations (maps), range and kernel of a linear map, rank and nullity, Inverse of a linear transformation, rank-nullity theorem, composition of linear maps, matrix associated with a linear map.

Eigenvalues, eigenvectors, symmetric, skew-symmetric and orthogonal matrices, Eigen basis, Diagonalization, Inner product spaces, Gram-Schmidt orthogonalization.

#### **Module 3: (10 Hours)**

Solution of polynomial and transcendental equations - Bisection method, Newton- Raphson methods and Regula-Falsi method.

Finite differences, Interpolation using Newton’s forward and backward difference formulae, Newton’s divided difference and Lagrange’s formulae, Numerical approximation of functions.

#### **Module 4: (10 Hours)**

Numerical differentiation, Numerical integration: Trapezoidal rule and Simpson’s 1/3rd and 3/8 rules, Gauss Legendre and Gauss quadrature rule.

Gauss Siedel iteration method for solving a system of linear equations Euler and modified Euler’s methods, Runge-Kutta methods.

#### **Text Books:**

1. Advanced Engineering Mathematics by E. Kreyszig, John Willey & Sons Inc. 10thEdition
2. Linear algebra and its applications by Gilbert Strang, Cengagelearning.

#### **Reference Books:**

1. Higher Engineering Mathematics by B. V. Ramana, McGraw Hill Edu-cation.
2. Engineering Mathematics by Pal and S. Bhunia, OxfordPublication.
3. Advance Engineering Mathematics by P. V.O’Neil.
4. Introductory methods of numerical analysis by S. S. Sastry,PHI.

**THIRD SEMESTER**

UPCTE301 **Fibre Science & Technology -I**

|  |
| --- |
| **Course Outcomes** |
| **After successful completion of this course, the students should be able to** |

* Basic of textile fibres and theircharacteristics.
* Sources, chemical composition of naturalfibres.
* Manufacturing of man-made fibres ( Regenerated and Synthetic fibres),
* Physical and Chemical Properties of different natural and man-made fibres anduses
* Understand fibre forming polymer , essential and desirable properties of textile fibres and classification of textilefibres.
* Describe the manufacturing process of different man-madefibres.
* Enunciate physical and chemical properties of natural and manmade fibres and theiruses.
* Demonstrate the identification of different natural and man-madefibres.

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
| Understand fibre forming polymer ,essential and desirable properties of textile fibres and classification of textile fibres. | **√** | **√** | **√** | **√** | **√** |  |  |  |  |  |  |
| Describe the manufacturing process ofdifferent man-made fibres. | **√** | **√** | **√** |  | **√** |  |  | **√** |  |  |  |
| Enunciate physical and chemical properties of natural and manmade fibres and theiruses. | **√** | **√** |  | **√** | **√** |  |  |  | **√** |  |  |
| Demonstrate the identification of differentnatural and man-made fibres. | **√** | **√** | **√** | **√** | **√** |  |  |  |  | **√** | **√** |

## Module-I ( 4 Hours)

**Introduction:** Definition of fibre, Staple fibre, Filament, Classification of textile fibres, Essential and desirable properties of textile fibres, Concepts of molecular weight, Degree of polymerization, Orientation and Crystallinity, Characteristics of fibre forming polymer, Advantages anddisadvantages of natural & manmadefibres.

## Module-II ( 12Hours) Natural fibres :

**Vegetable Fibres**

**Abbreviations Used:L = Lectures, P = Practical or Laboratory, T = Tutorial**

## IA = Internal Assessment , PA = Practical Assessment, EA = End-Semester Assessment

* 1. Cotton fibre - Production of cotton fibres, Varieties of cotton fibres. Physical and chemical properties of cotton fibre.Fibre Quality Index.Applications of Cottonfibre.
	2. Bast fibres – Concept of Bast fibres such as flax, jute, ramie,hemp.

Flax: Extraction process; Chemical composition; Distinctive properties and end uses

Jute: Varieties, Extraction process, Chemical composition ; Distinctive properties and end uses

## Animal Fibres

1. Production of raw silk, Chemical composition, varieties of silk and their physical and chemical properties, end usessilk.
2. Classification and varieties of wool, sorting and grading of wool, fibre extraction, chemical composition, physical and chemical properties of wool, end uses of woolfibre.

## Module-III ( 14 Hours)

**Man-made fibres :** Classification of man-made fibres, Basic production systems of the man- made fibre - Melt spinning, solution dry spinning and solution wet spinning - basic principles, brief idea about spinning head, spinneret, quench chamber, & coagulation bath, spin finish application.

1. Brief outline of manufacturing process of regenerated fibers viz.viscose rayon and diverse form of viscose, acetate -rayon, cupra-ammonium rayon. Distinctive properties and enduses
2. Raw material, technology of polymerization and brief outline of manufacturing process and parameters for polyester, nylon 6, nylon 66 and polypropylene. Distinctive properties and end uses ofthosefibres
3. Raw materials, technology of polymerization and brief outline of manufacturing process and parameters for acrylic fibre by dry spinning. Wet spinning of acrylic. Different solvents and parameters of regeneration bath for wet spinning of acrylic. Distinctive properties and enduses

Need and Mechanism of post spinning operations- Drawing and heat setting

**Identification of different fibres:** Identification of fibres by feel, microscopic view, burning behavior and solubility test. Effect of alkalis ,acids, oxidizing & reducing agent and water on natural and ma-made fibres.

## Books Recommended:

* 1. Cook Gordon J, “Hand Book of textile fibre”, Vol. I and II, WoodheadFibreScience
	2. Series, UK, 1984. 3.
1. “Hand Book of Fibre Chemistry”, Ed. M Lewin and E M Pearce, Mercel Dekker Inc.,1998.
2. Shenai V A, “ Textile Fibre ”, Sevak Publications,Mumbai,

**Abbreviations Used:L = Lectures, P = Practical or Laboratory, T = Tutorial**

## IA = Internal Assessment , PA = Practical Assessment, EA = End-Semester Assessment

1. W.E. Morton & J.W.S. Hearle, Physical properties of textile fibres, Textile Institute, U.K.
2. Progress in textiles: Science and technology Vol.-2 By Dr. V.K. Kothari, I.I.T.Delhi.
3. Gowariker V R, Viswanathan N V and Sridhar J, “Polymer Science”, New Age International Ltd., New Delhi,1996.
4. Fibre Science and Technology- S PMishra
5. R.W. Moncrieff - ManmadeFibres
6. Vaidya A A, “Production of Synthetic Fibres”, 1st Ed., Prentice Hall of India, NewDelhi, 1988.
7. H.F. Mark, S.M. Atlas and E. Cernia,” Man-made Fibres Science and Technology, Vol. 1,2,3,”

UPCTE302 **YARN MANUFACTURING-I**

## Course Outcomes:

**After successful completion of this course, the students should be able to;**

* + Basic concept of conversion of staple fibres toyarn.
	+ Theory of various operations carried out and working principle of machineries and different mechanism involved in pre spinning process for preparation of short staple fibresrequired for formation of yarn - ginning machinery, blowroom, card, drawframe.
	+ Processing of different types of fibres and their blends according to the specifications and needs of the customers
	+ Parameters required at different stages of processing of fibres and their influence on yarn quality.
	+ Maintenance schedules of variousmachineries.
	+ Outline the process flow of short staple spinningoperations.
	+ Choose correct parameters in various stages of pre spinning process for qualityyarn.
	+ Calculate draft, waste % and production of machines involved in eachprocess.
	+ Optimize machine setting and maintenance schedules of each machineinvolved.

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
| Outline the process flow of short staplespinning operations. | **√** | **√** | **√** | **√** | **√** |  |  |  |  |  |  |
| Choose correct parameters in various stages of pre spinning process forqualityyarn. | **√** | **√** | **√** |  | **√** |  |  | **√** |  |  |  |
| Calculate draft, waste % and production ofmachines involved in each process. | **√** | **√** |  | **√** | **√** |  |  |  | **√** |  |  |

**Abbreviations Used:L = Lectures, P = Practical or Laboratory, T = Tutorial**

## IA = Internal Assessment , PA = Practical Assessment, EA = End-Semester Assessment

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Optimize machine setting and maintenanceschedules of each machine involved. | **√** | **√** | **√** | **√** | **√** |  |  |  |  | **√** | **√** |

**Module I (10 Hours)**

**Ginning:** Objective of ginning, Pre and post ginning operations, Types of ginning machineries, baling of fibers. Effect of ginning performance on yarn quality.

**Introduction to Yarn Manufacturing:** Definition and classification of yarn, Various System of expressing yarn linear density. Principle of Yarn formation process from staple fibres - opening and cleaning, individualization, drafting, drawing, twisting. Process flow chart of short staple spinning system.

**Mixing & Blending:**Objective, different types of mixing & blending, difference between mixing & blending, Principles underlying for the selection of cotton and other fibres for mixing/ blending. Objective of tinting, use of anti-static agents, Different methods of mixing/blending and their advantages and disadvantages Problems in blending of man-made fibre withcotton

## Module II (10 Hours)

**Blow Room:** Objective, Pprinciple and description of opening, cleaning and mixing/blending machines used in a modern Blow-room line- Automatic bale opener/Uniflock/Blendomat, Mild openers –Step cleaners/,Maxi-flow/ Uni-clean, Mixing Machine – Multimixer/Unimix, Intensive openers – ERM /CVT, Dust removal and Contamination removal, Study of lap forming mechanism, Chute feed system. Blow Room Accessories – Smoke Detector, Metal Detector. Brief outline of setting the blow room line for processing different varieties of cotton mixing and man-made fibers. Nature of waste extracted in various openers and beaters, lint-trash ratio, nep generation, fibre breakage and their control. Calculations pertaining to production of blow room and cleaning efficiency, performance assessment of blow room line. Maintenance practices in Blow-room.

## Module III (10 Hours)

**Carding:** Objectives, principles of roller and clearer card, revolving flat card, Constructional features and working details of liker- in, cylinder, doffer and flats of a modern card. Theory of carding and stripping action. Fibre transfer mechanism. Forces acting on fibres. Carding disposition and doffing disposition; Centrifugal forces;Action between feed roller and licker-in, Cylinder and Flats, Transfer zone at doffer. Card clothing. Mechanism of neps and hook formation and their effect on yarn quality- their assessment and control,. Card wastes and their control. Carding defects- their causes and remedies. Calculations pertaining to draft and production. Maintenance practices in carding. Auto leveller in card. Latest developments.

## Module IV (10 Hours)

**Abbreviations Used:L = Lectures, P = Practical or Laboratory, T = Tutorial**

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**Drawing:** Objectives, principles of drawing and doubling. Detailed study of draw frame machine. Drafting operation in the drafting arrangement, behavior of fibres in the drafting zone; fibre friction field, drafting wave, roller slip and roller eccentricity. Performance assessment and calculation pertaining to draw frame machine. Latest developments in Draw frame, Process parameters and productioncalculation.

## Books Recommended:

1. Klein W., “The Technology of Short-staple Spinning “, The Textile Institute, Manchester,1999.
2. Klein W., “A Practical Guide to Opening and Carding “, The Textile Institute, Manchester,1999.
3. Klein W., “A Practical Guide to Combing, Drawing and Roving Frame “, The Textile Institute, Manchester,1999.
4. Oxtoby E ―Spun Yarn Technology‖ butter worth‘s, London, New Edition2002.
5. Chattopadhyay R., Technology of Carding, NCUTE, IIT Delhi,2003.
6. Chattopadhyay R. (Ed), Advances in Technology of Yarn Production, NCUTE, IIT Delhi,2002.
7. Salhotra K. R. &Chattopadhyay R., Book of papers on ―Blowroom and Carding,IIT Delhi1998.
8. Duraiswamy I, Chellamani P &Pavendhan A., ―Cotton Ginning‖ Textile Progress, The Textile Institute, Manchester, U.K., 1993.
9. Lord P.R., “Yarn Production: Science, Technology and Economics “, The Textile Institute, Manchester,1999.
10. Khare A R, “Elements of Blowroom, Carding and Drawframe”, Sai book Centre, Mumbai,Foster G A K, “Manual of Cotton Spinning”, Vol. I –IV, The Textile Institute, Manchester,1958.

ULCTE301 **YARN MANUFACTURING- I(PRACTICAL)**

## At least 10 of the following

1. To determine trash content% and analysis of waste by using trashanalyser
2. To study and sketch general outline of opener, cleaner and mixer/blender employed in Blow-Roomline.
3. To study the feed regulating mechanism in Blow-Roomline.
4. To determine the cleaning efficiency of a Blow-roomline.
5. To study and sketch the working mechanism of various operations of a card with respect to flow ofmaterial.
6. To study different settings of thecard
7. To study the gearing plan and calculate draft constant, draft and production constant of a Card.
8. To study the wire points used in different zone of acard.

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1. To process fibres in card and produce sliver and find out sliverhank.
2. To study and sketch the working mechanism of draw frame with respect to flow of material.
3. To study and sketch the working mechanism of drafting zone of drawframe.
4. To study the roller setting of draw frame draftingsystem.
5. To Calculate draft constant and requirement of draft change pinion to achieve required draft in a Drawframe to produce a sliver of desiredhank.
6. To process card slivers and produce sliver in Draw frame and find out sliverhank.

UPCTE303 **FABRIC MANUFACTURING - I**

## Course Outcomes:

**After successful completion of this course, the students should be able to;**

* + Need of various preparatory processes to woven fabricmanufacturing.
	+ Principle of woven fabricmanufacturing,
	+ Mechanism of machineries involved in preparatory processes and manufacturing of woven fabric and their operationalprinciple.
	+ Selection and control of process variables during weaving preparatory and weaving fabric.
	+ Various setting ofloom.
	+ Understand the object of all weaving preparatoryprocesses.
	+ Understand need manufacturing technology of ordinary winding and pirn winding process.
	+ Understand various motions of a plain loom, production and fabric weightcalculations.
	+ Understand method of fabric analysis and also to describe the identification and construction of basicweaves.

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| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
| Understand the object of allweavingpreparatory processes. | **√** | **√** | **√** | **√** | **√** |  |  |  |  |  |  |
| Understand need manufacturingtechnology of ordinary winding and pirn winding process. | **√** | **√** | **√** |  | **√** |  |  | **√** |  |  |  |
| Understand various motions of a plain loom, production and fabric weightcalculations. | **√** | **√** |  | **√** | **√** |  |  |  | **√** |  |  |
| Understand method of fabric analysis andalso to describe the identification and | **√** | **√** | **√** | **√** | **√** |  |  |  |  | **√** | **√** |

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| construction of basic weaves. |  |  |  |  |  |  |  |  |  |  |  |

**Module I (10 Hours)**

**Introduction to Fabric formation:** Weaving, knitting, braiding, non-woven, brief description of all methods, processes involved in it and their applications.Objectives of yarn Preparation for various methods of fabric formation.

**Winding**- Limitation of ring spinning, objectives of winding process. Machines: - Types of winding machine, precision winding, drum winding, merits and demerits. Features of winding machines- yarn path, details of machine zones. Functions and details of important accessories such as tensioners, yarn clearers, cradle weighting, drum drive, types of packages produced. Concepts of - Cone angle, angle of wind, wind per double traverse. Yarn Joining methods (Splicing and knotting principles).Patterning: Reasons and remedies. Yarn fault classifying systems.

Basic features of auto winders like Autoconer, Barbarcolmman, etc. Latest developments. Different causes of package faults and their remedies. Calculations of winding speed, production/spindle & per machine, and efficiency.

## Module II (10 Hours)

**Pirn winding:** Objectives, rewound weft, its advantage, need. Details of pirn winding machines with respect to drive to spindles, traverse,tensioning yarn path. Pirn build:- length of wind, chase length, diameter, bunch, tail ends etc. their importance during weaving process.Probable causes of package faults. Difference between warp and weft winding.

**Warping:** Need, Objectives, classification of warping process. Warping machine: - principle of operation of beam warping machine. Types of creels, functions of different elements present on creel and headstock of warping Machine.Defects of warping beams. Comparison of different beam warping machines. Principles of operation of sectional warping machine. Features of modern sectional warping machines. Latest developments. Calculation of average pirn diameter, winding speed, production/ spindle & per machine, efficiency**.** Calculations ofProduction of warping machine and efficiency.

## Module III (10 Hours)

**Sizing:** Need: Objectives, Techniques of sizing process: hank sizing, ball warp sizing, slasher sizing. Size Ingredients: Types (natural, synthetic), their functions, examples. Size cooking: - Need, equipments available, method of addition of ingredients and its importance. Sizing machine: Various zones, their functions. Creel and the types with comparison, elements in sow box and their functions. Various drying arrangements and drying mechanism in each. Head stock

-dry splitting, measuring, marking, winding, beam pressing etc. Modern developments in sizing. Various control points in sizing. Calculation of production and efficiency of sizing machine.

## Module IV (10 Hours)

**Drawing in:** Importance, different ways to do it, standard norms. Latest developments.

**Weaving:** Overall concept about looms and its elements. Different motions of looms: Primary,

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secondary and auxiliary motions. Study of weaves: - plain, twill and satin (basic

weaves).

## Books Recommended:

1. Talukdar MK, “Winding andWarping”
2. Lord PR, “Fibre toFabric”
3. Mark R, Robinson A T C, “Principles of Weaving”, The Textile Institute, Manchester, 1986.
4. Talukdar M K, Srirammulu P K and Ajgaokar D B, “Weaving – Machine, Mechanism and Management”, Mahajan Publisher Private Ltd., Ahmedabad, India,1998.
5. Ajagaonkar DB,“Sizing”.
6. Watson G, “Textile colour and design”, WoodheadPublisher..
7. Booth J E, “Textile Mathematics”, Part III, Textile Institute, Manchester,1977.

ULCTE302 **FABRIC MANUFACTURING -IPRACTICAL**

## At least 10 of the following

1. To study of the passage of yarn through various elements in different windingmachines.
2. Study of motion transmission system in windingmachine.
3. To study of the effect of slub catcher, yarn tensioner and yarn guide on package formation in windingmachine.
4. To study of the mechanical warp stop motion and ribbon breaking mechanism in winding.
5. To study of mechanism of a pirn-winding machine and Calculation of winding speed of Pirn windingmachine.
6. To study of passage of yarn through a beam warping m/c and function of its different parts.
7. To study of passage of yarn through a sectional warping m/c and function of its different parts.
8. To study of path of warp sheet in a multi cylinder-sizing machine and the features of its various parts/mechanism (Mill basedexperiment).
9. To study construction details and passage of materials in single end sizingmachine.
10. To prepare a sizing paste and apply on the given sort of yarn samples in a single end sizing machine and also size add on%.
11. To select the proper reed and heald for a weaver's beam and practice proper drawing-in of warp keeping in mind fabricconstruction.
12. To study the construction details and mechanism of conventional shuttleloom.

## Engineering Mechanics (Common to all Branches)

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**Mathematics – III (Common to all Branches) Organizational Behaviour (Common to all Branches)**

**Mathematics-III (3-1-0)**

**Prerequisites:**

1. Mathematics-I
2. Mathematics-II

**Course Outcomes**

On successful completion of this course, the students will be able to:

1. Have a fundamental knowledge of the concepts of probabilitytheory.
2. Do correlation and regression and fitting of different types ofcurves.
3. Apply sampling theory and theory of estimation in various engineering problems and do various tests of hypothesis andsignificance.
4. Use calculators and tables to perform simple statistical analyses for small samples and use popular statistics packages, such as SAS, SPSS, S-Plus, R or MATLAB to perform simple and sophisticated analyses for largesamples.

**Module 1: (10 Hours)**

Probability: Introduction, Probability of an event, additive rule & multiplication rule, conditional probability, Bayes’ rule, random variable, discrete and continuous probability distribution, Joint probability distribution, Mathematical expectations, Variance and Co- variance of random variables, Mean and Co- variance of linear combination of random variables, Chebyshevtheorem.

**Module 2: (10 Hours)**

Discrete Probability Distribution: Binomial & Multinomial, Hyper- geo- metric, Geometric, Poisson distribution.

Continuous Probability Distribution: Uniform, Normal, Exponential Distribution, Weibull’s Distribution, Chi-square Distribution, Sampling Distribution: Sampling Distribution of S2, t Distribution, F Distribution.

**Module 3: (10 Hours)**

Estimation of parameter: methods of estimation, Estimating the mean of a single sample, Standard error, Prediction interval, Tolerance limits, Estimating the difference between means of two samples, estimating proportion and variance of single sample, Estimating the difference between two proportions and variances of two samples, maximum likelihood estimation.

**Module 4: (10 Hours)**

Testing of hypothesis: one and two tailed test, test on a single mean when variance is known & variance is unknown. Test on two means, test on single mean and two mean populations. One and two sample test for variance. χ2 test for goodness of fit and test for independence.

Introduction to linear regression: Simple regression models, method of least squares, Properties of least square estimators, Inferences concerning the regression coefficients, Coefficients of determination and its application.

Statistical quality control (Simple Idea only)

**Text Books:**

1. Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers & Keying Ye,” Probability &Statistics

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for Engineers & Scientists”, Eighth Edition, 2007, Pearson Education Inc., New Delhi.

1. Jay L. Devore,” Probability and Statistics for Engineering and Sciences”, Seventh Edition, Thomson/CENGAGE Learning India Pvt.Ltd.

**Reference Books:**

1. William Mendenhall, Robert J. Beaver & Barbara M. Beaver,” Introduction to Probability and Statistics”, 13th Edition, 2009, CENGAGE Learning India Pvt. Ltd., NewDelhi.
2. T. Veerarajan,” Probability, Statistics and Random Processes”, Tata McGrawHill
3. Ronald Deep,” Probability and Statistics”, AcademicPress

# Organizational Behaviour (3-0-0)

**Prerequisites:**

1. English.

**Module 1: (10 Hours)**

The study of Organizational Behaviour: Definition, Meaning, Why study OB; Learning - Principles of learning and learning theories; Personality- Meaning, Determinants, Types, Personality and OB; Perception- Perceptual Process, perceptual errors, Importance of perception in organizations; Motivation- Nature and Importance, Theories of motivation (Herzberg, Maslow, McGregor).

**Module 2: (10 Hours)**

Group level: Groups in Organizations -Nature, Types, Reasons behind forming groups, Determinants, factors contributing to Group Cohesiveness, Group Decision Making- Process, advantages and disadvantages; Team- Effective Team Building; Types of Leadership- Effective Leadership, Styles of leadership, Leadership Theories-Trait Theory and Contingency Theory, Leadership and Followership; Conflict- Healthy Vs Unhealthy conflict, Conflict Resolution Techniques.

**Module 3: (10 Hours)**

Structural level: Organizational Culture: culture and organizational effective- ness; Organizational Change: Types of change, Reasons to change, Resistance to change and to manage resistance. Introduction to organizational development.

**Text Books:**

1. Stephens P. Robbins, Organizational Behaviour, PHI.
2. K. Aswatthappa, Organizational Behaviour,HPH.

**Reference Books:**

1. Kavita Singh, Organizational Behaviour, Pearson.
2. D. K. Bhattacharya, Organizational Behaviour, OUP.
3. Pradeep Khandelwal, Organizational Behaviour,TMH.
4. Keith Davis, Organizational Behaviour, McGraw Hill.
5. Nelson Quick, ORGB, CengageLearning.

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**FOURTH SEMESTER**

UPCTE401 **Fibre Science &Technology-II**

## Course Outcomes:

**After successful completion of this course, the students will be able to**

* + Impart knowledge related to the structure and morphology of textilefibres.
	+ Understand the different characteristics of eachfibre.
	+ Impart knowledge about process of producing bulk and textured yarn.
	+ Impart knowledge about high performancefibres
	+ Gain knowledge on the physical, chemical and morphological structures of natural and man-made fibers and techniques of theirmeasurement.
	+ Know andMeasure important fibre properties such as fibre length, fineness, strength, moisture regain and content %etc.
	+ Correlate the physical properties of fibre to its microstructure and its influence toother

characteristics.

* + Have knowledge on formation of texturisedyarn.
	+ Have knowledge on different high performancefibres.

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| Course Outcomes | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
| Gain knowledge on the physical, chemical and morphological structures of natural and man-made fibers techniques of theirmeasurement.. | **√** | **√** | **√** | **√** | **√** |  |  |  |  |  |  |
| Know and Measure important fibreproperties such as fibre length, fineness, strength, moisture regain and content %etc. | **√** | **√** | **√** |  | **√** |  |  | **√** |  |  |  |
| Have knowledge on formation of texturisedyarn from filament . | **√** | **√** |  | **√** | **√** |  |  |  | **√** |  |  |
| Have knowledge on different highperformance fibres. | **√** | **√** | **√** | **√** | **√** |  |  |  |  | **√** | **√** |

## Module-I ( 10 Hours)

**Structure of Fibers:**Study of structures of natural and man-made fibers – physical, chemical and morphological structures of natural and man-made fibers. Methods of investigation of fibre structure: Identification of chemical structure by IR spectroscopy. Identification of physical

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structure by X-ray, SEM,NMR etc.

**Molecular Characterization:** Molecular weight averages, method of determination of molecular weight: primary methods – end group analysis, osmometry, light scattering. Secondary methods – viscometry, gel permeation chromatography (Briefstudy).

**Mechanical Characterization**: Tensile characteristics –Study of strength, elongation, work of rupture, initial modulus, work factor and yield point – determination of tensile strength of single fibre, bundle strength of cotton fibre. Stress-strain relations of natural and manmade fibres - influence of humidity and temperature on tensile characteristics .Elastic recovery, Time effects- Study of creep phenomena. Brief study about torsional and flexural rigidity of commercially important fibres.

## Module-II( 12 Hours)

**Physical Characterization:Fibre length -** Technical significance of fibre length measurements in case of staple fibres – measurement of effective length, 2.5% and 50 % span length, Uniformity ratio and length distributions of cotton fibre; crimp; **Fibre fineness :** Fibre linear density, Technical significance of fibre fineness/linear density - methods of measuring fineness of cotton fibres, jute, flax, wool, silk and man-made fibres; Maturity of cotton fibre and its influence on fineness, concept of micro denier fibre; **Moisture Content and Regain:** Moisture content and regain - relative and absolute humidity, effect of moisture onfibres.

**Optical Properties:** Reflection and Lustre- refractive index and its measurement - birefringence, factors influencing birefringence. **Frictional properties:** frictional and surface characteristics of natural and synthetic fibres. **Electrical Properties:** Electrical resistance of fibres, measurements, factor influencing the dielectric properties of fibres. Static electricity problems and elimination technique.

## Module-III( 08 Hours)

**Texturing:**Introduction, Objectives of texturing thermoplastic and non-thermoplastic yarns- basic principles, feed material characteristics , study of the methods of texturisation - twist-set- detwist, false twist, edge crimp, stuffer box crimp; knit de-knit techniques of texturing and the techniques of modified stretch yarn; properties and uses of texturedyarn.

**High performance fibres.:** Introduction to Aramid Fibers, Glass fibre, Carbon fibre, PVA fibre, PVC fibre etc.

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**Books Recommended :**

1 Morton W E and Hearle J W S, “Physical Properties of Textile Fibres”, WoodheadPublishing Limited, England, 2008.

1. Meredith R. and Hearle J. W. S., “Physical Methods of Investigation of Textiles”, Wiley Publication, New York, 1989
2. Meredith R., “Mechanical Properties of Textile Fibres”, North Holland, Amsterdam,1986
3. Ugbolue S C O, “Structure and Property Relationships in Textile Fibres”, The Textile Institute, Manchester,1990
4. Raheel M. (ed.), “Modern Textile Characterization Methods”, Marcel Dekker,1995.
5. Mukhopadhyay S. K., “The Structure and Properties of Typical Melt Spun Fibres”Textile Progress, Vol. 18, No. 4, Textile Institute,1989.
6. Mukhopadhyay S. K., “Advances in Fibre Science” The Textile Institute,1992.
7. Hearle J.W.S., “Polymers and Their Properties, Vol.1. Fundamentals of Structuresand Mechanics”, Ellis Horwood, England,1982
8. Greaves P.H. and Aville B.P., “Microscopy of Textile Fibres”, Bios Scientific, U.K.,1995
9. Saville, “Physical Testing of Textiles”, M. K. Book Distributors,1998
10. Booth J.E “ Principle of Textile Testing”,Butterworth
11. R.W. Moncrieff - ManmadeFibres.

## ULCTE401 Fibre Science & Technology Laboratory At least 10 of thefollowing

**Physical and Chemical identification of following Textile fibres:**

1. Identification ofcotton.
2. Identification ofwool.
3. Identification ofsilk.
4. Identification of Bastfibres.
5. Identification ofpolyester.
6. Identification ofnylon.

## Identification of fibres and their ratio in blended textile:

1. Analysis of P/C blendedfabric.
2. Analysis of P/V blendedfabric.
3. Analysis of P/W blendedfabric.
4. To determine moisture content/regain of a fibre sample by hot airmethod.
5. To determine micronaire value of given cotton sample by Airflow method. Convert the result into SI unit and give a suitable rating to the fibresample.

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1. To determine the bundle strength and elongation at break of a cotton fibre using Stelometer instrument. Study the effect of rate of loading on tensile properties of the fibre.
2. To measure the tensile strength of singlefibre/filament.
3. Study of different parts and path of polymer in wet spinningmachine.

UPCTE402 **YARN MANUFACTURING –II**

## Course Outcomes:

**After successful completion of this course, the students should be able to;**

* Role of combing process and Roving process in preparatorysectionof short staple spinning.
* Operations and different mechanism of comber and speedframe.
* Design, constructional details and working principles of ring frames and machineries in post spinningprocess.
* Parameters required for processing of fibres and their blends in comber, speed frame and Ring frame snd their influence on yarnquality.
* Maintenance schedules of comber, speed frame and Ringframe.
* Understand the constructional features and working principle of combing preparatory machines, comber, speed frame, ring frame and post spinningmachines.
* Identify faults, their causes and remedies in each stage ofprocessing.
* Outline the gearing diagram of eachmachine.
* Calculate draft, waste percentage, speed and production of machines in eachprocess.

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| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
| Understand the constructional features and working principle of combing preparatorymachines, comber, speed frame, ring frame and post spinning machines. | **√** | **√** | **√** | **√** | **√** |  |  |  |  |  |  |
| Identify faults, their causes and remedies ineach stage of processing. | **√** | **√** | **√** |  | **√** |  |  | **√** |  |  |  |
| Outline the gearing diagram of eachmachine. | **√** | **√** |  | **√** | **√** |  |  |  | **√** |  |  |
| Calculate draft, waste percentage, speedand production of machines in each process. | **√** | **√** | **√** | **√** | **√** |  |  |  |  | **√** | **√** |

## Module-I (10 Hours)

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**Combing Process:** Objectives and principle of Comber. Methods of lap preparation for combing. Operating principles of sliver lap machine & ribbon lap machine. Working principle of combing machine- Feeding- types of feed, Circular combing and Top combing, detaching, sliver formation- timing diagram, cycle of combing. Production calculation and fractionating efficiency of a comber, factors influencing combing performance- effect of pre-comb draft and number of doubling in lap preparation, type of feed, combing settings and their importance. Noil extraction at backward feed and forward feed comber. Recent developments.

## Module-II (10 Hours)

**Roving Formation:** Objectives and principles of Speed Frame. Study of flow of material and different parts of roving machine. Drafting system, roller weighting and setting and distribution of draft. Principle of twisting, parts and function of flyer, development in design of a flyer. Principle of Winding, Flyer leading and bobbin leading systems. Building mechanism and cone drum arrangements. Features of a modern Simplex Frame. Defects and remedies in Simplex process. Lubrication and maintenance schedule for Speed Frame. Calculation pertaining to speed, production, draft and twist, coils/inch. Recentdevelopments.

## Module-III (10 Hours)

**Ring Spinning Process:** Objectives and principles of Ring Spinning Machines. Constructional features and identification of different parts. Principles of drafting systems and weighting system on ring frame. Twisting, winding and building operation. Role of drafting system, yarn guiding devices, forces acting between ring and traveler, yarn tension variation, balloon tension at maximum diameter, tasks of traveller, limiting speed, classification, form of traveler, traveler mass and material, different ring-traveller combinations, fiber lubrication, running on new-ring, winding process, cop structure, spinning geometry, causes of end breaks. Calculation pertaing to speed, draft, twist, production and efficiency in ring frame. General idea about Lubrication and maintenance of high speed ring frame. Recent developments.

## Module-IV(10 Hours)

**Doubling and Reeling Process:** Objectives and principle of doubling. Study of different components of ring doubler- creel, yarn guiding roller, rings, travellers and spindle. Building motions. Concept of balanced twist in doubled yarn, direction of twist in doubled yarn and its relation to single yarn. TFO- Construction details and principle of operation.

## Books Recommended:

1. Oxtoby E, “Spun Yarn Technology “, Butterworth, London,1987.
2. Klein W, “The Technology of Short-staple Spinning “, The Textile Institute, Manchester, 1998.
3. Klein W, “A Practical Guide to Combing, Drawing and Roving Frame “, The Textile Institute, Manchester,1999.
4. Klein W, “A Practical Guide to Ring Spinning “, The Textile Institute, Manchester,1999.

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1. Lawrence C A, “Fundamental of Spun Yarn Technology” CRCPress,

USA, 2003.

1. Lord P R, “Handbook of Yarn Production”, The Textile Institute, Woodhead Publication Limited, Cambridge,2003.
2. Shaw J, “Short-staple Ring Spinning, Textile Progress”, The Textile Institute, Manchester,1982.
3. Iredale J, “Yarn Preparation: A Handbook “, Intermediate Technology,1992.
4. Murty HVS, TFO- Technology&Techiques.

ULCTE402 **YARN MANUFACTURING - IIPRACTICAL**

## At least 10 of the following

1. To study the passage of materials in Sliver lap, Ribbon lap and Super lap former in comber preparatoryprocess.
2. To determine the pre-comb draft required for the preparation of comberlap.
3. To study the construction details and passage of materials in aComber.
4. To determine the speed, draft and production ofcomber.
5. To estimate the noil level and head to head variation in noil level in acomber.
6. To study the construction details and passage of materials in Rovingmachine.
7. To study the Gearing Diagram of roving frame and calculate Draft Constant and TwistConstant.
8. To study the building mechanism in a rovingframe.
9. To calculate required speed, draft and twist level and produce roving from a givendraw frame sliver and roving hank&puction.
10. To study the construction details and passage of materials in Ringframe.
11. To outline the main gearing diagram of ring frame and calculate Draft Constant andTwistConstant. &Production.
12. To study the building motion in ringframe.
13. To calculate required speed, draft and twist level and produce yarn from a givenroving and determine the yarn count &production.
14. To study the construction details and passage of materials in Ringdoubler.
15. To study the construction details and passage of materials ofTFO.
16. Production & twist calculation in TFO with 3 positions and its effect onyarnstrength.

UPCTE403 **FABRIC MANUFACTURING-II**

## Course Outcomes:

**After successful completion of this course, the students should be able to;**

**Abbreviations Used:L = Lectures, P = Practical or Laboratory, T = Tutorial**

## IA = Internal Assessment , PA = Practical Assessment, EA = End-Semester Assessment

* + Different components of automatic loom.
* Constructional features and operational principle of a automaticloom.
* Loom timing diagram and various mechanisms involved in automaticloom.
* Selection and control of process variables weavingfabric.
* Various setting ofloom.
* Identify the key components of a automatic loom and understand the function of various elements and mechanism of automatic loom, dobby,jacquard.
* Select and control process variables and the various settings used to produce fabric of desiredquality.
* Identify the trouble shooting problems and their solutions at each stagemanufacturing.
* Calculate speed, production etc. at each stage of woven fabricmanufacturing.

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| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
| Identify the key components of a automatic loom and understand the function ofvarious elements and mechanism of automatic loom, dobby,jacquard. | **√** | **√** | **√** | **√** | **√** |  |  |  |  |  |  |
| Select and control process variables and thevarious settings used to produce fabric of desired quality. | **√** | **√** | **√** |  | **√** |  |  | **√** |  |  |  |
| Identify the trouble shooting problemsandtheir solutions at each stagemanufacturing. | **√** | **√** |  | **√** | **√** |  |  |  | **√** |  |  |
| Calculate speed, production etc. at eachstage of woven fabric manufacturing. | **√** | **√** | **√** | **√** | **√** |  |  |  |  | **√** | **√** |

## Module I (10 Hours)

**Study of different motions and mechanism in automatic shuttle loom:**Shedding motion on the loom:Shed geometry and shedding requirement. Types of shed - Bottom closed, Semi-open, Center closed and open-sheds, their advantages and disadvantages, importance of bending factor, reed and reed counting systems. Shedding mechanisms : Tappet shedding - types of tappet shedding (Positive and Negative). Negative tappet shedding, relative throw of cams, Heald shaft reversing motionDobby Shedding: Negative Dobby shedding, mechanism of Keighley dobby, Preparation of pattern chain for it.Jacquard shedding: Mechanism of single lift-single cylinder, Double lift-single cylinder, Double lift-Double cylinder. Jacquard harness: different harness ties,

e.g. Straight, Pointed and Border Tie, Card punching for Jacquard. Comparison of Tappet, Dobby and Jacquard shedding.Numericals based onshedding.

## Module II (10 Hours)

**Picking motion on the loom:** Types of conventional picking mechanism - over picking, under picking and parallel picking. Description about types of picking. Calculation of shuttle velocity

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and energy of picking, picking force. Different picking accessories and their functions. Picking timing such as late picking and early picking. Reasons of false picking and shuttle fly. Study of picking mechanism as simple elastic system,nominal and actual picker displacement curves. Shuttle retardation curve during checking.

**Beat-up motion on the loom**: Sley motion, Factors affecting sley motion. Sley eccentricity and its effects, Kinematics of loom sley in normal conditions.

**Numerical** based on picking and sley movement.

## Module III (10 Hours)

**Cloth control:** Take-up motion – Objective, types. Five and seven-wheel take-up mechanisms and their comparison. Changes in Pick density, change places, expression for Pick density, Calculation of periodicity in pick variation due to faulty teeth or wheel eccentricity, Shirley take- up.

**Warp control:** Objective, types. Let-off mechanisms (negative friction type, Bartlett let off).Calculation of take-up and let-off.

## Module IV (10 Hours)

**Brief outline of Warp protector motion:** Loose-reed and Fast-reed mechanism. Warp stop motion. Weft stops motion: Side weft fork and Centre weft fork motion; Temples - Function, types. Brake.

**Automatic pirn change mechanism**: Objective, feeler and types of feeler, changemechanism. Fabric defects- causes andremedies.

## Books Recommended:

1. Mark R, Robinson A T C, “Principles of Weaving”, The Textile Institute, Manchester,1986.
2. Talukdar M K, Srirammulu P K and Ajgaokar D B, “Weaving – Machine, Mechanism and Management”, Mahajan Publisher Private Ltd., Ahmedabad, India, 1998.
3. Aswani K T, “Fancy Weaving mechanism”, Mahajan Publisher Private Ltd., Ahmedabad, India1990.
4. Ormerod& W. S. Sondhelm “Weaving Technology andOperations.
5. R.Sengupta “WeavingCalculation”.
6. Woven Fabric Production I, II, NCUTE Publications2002
7. S. Adanur, Handbook of Weaving, Technomic Publishing CompanyInc.

ULCTE403 **FABRIC MANUFACTURING–II PRACTICAL**

## At least 10 of the following

* 1. To study of picking mechanism. Picker movement in relation with crank shaft rotation and calculation of average velocity ofshuttle.
	2. To study of sley movement, construction and calculation of sleyeccentricity.
	3. To study and sketch the shedding mechanism with negative and positive tappets and to have practice of adjusting the shed height, shed opening, alignment and shedtiming.
	4. To study dobby shedding mechanism and way in which adjust the depth ofshed.

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* 1. To practice the card cutting and lacing of jacquarddesigns.
	2. To study of jacquard sheddingmechanism.
	3. To study of picking mechanism in automaticloom.
	4. To have practice of adjusting the pick strength, pick timing, picker replacement and reed adjustment.
	5. To study and sketch the 5-wheel and 7-wheel take upmotions.
	6. To study the working of positive and negative let-offmotion.
	7. To Study of Warp protection motion (both loose reed and fastreed).
	8. To study warp stopmotion.
	9. To study pirn changingmechanism.
	10. To study side/centre weft forkmechanism.
	11. Identification of fabric faults by fabric inspectionmachine.

## BASIC ELECTRONICS

**Module I**: (10 Hrs)

*Diodes and Applications* covering, Semiconductor Diode - Ideal versus Practical, Resistance Levels, Diode Equivalent Circuits, Load Line Analysis; Diode as a Switch, Diode as a Rectifier, Half Wave and Full Wave Rectifiers with and without Filters; Breakdown Mechanisms, Zener Diode – Operation and Applications; Opto-Electronic Devices – LEDs, Photo Diode and Applications; Silicon Controlled Rectifier (SCR) – Operation, Construction, Characteristics, Ratings, Applications;

**Module II***:* (10 Hrs)

*Transistor Characteristics* covering, Bipolar Junction Transistor (BJT) – Construction, Operation, Amplifying Action, Common Base, Common Emitter and Common Collector Configurations, Operating Point, Voltage Divider Bias Configuration; Field Effect Transistor (FET) – Construction, Characteristics of Junction FET, Depletion and Enhancement type Metal Oxide Semiconductor (MOS) FETs, Introduction to CMOScircuits;

**Module III***:* (10 Hrs)

*Transistor Amplifiers and Oscillators* covering, Classification, Small Signal Amplifiers – Basic Features, Common Emitter Amplifier, Coupling and Bypass Capacitors, Distortion, AC Equivalent Circuit; Feedback Amplifiers – Principle, Advantages of Negative Feedback, Topologies, Current Series and Voltage Series Feedback Amplifiers; Oscillators – Classification, RC Phase Shift, Wien Bridge, High Frequency LC and Non-Sinusoidal type Oscillators;

**Module IV** (10 Hrs)

*Operational Amplifiers and Applications* covering, Introduction to Op-Amp, Differential Amplifier Configurations, CMRR, PSRR, Slew Rate; Block Diagram, Pin Configuration of 741 Op-Amp, Characteristics of Ideal OpAmp, Concept of Virtual Ground.

**Books Recommended:**

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* + 1. David. A. Bell (2003), *Laboratory Manual for Electronic Devices and Circuits*,Prentice

Hall,India

* + 1. Santiram Kal (2002), Basic Electronics- Devices, Circuits and IT Fundamentals, Prentice Hall,India
		2. Thomas L. Floyd and R. P. Jain (2009), *Digital Fundamentals* by PearsonEducation,
		3. Paul B. Zbar, A.P. Malvino and M.A. Miller (2009), *Basic Electronics – A Text-Lab. Manual,* TMH
		4. R. T. Paynter (2009), *Introductory Electronic Devices & Circuits, Conventional Flow Version,*Pearson.

# Engineering Economics (3-0-0)

**Prerequisites:**

1. Mathematics.
2. BasicEconomics.

**Module 1: (10 Hours)**

Engineering Economics: Nature, Scope, Basic problems of an economy, Micro Economics and Macro Economics.

Demand: Meaning of demand, Demand function, Law of Demand and its exceptions, Determinants of demand, Demand Estimation and Forecasting, Elasticity of demand & its measurement (Simple numerical problems to be solved), Supply-Meaning of supply, Law of supply and its exception, Determinants of supply, Elasticity of supply, Determination of market equilibrium (Simple numerical problems to be solved).

Production: Production function, Laws of returns: Law of variable proportion, Law of returns to scale.

**Module 2: (10 Hours)**

Cost and revenue concepts, Basic understanding of different market structures, Determination of equilibrium price under perfect competition (Simple numerical problems to be solved), Break Even Analysis-linear approach (Simple numerical problems to be solved).

Banking: Commercial bank, Functions of commercial bank, Central bank, Functions of Central Bank. Inflation: Meaning of inflation, types, causes, measures to control inflation.

National Income: Definition, Concepts of national income, Method of measuring national income.

**Module 3: (10 Hours)**

Time value of money: Interest - Simple and compound, nominal and effective rate of interest, Cash flow diagrams, Principles of economic equivalence.

Evaluation of engineering projects: Present worth method, Future worth method, Annual worth method, Internal rate of return method, Cost benefit analysis for public projects.

Depreciation: Depreciation of capital assert, causes of depreciation, Methods of calculating depreciation (Straight line method, Declining balance method), After tax comparison of project.

**Text Books:**

1. Riggs, Bedworth and Randhwa,” Engineering Economics”, McGraw Hill EducationIndia.
2. Deviga Vengedasalam,” Principles of Economics”, Oxford UniversityPress.
3. William G. Sullivan, Elin M. Wicks, C. Patric Koelling,” Engineering Economy”,Pearson.
4. R. Paneer Selvam,” Engineering Economics”,PHI.

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1. S. P. Gupta,” Macro Economics”,TMH.
2. S. B. Gupta,” Monetary Economics”, Sultan Chand andCo.

**Environmental Science 4th Sem**

## Course Objectives:

* + Understanding the importance of ecological balance for sustainabledevelopment.
	+ Understanding the impacts of developmental activities and mitigationmeasures
	+ Understanding the environmental policies andregulations

## Course Outcomes:

Based on this course, the Engineering graduate will understand /evaluate / develop technologies on the basis of ecological principles and environmental regulations which in turn help in sustainable development

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| **UNIT – I**An Introduction to – Multidisciplinary nature of Environmental Studies. The Earth and Biosphere (The Earth Science)**Ecology:** Concept and Principle of Ecology, Ecological Succession, Population Ecology, Community Ecology, Relationship, Human Ecology, Origin and Evolution of Life, Plant and Speciation.**Ecosystems: Definition, Properties, Function and Structure of Ecosystem.** Ecological Balance: Cause, Food chains, food webs, Flow of Energy, Ecological Pyramids, Types of Ecosystem: Land, Aquatic and Artificial ecosystem. Biogeochemical cycles, Bioaccumulation, Bio magnification, ecosystem value, Degradation of Ecosystem.Bio-diversity and Conservation**Natural Resources:** Classification of Resources, Conservation of Resources, Environmental Degradation, Equitable use of Resources for Sustainable Life styles, Role of Individual in Conservation of natural Resources.**Water Resources: Sources,** Status of World and Indian’s Water Resources, Over Utilization of Water, Conservation, Flood and Control measure,Others.Mineral Resources. Land Resources, Energy Resources, Food Resources, etc.: Classification, Conservation, Environmental Impacts. |
| **UNIT – II** |

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| **Environmental Pollution:** Types of Pollution and Control Measures, Role of Individual in Pollution Prevention.**Waste Management:** MSW, WM Techniques, Agricultural Solid Waste Management and Legislation on Solid Waste management.**Disaster Management:** Objectives, Type of Disaster. Elements, Organisational Set- up, NDMA, Preparedness, Mitigation, Prevention, Response.**Environment and Development:** Social Issues, environmental Ethics, SustainableDevelopment, Sustainable Energy and materials, Environmental Challenges,: Climate Change, Green House Effect, Global Warming, Ozone Layer Depletion, Protection of Ozone Layer, Acid Rain, EL Nino, Waste land and itsReclamationHuman Population and the Environment: Pupation Growth and Explosion, Pupation Growth and Environment, Family Welfare Programme, Women and Child welfare, HIV/ AIDS, Environment and Health, Human Rights, Value of Education.**Resettlement and Rehabilitation:** Introduction, Social Impact Assessment, Methodology of SIA, Land Acquisition and Impact, Stake holder participation and consultation, Socio-economic Issue,, Mitigation Measure.Rehabilitation Action Plan, Legal Frame work, Training and capacity Building, Grievance and Redressal Mechanism. |
| **UNIT - III****Environmental Protection**: Introduction, International efforts, Government Effort, environmental Organisations, Public Awareness, Environmental Education and Training, Green Building, Clean Development Mechanism, carbon Credits.Environmental Legislation: Environmental Legal Framework, environmental Protection Act, 1986, the Air Act 1981, Water Act 1974, Wild Life Act, 1972, Forest Conservation Act, 1980.**Environmental Management:** Environmental Impact Assessment, TOR for EIA, EIA Methodology (Brief), Baseline Data, Environmental Clearance, MoEF Notification Dated September 2006, Stake holder in EIA ProcessEnvironment Management and EMP: Introduction, Issues covered, Environmental Management System- ISO-14000, Institution and Implementation Arrangement, Mitigation measures, Environmental Monitoring, Environmental Auditing. |

**TEXT BOOKS:**

1. EnvironmentalStudies(Concept,Impacts,Mitigationandmanagement)byM.P.PooniaandS.

C. Sharama, Khana Book Publishing Co. (P) T Ltd. 2019 Edition

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1. Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha for University GrantsCommission.
2. Environmental Studies by R. Rajagopalan, Oxford UniversityPress.

## REFERENCE BOOKS:

1. Environmental Science: towards a sustainable future by Richard T. Wright. 2008 PHL Learning Private Ltd. NewDelhi.
2. Environmental Engineering and science by Gilbert M. Masters and Wendell P. Ela. 2008 PHI Learning Pvt.Ltd.
3. Environmental Science by Daniel B. Botkin & Edward A. Keller, Wiley INDIAedition.
4. Environmental Studies by Anubha Kaushik, 4th Edition, New age international publishers.
5. Text book of Environmental Science and Technology - Dr. M. Anji Reddy 2007, BSPublications.

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**FIFTH SEMESTER**

UPCTE501 **TEXTILE CHEMICAL PROCESSING-I**

## Course Outcomes:

**After successful completion of this course, the students should be able to;**

* + To learn about necessity and application of various pretreatment given to textile materials during dyeingprocess.
	+ To gain knowledge about theory ofcoloration.
	+ To understand the dyeing principles of various cellulosic and protein based fibres based textilematerials.
	+ To understand the different machineries used for chemical processing of the textile materials
	+ Understand the requirements of pre treatments in wet processing oftextiles.
	+ Identify different class of dyes for cellulosic and protein fibres based textilematerials.
	+ Select the dyes and recipe for colouring the different fibre/fabric.
	+ Predict color fastness of the dyedfabric.

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| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
| Understand the requirements of pretreatments in wet processing of textiles. | **√** | **√** | **√** | **√** | **√** |  |  |  |  |  |  |
| Identify different class of dyes for cellulosic and protein fibres basedtextilematerials. | **√** | **√** | **√** |  | **√** |  |  | **√** |  |  |  |
| Select the dyes and recipe for colouring thedifferent fibre/ fabric. | **√** | **√** |  | **√** | **√** |  |  |  | **√** |  |  |
| Predict color fastness of the dyed fabric. | **√** | **√** | **√** | **√** | **√** |  |  |  |  | **√** | **√** |

## Module I (10 Hours)

**Introduction**: Process line for pretreatment, colouration and finishing of textiles.

**Singeing**: Objective, classification of singeing methods, advantages and drawbacks. Process and quality control aspects involved.

**Desizing**: Objectives, classification and mechanism involved in removal of size content in various methods. Desizing of natural and man-made fibres. Evaluation of desizing efficiency **Scouring**: Objectives, mechanism involved in removal of impurities, recipe and controlling parameters involved. Scouring of natural, manmade and blended textiles. Carbonisation of wool. Degumming of silk. Evaluation of scouring efficiency.

**Abbreviations Used:L = Lectures, P = Practical or Laboratory, T = Tutorial**

## IA = Internal Assessment , PA = Practical Assessment, EA = End-Semester Assessment

**Module II (10 Hours)**

**Bleaching:** Objectives of bleaching, hypochlorite, peroxide, chlorite and peracetic acid bleaching methods of bleaching. Mechanism involved in each type of bleaching with controlling parameters. Bleaching of cotton, silk, wool, man-made fibres and blended textiles by suitable bleaching agents. Optical whitening of cotton. Tests forbleaching

**Mercerization**: Objectives, mechanism and process parameters of hot and cold mercerization. Causticization. Brief idea of ammonia mercerization. Evaluation of mercerization

**Heat setting** : Objectives, mechanism and methods of heat-setting. Effectiveness of heat setting on various man made textiles and blends. Heat setting conditions and controls. Heat setting of polyester, nylon, acetate and their blends.Evaluation of degree of heat setting.

## Module III (10 Hours)

**Concept of colour**: Visible spectrum, wavelength and blindness of colour. Metamerism/isomerism. Additive and subtractive theories. Primary, secondary, tertiary, complementary and contrasting colors, shade, tint, Hue, chroma, color wheel. Tristimulus values of colour. Computer colour matching, kubelka-munk equation, reflectance factor, colour-co- ordinates, CIELAB values.

**Theory of dyeing:** Introduction to thermodynamics and kinetics of dyeing. Classification of dyes. Basic characteristic and chemical structure of dyes. Dye-fibre interaction

**Dyeing of textiles Cellulosic and Protein fibres**: Application of Direct, Reactive, Vat, Solubilized vat, Sulphur, Azoic dyes on cellulose fibres. Application of Acid, Basic and Metal complex dyes on wool and silk. Auxiliaries used in dyeing. Eco friendly chemicals and banned dyes.

## Books Recommended:

1. Karmakar S.R., ―Chemical Technology in the pretreatment processing of textiles, Textile Science & Technology, Elsevier Publication,1999.
2. Trotman, E.R., ―Dyeing and Chemical Technology of Textile Fibres, Charles Griffin and Co. Ltd., London.1991.
3. Shenai, V.A. ―Technology of Bleaching and Mercerizing - Vol. III, Sevak Publications Chennai,1991.
4. Bhagwat R.S ―Handbook of Textile Processing, Colour Publication, Mumbai,1999.
5. Shenai, V.A., ―Principle and Practice of Dyeing‖, Sevak Publisher,Bombay,1991.
6. T.L.Vigo, ―Textile Processing and Properties‖, Elsevier, New York,1994.

## ULCTE501 TEXTILE CHEMICAL PROCESSING-I PRACTICAL

**Abbreviations Used:L = Lectures, P = Practical or Laboratory, T = Tutorial**

## IA = Internal Assessment , PA = Practical Assessment, EA = End-Semester Assessment

**At least 10 of the following**

1. Desizing of grey cotton yarn/fabric using chemicals/enzyme and determine the desizing efficiency.
2. Scouring of desized cotton yarn/fabric and determine the scouring loss%, drop absorbency and degree ofimpurities.
3. Scouring of P/C blendedfabrics.
4. Bleaching of scoured cotton yarn/fabric with hypochlorite agent and measurement of the whiteness index, and change in mechanicalproperties.
5. Bleaching of cotton fabric with hydrogen peroxide agent and measurement of the whiteness index, and change in mechanicalproperties.
6. Cold and Hot mercerization of cotton yarn and measurement of the BAN, and change in mechanicalproperties.
7. Scouring and Bleaching ofWool.
8. Degumming ofSilk.
9. Dyeing of cotton yarn/fabric using direct dyes and studying the influence of Temperature, Time and Electrolyte on dye adsorption and fastnessproperties.
10. Dyeing of cotton yarn/fabric using vat dyes and assessment of fastness properties of dyed material.
11. Dyeing of cotton yarn/fabric using hot and cold brand reactive dyes and assessment of dye exhaustion % on dye bath and fastnessproperties.
12. Dyeing of cotton yarn/fabric using azoic dyes and assessment of fastness properties of dyedmaterial.
13. Dyeing of cotton yarn/fabric using sulphur dyes and assessment of fastness properties of dyedmaterial.
14. Dyeing of Wool fibres with Acid and metal complex dyes and assessment of fastness properties of dyedmaterial.
15. Dyeing of Silk yarn / fabric with Acid dyes and direct dyes and assessment of fastness properties of dyedmaterial.

UPCTE502 **YARN MANUFACTURINGIII**

## Course Outcomes:

**After successful completion of this course, the students should be able to;**

* + Control process parameters in new spinning system to produceyarn.
	+ Compare the structure and properties of rotor spun, friction spun and air-jet spun yarns with ring spun yarn.
	+ Select and control the process parameters to produce yarn from different long staple fibres such as wool, jute, flax andsilk.
	+ Calculate the production as well as draft of all the spinningsystems.

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| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
| Control process parameters in newspinning system to produce yarn. | **√** | **√** | **√** | **√** | **√** |  |  |  |  |  |  |
| Compare the structure and properties ofrotor spun, friction spun and air-jet spunyarns with ring spun yarn. | **√** | **√** | **√** |  | **√** |  |  | **√** |  |  |  |
| Select and control the process parametersto produce yarn from different long staple fibres such as wool, jute, flax and silk. | **√** | **√** |  | **√** | **√** |  |  |  | **√** |  |  |
| Calculate the production as well as draft ofall the spinning systems. | **√** | **√** | **√** | **√** | **√** |  |  |  |  | **√** | **√** |

**Module I (10 Hours)**

**Development in Ring Spinning : Compact Spinning -** working principles of different compact spinning systems-Elitwist-Comfortwin, structure and properties of compact yarns, applications of compact yarn - Techno economics of compact spinning. **SIRO Spinning-** Principle and mechanism of SIRO spinning system, structure, properties and end uses of SIRO yarn. Solo spinningsystem.

## Module II (10 Hours)

**Non-conventional spinning processes**: Causes leading to the advent of non-conventional systems of spinning.

**Rotor spinning :** Tasks of the rotor spinning machine; Mechanism of yarn formation on rotor spinning; Raw material requirements and preparation - raw materials requirements ( fibre lengths, fineness, strength, dirt & dust, foreign matter); Designing features of chief organs and their functions, sliver infeed unit, feeding roller & guide plate, opening unit - opening roller - clothing of the opening roller, trash removal, fibre guide passage, fibre flow into the Rotor - rotor groove, rotor diameter, combination of rotor diameter and rotor groove, rotor bearing, rotor revolutions, formation of a coherent fibre strand, back doubling, formation of the yarn, the false twist effect, wrapping fibers, yarn withdrawal and winding unit, navel, types of the navel, withdrawal tube, direction of withdrawal, package formation unit- requirements for the package, the winding process; Effect of rotor machine variables and fibre properties on the properties of rotor spun yarns. techno-economic aspects of rotor spinning system; Limitation of rotorspinning.

## Module III (10 Hours)

**Friction spinning :**Operating principle; Deigning aspects of feed device, opening roller and spinning drum, classification, raw material requirements, technological interrelationships, yarn structure and characteristics, techno-economic aspect.

**Air-jet spinning:** Mechanism of yarn formation on Air-jet spinning; Designing asepses of nozzles; Raw material requirements; Structure, properties and end uses of yarns spun on Air-jet

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## IA = Internal Assessment , PA = Practical Assessment, EA = End-Semester Assessment

spinning, technoeconomics aspects. Comparison of properties of ring spun, rotor spun, friction spun and air-jet spun yarn.

## Module IV (10 Hours)

Long Staple Spinning: Principle ,working and process parameters of spinning system for long staple fibres and their blends such as woollen , worsted, spun silk , flax and jute spinning system.

## Books Recommended:

1. MahendraGowda R V, “ New Spinning Systems”, NCUTE Publication, IIT Delhi,2006.
2. Eric, Oxtoby, "Spun Yarn Technology", Butterworths, London, 1988.
3. Klein.W, “ New Spinning Systems: Vol 5”, The Textile Institute”, UK,1993.
4. Lord P R, “Handbook of Yarn Production”, The Textile Institute, Woodhead Publication Limited, Cambridge,2003.

## ULCTE502 YARN AND FABRIC MANUFACTURING IIIPRACTICAL

**At least 10 of the following**

1. Study of flow of materials in Rotor spinningmachine.
2. Study of different elements of Rotor spinningmachine.
3. Study of draft distribution in Rotor spinningmachine.
4. Study of twist level in Rotor spunyarn.
5. Calculation of production of rotor spinningmachine.
6. To study (4x1) multiple boxmotion.
7. To study fabric formation in Terry towelloom.
8. To study the yarn passage in different shuttle lessloom
9. To study path of warp yarn in rapierloom.
10. To study picking mechanism in rapierloom.
11. To produce a fabric by changing the design in rapierloom.
12. To study path of warp yarn in air-jetloom.
13. To study picking mechanism in air-jetloom.

UPCTE503 **FABRIC MANUFACTURING III**

## Course Outcomes:

**After successful completion of this course, the students should be able to;**

* + Summarize the working of each element in unconventional weavingmachines.
	+ Illustrate the weft insertion cycle of different types of shuttle lesslooms.
	+ Calculate the WIR and production rate of the high speed weavingmachines.
	+ Describe about the multiphase weaving and its merit anddemerits.

**Abbreviations Used:L = Lectures, P = Practical or Laboratory, T = Tutorial**

## IA = Internal Assessment , PA = Practical Assessment, EA = End-Semester Assessment

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| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
| Summarize the working of each element inunconventional weaving machines. | **√** | **√** | **√** | **√** | **√** |  |  |  |  |  |  |
| Illustrate the weft insertion cycle ofdifferent types of shuttle less looms. | **√** | **√** | **√** |  | **√** |  |  | **√** |  |  |  |
| Calculate the WIR and production rate ofthe high speed weaving machines. | **√** | **√** |  | **√** | **√** |  |  |  | **√** |  |  |
| Describe about the multiphase weaving andits merit and demerits. | **√** | **√** | **√** | **√** | **√** |  |  |  |  | **√** | **√** |

**Module I (10 Hours)**

**Introduction:** Automatic loom and its merit over plain shuttle loom.

**Multiple box motion:** Types of multiple box motion, working principle of multiple box motion, two colour and four colour drop box motion, brief description of pick-at-will, pick and pick Motion. Pattern card and use of this to make some design in drop box mechanism.

**Terry weaving:** Essential feature of terry weaving loom, various principle of terry pile formation and itsApplication.

## Module II (10 Hours)

**Development of shuttle less looms:** - Limitation of shuttle looms, Classification of shuttle less Looms. Yarn preparation &pre-requisites for shuttle less weaving. Techno economics of shuttleless weaving. Principles of positive shedding, Selvedge and salient faturesof shuttle less loom. Different types of accumulator and its important.

**Projectile Loom:** Working elements and weft insertion cycle in projectile loom-Torsion bar picking mechanism-Weft selection device-Salient features of projectile loom, Weft insertion rate and production calculation.

## Module III (10 Hours)

**Rapier Loom:** Classification of rapier loom: Flexible, Rigid rapiers-Principles of tip and loop transfer- Weft insertion cycle-Rapier drives-Salient features. Zero velocity and non zero velocity tip transfer. Weft insertion rate and production calculation.

**Airjet loom:** Working principle – weft insertion mechanism - types of nozzles, profile reed. Air requirements. Weft insertion rate and production calculation.

## Module IV (10 Hours)

**Waterjet Loom:** Working principle - Weft insertion system – Nozzles - Water requirements – Weft insertion rate and production calculation.

**Multiphase loom: C**lassification, principles of operation, shedding mechanisms of weft way and warp way, supply systems for weft, Fabric Defects

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## IA = Internal Assessment , PA = Practical Assessment, EA = End-Semester Assessment

**Narrow fabric production:** Importance of narrow weaving. It’s manufacturing

process.

Unconventional Fabric Production: Concepts of 3D fabric production and circular loom.

## Books Recommended:

1. Talukdar M K, Srirammulu P K and Ajgaokar D B, “Weaving – Machine, Mechanism and Management”, Mahajan Publisher Private Ltd., Ahmedabad, India,1998.
2. Aswani K T, “Fancy Weaving mechanism”, Mahajan Publisher Private Ltd., Ahmedabad, India1990.
3. Ormerod& W. S. Sondhelm “Weaving – Technology andOperations,
4. R. Sengupta “WeavingCalculation”.
5. Woven Fabric Production I, II, NCUTE Publications2002.
6. Handbook of weaving, BySabitAdanur

UPCTE504 **FABRIC STRUCTURE AND DESIGN**

## Course Outcomes:

**After successful completion of this course, the students should be able to;**

* + Develop new weavestructures.
	+ Create new structures using color and weaveeffect.
	+ Draw simple and compound structures.
	+ Illustrate specialweaves.

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| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
| Develop new weave structures. | **√** | **√** | **√** | **√** | **√** |  |  |  |  |  |  |
| Create new structures using color andweave effect. | **√** | **√** | **√** |  | **√** |  |  | **√** |  |  |  |
| Draw simple and compound structures. | **√** | **√** |  | **√** | **√** |  |  |  | **√** |  |  |
| Illustrate special weaves. | **√** | **√** | **√** | **√** | **√** |  |  |  |  | **√** | **√** |

## Module I (10 Hrs)

**Introduction**: Basic concepts of yarn count, thread density, crimp and cover factor of fabric, classification of fabrics, concept of designing through fabric structure, importance of fabric structure analysis, representation of weave repeat, draft plan and peg plan, use of point paper.

**Elementary Weaves**: Construction of plain, twill, satin and sateen weaves and their derivatives. **Absorbent Fabrics:** Construction of diamond, diaper, honey comb, huck-a-back and mock-leno weaves.

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**Crepe weave:** Construction of crepe weaves.

## Module II (10 hours)

**Cord Structures**: Bedford cord, whip cord and welt with wadded structures.

**Color and Weave Effect**: Weave and color combinations of line effect, hounds tooth, birds eye, crows foot, hair lines and step pattern.

**Extra thread figuring:** Figuring with extra threads with single and two colors.

## Module III (10 hours)

**Pile structures**: Construction of velvet and velveteen fabrics, fustians.

**Backed fabrics**: Construction of backed fabric.

**Double Cloth**: Construction of self stitched, centre stitched and wadded double cloth.

## Module IV (10 hours)

**Special Weave:** Gauze and net leno fabrics, damasks, brocades, tapestry, tissue, lappet, swivel figured structures.

**Calculations:**Raw material calculations to produce different weaves and their technical specifications.

## Books Recommended:

1. Groscicki Z J, “Watsons Textile Design and Colour”, NewnesButtersworth(1988).
2. Groscicki Z J, “Watsons Advanced Textile Design”, NewnesButtersworth(1989).
3. Klibbe J W,“Structural Fabric Design”,Revised Edition,1965,North Carolina StateUniversity.
4. Nisbeth H, “Grammer of Textile Design”,TaraporeWala sons and Co.(1994).
5. Gokarneshan N, “Fabric Structure and Design”, New Age International, New Delhi(2004).

## ULCTE503 FABRIC STRUCTUREANDDESIGN PRACTICAL

**At least 10 of the following**

**Analysis of the fabric in respect to yarn and fabric parameters and their weave representation with draft and peg plan:**

* 1. Plainweave
	2. Plain derivative- Ribweave
	3. Twillweave
	4. Satin/sateenweave
	5. Diamondsweave
	6. Honey combweave
	7. Huck-a-backweave
	8. Mocklenoweave
	9. Crepeweave
	10. Bedford cord weaves/ welt structure
	11. Extra thread figuredweave
	12. Velvet/velveteenweave

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* 1. Doublecloth

UPETE501 **TECHNICAL TEXTILE**

## Course Outcomes:

**After successful completion of this course, the students should be able to;**

* Describe the classification of technicaltextiles.
* Outline the fibres, yarns and fabric structures used in technicaltextiles.
* Express the functions and property requirements of technical textiles and their applications indifferentfields.
* Demonstrate skills in the product development of technicaltextiles.

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| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
| Describe the classification oftechnicaltextiles. | **√** | **√** | **√** | **√** | **√** |  |  |  |  |  |  |
| Outline the fibres, yarns and fabricstructures used in technical textiles | **√** | **√** | **√** |  | **√** |  |  | **√** |  |  |  |
| Express the functions and propertyrequirements of technical textiles and their applications in different fields. | **√** | **√** |  | **√** | **√** |  |  |  | **√** |  |  |
| Demonstrate skills in the productdevelopment of technical textiles. | **√** | **√** | **√** | **√** | **√** |  |  |  |  | **√** | **√** |

## Module I (10 hours)

**Introduction:** Definition and scope for technical textiles, present status and future of technical textile. Briefidea about technical fibres - Carbon fibres-Aramid and related fibres, Glass threads, composite material.

**Filtration textiles:** Definition of filtration parameters, theory of dust collection and solid liquid separation,filtration requirements, concept of pore size and particle size, role of fiber, fabric construction and finishingtreatments.

**Agro textiles:** Fibres, Fabric Construction details, Properties and applications.

## Module II (10 hours)

**Protective Clothing:** Brief idea about different type of protective clothing, functional requirement of textilesin defence including ballistic protection materials and parachute cloth, temperature and flame retardantclothing, chemical protective clothing, water proof breathable

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fabrics.

**Sports and recreation textiles:** Functional requirement of different types of product and their construction.

## Module III (10 hours)

**Medical textiles:** Classification of medical textiles. Medical Textiles: Surgical Textiles and Sutures. Cardio-Vascular textiles (Knitted cardiac biological valves). Dialytic Textiles, Hollow fibres as dialysis membrane,Hospital Textiles- operating and post operating clothing, disposable drapes. Textiles for sanitary applications.

## Module IV (10 hours)

**Geotextiles:** Brief idea about geo-synthetics and their uses, essential properties of geotextiles, geotextiletesting and evaluation, application examples of geotextiles.

**Automotive textiles:** Brief idea about the important properties and requirements in automotive textiles,textiles components in tyre, tyre structure and design.

**Other uses of technical textile:**Textilesin electronics, power transmission belting, hoses, canvas covers andtarpaulins.

## Books Recommended:

1. Horrocks AR and AnandSC,“Handbook of Technical Textiles”, Woodhead Publication Ltd,Cambridge (2000).
2. RaoGV and Raju GVS, “Engineering with Geosynthetics”, Tata McGraw Hill Publishing Co. Ltd., NewDelhi(1990).
3. Svedova J, “Industrial Textile”,Elsevier, New York(1990).
4. Raheel M, “Modern Textile Characterization Methods”, Marcel Dekker, Inc.(1996).
5. Mukhopadhyay S K and Partridge J F, “Automotive Textiles”, The Textile Institute (1999).
6. SabitAdanur, “Wellington Sears Handbook of Industrial Textiles”, Technomic publishing company Inc.,USA,1995.
7. Pushpa B and Sengupta AK, "Industrial Application of Textiles for Filteration and Coated fabrics",Textile Progress Vol.14,1992.

UPETE502 **TEXTILE FINISHING AND CLOTHING CARE**

## Course Outcomes:

**After successful completion of this course, the students should be able to;**

* Apply functional finish on textilematerials.
* Control processing parameters in finishing ofgarments.
* Implement spotting and laundering methods ontextile.
* Perform enzymatic processing offabrics.

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| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
| Apply functional finish on textile materials. | **√** | **√** | **√** | **√** | **√** |  |  |  |  |  |  |
| Control processing parameters in finishingof garments. | **√** | **√** | **√** |  | **√** |  |  | **√** |  |  |  |
| Implement spotting and launderingmethods on textile. | **√** | **√** |  | **√** | **√** |  |  |  | **√** |  |  |
| Perform enzymatic processing of fabrics. | **√** | **√** | **√** | **√** | **√** |  |  |  |  | **√** | **√** |

**Module I (10 Hours)**

**Introduction:** Consideration for finishing, various terms used in finishing, classification of finishing, types of finishing.

**Finishing Chemicals:** Stiffening agents, cross-linking agents, resins, softening agents, silicones, polymers, bleaching agents, optical brightening agents.

**Finishing Machines:** Padding mangle, calender, sanforizer, Stenter, Raising, Milling, Decatizer, Emerizer.

## Module II (10 Hours)

**Various Functional Finishes:** Water repellent/proof, fire repellent, mildew/moth proof, soil release finish, anti static, miscellaneous finishes.

**Special Finishes:** Anti crease, Anti shrinkage, anti-microbial, UV resisting finish, softening, stiffening, raising, embossing, felting, non- felting new finishes**,** Biopolishing.

## Module III (10 Hours)

**Finishing of Garments:** Introduction to garment dyeing and printing - Flock printing, foam printing, transfer printing, wet transfer, film release, sublimation transfer printing -Preparations of logo and motifs for fixing on garments. Durable press finish - resin, wash and wear, acid wash, stone wash, bio-stoning, crinkled effect, softening, chemical and enzyme, denim and blast finishing and controlling factors. Brushing ofgarment.

## Module IV (10 Hours)

**Spotting and Laundering of Garments:** Identification of stains, characteristics and history, selection of spotting chemicals, factors for spotting, dry cleaning, washing machine equipments and processing conditions, pressing.

**Applications of enzymes in Textile Processing and finishing**: Types of enzymes andtheir uses in retting process of linen fibres, textile processing- biodesizing, bioscouring, biobleaching, wool processing, biostoning, biopolishing, textile after care.

## Books Recommended:

1. Whittall NS, "Laundering and dry cleaning", vol.8, TextileProgress.

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1. Goldman RF, and Lyle DS "Performance of textiles" John Wiley and sons, NewYork.
2. Ashelfrd, “Care of Clothes “, NationalTrust.
3. "Garment wet processing technical manual",AATCC/SDC.
4. Mehta PV, "An Introduction to quality control for the apparel industry", ASQC quality press, New York.

UOETE501 **TEXTILE STRUCTURALCOMPOSITE**

## Course Outcomes

**After successful completion of this course, the students should be able to;**

* Describe the various reinforcements and resins used in compositematerials.
* Analyze and interpret the structure of the compositematerials.
* Demonstrate the necessary skills in the composite materialdevelopment.
* Outline the various testing performed in compositematerials.

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| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
| Describe the various reinforcements andresins used in composite materials. | **√** | **√** | **√** | **√** | **√** |  |  |  |  |  |  |
| Analyze and interpret the structure of thecomposite materials. | **√** | **√** | **√** |  | **√** |  |  | **√** |  |  |  |
| Demonstrate the necessary skills in thecomposite material development. | **√** | **√** |  | **√** | **√** |  |  |  | **√** |  |  |
| Outline the various testing performed incomposite materials. | **√** | **√** | **√** | **√** | **√** |  |  |  |  | **√** | **√** |

## Module I (10 Hours)

**Introduction to Composites:** Definition and classification –Structure of the matrix such as MMC, CMC and PMC. Reinforcement forms – Limitations of the conventional engineering materials such as metal, plastics and ceramics-Advantages of Composites over Conventional Engineering materials. Introduction to green composites andnano-composites.

**Matrix and Reinforcement:** Matrix polymer-Thermosets, thermoplastics-Reinforcing agents- Types of reinforcing agents such as fibre, particulate and laminates-Fibre forms such as roving, yarns, fabrics. Testing of Matrix and Reinforcement materials. Prepregs and preforms – manufacturing technologies, advantages and Limitations.

## Module II (10 Hours)

**Mechanics of Composites:** Mechanical Properties of composites-Elasticity of Composites-

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Failure modes of Composites-Ply and orientation- Rule of Mixture and Property prediction-Fibre Volume fraction (FVF) and Fibre Mass Fraction (FMF)-Interface and interfacial reactions-Other properties of Composites such as Delamination and Fracture toughness- Compression behavior of Composites- Calculations in FVF, FMF and ply thickness.

## Module III (10 Hours)

**Composites Manufacturing Method:** Goals of Composite manufacturing process, Manufacturing Technologies, Characteristics, Application and Limitations: Lay-up, Spray lay- up, Automatic Lay-up, Vacuum bagging, Compression moulding, Injection moulding, Filament winding, Pultrusion, Resin transfer moulding.

## Module IV (10 Hours)

**Testing of Composites:** Types of loading: Tension, Compression, shear, flexure. Destructive Testing: Tensile Testing: Inplane tension test, out of plane tensile test - Compressiontest, interlaminar shear testing, tensile test, rail shear test, short beam shear test, interlaminar fracture testing, Fibre volume fraction: Matrix digestion, Ignition Loss. Moisture diffusivity, void content, accelerated weathering test. Non destructive test: visual, optical, ultrasonic, acoustic, radiographic,thermal.

## Books Recommended:

1. Guneri Akovali ―Handbook of Composite Fabrication‖, Rapra Technology Ltd,2003.
2. Autar K.Kaw , ―Mechanics of Composite Materials‖, Second Edition, CRC press,2006.
3. George H.Stab , ―Laminar Composites‖, B-Hpublication,1999.
4. Sanjay K.Mazumdar, ―Composite manufacturing-Material, Product and Process engineering‖,CRC

1. press, 2002.

1. Reinhart T J, “Introduction to Composites”, in Engineering Materials Handbook, Vol. 1, Composites,

2. ASM International, 1993.

1. Chau T, and Ko F K, eds., “Textile Structural Compostes”, Elsevier,1989.
2. Adanaur S, “Textile Structural Compostes”, in Handbbook of Industrial Textiles.ed.

## SIXTH SEMESTER

UPCTE601 **TEXTILE CHEMICAL PROCESSINGII**

## Course Outcomes:

**After successful completion of this course, the students should be able to;**

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* + Perform dyeing of textiles made up synthetic fibres and theirblends.
* Control process parameters and use of dyeing machines for dyeing of textilematerials.
* Select the dyes and recipe for preparation of printing paste for printing of textile materials.
* Have concept about various finishing treatment process and treat the fabric with different finishingagent.

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| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
| Perform dyeing of textiles made upsynthetic fibres and their blends. | **√** | **√** | **√** | **√** | **√** |  |  |  |  |  |  |
| Control process parameters and use of dyeing machines for dyeing of textilematerials. | **√** | **√** | **√** |  | **√** |  |  | **√** |  |  |  |
| Select the dyes and recipe for preparation of printing paste for printing oftextilematerials. | **√** | **√** |  | **√** | **√** |  |  |  | **√** |  |  |
| Have concept about various finishing treatmentprocessandtreatthefabricwithdifferent finishing agent. | **√** | **√** | **√** | **√** | **√** |  |  |  |  | **√** | **√** |

## Module I (10 Hours)

**Dyeing of synthetic fibres:** Dyeing of polyester with disperse dye.Dyeing of Nylon with acid dye.Dyeing of acrylic with cationic dye.

**Dyeing of blends**: Classification of blends and shades, Methods for dyeing of blends.Suitability of each method for dyeing of specific blend- P/C, P/V, P/W. W/A.

## Module II (10 Hours)

**Identification of dyes**: Identification of dye on dyed natural and man made textiles **Carbonisation:** Objectives, selection of chemical, process parameters, trouble shoots, precautionary measures and efficiency of carbonisation.

**Dyeing machineries**: J-box, kier, mercerizing machinery, loose fibre, yarn and package dyeing machines. Jigger, winch, jet and HTHP beam dyeing machine. Padding mangle, Continuous bleaching range, Continuous dyeing range.

## Module III (10) Hours)

**Printing:** Objective, Difference between dyeing and printing, Characteristics of printing paste ingredients, classification and mechanism of thickeners.

**Printing methods**: Hand block, roller and screen printing processes. Working of roller printing machine, photoelectric method of screen preparation.Drawback and advantage of each method.

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**Styles of printing:** Direct, Discharge and Resist. Printing of cotton with reactive, vat and azoic dyes and pigment, Silk with acid dyes, Polyester with disperse dye and Acrylic with basic dyes. **Printing after treatments**: Steaming, curing, ageing inprinting.

**Transfer Printing:** Types, mechanism and machineries of transfer printing.

**Digital Printing:** Mechanism, process parameters and machinery.

## Module IV (10 Hours)

**Finishing:** Significance and classification of finishing.

**Mechanical finish:** Mechanism of Softening,calendaring, Sanforizing and their evaluation **Chemical and functional finish:** Mechanism, process parameters and troubleshootings of Softening,anti crease finish , water proof and water repellent finish, flame-retardant and fire proof finish, moth proof and insect repellent finish, Soil release finish; Organdi finish; Biopolishing, Stonewashing of denim , Anti-microbial finish, UV finish, antistatic finish, non- slip finish and theirevaluation.

**Waste minimization:** Need for waste minimization. Brief idea about chemical and auxiliary‘s conservation, water conservation, energy conservation. Textile effluent management.Techniques of effluent treatment.Flow chart of primary, secondary and tertiary effluent treatment.

## Books Recommended:

1. Miles L W C, “Textile Printing”, Dyers Company Publication Trust, Bradford, England, 1981.
2. Shenai V A, “Technology of Printing”, Sevak Publications, Mumbai,1990.
3. Hall A J, “Textile Finishing”, Haywood Books, London,1996.
4. Shenai V A and Saraf, N M, “Technology of Textile Finishing”, Sevak Publications, Mumbai, 1990.
5. Karmakar S. R., “Chemical Technology in the Pre-treatment Process of Textiles”, Elsevier sciences,1999.
6. Schindler W. D. and Hauser P. J., "Chemical finishing of textiles", Woodhead Publishing Ltd.,2004.
7. Cavaco-Paulo A. and Gubitz G. M., “Textile Processing with enzymes”, Woodhead Publication Ltd.,2003.

## ULCTE601 TEXTILE CHEMICAL PROCESSING IIPRACTICAL

**At least 10 of the following**

1. Dyeing of Polyester fibres/yarn/fabrics with Disperse Dye using carrier dyeingprocess.
2. Dyeing of Polyester fibres/yarn/fabrics with Disperse Dye using HT-HP dyeingprocess.
3. Dyeing of Nylon yarn/fabric with AcidDye.
4. Dyeing of polyacrylonitrilefibre with cationicdyes.

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1. Dyeing of blended fabric with suitabledyes.
2. Printing of cotton fabric with direct style printing and assessment of fastness properties of printedmaterial.
3. Printing of cotton fabric with discharge style printing and assessment of fastness properties of printedmaterial.
4. Printing of cotton fabric with resist style printing and assessment of fastness properties of printedmaterial.
5. Finishing of cotton fabric using starch and evaluation of stiffness andadd-on%.
6. Finishing of cotton fabric using softeners and evaluation of drape andadd-on%.
7. Crease Proofing of cotton fabric and evaluation of crease recoveryangle.
8. Assessment of shrinkage of woven and knitted fabrics.
9. Finishing of cotton fabric with anti-pilling finish and evaluation ofpilling.
10. Finishing of cotton fabric with water repellent finish and evaluation of wettingangle.
11. Finishing of cotton fabric with flame retardant finish and evaluation ofLOI.
12. Finishing of cotton fabric with soil release finish and measure the ability of fabric to release oily stains during homelaundering.
13. Determination of the colour difference and colour strength value of dyed material using computer colour matchingsystem.

UPCTE602 **TESTING OF TEXTILEMATERIALS**

## Course Outcomes:

**After successful completion of this course, the students should be able to;**

* Describe the principle of measurement of different parameters and characteristics of yarn andfabric.
* Operate equipment used for testing various properties of yarns and fabrics applying knowledge gained through this course.
* Analyze the various reports generated during quality evaluation of yarn andfabric.
* Interpret the results and drawinginterferences.

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| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
| Describe the principle of measurement of different parameters and characteristics ofyarn and fabric. | **√** | **√** | **√** | **√** | **√** |  |  |  |  |  |  |
| Operate equipment used for testing various properties of yarns and fabrics applyingknowledge gained through this course. | **√** | **√** | **√** |  | **√** |  |  | **√** |  |  |  |
| Analyze the various reports generatedduring quality evaluation of yarn and | **√** | **√** |  | **√** | **√** |  |  |  | **√** |  |  |

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| fabric. |  |  |  |  |  |  |  |  |  |  |  |
| Interpret the results and drawinginterferences. | **√** | **√** | **√** | **√** | **√** |  |  |  |  | **√** | **√** |

**Module I (10 Hours)**

**Introduction to Textile testing:** Importance of testing, Quality, Relative humidity and standard condition for testing. Moisture content moisture regains, Selection of sample for testing. Different technique for yarn and fabricsampling.

## Module II (10 Hours)

**Yarn Testing:** Count, Twist, Doubling effect on count and uniformity. Single yarn strength and Lea count strength product (CSP) and Corrected Count StrengthProduct (CCSP). factors affecting tensile properties.Tensile properties and - various type ofmeasuring instruments based on CRT, CRL and CRE and their working principles, bending rigidity of Yarn by heart-loop test. **Yarn Surface quality:** Nature and causes of irregularities, principles of evenness testing: optical and capacitance methods, evaluations and interpretation of evenness results, concept of index of irregularity. Variance - length curves and spectrogramanalysis, yarn imperfections, yarn faults classification, UsterClassimat andClassifault.

**Yarn hairiness:** Importance and assessment techniques.

## Module III (10 Hours)

**Testing of fabric Dimensional Properties**: Thickness, Area density (GSM),Warp and Weft crimp, Cover factor calculations.

**Testing of fabric Properties:** Tensile, Tear, compression and shear, Fabric Abrasion, Pilling, Bursting,flexural rigidity; Drape-ability, Crease recovery.

**Transmission behavior of fabrics:** Measurement of Air, water, heat and static charge transmission. Wicking: vertical and horizontal transportation of liquid.

## Module IV (10 Hours) Garment Testing:

**Sewability:** Seam strength, Seam slippage, Seam pucker, Needle Cutting Index Low stress Mechanical Properties of Fabric, Primary and total hand value.

## Books Recommended:

1. J.E. Booth, Principle of TextileTesting
2. V K Kothari, Testing and quality managementVol-1
3. GAV Leaf, Practical Statistics For The Textile Industry: Part I, The Textile Institute,1984.
4. Saville B P, Physical Testing of Textiles, Woodhead publishing -UK,2004.
5. Jinlian H U, Fabric Testing, Woodhead Publishing,2008.
6. ArindamBasu, Textile Testing (Fibre, Yarn and Fabric), SITRA, Coimbatore,2001.

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## IA = Internal Assessment , PA = Practical Assessment, EA = End-Semester Assessment

1. Somasundar S, Application of Statistical Methods in Textile Industry, SITRA,Coimbatore,1998.

## ULCTE602 TESTING OFTEXTILE MATERIALS PRACTICAL

**At least 10 of the following Yarn Testing**

1. To determine the Hank and Hank C.V% of the given sliver / Determination of the within bobbin and between bobbin hank C.V % of the givenroving.
2. To determine the count of a yarn by using physical/electronicbalance.
3. To measure the Single yarn and Ply yarn twist of the given yarn sample using Twist Tester.
4. To determine the Yarn count, Lea Strength and CSP of the given yarnsample.
5. To determine the single yarnstrength.
6. To Study evenness and imperfection in the given yarn and compare the results with Uster statistics.
7. To Study the spectrogram and irregularity trace to determine type ofirregularity.
8. To Prepare yarns Appearance Boards and compare with ASTMstandards.

## Fabric Testing

1. To characterize a woven fabric with respect to its dimensional properties: thread density, yarn number, crimp, weave, cover factor, weight, skewness,thickness
2. To determine the tensile strength of a woven fabric by strip test method. Draw load- elongation curve of a wovenfabric.
3. To determine the tear strength of a fabric using Elmensdorf tear tester or ballistictester.
4. To determine the bursting strength of a fabric using hydraulic burstingtester.
5. To determine the abrasion resistance of afabric.
6. To determine the bending length and flexural rigidity of a woven fabric using the Shirley tester.
7. To determine the crease recovery of fabric and observe the effect of loading time and recovery time on creaserecovery.
8. To determine the drape coefficient of woven and knitted fabric using the drapemeter.
9. To measure the Air permeability and Fabric Impact Strength of the givenfabric.
10. To measure the water permeability of the givenfabric.

UPETE601 **GARMENT MANUFACTURINGTECHNOLOGY**

## Course Outcomes:

**After successful completion of this course, the students should be able to;**

**Abbreviations Used:L = Lectures, P = Practical or Laboratory, T = Tutorial**

## IA = Internal Assessment , PA = Practical Assessment, EA = End-Semester Assessment

* + Describe structure and classification of Apparel industries as per size, labour and product and understand the development of apparel industry inIndia.
* Describe various requirements and importance of pattern making, cutting, sewing, finishing andInspection.
* Compare various production technologies and itstypes.
* Discuss the applications of CAD/CAM in apparelindustry.

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| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
| Describe structure and classification of Apparel industries as per size, labour andproduct and understand the development of apparel industry in India. | **√** | **√** | **√** | **√** | **√** |  |  |  |  |  |  |
| Describe various requirements and importance of pattern making,cutting,sewing, finishing and Inspection. | **√** | **√** | **√** |  | **√** |  |  | **√** |  |  |  |
| Compare various productiontechnologiesand its types. | **√** | **√** |  | **√** | **√** |  |  |  | **√** |  |  |
| Discuss the applications of CAD/CAM inapparel industry. | **√** | **√** | **√** | **√** | **√** |  |  |  |  | **√** | **√** |

## Module I (10 Hours)

**Garment Manufacturing**: Introduction.

**Raw material**: Woven and knitted fabrics with their characteristics and applications for different uses, Garment manufacturing from woven and knitted fabrics, Lining and interlinings, sewing threads. Selection of Fabrics for Garments.

**Designing and Pattern making**: Introduction to designing, Pattern making – draft construction, advanced Pattern making, grading of pattern, marker planning, fabric spreading, laying methods, Factors affecting spreading, 3D body scanner for measurements, fabric cutting, computerized cutting machines, easy match system, automatic ticketing and bundling, garment size and size charts.

## Module II (10 Hours)

**Marker Making: Objectives**, Method of marker making.

**Spreading and lay planning**: Introduction to symmetrical and asymmetrical fabrics, criteria of spreading, methods of spreading, spreading m/cs. Principles of lay plan, types of lay plan.

**Cutting**: Introduction to cutting room processes, cutting methods, alternative methods of joining the fabric

**Sorting/bundling system:** Introduction, need of Sorting/Bundling system, precautionary measure to betaken.

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**Module III (10 Hours)**

**Garment Sewing**: Introduction to sewing m/c and its parts, sewing room processes and working details. Different types of sewing m/c and its suitability, Different sewing m/c driving system. Attachment of sewing machine.LAN in Sewing machine and sewing room planning. Preparation of seamless garments and its applications. Sewing dynamics:

**Sewing Needles and Threads:** Needle – functions, special needles, Needle size, Needle points; sewing thread- construction, material, thread size and packages.

**Sewing stitches and seams types**: Stitch formation, types of stitches, seam classification, seam geometry seam strength and slippage, seam puckering, seam quality. Thread calculation and its consumption.

**Trimming and Garment accessories**: Definition, types, trimming methodologies and accessoriesapplication.

## Module IV (10Hours)

**Garment finishing**: Fasteners, thread tucking, care and size labeling system, checking, pressing, folding and packing, packing standards for domestic and export markets.

**Quality Control in Garment manufacturing:** Control in pattern making, grading, fabric laying, marking, sewing and finishing, control of garment defects.

**Computer Application in Garment Manufacturing**: Application in pattern making, grading, lay planning, sewing and finishing, computer aided embroidery designs. Concepts of computer integrated manufacturing (CIM) in the garment industry.

## Books Recommended:

1. Gerry Cooklin, “Introduction to clothingManufacture”.
2. Jacob Solinger, “Apparel Manufacturing Handbook”.
3. Dora S. Lewin, Mabel Goode, “Clothing construction and wardrobeplanning”.
4. V.Subramaniam, “Garment Technology”, Winter School booklets1990.
5. T Ramchandran, “Introduction to Garment ManufacturingTechnology”.
6. Mary Methews, “Practical Clothing Construction” Part I &II.
7. Carr H and Lantham B, “The Technology of Clothing Manufacture”, Om BookService.
8. Mehta P V and Bhardwaj S K, “ Managing Quality in apparel industry”, Om Book Service.
9. Aldrich W, “Metric Pattern Cutting”, OM BookService.
10. Cooklin Gerry, “Garment Technology for Fashion Designers”, OM BookService.
11. Eveleyn M and Ucas, “Clothing Construction”, Hughton Mifflin Co,Boston.

UPETE602 **HIGH PERFORMANCEFIBRES**

## Course Outcomes

**After successful completion of this course, the students should be able to**.

* State the application of high performancefibre.
* Learn the manufacture methods of high performancefibre.

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* + Explain the working of fibre formingtechniques.
* Choose the appropriate polymers and auxiliary chemicals in fibreformation.

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| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
| State the application of high performancefibre. | **√** | **√** | **√** | **√** | **√** |  |  |  |  |  |  |
| Learn the manufacture methods of highperformance fibre. | **√** | **√** | **√** |  | **√** |  |  | **√** |  |  |  |
| Explain the working of fibre formingtechniques. | **√** | **√** |  | **√** | **√** |  |  |  | **√** |  |  |
| Choose the appropriate polymers andauxiliary chemicals in fibre formation. | **√** | **√** | **√** | **√** | **√** |  |  |  |  | **√** | **√** |

## Module I (10 Hours)

**Aramid and Sulfur Based Fibres:** Requirements of high performance fibres. Aramid fibre, Formation, Structure, Properties and application. Polyphenyl sulphide fibres - Fibre formation - Properties – Applications.

**Carbon and Glass Fibres:** Classification of Carbon fibres - Manufacturing processes from Polyacrylonitrile (PAN), Rayon and Pitch based fibres - Properties and Applications. Glass fibres

–Optical fibres Types and composition -manufacturing processes - Fibre structure - Properties - Applications.

## Module II (10 Hours)

**Metallic Fibres:** Metallic fibres -. Steel fibre - Formation – Structure – Properties and application. Aluminium Oxide fibres- Preparation and manufacturing process - Properties - Applications – Composites of Aluminium Oxide fibres. Lead fibres – Fibre Preparation - Properties - Applications - Sound Control and Radiation Shielding Materials.

## Module- III (10 Hours)

**Ceramic, Elastomeric and PBI Fibres:** Ceramic fibres – classification, fibre formation, composition, structure, properties and applications.

Elastomeric (Polyurethane) fibres - manufacturing processes - Properties - Applications. HDPE fibersmanufacturing processes - Properties -Applications. Polybenzimidazole (PBI) - Fibre formation, structure, properties and applications.

## Module IV (10 Hours)

**New Fibres:** Polystyrene based fibres - Preparation - Properties – Applications. Micro fibres- Preparation – Properties; Bio-absorbable fibres from Cotton, Rayon, Poly Lactic Acid (PLA); Nano-fibres, Ultra-fine fibres, Hollow fibres and its uses.

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**Books Recommended:**

1. Mukhopadyay S.K., ―High Performance Fibres‖, Textile Progress, Textile Institute, Manchester, Vol. 25,1993.
2. Menachem Lewin and Jack Preston., ―High Technology Pibers - part B‖, Marcel Dekker, New York, 1989.
3. Gupta V.B. and Kothari V.K., ―Manufactured Fibre Technology‖, Chapman Hall Publishing Company,1997.
4. Anand S.C., ―Medical textiles: Proceedings of the 2nd International conference‖ Bolton, UK. 2001.
5. Menachem Lewin & Jack Preston, ―High Technology Fibres - Part A‖, Marcel Dekker, New York,1985.

UPETE603 **KNITTING AND NONWOVENTECHNOLOGY**

## Course Outcomes:

**After successful completion of this course, the students should be able to;**

* Gain Knowledge of different knitted fabric structure and theirproperties.
* Describe the various elements and mechanism of different types of knittingmachines.
* Gain knowledge of production of machine and control the loop length in knittedfabric.
* Gain knowledge on different techniques for formation of non-wovenfabric.

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| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
| Gain Knowledge of different knitted fabricstructure and their properties. | **√** | **√** | **√** | **√** | **√** |  |  |  |  |  |  |
| Describe the various elements and mechanism of different types ofknittingmachines. | **√** | **√** | **√** |  | **√** |  |  | **√** |  |  |  |
| Gain knowledge of production of machine and control the loop length in knittedfabric. | **√** | **√** |  | **√** | **√** |  |  |  | **√** |  |  |
| Gain knowledge on different techniques forformation of non-woven fabric. | **√** | **√** | **√** | **√** | **√** |  |  |  |  | **√** | **√** |

## Module I (10 Hours)

**Introduction to Knitting**: Difference between woven and knitted products and process. Classification of knitting machine and mechanism. Elements of knitting: needles, sinker and cam. Knitting action of Latch needle and beardedNeedle.

**Terms and Definitions used in knitting**: Wales, Courses, Face loop, Back loop, Stitch density, Pitch, Gauge, Float & Tuck Stitches and their effects on fabrics. Some stitch notation.

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**Module II (10 Hours)**

**Weft Knitting:** Circular weft knitting machine and its mechanism, Creel, Tensioner, Method of yarn feeding. Classification and representation of weft knit structures and characteristics of Plain, Rib, Interlock and Purl structures and their derivatives.

**Knitting Science:** Loop length, Geometry of knitted structure, Knitting Constants, Robbing back, Areal density, Tightness factor, Spirality in knitted structure. Yarn requirement for knitting, norms of cotton yarn for knitting, fibers used in knitting for both weft and warp knitting. Selection of cone angle forknitting.

## Module III (10 Hours)

**Warp knitting:** Basic difference in warp knitting and weft knitting process and product. Types of warp knitting machines: Tricot & Raschel, Elements of warp knitting: Needle and Needle bar, Pressure Bar, Latch guard, Sinker and sinker bar, Guide and guide bar. DifferentMotions, Types of lapping and warp knitted structuresand their uses, Knitted Spacerfabric.

## Module IV (10 Hours)

**Non-woven Technology:** Introduction to non-woven technology. Types of fibres used, Methods of web preparation, Orientation of fibres in the web: Cross laid, parallel laid, Random laid, perpendicular laid web (struto technology), Methods of bonding of web: Needle Punching, Chemical Bonding, Thermal bonding, Spun laid technology. Non-woven fabric properties influencing factors. Effects of process and machine variables on properties of nonwoven, stitch bonding and tufting.Spun bonding and melt blowing method of nonwoven production, Ultra sonic and infrared bonding, Structure, properties and application of nonwoven fabrics. Manufacturing of Nano Fabric by Electro spinningmethod.

## Books Recommended:

1. D. B Ajgaonkar, Knitting technology, Universal Publication Corporation, Mumbai,1998.
2. Dr.N.Anbumani, Knitting Fundamentals, Machines, Structures and Developments‖, New Age International,2006.
3. S C Ray, “Fundamental and advance in knitting Technology”, Woodheadpublishers.
4. Chandrasekhar Iyer, Bernd Mammel and Wolfgang Schach, Circular knitting, MeisenbachGmbh, Bamberg,1995.
5. D.J. Spencer, Knitting technology, Textile Institute Manchester,2005.
6. S.J.Russell, “Hand Book of Nonwovens”, Wood head publications Ltd., ISBN-13: 978-1- 85573-603-0,2007.
7. Wilhelm A, Hilmar F and Walter K, “Nonwoven Fabrics: Raw Materials, Manufacture, Applications, Characteristics, Testing Processes”, Wileyverlag Gmbh & Co. Kgaa, Weinheim, 2003.

## ULCTE603 CAD & KNITTING AND NONWOVEN TECHNOLOGYPRACTICAL

**At least 10 of the following**

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* 1. Introduction to ArahPaint- Understanding program appearance, sequence of steps and basic operation oftools.
	2. Creating stripe and check pattern, half-drop design and working withfilters
	3. IntroductiontoArahWeave- Prerequisite to the application, working with files and viewing fabricsimulation.
	4. Conversion of images into jacquard weave and construction of extra thread figured fabric.
	5. Introduction to ArahDrape and viewing texture onmodels.
	6. To study the parts and path of yarn through circular knittingmachine.
	7. To study the parts and path of yarn through flat-bed knittingmachine.
	8. To study the different knitting elements including the camsystem.
	9. To study the different elements of a needle punched non-wovenmachine.
	10. To produce a sample of non-woven fabric using needle punched non-wovenmachine.
	11. To study the construction & working of compression molding machine for manufacturing of composite usingNonwovens.

## UPETE604 TEXTILE MILL PLANNING ANDORGANIZATION

**Course Outcomes:**

**After successful completion of this course, the students should be able to;**

* Understand the principles of layoutplanning.
* Implement the measures to reduce powerconsumption.
* Understand organizational structure andpattern.
* Explain financial management in relation to textilecosting.

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| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
| Understand the principles of layoutplanning. | **√** | **√** | **√** | **√** | **√** |  |  |  |  |  |  |
| Implement the measures to reduce powerconsumption. | **√** | **√** | **√** |  | **√** |  |  | **√** |  |  |  |
| Understand organizational structureandpattern. | **√** | **√** |  | **√** | **√** |  |  |  | **√** |  |  |
| Explain financial management in relationto textile costing. | **√** | **√** | **√** | **√** | **√** |  |  |  |  | **√** | **√** |

## Module I (10 Hours)

**Location and Layout Planning:** Plant location and site selection, Factors affecting location, Plant layout, Different types of layouts, Principles of machinery lay-outs and different flow plans of material for spinning , weaving and process house. Calculation for balancing of different machines in a Textile mill.

**Plant services:** Ventilation and lighting plan. Humidification systems used in Textile Mills, Developments in humidification systems, Utilization of steam and power, Power consumption -

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Energy consumption in textile machines, Measures to reduce power

consumption.

## Module II (10 Hours)

**Material handling:** Importance of material handling, Methods and equipment employed classification of material handling equipments, control of wastes.

**Store Routine:** Function of stores, procedure for material procurement, effective stores management, ABC analysis, basic inventory control, stock evaluation.

## Module III (10 Hours)

**Human Resource Management:** Organizational structure, patterns, communication. Selection, recruitment and training, Different categories of labour required in various section of spinning, weaving and processing departments, work load, work assignment, Calculation for work assignment, Idea of productivity calculations of spinning and weaving mill and factors affecting productivity. Labour laws, labour welfare activities, methods of wage remuneration, wage determination process, job evaluation, payments by results, motivation, financial & non-financial incentives, disciplinary action – warning, show cause notice, suspension and dismissals, retrenchment & VRS.

**Maintenance Management:** Maintenance systems - types of maintenance practices and concepts, planned & unplanned maintenance, corrective & design maintenance, routine and preventive maintenance, Work Study in maintenance and, planning of maintenance work, making schedules, recording of maintenance activities. Accidents and safety engineering, Fire prevention andprotection.

## Module IV (10 Hours)

**Cost Accounting and Control:** Introduction, costing - its importance & use, Elements of cost, Cost classification, Total cost analysis, Costing the products, Control and accounting of materials, labour andoverhead.

**Financial Management:** Preparation of Balance sheet - Capital and running cost - profit and loss account, Break even analysis. Financial ratios - their analysis andinterpretation

## Books Recommended:

1. Dudeja V D, “Management of Textile Industry”, Textile Trade Press,Ahmedabad.
2. Ormerod A, “Textile Project Management”, The Textile Institute, ManchesterUK.
3. Talukdar M K, Srirammulu P K and Ajgaokar D B, “Weaving – Machine, Mechanism and Management”, Mahajan Publisher Private Ltd., Ahmedabad,India.
4. Garde A R and Subramanian T A, “Process Control in Spinning”, ATIRAAhmedabad.
5. Higgins, “Handbook of Maintenance Management”, Prentice Hall NewYork.

## UOETE601 CLOTHING SCIENCE AND TECHNOLOGY

**Course Outcomes:**

**Abbreviations Used:L = Lectures, P = Practical or Laboratory, T = Tutorial**

## IA = Internal Assessment , PA = Practical Assessment, EA = End-Semester Assessment

**After successful completion of this course, the students should be able to;**

* Describe thermal and non-thermal components of clothingcomfort.
* Explain the role of body components in maintaining bodytemperatures
* Recognize the Principles of heat transfer to and away humanbody
* Explain various aspects of thermal & skin sensational clothingcomfort

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| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
| Describe thermal and non thermalcomponents of clothing comfort. | **√** | **√** | **√** | **√** | **√** |  |  |  |  |  |  |
| Explain the role of body components inmaintaining body temperatures | **√** | **√** | **√** |  | **√** |  |  | **√** |  |  |  |
| Recognize the Principles of heat transfer toand away human body | **√** | **√** |  | **√** | **√** |  |  |  | **√** |  |  |
| Explain various aspects of thermal & skinsensational clothing comfort | **√** | **√** | **√** | **√** | **√** |  |  |  |  | **√** | **√** |

## Module I (10 Hours)

**Introduction:** Concept of selection of fabrics for clothing purpose. Types of fabric required for apparel use for different age group, occasions, purpose. Fabric properties and performance for apparel use.

**Serviceability of Fabrics:** Abrasion resistance - flat abrasion, flex abrasion, edge abrasion, Pilling - mechanism of pilling formation, anti-pilling techniques, Snagging, Strength, Tearing strength - Tensile strength - Bursting strength , seam strength and seam slippage.

**Tailorability of fabrics :** tailorability of woven and knitted garments, Tailorability of leather garments and fur garments

## Module II (10 Hours)

**Aesthetic properties**: Drape, Crease and Wrinkle recovery - Lustre. Yarn unevenness: neps, thick place, thin place, periodic fault, Scroopiness, Colour- Colour fastness: to light, washing, perspiration, rubbing, dry cleaning.

**Dimensional Stability of Fabrics:** Hygral expansion, Relaxation shrinkage, Swelling shrinkage, Felting shrinkage. Mechanism of fabric shrinkage- Relationship between Hygral Expansion, Relaxation shrinkage and extensibility - Knitting Process Parameters and fabric stability. Methods of measuring dimensional stability to dry cleaning and dry heat.

**Fabric Hand :** smoothness, fullness and stiffness, subjective hand judgment, objective evaluation of fabric hand and itsapplications.

## Module III (10 Hours)

**Clothing Comfort:** Definition of comfort - Human clothing system - Physical, Physiological andpsychologicalaspectsofcomfort.Tactileandpressuresensationaspects.Applicationsof

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clothing comfort research.

**Thermal Comfort:** Introduction. Thermal transfer processes. Dry heat transfer and Rapid heat transfer. Function of Textiles in enhancing thermal comfort. Comparison of thermal comfort properties for different textile structures.

## Module IV (10 Hours)

**Functional Properties:** Elasticity: elastic recovery, residual strain; Thermal insulation. Water repellence, water resistance and water proof; Wicking: vertical and horizontal transportation of liquid; Water absorbency; UV protection; Soil release

**Safety:** Toxicity - residual dye stuff and other finishing agent ; Flammability

## Books Recommended :

1. Kothari, V K, “Testing and Quality Management”, CBS Book Publishers, New Delhi, 2000.
2. Li. Y, “The Science of Clothing Comfort”, Textile Progress, Volume: 31, No. 1/2, Textile Institute.
3. Saville B P, “Physical Testing of Textiles”, The Textile Institute, Woodhead publication limited,Cambridge.
4. Billie J Collier and Helen H Epps, “Textile Testing and Analysis”, Prentice- Hall Inc., NewJersey.
5. Lyman Fourt & Norman R.S. Hollies, “Clothing: Comfort & Functions”, Marcel Dekker, Inc,Newyork.
6. G.Song, “Improving Comfort in Clothing”, WoodheadPublication.
7. A.Das, R.Alagirusamy, “Science in Clothing Comfort”, WoodheadPublication.

## SEVENTH SEMESTER

UPETE701 **PROCESS CONTROL IN TEXTILEMANUFACTURING**

**Course Outcomes:**

**After successful completion of this course, the students should be able to;**

* Apply process parameters and control measures in each stage of yarn manufacturing process to produce quality yarn at reduced cost of production.

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## IA = Internal Assessment , PA = Practical Assessment, EA = End-Semester Assessment

* + Apply process parameters and control measures in each stage of weaving process to produce flaw lessfabrics.
* Apply control measures to improve loomefficiency.
* Analyze quality of fabrics and classify fabricdefects.

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| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
| Apply process parameters and control measures in each stage of yarn manufacturing process to produce qualityyarn at reduced cost of production. | **√** | **√** | **√** | **√** | **√** |  |  |  |  |  |  |
| Apply process parameters and control measures in each stage ofweaving processto produce flaw less fabrics. | **√** | **√** | **√** |  | **√** |  |  | **√** |  |  |  |
| Apply control measures to improve loomefficiency. | **√** | **√** |  | **√** | **√** |  |  |  | **√** |  |  |
| Analyse quality of fabrics and classifyfabric defects. | **√** | **√** | **√** | **√** | **√** |  |  |  |  | **√** | **√** |

## Module I (10 Hours)

**Raw material management:** Importance, need of instrumental evaluation, traditional methods of cotton selection, importance of cost in raw material, use of linear programming for mixing, balemanagement.

**Process management in blow room & card:** Blow room & card as integrated system, control of waste, cleaning efficiency, neps and fibre rupture, contamination control, selection of proper sequence processparameters.

**Process management at Comber preparatory & combing:** Significance & importance of good lap for comber, evaluation of comber performance, fractionating efficiency of comber, comber waste analysis, influence of various factors on combing performance.

**Process management at Draw frame:** Drafting wave & its significance, roller nip movement, roller speed variation, roller vibration, influence of parameters like speed, setting, Role of auto leveller, role of material channelizing in spinning.

**Process management at Speed frame:** Influence of process parameters like flyer speed, twist, break draft and settings on roving quality. Reasons for stretch in roving and its control at speed frame.

## Module II (10 Hours)

**Process management in Ring Spinning:** Influence of various machine and material parameters on yarn quality. Control of yarn count and strength, within and between bobbinvariation, Controlofyarnevennessandimperfections,Typesofyarnirregularities,measurementcauses

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## IA = Internal Assessment , PA = Practical Assessment, EA = End-Semester Assessment

and assessment.

**Control of yarn Hairiness:** Measurement, role played by fibre properties and process parameters.

**End breaks in spinning:** Importance, assessment and controls

**Control of Yarn and package faults:** Influence of fibre properties, machine parameters on classimat faults, control of faults. Study and control of faults like slubs, crackers, spinners double bad piecing, double gaiting, slough off, hard/soft packages. Classification, causes and methods to reduce faults, Strength CV% and its control.

## Module III (10 Hours)

**Process Control in Winding:** Control of quality of knot, characteristics of good splice- appearance and strength rating, yarn faults classification by Classimat, yarn clearer setting adjustment and removal of yarn faults, package defects, performance in winding, control of productivity, calculation of expected efficiency of an Autoconer. Control of Tension level, Relative humidity and temperature, Machine and labour productivity. Norms. Performance assessment and calculations.

**Process Control in Pirn Winding:** Minimising End breaks, stoppages due to mechanical failure, Improving build of pirn, control of speed and efficiency.

**Process Control in Warping:** Control of end breaks, tension levels, quality and the productivity in warping.

## Module IV (10 Hours)

**Process Control in Sizing:** Control of size paste concentration, Squeeze pressure, sow box temperature, size add on, drying cylinder temperature and stretch.

**Process Control in Drawing-in and Tying:** Care in use and selection of healds and reeds; Drop Pins, Care in Drawing-in and Warp tying.

**Control of Productivity in Loom Shed:** Control of Loom Speed, efficiency and stoppages, quality of yarn. Calculations on loom efficiency.Machine and labour productivity norms.Weaving Performance assessment. Fabric defects and valueloss.

**Control of Hard Waste and Consumption of Accessories:** Control of waste in winding, warping, sizing and drawing-in, pirn winding and loom shed. Selection and care of accessories

## Books Recommended:

1. Garde AR, Subramaniam TA, “Process Control in Spinning”, ATIRA Publicaitons, Ahmedabad.
2. Klein W, “Man-made Fibres and their Processing”,The Textile Institute,Manchester.
3. Lord P.R., “Yarn Production; Science, Technology and Economics”, The Textile Institute,
4. 4, Furter R, “Evenness Testing in Yarn Production Part 1 and Part II“, The Textile Institute,Manchester.
5. Van der Sluijs M and Hunter L, “Neps in Cotton Lint, Textile Progess“,The Textile Institute,Manchester.

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## IA = Internal Assessment , PA = Practical Assessment, EA = End-Semester Assessment

1. Slater K “Yarn Evenness”, Textile Progress, The Textile Institute, Manchester.
2. Paliwaland MC, Kimothi PD, “Process control in weaving”, ATIRAPublication.
3. Majumdar A, Das A, Alagirusamy R and Kothari VK, “Process Control in Textile Manufacturing”,WoodheadPublisher

UPETE702 **SUSTAINABILITY INTEXTILE**

## Course Outcomes:

**After successful completion of this course, the students should be able to;**

* Understand methods of production and practices of organiccotton.
* Understand the properties and benefits of synthetic sustainablefibres.
* Implement enzyme biotechnology for sustainabletextile.
* Improve sustainability in pretreatment, dyeing and finishingprocesses.

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| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
| Understand methods of production andpractices of organic cotton. | **√** | **√** | **√** | **√** | **√** |  |  |  |  |  |  |
| Understand the properties and benefits ofsynthetic sustainable fibres. | **√** | **√** | **√** |  | **√** |  |  | **√** |  |  |  |
| Implement enzyme biotechnology forsustainable textile. | **√** | **√** |  | **√** | **√** |  |  |  | **√** |  |  |
| Improve sustainability in pretreatment,dyeing and finishing processes. | **√** | **√** | **√** | **√** | **√** |  |  |  |  | **√** | **√** |

## Module I (10 hours)

**Sustainability through the supply chain:** Achieving sustainable textiles: a designer’s Perspective. Key issues affecting textile and fashion design. Strategies for fashion and textile design. Strategies for textile and fashion designers: recycling and reuse: beginning to close the loop. The designer empowered.

**Sustainable cotton production:** Cotton basics. Global ecological effects. Economic systems. Farm systems, Water, Chemicals.

**Organic cotton:** Production practices and post-harvest considerations: World organic cotton production. Organic cotton production practices. Post-harvest handling/processing of organic cotton. Limitations to organic production. Strategies to improve organic cotton production. National obligatory standards for organic cotton and organic cotton certifiers. Optional/voluntary organic textile processing standards and eco-textile standards. Corporate social responsibility (CSR)/ethical production. Naturally coloredcotton

Sustainable wool production and processing: Consumer trends and environmental impacts. Wool

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fibre: structure and properties. Wool and ecolabels. Life cycle assessment (LCA) studies. Outcomes.

## Module II (10 hours)

**Sustainable synthetic fibres:** Poly(hydroxyalkanoates) (PHA) and other fibres: Poly(hydroxyalkanoates)-based oriented structures. Poly(caprolactone)-based fibres. Structure of drawn fibres. Thermal properties. Enzymatic and hydrolytic degradation. Other biodegradable and sustainable polyesters. Application of polyester-based biodegradable fibres.

Chemicals allowed and prohibited for use in preparation, dyeing, printing and finishingof organic cotton textiles (Global Organic Textile Standards, Organic Exchange Guidelines, Organic TradeAssociation).

## Module III (10 hours)

**Enzyme biotechnology for sustainable textiles:** Enzyme applications in textile processing. Life cycle assessments of enzymes used in the textile industry. Environmental assessment of the enzymatic scouring of package cotton yarn for dark-shade dyeing as an alternative to conventional chemical scouring. Environmental assessment of enzymatic bleach clean-up of light-coloured package yarn and knitted fabrics as an alternative to rinsing with hot water.

**Key sustainability issues in textile dyeing:** Key factors for improving sustainability in dyeing and finishing .

**Environmentally friendly flame-retardant textiles:** Key issues of flame retardants. Legislative and regulatory drives for minimizing environmental implications. Desirable properties of an ideal flame-retardant chemical used in textile applications. Strategies for development of environmentally friendly flameretardants.

## Module IV (10 hours)

**Environmentally friendly plasma technologies for textiles**: Atmospheric pressure plasma processes. Environmental benefits of plasma technology.

**Understanding and improving textile recycling:** Systems theory. Understanding the textile and apparel recycling process. Textile recycling companies. The sorting process. The pyramid model. Textile recycling constituents.

**Eco-labeling for textiles and apparel:** Key principles: eco-labeling and sustainability. Standards and eco-labeling defined fortextiles.

## Books Recommended:

1. Marion Tobler, “Handbook of sustainable textile production”, WoodHeadpublishing.
2. R S Blackburn, “Sustainable Textiles: Life Cycle and Environmental Impact”, WoodHeadpublishing.
3. R S Blackburn, “Biodegradable and sustainable fibres”, WoodHeadpublishing.
4. Subramanian Senthilkannan Muthu “Sustainable Innovations in Textile Fibres”, WoodHeadpublishing.

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UPETE703 **THEORY OF TEXTILESTRUCTURE**

## Course Outcomes:

**After successful completion of this course, the students should be able to;**

* Understand ideal helical model of yarn and different structural parameters.
* Illustrate method of measuring structuralparameters.
* Determine effect of different parameters affecting the structure of yarn and on its properties.
* Illustrate structural characteristics of knitted and nonwovens and design the fabric to get the desiredproperty.

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| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
| Understand ideal helical model of yarnanddifferent structural parameters. | **√** | **√** | **√** | **√** | **√** |  |  |  |  |  |  |
| Illustrate method of measuring structuralparameters. | **√** | **√** | **√** |  | **√** |  |  | **√** |  |  |  |
| Determine effect of different parametersaffecting the structure of yarn and on its properties. | **√** | **√** |  | **√** | **√** |  |  |  | **√** |  |  |
| Illustrate structural characteristics ofknitted and nonwovens and design the fabric to get the desired property. | **√** | **√** | **√** | **√** | **√** |  |  |  |  | **√** | **√** |

## Module I (10 Hours)

**Geometry of twisted yarn:** Idealized helical yarn structure; yarn count and twist factors, twist contraction; Limits of twist.

**Packing of fibres in yarn:** Idealized packing; measurement of packing density and radial packing density of yarn; Packing in actual yarns; Specific volume of yarns; Equation of yarn diameter.

**Fibre Migration:** Ideal migration, tracer fiber technique, characterization of migration behavior, migration in spun yarns, mechanisms of migration, effect of various parameters on migration behavior.

## Module II (10 Hours)

**Structural Mechanics**: Translation of fiber properties into yarn properties; Extension of continuous filament yarn for small strains and large strains; Prediction of breakage, Nature of rupture for continuous filament yarn. Extension and breakage of spun yarn, Blended yarn structure, Structure property relationship of ring, rotor, air-jet, friction spun yarn, Extension of continuous filament yarn.

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**Module III (10 Hours)**

**Fabric Geometry:** Engineering approach to the analysis of fabric, Pierce geometrical model, flexible thread model and rigid thread model, Square fabric, Jammed Structure, square and jammed fabric, Crimp interchange, Maximum possible cover factor. Yarn cross sections in the fabric, Pierce elastic thread model. Geometry of weft and warp knitted structures.

## Module IV (10 Hours)

Fabric deformation under tensile stress; prediction of modulus; tensile properties in bias direction. Other fabric deformation: compression, shear, bending and buckling; fabric handle; Structure of felts and stitch bonded fabric; Basic of braided fabricstructure.

## Books Recommended:

1. Hearle J. W. S., “Structural Mechanics of Fibers, Yarns and Fabrics”, Wiley-Interscience, NewYork,1969.
2. Goswami B. C., “Textile Yarns: Technology, Structure and Applications”, Wiley- Interscience, NewYork, 1977.
3. Jinlian Hu., “Structure and Mechanics of Woven Fabrics”, Woodhead Publishing Ltd., 2004.
4. Hearle J. W. S., John J., Thwaites. and JafargholiAmirbayat., “Mechanics of Flexible FibreAssemblies”, Sijthoff and Noordhoff,1980.
5. Hassan M. Berery., “Effect of Mechanical and Physical Properties on Fabrics Hand”, Wood headpublishing Ltd.,2005.
6. Behera BK, Hari PK, “Woven Textile Structure: Theory and Applications”. Woodhead publishing.

UPETE704 **ADVANCED CHEMICALPROCESSING**

## Course Outcomes:

**After successful completion of this course, the students should be able to:**

* Modify the combining sequences of pretreatmentprocess.
* Adopt techniques for minimization of energy consumption and waste water during chemicalprocessing.
* Evaluate process and quality control parameters during chemical processing oftextiles.
* Illustrate automation in various machineries used in chemicalprocessing.

**Abbreviations Used:L = Lectures, P = Practical or Laboratory, T = Tutorial**

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| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
| Modify the combining sequences ofpretreatment process. | **√** | **√** | **√** | **√** | **√** |  |  |  |  |  |  |
| Adopt techniques for minimization ofenergy consumption and waste water during chemicalprocessing. | **√** | **√** | **√** |  | **√** |  |  | **√** |  |  |  |
| Evaluate process and quality controlparameters during chemical processing of textiles. | **√** | **√** |  | **√** | **√** |  |  |  | **√** |  |  |
| Illustrate automation in variousmachineries used in chemical processing. | **√** | **√** | **√** | **√** | **√** |  |  |  |  | **√** | **√** |

**Module I (10 hours)**

**Combined pretreatment methods**: Basic criteria for combining pretreatment methods, combined desizing and bleaching, scouring and bleaching, desizing, scouring and bleaching of natural, man-made and blended textiles.

**Controlled application techniques**: Concept of short liquor processing: advantages and limitations, Short liquor pretreatment and dyeing of various textiles, Performance assessment of eachmethod**.**

**Color Fastness determination**: Color Fastness criteria of dyed and printed textile. Methods to determine color fastness to washing, light, perspiration, sublimation and chlorine treatment and theirgrading.

## Module II (10 hours)

**Evaluation of auxiliaries**: Importance and method of evaluation of wetting agents, optical brighteners, flame retardants, water repellents and soil release agents.

**Reduction in wastage of energy:** Development of new continuous and batch machines as well as modifiedprocesses.

**Reduction in waste water load**: Specification of water for use in industries and its discharge to public sewage, bio-degradation of chemicals. Measurement of waste water load. Preventive measures to reduce waste water load.

## Module III (10 hours)

**Thermodynamic study of dyeing**: Study of vat dye on cotton, acid dye on wool and nylon. Dyeing equilibrium and concept of half time dyeing.

**Development in chemical processing**: Various developments in pre-treatments, dyeing, printing and finishing of textiles in reference to use of water, right first time dyeing and controlled applicationtechniques.

## Module IV (10hours)

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**Process and quality control**: Detailed study of chemical processing methods. Control of process parameter and quality of raw and processed materials.Evaluation for quality of processed textiles after each processingstep.

**Shade reproduction and repetition**: Theory and tristimulus values of color, color coordinates. Primary, secondary and tertiary colors.Color yield.Analysis of shade.Preparation of shade data forreproduction.

**Automation in dye house**: Automation in dyeing machineries and in color kitchen. On- line monitoring of concentration of dye and chemical.

## Books Recommended:

1. Bird C L and Boston W S, “The theory of coloration of textiles”, Dyers Company Publication Trust, Bradford,England.
2. Manivaskaram N, “Treatment of Textile Processing Effluent”, Sakthi Publications, Coimbatore.
3. Peters R H, “Textile Chemistry”, Vol- III, Elsevier Scientific Publishing Co., NewYork.
4. Smethwurst G, “Basic water Treatment”, IBT Publications,Delhi.
5. Sule A D, “Computer colour analysis”, New Age International (P) Ltd., NewDelhi.

## UOETE701 SPECIALTY YARN AND FABRIC

**Course Outcomes:**

**After successful completion of this course, the students should be able to;**

* Describe the characteristics of raw materials and techniques and parameters required for formation of texturedyarn.
* Outline the process sequences for formation of yarn from man-made staplefibres.
* Demonstrate the methods of formation of coreyarn.
* Describe the working principle of different new spinning technology for formation of yarn and application of thoseyarns.

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| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
| Describe the characteristics of raw materials and techniques andparametersrequired for formation of textured yarn. | **√** | **√** | **√** | **√** | **√** |  |  |  |  |  |  |
| Outline the process sequences forformation of yarn from man-made staple fibres. | **√** | **√** | **√** |  | **√** |  |  | **√** |  |  |  |
| Demonstrate the methods of formation ofcore yarn. | **√** | **√** |  | **√** | **√** |  |  |  | **√** |  |  |
| Describe the working principle of differentnew spinning technology for formationof | **√** | **√** | **√** | **√** | **√** |  |  |  |  | **√** | **√** |

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| yarn and application of those yarns. |  |  |  |  |  |  |  |  |  |  |  |

**Module I (10 Hours)**

**Textured yarn technology:** False Twist Texturising Techniques. Principle of False twists texturising machines, Single heater anddouble heater. Twisting elements. Factors influencing Twist, Properties of Textured yarn, Effect offeed material and process variables. Basics of air jet texturing, types of yarns produced, process variables -over feed, air pressure temperature and water content. Nozzles, evaluation of textured yarn.Measurement of shrinkage force.Crimp contraction and dye uniformity. Texturamat, M Dynafil tester.

## Module II (10 Hours)

**Spinning of man-made staple fibres:** Study of the spinning of man-made staple fibres, material preparation, processing guidelines, problems, settings, modifications required on cotton and worsted spinning system, steaming and stabilization of yarns. Spinning of dyed fibres, Spinning of micro fibres. Conversion of filament to spun yarn, Principles of stretch breaking and cutting tow to sliver and yarn converter. Formation bulked Acrylic yarn.

## Module III (10 Hours)

**Production of Fancy yarn:** Classification of fancy yarn. Methods of producing slub yarn, Drawn and spun yarn, Methods of producing Knop yarn, Snarl yarn, Loop yarn, Spiral yarn etc. Methods of producing mélange yarn. Method of producing melange yarn, Chennile yarn. Hybrid yarn. High bulk yarn, reflective yarn, electro-coated yarn, Elastomericyarn.

**Narrow fabrics:** Introduction to fibre and yarn types, fabrics. Preparation for narrow fabric production, winding, warping, sizing, looming.Narrow fabric production**,** Woven narrow fabrics and their constructions, structure of narrow fabrics woven on shuttleless looms. Conventional shuttle looms. Needle looms for narrow fabrics production. Braided fabrics

3D Fabric and Spacer fabric production. Profiled fabrics, Contour fabrics. Polar fabrics, Spiral fabrics,

## Module IV (10 Hours)

**Industrial tapes:** Slide fastener tapes - Insulating tapes, Book binder’s tapes, Labeling Tapes, Border Tapes, Elastic- Pleated lingerie ribbing.

**Carpets:** Non-pile carpet weaves and their looms. Pile surfaced carpet weaves and their looms. Needle felt floor coverings.

**Home textile products:** Definition – requirements and production of Kitchen linen, Bed linen, Furnishing, Floor coverings, Wall coverings, Decoration fabrics.

## Books Recommended:

1. Eric Oxtoby, “Spun Yarn Technology”.
2. Goswami, Martindle, Scardino, “TextileYarns”.
3. Klien W, “New Spinning Technology”, The Textile institute,Manchester.

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1. Salhotra K R, “Spinning of Manmades and blends on cotton system”, The Textile Association,India.
2. Lawrence C A, “Fundamentals of Spun Yarn Technology”, CRC Press LLC, Florida, USA.
3. Chattopadhyay R, “Advance in Technology of yarn Production”, Nodal Centre for Upgradation of Textile Education, IITDelhi.

## UOETE702 COLORMEASUREMENT

**Course Outcomes:**

**After successful completion of this course, the students should be able to;**

* Describe concept of colorperception.
* Explain elements of spectrophotometry and components ofcolorimeter.
* Establish spectral curves and their relationship to pre-receivedcolor.
* Develop computer aided color matching and recipe predictionalgorithms.

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| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
| Describe concept of color perception. | **√** | **√** | **√** | **√** | **√** |  |  |  |  |  |  |
| Explain elements of spectrophotometry andcomponents of colorimeter. | **√** | **√** | **√** |  | **√** |  |  | **√** |  |  |  |
| Establish spectral curves and theirrelationship to pre-received color. | **√** | **√** |  | **√** | **√** |  |  |  | **√** |  |  |
| Develop computer aided color matchingand recipe prediction algorithms. | **√** | **√** | **√** | **√** | **√** |  |  |  |  | **√** | **√** |

## Module I (10 Hours)

How we see colour, Causes of colour, Basic concept of colour perception, construction of human eye, brief idea about the relation between colour and chemical constitution. Chromogen, Chromophores and Auxochromes. Photophic and scotophic vision, Light, light sources and light interactions: reflection, scattering absorption and transmission,

## Module II (10 Hours)

**Color theory:** Tone, Shade, Tint.colour order systems, Munsell colour order system. Colour wheel. Additive and subtractive system, Grass man Law.Visual description of colour, K/S, Beer- Lambest law, Flux theory.Kubelka-Munk Equation.Spectral curves and their relationship to pre- received colour.λmax, Colour Index.

## Module III (10 Hours)

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**Color measurements and Parameters:** Colour measuring instruments- spectrophotometers, colorimeters and their components. Principle of spectrophotometry.Measuring geometry, Standard observer colour matching functions.CIE illuminants, observers.Trichmoaticity, Opponent theory. Chromaticity coordinates. Relationship of hue, value and chroma Metamerism. Whiteness & Yellowness Indices, Computer aided Colour matching and recipe prediction algorithms. CIE L\*a\*b\*, CIE L\*c\*h\*, CIE colour space, DE, DE CMC.Measurement conditions.CCM applications and reports for QC.Shadecorrection.

## Module IV (10 Hours)

**Color Communication:** Device dependent and device independent colour spaces, Computer and display RGBs, Imaging Systems and sensors, Colour space transformations, Colour Gamut, ICC profile. Pantone and HTML reference. Shade Card, Visual Perception chromatic adaptation and colour constancy.

## Books Recommended:

1. R. McDonald, Colour Physics for Industry, Society of Dyers and Colourists, Bradford, UK , 1997.
2. A.K. Roy Choudhury, " Modern Concept of Color and Appearance" published jointly by Science Publishers, Inc., Enfield, NH 03748, USA, and Oxford &IBH Publishing Co. Pvt.Ltd.New Delhi,2000.
3. M L Gulrajani, Colour Measurement: Principles, advances and industrial applications. Edited by Woodhead Publishing Series in Textiles No. 103, ISBN 1 84569 559 3,2010.
4. A.K. Roy Choudhury, Principles of colour and appearance measurement, Volume1. Object Appearance, Colour Perception and Instrumental Measurement (Woodhead, UK). Released on 27 Jan 2014.
5. A.K. Roy Choudhury, Principles of colour and appearance measurement ,Volume 2: Visual Measurement of Colour, Colour Comparison and Management, released on 13 Oct.,2014.
6. Committee on Colorimetry of the Optical Society of America, The science of color, Thomas Y. Cromwell, New York,1953.
7. K McLaren, The Colour Science of Dyes and Pigments, Adam-Hilger, Bristol (U.K.), 1983.
8. Kurt Nassau, The Physics and Chemistry of Colour, Wiley-Interscience, New York,1983.
9. H. S. Shah and R. S. Gandhi, Instrumental colour measurements and computer aided colour matching for textiles, Mahajan, India,1990.
10. R W G Hunt, Measuring Colour, Ellis Horwood, Chichester (U.K.),1987.
11. D. B. Judd and G. Wyszecki, Color in business, science and industry, 2nd.Ed., John Wiley & sons, New York,1963.
12. Total Colour Management in Textiles (Woodhead Publishing), Prof.JohnXin, 1st edition 2006, eBook ISBN: 9781845691080, Hardcover ISBN:9781855739239.

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**Entrepreneurship Development (3-0-0)**

**Prerequisites:**

1. Organizational Behaviour.
2. English.

**Module 1: (06 Hours)**

Entrepreneurship: Concept of Entrepreneurship and Intrapreneurship, Types of Entrepreneur, Nature and Importance, Entrepreneurial Motivation and Achievement, Entrepreneurial Personality & Traits and Entrepreneurial Skills.

**Module 2: (08 Hours)**

Entrepreneurial Environment, Identification of Opportunities, Converting Business, Opportunities into reality. Start-ups and business incubation, Skill Development. Setting up a Small Enterprise. Issues relating to location, Environmental Problems and Industrial Policies and Regulations.

**Module 3: (08 Hours)**

Basics of Accounting, Terms: Assets, Liabilities, Equity, Revenue, Expense, Working capital, Marketing Mix and STP.

HRM: Concepts and Function, Labour Laws- Factories Act, Organizational sup- port services - Central and State Government, Incentives and Subsidies.

**Module 4: (08 Hours)**

Sickness of Small-Scale Industries, Causes and symptoms of sickness, cures of sickness, Role of Banks and Government in reviving sick industries.

**Text Books:**

1. Entrepreneurship Development and Management, Vasant Desai, HPH.
2. Entrepreneurship Management, Bholanath Dutta, ExcelBooks.
3. Entrepreneurial Development, Sangeeta Sharma, PHI.
4. Entrepreneurship, Rajeev Roy, Oxford UniversityPress.

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**EIGHTH SEMESTER**

UPETE801 **INTELLIGENT AND FUNCTIONAL TEXTILE**

## Course Outcomes:

**After successful completion of this course, the students should be able to;**

* + Understand the concept of smart and intelligent textile in terms of high protection and comfortproperties.
	+ Develop stimuli sensitive polymers for breathabilityapplication.
	+ Design textile-based sensor for differentapplications.
	+ Learn intelligent textile for medical and health monitoringapplications.

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| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
| Understand the concept of smart and intelligent textile in terms of highprotection and comfort properties. | **√** | **√** | **√** | **√** | **√** |  |  |  |  |  |  |
| Develop stimuli sensitive polymers forbreathability application. | **√** | **√** | **√** |  | **√** |  |  | **√** |  |  |  |
| Design textile-based sensor for differentapplications. | **√** | **√** |  | **√** | **√** |  |  |  | **√** |  |  |
| Learn intelligent textile for medical andhealth monitoring applications. | **√** | **√** | **√** | **√** | **√** |  |  |  |  | **√** | **√** |

## Module I (10 Hours)

**Definition of smart and intelligent textiles:** Passive and active functionality, components of smart technology, Research areas related to smart textiles.

**Textile with high protection and comfort properties:** Extreme winter clothing with low heat Transmission. Heat absorbing and heat storing systems, Variable heat absorption surfaces.

**Phase change materials:** Heat balance and thermophysical comfort. Phase Change Technology. Incorporation of PCMs in fibres and fabrics. Measurement of thermo-regulating properties of fabrics with microPCMs.

## Module II

**Solar textiles:** Solar cells, Textile fibres as substrate, technological specification for fibres as solar cell, conductive layer for photovoltaic. Manufacture of PV fabrics.

**Chromic materials:** Environmentally sensitive textiles**:** photochromic and thermochromic: chameleonic fabrics. Electrochromic materials.

**Shape memory materials:** Stimuli sensitive polymers such as temperature, pH, ionic, magnetic sensitive materials, design and their applications to textile. Potential use of shape memory polymer in smart textile.

**Breathable textile:** Shape memory polymer film for breathable textile. Water vapour

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permeability through shape memory polyurethane.

## Module III

**Conductive textiles:** Conductive polymers and fibres for electronic textiles. Carbon nanotube yarn for electronic textile.

**Design and manufacture of textile-based sensor:** Approach to develop textile-based sensors. Types and application of textile-based sensor measurement parameters. Integration of micro- electronics with yarn for smart textile application. Fibres-electronics technology.

## Module IV

**Textiles for military personnel:** Smart Textile for communication, health monitoring. Camouflage (radar shielding) fabrics.

**Intelligent textiles for medical and health monitoring applications:** Significance of using intelligent textiles and Potential application from medical needs to technological solutions. Garments in pre-hospital emergency care.

## Books Recommended:

1. Tao Xiaoming,” Smart fibres, fabrics and clothing”, Woodhead publishing(2001).
2. Tao Xiaoming, “Wearable electronics and photonics”, Woodhead publishing limited (2005).
3. H Mattila, “ Intelligent textiles and clothing”, CRC press(2006).
4. Tilak Dias, “Electronic Textiles: Smart Fabrics and Wearable Technology”, Woodhead publishing(2015).
5. Vincenzini, “Smart textiles”, Trans tech pub ltd(2009).
6. Jinlian Hu, “Adaptive and functional polymers, textiles and their applications”, Imperial college press (2011).
7. M L Gulrajani, “Advances in the dyeing and finishing of technical textiles”, Woodhead publishing limited(2013).

## UPETE802 APPAREL PRODUCTION PLANNING, CONTROLLING & SCHEDULING

**Course Outcomes:**

**After successful completion of this course, the students should be able to;**

* + Understand concept of apparel production and itscomponents.
	+ Learn production planning, and control scheduling of apparel products.
	+ Analyse quantitative production and calculate SMV andSAM.
	+ Know concept of lean manufacturing, JIT andERP.

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| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
| Understand concept of apparel productionand its components. | **√** | **√** | **√** | **√** | **√** |  |  |  |  |  |  |
| Learn production planning, and controlscheduling of apparel products. | **√** | **√** | **√** |  | **√** |  |  | **√** |  |  |  |
| Analyse quantitative production andcalculate SMV and SAM. | **√** | **√** |  | **√** | **√** |  |  |  | **√** |  |  |
| Know concept of lean manufacturing, JITand ERP. | **√** | **√** | **√** | **√** | **√** |  |  |  |  | **√** | **√** |

**Module I (10 Hours)**

**Introduction to Apparel Production:** Concept of apparel production, Productivity components of production, Different apparel production systems (customized, divisional, batch. Progressive bundle, line, Modular production system, unit production system & mass customization)

## Module II (10 Hours)

**Production planning and Scheduling:** Definition, Objectives and functions of Production planning, control, loading and Scheduling, organization of various departments in apparel industry. Development of MIS for production.

**Introduction to plant layout:** Criteria for evaluation, determining minimum space requirement, calculation grid, plant size location, basic production layout.

## Module III (10 Hours)

**Motion & Time study:** Definition & scope of motion & time study, Data for sewing work study & GSD, improvement of production efficiency, principle of work cycle timing, concept of measuring operator efficiency, Quantitative Production analysis, Line balancing. Calculation of SMV and SAM.

**Work measurement:** Uses of work measurement, data, and basic procedure of work measurement. Production planning order preparation, material resource planning and Material management.

## Module IV (10 Hours)

**Coordination of activities in a garment manufacturing unit**: Layering & marker planning, Cutting room planning, planning of sewing room, in clothing production.

**Quick response in apparel manufacturing:** concept of lean manufacturing, kanban, JIT, ERP

## Books Recommended:

1. A.J. Chutter, “Introduction to clothing productionmanagement”.

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1. Rajesh Bheda, “Production management in apparelindustry”.
2. Apple J M, “Plant layout & materials handling”, RonaldPress.
3. Barnes Ralph, “Motion and time study”, John Wiley &Sons.

## UOETE801 APPLICATION OF NANO TECHNOLOGY INTEXTILE

**Course Outcomes:**

**After successful completion of this course, the students should be able to;**

* + Understand electro spinning of nano fibres for tissue engineeringapplication.
	+ Analyze structure properties relationship of nano fibres by controlling themorphology.
	+ Explain nano coating and surface modificationtechnology.
	+ Identify multifunctional polymer nano composites for industrialapplications.

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| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
| Understand electrospinning of nanofibresfor tissue engineering application. | **√** | **√** | **√** | **√** | **√** |  |  |  |  |  |  |
| Analyse structure properties relationship of nanofibres by controlling themorphology. | **√** | **√** | **√** |  | **√** |  |  | **√** |  |  |  |
| Explain nanocoating and surfacemodification technology. | **√** | **√** |  | **√** | **√** |  |  |  | **√** |  |  |
| Identify multifunctional polymernanocomposites for industrial applications. | **√** | **√** | **√** | **√** | **√** |  |  |  |  | **√** | **√** |

## Module I (10 Hours)

**Nanofibre production:** Electrospinning of nanofibers and the charge injection method. Principles of electrostatic atomization. Electrospraying and electrospinning by the capillary method. Electrospraying and electrospinning by the charge injection method.

**Continuous yarns from electrospun nanofibers:** Controlling fiber orientation. Producing noncontinuous or short yarns. Producing continuous yarns.

**Producing nanofiber structures by electrospinning for tissue engineering:** Fabrication of nanofibrous scaffolds. Characterization of nanofibrous scaffolds. Cell–scaffold interaction.

## Module II (10 Hours)

**Producing polyamide nanofibers by electrospinning:** Properties of electrospun nanofibers. Measuring the effects of different spinning conditions and the use of high molecular weight polymers on the properties of electrospun nanofibers.

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**Controlling the morphologies of electrospun Nanofibres:** Electrospinning process and fibre morphology. Polymer concentration and fibre diameter. Fibre bead formation and fibre surface morphology. Controlling fibre alignment and web morphologies. Bicomponent cross-sectional nanofibres

**Carbon nanotubes and nanocomposites:** Structure of carbon nanotubes,Synthesis, characterization purification and application of carbon nanotubes in aerospace engineering. Nanostructured solid propellants for rockets.

## Module III (10 Hours)

**Nanocoatings and surface modification techniques:** Nanotechnologies for coating and structuring of Textiles. Production of nanofiber nonwovens using electrostatic spinning. Anti- adhesive nanocoating of fibers and textiles. Water- and oil-repellent coatings by plasma treatment. Self-cleaning superhydrophobic surfaces.

## Module IV (10 Hours)

**Multifunctional polymer nanocomposites for industrial applications:** The development of functional polymer nanocomposites. Improving the mechanical properties of polymer nanocomposites. Improving the fire-retardant properties of polymer nanocomposites. Improving the tribological properties of polymer nanocomposites.

## Books Recommended:

1. P Brown, K Stevens, “Nanofibers and nanotechnology in Textile”, WoodHead publishing.
2. A.K. Haghi, G.E. Zaikov, “Development of Nanotechnology in Textile”, Nova Publishers,NewYork.

## UOETE802 COSTING OF TEXTILEMATERIALS

**Course Outcomes:**

**After successful completion of this course, the students should be able to;**

* + Understand the techniques of costing and theircontrol.
	+ Plan, analyse and implementproject.
	+ Understand appraisal criteria forproject.
	+ Explain financial management in relation to textilecosting.

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| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
| Understand the techniques of costing andtheir control. | **√** | **√** | **√** | **√** | **√** |  |  |  |  |  |  |
| Plan, analyse and implement project. | **√** | **√** | **√** |  | **√** |  |  | **√** |  |  |  |
| Understand appraisal criteria for project. | **√** | **√** |  | **√** | **√** |  |  |  | **√** |  |  |

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| Explain financial management in relationto textile costing. | **√** | **√** | **√** | **√** | **√** |  |  |  |  | **√** | **√** |

**Module I**

**Costing as an aid to management:** Elements of cost, Classification of cost; Direct cost , Indirect cost, fixed cost, variable cost and semi variable cost, opportunity cost. Cost terms related to incomemeasurement.

**Inventory cost:** Costing of materials, Methods of valuing materials: FIFO, LIFO, Average cost method, Inflated price method, identification method, base stock method, HIFO, Market price method, Techniques of material control: Economic order quantity, Just in Time inventory system, stock control through ABC Analysis, VEDanalysis.

**Labour cost:** Types of labour, control of labour cost, labour turnover and turnover cost, time and motion study, job analysis and job evaluation, remuneration and incentives, time wage system, piece wage system.

**Overheads:** Importance and classification of overheads, allocation and apportionment of overhead to cost centres.

## Module II

**Methods of costing:** Job, batch and contract costing, process costing: waste cost and its control in a textile mill, joint and by-product costing, unit cost: costs of yarns and fabrics, fabric processing cost.

**Techniques of cost analysis and control:** Absorption and marginal costing, cost-volume-profit- analysis, break-even point, contribution margin, margin of safety, standard costing, budgetary control, productivity and value analysis.Profit calculation.

## Module III

**Project Planning:** Capital expenditure, phases of capital budgeting, generation and screening of project ideas, project rating index, resource allocation framework.

**Project Analysis:** Feasibility study, product life cycle, market analysis, market planning, market survey and characterisation of markets, demand analysis, demand forecasting, technical analysis, project charts and layouts.

## Module IV

**Financial analysis:** Time value of moneyand cost of capital, Cost of project, sources of finance, projected financial statements, working capital requirement, estimate of sale and production, cost of production, Balance sheet, Fund flow statement.

**Appraisal criteria:** net present value, benefit cost ratio, internal rate of return, payback period, analysis of risk and social cost benefit analysis

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**Project implementation:** Network techniques, PERT, CPM. Project Review and

Administration.

## Books Recommended:

1. Jain S P, Narang K L and Dhingra T R, “Cost Accounting”, 6thEd., Kalyani publishers, NDelhi.
2. Kerzner H, “Project Management” 1st Ed., CBS Publishers and distributors,Delhi.
3. PrasanaC, “Projects- Planning, Analysis, Selection, Implementation and Review”,Tata Mc Grawhill Publishing Co. Ltd., N. Delhi.
4. Ormerod A, “Textile Project Management”, The Textile Institute,ManchesterUK.
5. Khan M Y and Jain P K, “Cost Accounting and Financial Management”, Tata McGrawhill,Delhi.

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| **OPEN ELECTIVE OFFERED BY OTHER BRANCHES TO "TEXTILE ENGINEERING"** |
| **OPEN ELECTIVE - I (5TH SEM)** |
| **Sl. No** | **Branch** | **Subject Code** | **Subject** |
| 1 | CIVIL ENGINEERING | UOECE501 | Fluid Mechanics |
| 2 | ELECTRICAL ENGINEERING | UPEEE804 | Industrial Electrical Systems |
| 3 | MECHANICAL ENGG. | UOEME501 | Thermodynamics and Heat Transfer |
| UOEME502 | Applied Thermal Engineering |
| 4 | INSTRUMENTATION & ELECTRONICS ENGG. | UOEIE501 | Digital Communication |
| 5 | COMPUTER SCIENCE ENGG | UOECS504 | Real-Time Systems |
| UOECS505 | Advance Algorithms |
| UOECS506 | Parallel & Distributed Systems |
| 6 | INFORMATION TECHNOLOGY | UOEIT501 | Data Structure |
| 7 | BIOTECHNOLOGY | UOEBT501 | Physiology for Engineers |
| 8 | FASHION TECHNOLOGY | UOEFT501 | Fundamental Techniques of Apparel Design |
| **OPEN ELECTIVE - II (6TH SEM)** |
| **Sl. No** | **Branch** | **Subject Code** | **Subject** |
| 1 | CIVIL ENGINEERING | UOECE601 | Mechanics of Solids |
| 2 | ELECTRICAL ENGINEERING | UPEEE601 | Renewable Energy Systems |
| 3 | MECHANICAL ENGG. | UOEME601 | Basic Manufacturing Process |
| 4 | INSTRUMENTATION & ELECTRONICS ENGG. | UOEIE601 | MICRO ELECTRO MECHANICAL SYSTEM (MEMS) |
| 5 | COMPUTER SCIENCE ENGG | UOECS609 | Cambinatorics & Graph Theory |
| UOECS610 | Human Computer Interaction. |
| 6 | INFORMATION TECHNOLOGY | UOEIT601 | Object Oriented Programming using C++ |
| 7 | BIOTECHNOLOGY | UOEBT601 | Introduction to Biopharmaceutical Technology |

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| 8 | FASHION TECHNOLOGY | UOEFT601 | Visual Art and Illustration Techniques |
| **OPEN ELECTIVE - III (7TH SEM)** |
| **Sl. No** | **Branch** | **Subject Code** | **Subject** |
| 1 | CIVIL ENGINEERING | UOECE701 | Composite Materials |
| 2 | ELECTRICAL ENGINEERING | UPEEE704 | Control System Design |
| 3 | MECHANICAL ENGG. | UOEME702 | Mechanics of Solids |
| 4 | INSTRUMENTATION & ELECTRONICS ENGG. | UOEIE701 | Satellite Communication |
| 5 | COMPUTER SCIENCE ENGG | UOECS709 | Big Data Analytics |
| UOECS710 | Information Retrieval |
| 6 | INFORMATION TECHNOLOGY | UOEIT701 | Java Programming |
| 7 | BIOTECHNOLOGY | UOEBT701 | Computational Biology |
| 8 | FASHION TECHNOLOGY | UOEFT701 | Fashion Photography |

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**OPEN ELECTIVE**

**(Offered by Textile Engineering for all B. Tech Programmes)**

UOETE501 **TEXTILE STRUCTURALCOMPOSITE**

## Course Outcomes

**After successful completion of this course, the students should be able to;**

* + Describe the various reinforcements and resins used in compositematerials.
	+ Analyze and interpret the structure of the compositematerials.
	+ Demonstrate the necessary skills in the composite materialdevelopment.
	+ Outline the various testing performed in compositematerials.

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| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
| Describe the various reinforcements andresins used in composite materials. | **√** | **√** | **√** | **√** | **√** |  |  |  |  |  |  |
| Analyze and interpret the structure of thecomposite materials. | **√** | **√** | **√** |  | **√** |  |  | **√** |  |  |  |
| Demonstrate the necessary skills in thecomposite material development. | **√** | **√** |  | **√** | **√** |  |  |  | **√** |  |  |
| Outline the various testing performed incomposite materials. | **√** | **√** | **√** | **√** | **√** |  |  |  |  | **√** | **√** |

## Module I (10 Hours)

**Introduction to Composites:** Definition and classification –Structure of the matrix such as MMC, CMC and PMC. Reinforcement forms – Limitations of the conventional engineering materials such as metal, plastics and ceramics-Advantages of Composites over Conventional Engineering materials. Introduction to green composites andnano-composites.

**Matrix and Reinforcement:** Matrix polymer-Thermosets, thermoplastics-Reinforcing agents- Types of reinforcing agents such as fibre, particulate and laminates-Fibre forms such as roving, yarns, fabrics. Testing of Matrix and Reinforcement materials. Prepregs and preforms – manufacturing technologies, advantages and Limitations.

## Module II (10 Hours)

**Mechanics of Composites:** Mechanical Properties of composites-Elasticity of Composites- Failure modes of Composites-Ply and orientation- Rule of Mixture and Property prediction-Fibre Volume fraction (FVF) and Fibre Mass Fraction (FMF)-Interface and interfacial reactions-Other properties of Composites such as Delamination and Fracture toughness-Compression behavior of Composites- Calculations in FVF, FMF and ply thickness.

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**Module III (10 Hours)**

**Composites Manufacturing Method:** Goals of Composite manufacturing process, Manufacturing Technologies, Characteristics, Application and Limitations: Lay-up, Spray lay- up, Automatic Lay-up, Vacuum bagging, Compression moulding, Injection moulding, Filament winding, Pultrusion, Resin transfer moulding.

## Module IV (10 Hours)

**Testing of Composites:** Types of loading: Tension, Compression, shear, flexure. Destructive Testing: Tensile Testing: Inplane tension test, out of plane tensile test - Compressiontest, interlaminar shear testing, tensile test, rail shear test, short beam shear test, interlaminar fracture testing, Fibre volume fraction: Matrix digestion, Ignition Loss. Moisture diffusivity, void content, accelerated weathering test. Non destructive test: visual, optical, ultrasonic, acoustic, radiographic,thermal.

## Books Recommended:

1. Guneri Akovali ―Handbook of Composite Fabrication‖, Rapra Technology Ltd,2003.
2. Autar K.Kaw , ―Mechanics of Composite Materials‖, Second Edition, CRC press,2006.
3. George H.Stab , ―Laminar Composites‖, B-Hpublication,1999.
4. Sanjay K.Mazumdar, ―Composite manufacturing-Material, Product and Process engineering‖,CRC

3. press, 2002.

1. Reinhart T J, “Introduction to Composites”, in Engineering Materials Handbook, Vol. 1, Composites,

4. ASM International, 1993.

1. Chau T, and Ko F K, eds., “Textile Structural Compostes”, Elsevier,1989.
2. Adanaur S, “Textile Structural Compostes”, in Handbbook of Industrial Textiles.ed.

## UOETE601 CLOTHING SCIENCE ANDTECHNOLOGY

**Course Outcomes:**

**After successful completion of this course, the students should be able to;**

* + Describe thermal and non-thermal components of clothingcomfort.
	+ Explain the role of body components in maintaining bodytemperatures
	+ Recognize the Principles of heat transfer to and away humanbody
	+ Explain various aspects of thermal & skin sensational clothingcomfort

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| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
| Describe thermal and non thermalcomponents of clothing comfort. | **√** | **√** | **√** | **√** | **√** |  |  |  |  |  |  |
| Explain the role of body components in | **√** | **√** | **√** |  | **√** |  |  | **√** |  |  |  |

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| maintaining body temperatures |  |  |  |  |  |  |  |  |  |  |  |
| Recognize the Principles of heat transfer toand away human body | **√** | **√** |  | **√** | **√** |  |  |  | **√** |  |  |
| Explain various aspects of thermal & skinsensational clothing comfort | **√** | **√** | **√** | **√** | **√** |  |  |  |  | **√** | **√** |

**Module I (10 Hours)**

**Introduction:** Concept of selection of fabrics for clothing purpose. Types of fabric required for apparel use for different age group, occasions, purpose. Fabric properties and performance for apparel use.

**Serviceability of Fabrics:** Abrasion resistance - flat abrasion, flex abrasion, edge abrasion, Pilling - mechanism of pilling formation, anti-pilling techniques, Snagging, Strength, Tearing strength - Tensile strength - Bursting strength , seam strength and seam slippage.

**Tailorability of fabrics :** tailorability of woven and knitted garments, Tailorability of leather garments and fur garments

## Module II (10 Hours)

**Aesthetic properties**: Drape, Crease and Wrinkle recovery - Lustre. Yarn unevenness: neps, thick place, thin place, periodic fault, Scroopiness, Colour- Colour fastness: to light, washing, perspiration, rubbing, dry cleaning.

**Dimensional Stability of Fabrics:** Hygral expansion, Relaxation shrinkage, Swelling shrinkage, Felting shrinkage. Mechanism of fabric shrinkage- Relationship between Hygral Expansion, Relaxation shrinkage and extensibility - Knitting Process Parameters and fabric stability. Methods of measuring dimensional stability to dry cleaning and dry heat.

**Fabric Hand :** smoothness, fullness and stiffness, subjective hand judgment, objective evaluation of fabric hand and itsapplications.

## Module III (10 Hours)

**Clothing Comfort:** Definition of comfort - Human clothing system - Physical, Physiological and psychological aspects of comfort. Tactile and pressure sensation aspects. Applications of clothing comfortresearch.

**Thermal Comfort:** Introduction. Thermal transfer processes. Dry heat transfer and Rapid heat transfer. Function of Textiles in enhancing thermal comfort. Comparison of thermal comfort properties for different textile structures.

## Module IV (10 Hours)

**Functional Properties:** Elasticity: elastic recovery, residual strain; Thermal insulation. Water repellence, water resistance and water proof; Wicking: vertical and horizontal transportation of liquid; Water absorbency; UV protection; Soil release

**Safety:** Toxicity - residual dye stuff and other finishing agent ;Flammability

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**Books Recommended :**

1. Kothari, V K, “Testing and Quality Management”, CBS Book Publishers, New Delhi, 2000.
2. Li. Y, “The Science of Clothing Comfort”, Textile Progress, Volume: 31, No. 1/2, Textile Institute.
3. Saville B P, “Physical Testing of Textiles”, The Textile Institute, Woodhead publication limited,Cambridge.
4. Billie J Collier and Helen H Epps, “Textile Testing and Analysis”, Prentice- Hall Inc., NewJersey.
5. Lyman Fourt & Norman R.S. Hollies, “Clothing: Comfort & Functions”, Marcel Dekker, Inc,Newyork.
6. G.Song, “Improving Comfort in Clothing”, WoodheadPublication.
7. A.Das, R.Alagirusamy, “Science in Clothing Comfort”, WoodheadPublication.

## UOETE701 SPECIALTY YARN AND FABRIC

**Course Outcomes:**

**After successful completion of this course, the students should be able to;**

* + Describe the characteristics of raw materials and techniques and parameters required for formation of texturedyarn.
	+ Outline the process sequences for formation of yarn from man-made staplefibres.
	+ Demonstrate the methods of formation of coreyarn.
	+ Describe the working principle of different new spinning technology for formation of yarn and application of thoseyarns.

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| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
| Describe the characteristics of rawmaterials and techniques and parameters required for formation of textured yarn. | **√** | **√** | **√** | **√** | **√** |  |  |  |  |  |  |
| Outline the process sequences for formation of yarn from man-madestaplefibres. | **√** | **√** | **√** |  | **√** |  |  | **√** |  |  |  |
| Demonstrate the methods of formation ofcore yarn. | **√** | **√** |  | **√** | **√** |  |  |  | **√** |  |  |
| Describe the working principle of different new spinning technology for formationofyarn and application of those yarns. | **√** | **√** | **√** | **√** | **√** |  |  |  |  | **√** | **√** |

## Module I (10 Hours)

**Textured yarn technology:** False Twist Texturising Techniques. Principle of False twists texturising machines, Single heater anddouble heater. Twisting elements. Factors influencing

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Twist, Properties of Textured yarn, Effect offeed material and process variables. Basics of air jet texturing, types of yarns produced, process variables -over feed, air pressure temperature and water content. Nozzles, evaluation of textured yarn.Measurement of shrinkage force.Crimp contraction and dye uniformity. Texturamat, M Dynafil tester.

## Module II (10 Hours)

**Spinning of man-made staple fibres:** Study of the spinning of man-made staple fibres, material preparation, processing guidelines, problems, settings, modifications required on cotton and worsted spinning system, steaming and stabilization of yarns. Spinning of dyed fibres, Spinning of micro fibres. Conversion of filament to spun yarn, Principles of stretch breaking and cutting tow to sliver and yarn converter. Formation bulked Acrylic yarn.

## Module III (10 Hours)

**Production of Fancy yarn:** Classification of fancy yarn. Methods of producing slub yarn, Drawn and spun yarn, Methods of producing Knop yarn, Snarl yarn, Loop yarn, Spiral yarn etc. Methods of producing mélange yarn. Method of producing melange yarn, Chennile yarn. Hybrid yarn. High bulk yarn, reflective yarn, electro-coated yarn, Elastomericyarn.

**Narrow fabrics:** Introduction to fibre and yarn types, fabrics. Preparation for narrow fabric production, winding, warping, sizing, looming.Narrow fabric production**,** Woven narrow fabrics and their constructions, structure of narrow fabrics woven on shuttleless looms. Conventional shuttle looms. Needle looms for narrow fabrics production. Braided fabrics

3D Fabric and Spacer fabric production. Profiled fabrics, Contour fabrics. Polar fabrics, Spiral fabrics,

## Module IV (10 Hours)

**Industrial tapes:** Slide fastener tapes - Insulating tapes, Book binder’s tapes, Labeling Tapes, Border Tapes, Elastic- Pleated lingerie ribbing.

**Carpets:** Non-pile carpet weaves and their looms. Pile surfaced carpet weaves and their looms. Needle felt floor coverings.

**Home textile products:** Definition – requirements and production of Kitchen linen, Bed linen, Furnishing, Floor coverings, Wall coverings, Decoration fabrics.

## Books Recommended:

1. Eric Oxtoby, “Spun Yarn Technology”.
2. Goswami, Martindle, Scardino, “TextileYarns”.
3. Klien W, “New Spinning Technology”, The Textile institute,Manchester.
4. Salhotra K R, “Spinning of Manmades and blends on cotton system”, The Textile Association,India.
5. Lawrence C A, “Fundamentals of Spun Yarn Technology”, CRC Press LLC, Florida, USA.
6. Chattopadhyay R, “Advance in Technology of yarn Production”, Nodal Centre for Upgradation of Textile Education, IIT Delhi.

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**UOETE702 COLORMEASUREMENT**

**Course Outcomes:**

**After successful completion of this course, the students should be able to;**

* + Describe concept of color perception.
	+ Explain elements of spectrophotometry and components ofcolorimeter.
	+ Establish spectral curves and their relationship to pre-receivedcolor.
	+ Develop computer aided color matching and recipe predictionalgorithms.

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| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
| Describe concept of color perception. | **√** | **√** | **√** | **√** | **√** |  |  |  |  |  |  |
| Explain elements of spectrophotometry andcomponents of colorimeter. | **√** | **√** | **√** |  | **√** |  |  | **√** |  |  |  |
| Establish spectral curves and theirrelationship to pre-received color. | **√** | **√** |  | **√** | **√** |  |  |  | **√** |  |  |
| Develop computer aided color matchingand recipe prediction algorithms. | **√** | **√** | **√** | **√** | **√** |  |  |  |  | **√** | **√** |

## Module I (10 Hours)

How we see colour, Causes of colour, Basic concept of colour perception, construction of human eye, brief idea about the relation between colour and chemical constitution. Chromogen, Chromophores and Auxochromes. Photophic and scotophic vision, Light, light sources and light interactions: reflection, scattering absorption and transmission,

## Module II (10 Hours)

**Color theory:** Tone, Shade, Tint.colour order systems, Munsell colour order system. Colour wheel. Additive and subtractive system, Grass man Law.Visual description of colour, K/S, Beer- Lambest law, Flux theory.Kubelka-Munk Equation.Spectral curves and their relationship to pre- received colour.λmax, Colour Index.

## Module III (10 Hours)

**Color measurements and Parameters:** Colour measuring instruments- spectrophotometers, colorimeters and their components. Principle of spectrophotometry.Measuring geometry, Standard observer colour matching functions.CIE illuminants, observers.Trichmoaticity, Opponent theory. Chromaticity coordinates. Relationship of hue, value and chroma Metamerism. Whiteness & Yellowness Indices, Computer aided Colour matching and recipe prediction algorithms. CIE L\*a\*b\*, CIE L\*c\*h\*, CIE colour space, DE, DE CMC.Measurement conditions.CCM applications and reports for QC.Shadecorrection.

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**Module IV (10 Hours)**

**Color Communication:** Device dependent and device independent colour spaces, Computer and display RGBs, Imaging Systems and sensors, Colour space transformations, Colour Gamut, ICC profile. Pantone and HTML reference. Shade Card, Visual Perception chromatic adaptation and colour constancy.

## Books Recommended:

1. R. McDonald, Colour Physics for Industry, Society of Dyers and Colourists, Bradford, UK , 1997.
2. A.K. Roy Choudhury, " Modern Concept of Color and Appearance" published jointly by Science Publishers, Inc., Enfield, NH 03748, USA, and Oxford &IBH Publishing Co. Pvt.Ltd.New Delhi,2000.
3. M L Gulrajani, Colour Measurement: Principles, advances and industrial applications. Edited by Woodhead Publishing Series in Textiles No. 103, ISBN 1 84569 559 3,2010.
4. A.K. Roy Choudhury, Principles of colour and appearance measurement, Volume1. Object Appearance, Colour Perception and Instrumental Measurement (Woodhead, UK). Released on 27 Jan 2014.
5. A.K. Roy Choudhury, Principles of colour and appearance measurement ,Volume 2: Visual Measurement of Colour, Colour Comparison and Management, released on 13 Oct.,2014.
6. Committee on Colorimetry of the Optical Society of America, The science of color, Thomas Y. Cromwell, New York,1953.
7. K McLaren, The Colour Science of Dyes and Pigments, Adam-Hilger, Bristol (U.K.), 1983.
8. Kurt Nassau, The Physics and Chemistry of Colour, Wiley-Interscience, New York,1983.
9. H. S. Shah and R. S. Gandhi, Instrumental colour measurements and computer aided colour matching for textiles, Mahajan, India,1990.
10. R W G Hunt, Measuring Colour, Ellis Horwood, Chichester (U.K.),1987.
11. D. B. Judd and G. Wyszecki, Color in business, science and industry, 2nd.Ed., John Wiley & sons, New York,1963.
12. Total Colour Management in Textiles (Woodhead Publishing), Prof.JohnXin, 1st edition 2006, eBook ISBN: 9781845691080, Hardcover ISBN:9781855739239.

## UOETE801 APPLICATION OF NANO TECHNOLOGY IN TEXTILE

**Course Outcomes:**

**After successful completion of this course, the students should be able to;**

* + Understand electro spinning of nano fibres for tissue engineeringapplication.
	+ Analyze structure properties relationship of nano fibres by controlling themorphology.
	+ Explain nano coating and surface modificationtechnology.
	+ Identify multifunctional polymer nano composites for industrialapplications.

**Abbreviations Used:L = Lectures, P = Practical or Laboratory, T = Tutorial**

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
| Understand electrospinning of nanofibresfor tissue engineering application. | **√** | **√** | **√** | **√** | **√** |  |  |  |  |  |  |
| Analyse structure properties relationship of nanofibres by controlling themorphology. | **√** | **√** | **√** |  | **√** |  |  | **√** |  |  |  |
| Explain nanocoating and surfacemodification technology. | **√** | **√** |  | **√** | **√** |  |  |  | **√** |  |  |
| Identify multifunctional polymer nanocomposites for industrialapplications. | **√** | **√** | **√** | **√** | **√** |  |  |  |  | **√** | **√** |

**Module I (10 Hours)**

**Nanofibre production:** Electrospinning of nanofibers and the charge injection method. Principles of electrostatic atomization. Electrospraying and electrospinning by the capillary method. Electrospraying and electrospinning by the charge injection method.

**Continuous yarns from electrospun nanofibers:** Controlling fiber orientation. Producing noncontinuous or short yarns. Producing continuous yarns.

**Producing nanofiber structures by electrospinning for tissue engineering:** Fabrication of nanofibrous scaffolds. Characterization of nanofibrous scaffolds. Cell–scaffold interaction.

## Module II (10 Hours)

**Producing polyamide nanofibers by electrospinning:** Properties of electrospun nanofibers. Measuring the effects of different spinning conditions and the use of high molecular weight polymers on the properties of electrospun nanofibers.

**Controlling the morphologies of electrospun Nanofibres:** Electrospinning process and fibre morphology. Polymer concentration and fibre diameter. Fibre bead formation and fibre surface morphology. Controlling fibre alignment and web morphologies. Bicomponent cross-sectional nanofibres

**Carbon nanotubes and nanocomposites:** Structure of carbon nanotubes,Synthesis, characterization purification and application of carbon nanotubes in aerospace engineering. Nanostructured solid propellants for rockets.

## Module III (10 Hours)

**Nanocoatings and surface modification techniques:** Nanotechnologies for coating and structuring of Textiles. Production of nanofiber nonwovens using electrostatic spinning. Anti- adhesive nanocoating of fibers and textiles. Water- and oil-repellent coatings by plasma treatment. Self-cleaning superhydrophobic surfaces.

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**Module IV (10 Hours)**

**Multifunctional polymer nanocomposites for industrial applications:** The development of functional polymer nanocomposites. Improving the mechanical properties of polymer nanocomposites. Improving the fire-retardant properties of polymer nanocomposites. Improving the tribological properties of polymer nanocomposites.

## Books Recommended:

* 1. P Brown, K Stevens, “Nanofibers and nanotechnology in Textile”, WoodHead publishing.
	2. A.K. Haghi, G.E. Zaikov, “Development of Nanotechnology in Textile”, Nova Publishers,NewYork.

## UOETE802 COSTING OF TEXTILEMATERIALS

**Course Outcomes:**

**After successful completion of this course, the students should be able to;**

* + Understand the techniques of costing and theircontrol.
	+ Plan, analyse and implementproject.
	+ Understand appraisal criteria forproject.
	+ Explain financial management in relation to textilecosting.

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
| Understand the techniques of costing andtheir control. | **√** | **√** | **√** | **√** | **√** |  |  |  |  |  |  |
| Plan, analyse and implement project. | **√** | **√** | **√** |  | **√** |  |  | **√** |  |  |  |
| Understand appraisal criteria for project. | **√** | **√** |  | **√** | **√** |  |  |  | **√** |  |  |
| Explain financial management in relationto textile costing. | **√** | **√** | **√** | **√** | **√** |  |  |  |  | **√** | **√** |

## Module I

**Costing as an aid to management:** Elements of cost, Classification of cost; Direct cost , Indirect cost, fixed cost, variable cost and semi variable cost, opportunity cost. Cost terms related to incomemeasurement.

**Inventory cost:** Costing of materials, Methods of valuing materials: FIFO, LIFO, Average cost method, Inflated price method, identification method, base stock method, HIFO, Market price method, Techniques of material control: Economic order quantity, Just in Time inventory system, stock control through ABC Analysis, VEDanalysis.

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**Labour cost:** Types of labour, control of labour cost, labour turnover and turnover cost, time and motion study, job analysis and job evaluation, remuneration and incentives, time wage system, piece wage system.

**Overheads:** Importance and classification of overheads, allocation and apportionment of overhead to cost centres.

## Module II

**Methods of costing:** Job, batch and contract costing, process costing: waste cost and its control in a textile mill, joint and by-product costing, unit cost: costs of yarns and fabrics, fabric processing cost.

**Techniques of cost analysis and control:** Absorption and marginal costing, cost-volume-profit- analysis, break-even point, contribution margin, margin of safety, standard costing, budgetary control, productivity and value analysis.Profit calculation.

## Module III

**Project Planning:** Capital expenditure, phases of capital budgeting, generation and screening of project ideas, project rating index, resource allocation framework.

**Project Analysis:** Feasibility study, product life cycle, market analysis, market planning, market survey and characterisation of markets, demand analysis, demand forecasting, technical analysis, project charts and layouts.

## Module IV

**Financial analysis:** Time value of moneyand cost of capital, Cost of project, sources of finance, projected financial statements, working capital requirement, estimate of sale and production, cost of production, Balance sheet, Fund flow statement.

**Appraisal criteria:** net present value, benefit cost ratio, internal rate of return, payback period, analysis of risk and social cost benefit analysis

**Project implementation:** Network techniques, PERT, CPM. Project Review and Administration.

## Books Recommended:

1. Jain S P, Narang K L and Dhingra T R, “Cost Accounting”, 6thEd., Kalyani publishers, NDelhi.
2. Kerzner H, “Project Management” 1st Ed., CBS Publishers and distributors,Delhi.
3. PrasanaC, “Projects- Planning, Analysis, Selection, Implementation and Review”,Tata Mc Grawhill Publishing Co. Ltd., N.Delhi.
4. Ormerod A, “Textile Project Management”, The Textile Institute,ManchesterUK.
5. Khan M Y and Jain P K, “Cost Accounting and Financial Management”, Tata McGrawhill,Delhi.

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