SANT GADGE BABA AMRAVATI UNIVERSITY

DRAFT SYLLABUS OF SEMESTER III & IV BACHELOR OF TEXTILE ENGG.) NEP-2020

SEMESTER III

COURSE: TEXTILE FIBER - I

Course Code: 3TX200PC **Course Hours: 3 Th** **Credits: 3**

Course Description:
This course serves as a core subject of the program. This course focuses on the basics of natural textile fiber. Student should understand and deals with the extraction of fibers, morphological structure, properties and applications of natural textile fibers.

Course Outcomes:
By the end of this course, students will be able to:

1. Understand basics of natural textile fiber and its classification.
2. Illustrate the concept of fiber structure analysis.
3. Analyze the morphological and chemical structure of cotton fibre.
4. Demonstrate the extraction process and properties of bast fiber
5. Understand the morphological structure and properties of animal fibers
6. Explain the various emerging unconventional natural fibers and its use.

Course Topics

SECTION 'A'

Unit 1: Introduction to Textile Fiber

- Definition of fibre, Staple fiber, filament, Classification of Textile fibres
- Essential and desirable properties of Textile fibres,
- Definition of Polymers, Types of polymers, Requirements of fibre forming polymers.
- Concept of molecular weight, Degree of polymerization,
- Orientation and crystallinity, effect of orientation and crystallinity on the properties of fibres.

Unit 2: Analysis of fibre structure

- Analysis of fibre structure: Introduction, crystal structure, and polymer crystals.
- X-ray diffraction: Bragg's law, X-ray diffractometer.
- Electron microscopy: Principle and working of Transmission and scanning electron microscope.
- Spectroscopy: Principle and working of IR-Spectroscopy and NMR-Spectroscopy.

Unit 3: Cotton fibre

- Introduction to cotton fibre, Chemical structure of cotton fibre,
- Morphological structure
- Physical, chemical and biological properties
- Applications

SECTION 'B'

Unit 4: Bast Fibre

- Jute: Cultivation and Extraction of Jute fibre, morphological structure of jute fibre, physical, chemical and biological properties, Applications
- Flax: Retting and extraction process, morphological structure of flax fibre, physical, chemical and biological properties, Applications.
- Introduction to hemp, Ramie and its distinctive features

Unit 5: Animal Fibre

- Types of wool, grading of wool, morphological structure of wool, chemical composition, Polymer system of wool, Physical, chemical and biological properties and Applications.
- Types of silk, Production of silk (life cycle, reeling), Structure of silk.
- Chemical composition, polymer system of silk.
- Physical, chemical and biological properties and Applications

Unit 6: Emerging Unconventional Natural Fibres.

- Introduction to Banana, Pineapple, Sisal, Spider silk and their distinctive features
- Introduction to fibres like mohair, camel their distinctive features and applications
- BT Cotton

TEXT BOOKS AND REFERENCES:

1. **Mishra, S.P.** ***fibre Science and Technology: New age International*** **Publications.**

- **Relevance:**This book covers various types of textile fibers, their properties, and applications, which directly relates to units 1, 3, 4,5 and 6

2. **Kothari, V.K.** ***Textile Fibres: Developments and Innovations,*** **IAFL Publications, 2000.**
- **Relevance:** This book provides a broad overview of textile fibers manufacturing and properties making it relevant for Units 1, 3, 4, 5 and 6

3. **V.A.Shenai, Textile Fibres – Vol.-I , Sevak Publications**
- Relevance: This book provides a broad overview of textile fibers, extraction process and applications which directly relates to units 1, 3, 4, 5 and 6

4. **V. Gowarikar, Polymer science- New age International Ltd. Publications**
- **Relevance:** This book provides a broad overview of textile science and technology, including analysis of fiber structure which directly relates to Units 2

5. **S. B. Sreenivasan, Bt Cotton in India: An Introduction , ICFAI University Press Publications**
- **Relevance:** This book provides a broad overview of textile science and technology, including BT cottonwhich directly relates to Units 6

6. **M. J. John, Natural Polymers- Volume 1: Composites**
- **Relevance:** This book provides a broad overview of textile science and technology, including spider silk fibers making it relevant fo

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COURSE: YARN MANUFACTURING - I

Course Code: 3TX201PC **Course Hours: 3Th** **Credits: 3**

Course Description:

This course serves as a core subject of the program. This course focuses on fundamental concepts related to yarn manufacturing processes. Through a series of lectures, students will be briefly introduced to key terms, principles, and processes involved in yarn production.

Course Outcomes:

By the end of this course, students should be able to:

1. Illustrate the working principles of blowroom process and its constructional details.
2. Understand concepts and process of mixing and blending.
3. Demonstrate the working principles of carding process and its constructional details.
4. Understand concept of drawing process and its constructional details.
5. Describe concept of combing preparatory process and description regarding combing preparatory machines.
6. Demonstrate concept of combing process and constructional details.

Course Topics:

SECTION 'A'

Unit 1: Blowroom Process

- Introduction to principle of ginning process
- Baling and pressing– objectives, baling and pressing machines, bale specifications
- Process flow chart of spinning process.
- Objectives of blowroom, principles and basics of degree of opening, cleaning
- Opening and cleaning machines-automatic bale openers, cleaners, multi roll technology, multi-function separators etc
- Material transportation system, automatic waste removal system. Calculations related to cleaning efficiency and production. recent developments in blowroom machines.

Unit 2: Mixing & Blending Process

- Objectives, importance of mixing, methods of mixing,
- Principle and working details of mixing machines, integrated mixers etc.
- Blending- objectives, measures of blending, selection of blend constituents, blend ratio
- Blending techniques, compatibility requirements,.
- Principle and working details of blending, integrated mixers etc
- Blending of irregularities

Unit 3: Carding Process

- Objectives, principle, constructional details of new generation cards, operating regions of the card,
- Transfer efficiency-definition, importance, factors affecting transfer efficiency
- Auto-levelers- basic type, principle and working of autolevellers.
- Different settings of carding machine and its importance.
- Recent developments in carding machine-on line nep control, auto can changer, automatic suction system, digital drives, sliver information system, on quality control.etc
- Calculations related to production and cleaning efficiency. recent developments in carding machines.

SECTION 'B'

Unit 4: Drawing Process

- Objectives, principle, constructional details of draw frame machine.
- Principle of drafting, types of drafting system, types of draft, roller setting.
- Roller settings, drafting irregularities.
- Process parameters affecting drawing performance,
- Production calculations.
- Recent developments in draw frame machine

Unit 5: Combing Preparatory Process

- Objectives, importance of combing preparatory
- Methods of comber lap preparation
- Hook reversal process
- Process parameters-pre-comb draft, lap weight etc
- Effect of lap preparation on combing performance
- Recent developments in combing preparatory machines.

Unit 6: Combing Process

- Objectives, principle and constructional details of combing machine
- Stages of combing cycle, settings of combing machine and its importance.
- Fractionating efficiency, comber noil and its influence on combing performance.
- Process parameters influencing combing operation and sliver quality.
- Calculations related production and fractionating efficiency
- Recent developments in combing machine.

TEXT BOOKS & REFERENCE BOOKS :

1. **Klein W, Manual of Textile Technology, Vol. I – III, The Textile Institute, UK, 1987.**
   - **Relevance:** This book provides comprehensive information on spinning process including blowroom, carding, combing and drawing, which are crucial for understanding Units 1to 6 of your syllabus.
2. **Oxtoby E, Spun Yarn Technology, by Butterworth and Co. Ltd. publication, 1987**.
   - **Relevance:** This book covers various types of opening and cleaning machines, different section of carding machines which directly relates to Unit 2, 3 (Blowroom and carding) and Unit 4(Drawing).
3. **Lord P R,Handbook of Yarn Production The Textile Institute, Woodhead Publication Limited.**
   - **Relevance:** This book offers detailed information on different yarn production method, including ring spinning, rotor spinning friction spinning which relates to unit,1, 2, 3, 4 and 5,6 (combing process).
4. **Shirley, Opening and Cleaning, the Textile Institute Publication, Manual of Cotton Spinning Vol. II, Part-II.**
   - **Relevance:** This book discusses opening and cleaning principles and it machines, which supports the topics covered in Unit 1,2,3 (blowroom, mixing, blending and carding process).
5. **Dr. Zoltan S. Szaloki, Opening Cleaning and Picking, Institute of Textile Technology, Virginia.**
   - **Relevance:** This book discusses opening and cleaning principles and it machines, which supports the topics covered in Unit 1,2,3 (blowroom, mixing, blending and carding process).
6. **Dr. A. R. Khare, Elements of Blowrrom and Carding.**
   - **Relevance:** This book discusses opening and cleaning principles and it machines, which supports the topics covered in Unit 1,2,3 (blowroom, mixing, blending and carding process).
7. **T.K. Pattabhiraman, Essential calculations of practical cotton spinning.**
   - **Relevance:** This book provides comprehensive information on spinning process and its calculations including blowroom, carding, combing and drawing, which are crucial for understanding Units 1 to 6 of your syllabus.

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COURSE: TEXTILE TESTING AND QUALITY CONTROL

Course Code: 3TX202PC Course Hours: 3 Th. Course Credits: 3

Course Description:
This course serves as program core course, it aims to enhance basic theoretical knowledge of Testing of textile materials. It focuses on the various statistical techniques used in testing, evaluation of fibre characteristics, importance of moisture relation and tensile properties of textiles. This course provides foundational knowledge in textile testing, data collection, analysis and result calculation.

Course outcomes:
After the completion of Textile Testing and statistic course, students will able to

1) Understand the knowledge of quality control scheme and importance of testing

2) Describe knowledge of statistic applications in testing of Textiles
3) Examine the statistical analysis of various testing results
4) Identify various sampling methods of textile material for testing
5) Understand moisture properties and its measurement
6) Understand tensile properties and its evaluation

Course Topics:

SECTION 'A'

Unit- I: Objects of Testing and Element of Statistics.

- Tested Quality Schemes like Wool Mark, ISI Mark. Introduction to Standards like ASTM, ISO, etc.
- Element of Statistics: Frequency Distribution Graphical Presentation of Data, Measures of Location Like Mean, Mode, Median, Quartiles, Percentiles. Calculation Methods.

Unit –II: Measures of Dispersion

- Range, Quartile Deviation, Percentage Mean Deviation, Standard Deviation, CV%, Variance.
- Comparison of frequency distributions, Normal distribution. Population values & sample values, Sampling Distribution, Standard Error.

Unit –III: **Significance Testing**

- Significance of mean & s. d., Level of confidence. Number of tests to be carried out, Quality Control Charts, X -chart, R-chart.
- Binomial & Poisson distribution, Correlation. Selection of sample for testing, Terms: Population Random sample, Biased sample.

SECTION 'B'

Unit –IV: **Sampling Methods for Fibre Properties**

- Sampling methods - Zoning method, Squaring method, Cut squaring method,
- Core sampling method length & extent biased sample, sampling for raw cotton testing
- Terms used in sampling,
- Fibre sampling from combed slivers, roving and yarns, Yarn sampling, fabric sampling.

Unit V: Textile Testing and Standard Moisture Conditions

- Terms and definitions, Effect of moisture on textiles
- Regain–humidity relationships, factors affecting moisture regain,
- Instrument using effect of regain on electrical properties of textile materials
- Measurement of atmospheric conditions- dry and wet bulb hygrometer, measurement of regain –oven dry method,
- methods based on resistance and capacitance principles.

Unit VI: Tensile Testing

- Terminology and definitions load elongation curves, stress strain curve, initial young modulus, yield point, work of rupture, work factor, elastic recovery, instantaneous and time dependent effects, creep,
- Types of tensile testing machines: CRL, CRE and CRT principle, various types of measuring instruments and their working principles,
- factors affecting tensile properties. Testing of fibre properties - Historical review of fibre length and strength testing

TEXT BOOKS AND REFERENCES:

1) **Principles of Textile Testing -J.E. Booth**

- **Relevance:** This book covers various aspects of statistics. The detailed content makes it a valuable reference for students, educators, and professionals in the textile industry, which is crucial for understanding Units 1, 2, 3 and 4 of your syllabus.

2) **Physical Testing of Textiles - B. P. Saville**

- **Relevance:** This book provides various concept, factors and effect of moisture on textile martial. The detailed content makes it a valuable reference for students, educators, and professionals in the textile industry, which is crucial for understanding Units 5 and 6 of your syllabus.

3) **Textile Testing - Grover and Hamby.**

- **Relevance:** This book is a comprehensive resource that delves into the importance of Textile Testing, method, result collection and analysis of sample data for prediction of population value which is crucial for understanding Units 1, 2 and 6 of your syllabus.

4) **Physical properties of Textile Fibres, J. W. S. Morton & Hearle.**

- **Relevance: This book provides various concept, factors and effect of moisture on** textile martial. The detailed content makes it a valuable reference for students, educators, and professionals in the textile industry, which is crucial for understanding Units 5 and 6 of your syllabus.

5) **Handbook of Indian Standards.**

- **Relevance:** This book provides various concept, factors and effect of moisture on textile martial. The detailed content makes it a valuable reference for students, educators, and professionals in the textile industry, which is crucial for understanding Units 1 and 2.

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SEMESTER: 3RD (TEXTILE ENGINEERING)

COURSE TITLE: COMMUNITY ENGAGEMENT / FIELD PROJECT

Credits: 2 **Contact Hours**: 4 hours/week

Course Description:
This course introduces students to real-world textile field related challenges and opportunities within rural and urban communities. It emphasizes problem-solving, teamwork, and communication skills through active engagement with the community. Students will explore the community related problems in textiles and will get hands-on experience in addressing practical challenges. The course promotes an understanding of community-centric and sustainable engineering practices tailored to the textile industry.

Course Outcomes:
1. Identify basic textile-related community issues.
2. Suggest simple, practical solutions based on textile knowledge.
3. Present findings and recommendations effectively.

Course Contents:

1. Orientation and Introduction (Week 1)
- Overview of the course objectives.
- Basics of community engagement and sustainability in textiles.
- Discussion of simple case studies related to rural or urban textile challenges.
- Selection of project themes.

2. Problem Identification (Weeks 2-3)
- Community visits to identify one specific issue.
- Interaction with stakeholders (artisans, small-scale workers, cottage industry personals).
- Prepare a simplified problem statement.

3. Research and Planning (Weeks 4-5)
- Literature review and stakeholder discussions.
- Develop a short, practical project plan, including objectives and a simple methodology.

4. Field Work and Data Collection (Weeks 6-8)
- Conduct community visits for data collection.
- Identify one area of intervention (e.g., skill training, basic waste recycling ideas etc).

5. Solution Development (Weeks 9-10)
- Propose simple, actionable solutions.
- Create basic prototypes or plan a small activity

6. Documentation and Presentation (Weeks 11-12)
- Prepare a short project report with findings and recommendations.
- Present the report in a simplified format (e.g., slides, poster presentation).

Note: Student will work on any team relating to above syllabus based on local to global needs. else following are suggested themes, out of which student may choose any One Suggested themes:

1. Recycling and reusing textile waste.
2. Support for traditional crafts using basic tools.
3. Basic skill-building sessions for artisans (e.g., dyeing or stitching techniques).
4. Awareness campaigns on eco-friendly textile practices.

TEXTILE AND COMMUNITY ENGAGEMENT REFERENCE BOOKS:

1. **Sustainability in the Textile and Apparel Industries"** by *Subramanian Senthilkannan Muthu* **Relevance:** This book focuses on sustainable practices within the textile industry, aligning with the course's emphasis on sustainability and the circular economy.
2. **Textiles and the Environment: An Environmental Perspective"** by *Jie Fu and Karen Chapman* **Relevance:** Provides insights into the environmental impacts of textiles and practical approaches to sustainability, helpful for community-based problem-solving.
3. **Circular Economy in Textiles and Apparel"***Edited by Subramanian Senthilkannan Muthu* **Relevance:** Explores practical ways to implement circular economy principles, essential for understanding sustainable solutions in community contexts.

COMMUNITY ENGAGEMENT AND PRACTICAL PROBLEM-SOLVING REFERENCE BOOKS:

5. **Design for Sustainability: A Sourcebook of Integrated Eco-Logical Solutions"** by *Janis Birkeland* **Relevance:** Covers sustainable design principles that can inspire practical solutions for textile-related community challenges.
6. **Community Based Research: Teaching for Community Impact"** by *M Beckman & J F. Long* **Relevance:** Focuses on engaging communities in research and solution-building, enhancing teamwork and communication skills.

7. **Introduction to Sustainability in the Textile Industry"** by *Md. Ibrahim H. Mondal* **Relevance:** Provides practical knowledge about incorporating sustainability within textile practices, directly tying into the course's goals.

COURSE NAME: **FASHION DESIGNING**

Course code: 3TX205M **Contact Hrs: 1 (TH) 2(Pr) Credits: - 2**

Course Description:

Fashion designing course provides the knowledge and skills required for dynamic field of fashion and apparel design. The program typically covers a combination of technical, artistic, and business aspects of fashion, ensuring a well-rounded understanding of the industry.

Course Outcomes:

After completion of Fashion Designing the students will be able to

1) Understand different terms of fashion
2) Differentiate categories of fashion and its adoption
3) Evaluate the fashion research and its analysis

UNIT-I: Fashion Concept

- History of fashion
- Scope of Styling: Understanding styling in fashion, including the differences between fashion designing and fashion styling, and different types of styling.
- Elements of Style: Learn about trends, their setting, and the elements that make up style and design.
- Fashion Terminologies: Key terms like classics, fads, haute couture, fashion leaders, and followers.
- Theories of Fashion Movement: Analyzing the Trickle-Up, Trickle-Down, and Trickle-Across theories of fashion.
- Fashion Life Cycle: Study the various stages in the life of a fashion trend, from inception to decline

Practical:

- Research study on history of fashion.
- Research study on current fashion.
- Market survey analysis report
- Creating fashion board of era with contemporary changes.

UNIT-II: Fashion Design Processes

- Forecasting: Understand short-term vs long-term forecasting, color and textile forecasting, and how to predict styles and sales.
- Figure Proportions: Learn about real versus fashion figure illustrations, critical for design accuracy.
- Client Brief & Research: Develop skills in interpreting client briefs, exploring innovative opportunities, and conducting inspiration and research.
- Design Process: Steps in designing, including the creation of mood boards, storyboards, and concept boards to express themes and ideas.
- Prototyping & Portfolio: Learn the process of prototyping designs, creating collections, and building a professional portfolio.

Practical:

- Illustration of Mechanical Figure.
- Illustration of Fashion Figure.
- Creating mood Board Story board.
- Portfolio Designing of Clint.

UNIT-III: Elements and Principles of Fashion Design

- Aspects of Design: Structural, functional, and decorative components in fashion design.
- Elements of Design: Deep dive into design elements like line, shape, silhouette, form, size, color, texture, pattern, and typography.
- Principles of Design: Learn how to apply balance, rhythm, proportion, emphasis, harmony, and unity to fashion design.
- Importance of Fashion Design: Understanding the significance and impact of fashion design within the industry.
- Drawing Tools & Techniques: Overview of materials and tools used in the fashion design process, along with basic drawing techniques.
- Color Theories & Schemes: Explore fundamental color concepts, color theories, and how to apply color schemes in designs.

Practical:

- Illustration using Structural, functional, and decorative components in fashion.
- Illustration using Elements of Design line, shape, silhouette.
- Preparing color wheel, color board.
- Preparing flats of garment.

TEXT BOOKS AND REFERENCES:

1. **Fashion Theory: A Reader** by Malcolm Barnard

- **Relevance:** This book provides Covers essential fashion theory including terminology, history, and the evolution of fashion; related to unit 1,2

2. **The Fashion System** by Roland Barthes

- **Relevance:** This book is a key text for understanding fashion terminology and the communication of fashion related to unit 1,2.

3. **Fashion Design: A Process of Creation** by Kathryn McKinley & Janine Munslow

- **Relevance:** This book offers an in-depth exploration of the fashion design process, including fashion history and styling. Related to unit 1

4. **Fashion Sketchbook** by Bina Abling

- **Relevance:** This book is a comprehensive guide on drawing and illustrating fashion figures and technical sketches, which is related to unit 2

5. **Fashion Illustration: Inspiration and Technique** by Anna Kiper

- **Relevance:** This book Teaches how to create fashion figures, sketch designs, and build a portfolio with various techniques ,which is related to unit 2

Fashion Design Essentials: 100 Principles of Fashion Design by Jay Calderin

- **Relevance:** This book gives you a thorough resource on the core principles and elements of design, including balance, proportion, and rhythm. which is related to unit 2 ,3

6. **Color for Fashion** by JoenWolfrom

- **Relevance:** This book Offers an in-depth exploration of color theory and its application to fashion design. which is related to unit 3

7. **Fashion Drawing:** A Visual Guide to Drawing Fashion by Michele Wesen Bryant

- Relevance: This book helps students master fashion **sketching techniques using the right tools and materials. which is related to unit 3**

8. **The Art of Fashion Draping** by Connie Amaden-Crawford

- **Relevance:** This book gives a detailed guide to the draping techniques used to create garments, focusing on the structural aspects of fashion design. which is related to unit 3

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COURSE: ELEMENTS OF COSTING AND ECONOMICS

Course Code: 3TX207EM **Course Hours: 2 Th** **Credits: 2**

Course Description:
Elements of Costing and Economics explore fundamental concepts in costing and economics, emphasizing practical applications in business decision-making. The course covers the principles, methods, and procedures associated with cost management, material handling, and inventory control. Additionally, it introduces the basics of economics, including demand-supply interactions, market types, monetary systems, and taxation principles. The curriculum is structured to provide students with the skills necessary for effective cost analysis and economic reasoning.

Course Outcomes:
Upon successful completion of the course, students will be able to:
1. Understand Costing Principles and demonstrate the use of costing techniques.
2. Implement inventory controls.
3. Understand Fundamentals of Economics.

Unit-I: Costing

- Meaning and various methods of costing.
- Elements of cost, prime cost, factory overheads, factory cost, selling and distribution overheads. Total cost. Concept of BEP. Fixed cost, Variable cost. cost-volume- profit (CVP) relationship,
- contribution margin per unit, contribution to volume (C/V) ratio, desired sales volume for given gross and net profits; effect of changes in fixed cost, variable cost and selling price on break-even sales revenue and margin of safety; Numerical examples.
- Different pricing basis of raw materials (FIFO, LIFO and Average)

Unit-II: Inventory

- Importance and meaning, Purchase Procedure
- Considerations for fixing maximum and minimum stock to bemaintained.
- EOQ inventory system. ABC inventory control system.

- Annual stock taking and perpetual inventory,

Unit-III: Economics

- Definition and scope. Characteristics and classification of wants.
- Meaning of demand, supply, law of demand, law of supply, price elasticity of demand, factors affecting elasticity of demand.
- Type of Markets: - Perfect Market, Imperfect market (Monopoly, Oligopoly. etc.) Money functions, pricelevel, inflation.

TEXT BOOKS AND REFERENCES:

1. **Cost Accounting: Principles and Practice By B. M. LallNigam; I. C. Jain.**
   Relevance: This book offers detailed information about Elements of cost and costing Methods which directly relates with unit 1.

2. **Inventory Management: Principles & Practices by Naryan P; Jaya Subramanian.**
   Relevance: The book explains the fundamental principles of Inventory Management and various techniques of inventory control which directly relates with unit 2

3. **Elementary Economic Theory by K. K. Dewett; J. D. Varma,**
   Relevance: This book provides comprehensive information about economic terminologies and concepts which directly relates with unit 3.

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SEMESTER IV

COURSE: TEXTILE FIBER – II

Course Code: 4TX209PC **Course Hours: 2Th Credits: 2**

Course Description:
This course serves as a core subject of the program. It focuses on the basics of manmade fiber and its various manufacturing technologies, properties and applications. It gives an understanding about chemistry, synthesis, structures and their relationship with the utility of manmade fibers in diverse sector of textile engineering.

Course Outcomes:
By the end of this course, students will be able to:

1. Understand the basics of manmade fibers.
2. Demonstrate the manufacturing process of various regenerated fibers.
3. Understand the synthesis and properties of polyamide and polyester.
4. Explain the polymerization and synthesis process of vinyl and polyolefin fibers
5. Illustrate the concepts and principles of various texturizing methods.
6. Describe the manufacturing process and applications of sustainable manmade fibers.

Course Topics:

SECTION 'A'

Unit 1: Introduction to manmade fibers

- Introduction to manmade fiber, Merits and Demerits of manmade and nature fiber
- hetrochain and carbon chain polymers
- Addition and condensation polymerization methods
- Study of intra-polymer and inter-polymer forces in fibre polymer.
- Concept of thermoplastic and thermoset material.
- Introduction to melt spinning, dry spinning and wet spinning.

Unit 2: Regenerated fibers

- Regenerated fibres: Viscose rayon: Manufacturing process
- Physical and chemical properties, Applications
- Cuprammonium rayon: Manufacturing process, Physical and chemical properties, Physical, chemical and biological properties, Applications.
- High wet modulus and Polynosic rayon: Manufacturing process, Physical and chemical properties, Applications.
- Introduction to Acetate & Triacetate fibres.

Unit 3: Synthetic fibers-Polyamide and Polyester

- Synthetic fibres: Polyamide Fibres: Nylon-6, Nylon-66, Raw materials,
- Manufacturing process, Microscopic structure, Physical and chemical properties, Applications
- Polyester fibre: Raw materials,manufacturing process,]
- Microscopic structure, Physical and chemical properties, Applications.

SECTION 'B'

Unit 4: Vinyl and Polyolefin fibers

- Synthetic fibres: i) Polyacrylonitrile fibres: Acrylic and ModacrylicfibresRaw materials,

- Manufacturing process, Microscopic structure, Physical and chemical properties, Applications.

- Polyvinyl alcohol and Polyvinyl chloride fibres: Raw materials, manufacturing process,
- Microscopic structure, Physical and chemical properties Applications.
- Polyethylene & Polypropylene fibres: Raw materials, manufacturing process,
- Microscopic structure, Physical and chemical properties, Applications

Unit 5: Texturizing Methods

- Texturizing: Introduction to various methods of texturizing: Draw Texturising, - sequential (False twist process) and simultaneous draw texturising.
- Air Jet Texturizing: - Principle and working of machine.
- Other Texturizing Methods:- Stuffer box crimping, Edge Crimping, Knit-de-knit, Gear crimping. Properties of air and draw textured yarn.

Unit 6: Sustainable manmade fiber

- Biodegradable Polyesters and Polyamides: manufacturing process, properties and applications.
- Polylactic acid fiber: manufacturing process, Properties and applications
- Recycled polyester, manufacturing process, Properties and applications.

TEXT BOOKS AND REFERENCES

1. **Gohl and Vilensky:, Textile Science:**
- Relevance: This book covers various types of manmade fibers, their properties, and applications, which directly relates to Units1, 2, 3, 4 5

2. **R.W. Moncrieff, Man Made Fibres**
- Relevance: This book provides a broad overview of manufacturing of various manmade fibers and its propertieswhich directly relates Units 1, 2, 3, 4,5

3. **Mishra, S.P.** ***Fiber Science and Technology: New age International*** **Publications.**
- **Relevance:**This book covers various types of regenerated and synthetic fibers, manufacturing, their properties, and applications, which directly relates to Units 1, 2, 3, 4 5

4. **Chi Zang, BiodegradablePolyesters:Wile Publications.**
- **Relevance:**This book covers biodegradable polymers,manufacturing process, properties, and applications, which directly relates to Unit 6

5. **S. S. Muthu Recycled Polyesters: Springer Publications.**
- **Relevance:**This book covers sustainable raw material, manufacturing process, properties, and applications, which directly relates to Unit 6

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COURSE: YARN MANUFACTURING – II

Course Code: 4TX210PC **Course Hours: 3Th Credits: 3**

Course Description:

This course serves as a core subject of the program. This subject focuses on fundamental concepts related to yarn manufacturing processes. Students will understand key terms, principles, and processes involved in the yarn production.

Course Outcomes:

By the end of this course, students should be able to:

1. Understand the concept, construction and working of speed frame machine.
2. Demonstrate the concept construction and working of speed frame machine.
3. Illustrate the principle of drafting and various drafting systems.
4. Understand the influence of spinning geometry and spinning triangle on yarn quality.
5. Describe the concept of doubling process and fancy yarn production.
6. Analyze effect of process parameters on yarn quality and process performance.

Course Topics:

SECTION 'A'

Unit 1: Speed Frame Process

- Objectives, construction details of modern speed frame,
- Construction details of flyer, spindle and presser,
- Bobbin leading and flyer leading winding principle.
- Principal and constructional details of differential and building mechanisms.
- Various parameters affecting roving quality and production.
- Recent developments in speed frame machine-Auto bobbin transport system etc.

Unit 2: Ring Spinning Process

- Objectives, principle of ring spinning, construction details of ring frame machine.

- Details of creel, rings, travelers, ,balloon control ring, lappet, thread guide,
- Traveler clearers and setting, suction system.
- Types of spindles, spindle drives and spindle centering.
- Building mechanism and influence on bobbin quality, winding and binding coils.
- Calculation related to production.

Unit 3: Drafting System

- Importance, principle of drafting and constructional details of drafting system
- Types of drafting system, top arm drafting system and its advantages, offset drafting
- Top and bottom rollers, cots, aprons, spacers, types of flutes,
- Drafting parameters and its influence on drawing performance
- Factors affecting on roller settings and drafting performance,
- Roller slip, drafting waves and floating fibres in drafting zone.

SECTION 'B'

Unit 4: Spinning Geometry

- Importance and details of spinning geometry, yarn structure and properties.
- Effect of spinning triangle, spinning angle, spinning tension, yarn balloon
- Different yarn faults its causes, effect, remedies.
- End breakages- its causes, effect, and remedies.
- Yarn faults- its causes, effect and remedies.
- Recent developments in ring spinning

Unit 5: Compact & Other Spinning Processes

- Principles and importance of compact spinning
- Methods compact spinning systems and its constructional details
- Structure and properties of compact yarns
- Advantages of compact spinning system
- Introduction to blend spinning
- Introduction to woolen spinning, worsted spinning and jute spinning

Unit 6: Doubling Process

- Objectives and importance of doubling process,
- Method s of yarn doubling, types of doubled yarn, effects of twist direction,
- Structure and properties of folded yarns,
- Methods of ply twisting– ring doubling machines, two stage twisting and up twister.
- Two for one twister- principle, design and constructional details of TFO machine,
- Recent developments in doubling machines.

TEXT BOOKS & REFERENCES :

1. **Klein W, Manual of Textile Technology, Vol. I – III, The Textile Institute, UK, 1987.**
   Relevance: This book provides comprehensive information on spinning process including speed frame, ring spinning and doubling, which are crucial for understanding Units 1 to 6 of your syllabus.
2. **Oxtoby E, Spun Yarn Technology, by Butterworth and Co. Ltd. publication, 1987**.
   Relevance: This book covers various spinning process such as speed frame and ring spinning which relates to Unit 1,2, 3, 4 andUnit 5, 6(Jute spinning, woolenspinning, worstedspinning and doubling).
3. **Lord P R, Handbook of Yarn Production The Textile Institute, Woodhead Publication Limited.**
   Relevance: This book offers detailed information on different yarn production methods, including ring spinning, Jute spinning, woolen spinning, worsted spinning and compact spinning which relates to unit,1, 2, 3, 4 and 5.
4. **Dr. A. R. Khare, Elements of Ring spinning.**
   Relevance: This book discusses ring spinning principles, constructional details of machines, spinning geometry which supports the topics covered in Unit 1,2,3,4 (Speed frame, ring frame, drafting system, spinning geometry).
5. **T.K. Pattabhiraman, Essential calculations of practical cotton spinning.**
   Relevance: This book provides comprehensive information on spinning process and its calculations including ring spinning, jute spinning, woolen spinning, worsted spinning and doubling, which are crucial for understanding Units 1 to 6 of your syllabus.

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COURSE: FABRIC MANUFACTURING – I

Course Code: 4TX211PC Course Hours: 3Th Credits:3

Course Description:
This course serves as a core subject of the program. This course introduces the fundamental processes involved in weaving preparation, focusing on the critical steps required to transform yarn into warp and weft suitable for weaving. It emphasizes the techniques, machinery, and materials used in preparing yarn for the weaving process, ensuring efficiency and quality in fabric production. Through a series of lectures, students will understand the key terms, principles, and pre-processes involved in fabric manufacturing.

Course Outcomes:
By the end of this course, students should be able to:
1) Demonstrate the concept and principle of winding and high speed winding machines.
2) Understand the technical features and operating principles of automatic winding machines
3) Explain the concept and principles of warping and high speed description about high speed warping machines
4) Describe the technical features and operating principles of automatic warping machines
5) Describe the concepts and description of sizing machines.
6) Distinguish the various control systems, size paste ingredients used in sizing process.

Course Topics:

SECTION 'A'

Unit 1: Introduction to Winding Process:

- Brief outline of the process involve in weaving, Yarn quality attributes, Uster yarn quality, objectionable faults & its classification as per Ustercalssimate.
- Winding: Objectives:- High speed winding process, geometrical aspects of winding machines, description about tensioners, slub catchers, winding unit, anti-patterning and safety devices.
- Concept of cone angle, angle of wind, wind per traverse, production efficiency speed, time, calculation related to winding process.

Unit 2: Automatic Winding Machines

- Automatic cone and cheese winding machines, methods of yarn joining, splicing and knotting.
- Concept and constructional details of automatic winding machines: Creel, unwinding tension regulation unit, splicer,
- EYC: optical and capacitance, automatic package doffing and dust removal splicing: Types viz. mechanical, pneumatic, and thermal. Splice quality assessment.
- Internal and between machine material flow with respect to weft winding, brief description about pirn winding process.

Unit 3: Introduction to Warping Process

- Objectives and classification of warping process, construction details about beam warping: viz. Creel, tensioner, stop motions and head stock drive.
- Modern developments in warping: - Designing creels, various modern types of creel, pre tensioner, automatic tension regulation system.

SECTION 'B'

Unit 4: Automatic Warping Machines

- Modern developments with respect to head stock of beam warping. Auto leasing, drive, breaks and doffing and donning systems.
- Sectional warping: objective, constructional details of sectional warping process, auto-leasing, drum traverse, cone angle adjustment and beam traverse.
- Calculation related to production, speed, time, efficiency of warping machines.

Unit 5: Introduction to Sizing Process and machines

- Concept of yarn weaveability, Sizing : Necessity and objectives, constructional details and calculations regarding slasher sizing and multi-cylinder sizing.
- Study of modern sizing elements viz. creels, unwinding tension control, saw box, yarn drying methods, head stock weavers beam pressing and doffing.

Unit 6: Introduction to Sizing ingredients and its recipes

- Sizing control systems viz. size paste level, temperature, stretch, moisture control of sizing machines, production calculation speed, time, and efficiency.
- Concept of optimum size pick up and add-on different sizing ingredients with respect to properties, cooking methods and there testing.
- Description about size paste cooking plants, types of sizing: Heavy, medium, light and pure. Sizing of polyester, PV, PC, blends.

TEXT BOOKS AND REFERENCES:

1. **Yarn Preparation (Vol-1 and 2) By R.Sengupta, Published by Popular Prakashan in Bombay in 1963**

- **Relevance:**This volume covers various aspects of yarn preparation, including winding, warping, and other preparatory processes essential for efficient weaving. The detailed content makes it a valuable reference for

students, educators, and professionals in the textile industry, which is crucial for understanding Units 1, 2, 3 and 4 of your syllabus.

2. **Sizing Method, Material and Mechanism ByD.B.Ajgaokar And talukdar, Published by Textile Trade Press, 1982.**

   Relevance: This book provides an in-depth exploration of various materials, methods, and machinery associated with sizing, making it a valuable resource for professionals and students in the textile industry, which directly relates to Unit 5 (Concept of sizing and machines) and Unit 6 (Sizing ingredients and Recipes).

3. **Weaving Calcutions', By R. Sengupta, Published by D.B. Taraporevala Sons and Company, spanning ,1961.**

   Relevance: This book is a comprehensive resource that deals into the mathematical aspects of weaving, providing essential formulas and methodologies, The book covers various topics, including yarn count, twist per inch, winding, warping, sizing, and weaving calculations, making it pertinent to Unit 1, 2, 3 and 4.

4. **Textile Mathematics (Vol-3)', By J.E.Booth, Published by The Textile Institute in 1977.**

   Relevance: This book is a comprehensive resource that delves into the mathematical principles applied in textile production.

5. **Weaving Technology And Operation', By Allan Armored Andwalter S Sondhel,Published by The Textile Institute in 1995.**

   Relevance: This book is a comprehensive resource that delves into the intricacies of weaving technology and its practical applications, The book covers a wide range of topics, including: Winding, Warping, Sizing, Weaving Machines, Automation in Weaving, Quality Control. These subjects are crucial for understanding the complete process of fabric production, from yarn preparation to the final woven product, making it relevant for Units 1, 2, 3, 4, 5 and 6.

6. **Weaving Technology', By N.M.Kulkarni.**

   Relevance: This book provides comprehensive information about the preparatory process of weaving and different weaving technologies of syllabus making it relevant for Units 1, 2, 3, 4, 5 and 6.

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COURSE NAME: GARMENT PATTERN DESIGNING

Course code: 4TX214M **Course: 1 (TH) 2(Pr) Credits: - 2**

Course Description:
This course is designed to provide students with a deep understanding of garment designing- from the basics to advanced techniques, and their application in the garment manufacturing industry.

Course Outcomes:
After completion of the course students will be able to:

1. Explain the scenario of apparel industry its structure, types, size, labor and products etc. and the various technological aspects and production process involved in pattern making.
2. Discuss the various technological aspects and production process involved in cutting, sewing fusing , finishing and inspection.
3. Analyze the various production systems and use of CAD-CAM in garment manufacturing.

UNIT-I: Introduction to Garment Pattern Designing

- World and Indian Scenario of Garment Industry:
  Overview of the size, sectors, structure, types of products, and recent business developments in the apparel industry, with a focus on export-related activities.
- Garment Manufacturing Process:
  Brief outline of the steps involved in industrial garment manufacturing, including pattern making, cutting, sewing, fusing, finishing, and inspection.
- Pattern Making:
  Introduction to the measurement process, size charts, and the measurement of various garment sizes.
  Understanding the definition of different garment parts and positions.

Practical:

1. Drawing and sketching different garment parts (types of sleeves, collars, patterns).
2. Sketching bodice block, skirts, trousers.
3. Sketching garments for male, female, and kids.

UNIT-II: Pattern Making Methods

- Metric Pattern Method
- Industrial Block Method
- Basic Block Construction
- Block Preparation and Corrections
- Figure Analysis:
  Study of body ideals, body proportion, height, weight distribution, and individual body analysis for all age groups (horizontal and vertical measurements).

- Muslin Pattern & Commercial Pattern:
  Fabric preparation for garment manufacturing.
- Drafting of Bodice Blocks:
- Bodice block drafting for men, women, and kids.

Practical:

1. Drafting bodice block for male.
2. Drafting bodice block for female.
3. Drafting bodice block for kids.

UNIT-III: Manipulations in Basic Blocks

- Methods of Dart Manipulation:
- Pivot Method
- Slash and Spread Method
- Point Shifting Method
- Adding Style Lines:
  Introduction to adding princess lines, empire lines, yokes, and design lines.
- Adding Fullness:
  Techniques for adding fullness with darts, pleats, tucks, and frills.
- Pattern Making Fundamentals:
  Labeling patterns, understanding the importance of grain lines, and introduction to pattern grading.

Practical:

1. Preparing patterns using dart manipulation.
2. Preparing patterns by adding style lines.
3. Preparing patterns by adding fullness (darts, pleats, tucks, frills).

TEXT BOOKS AND REFERENCES:

1. **Patternmaking for Fashion Design" by Helen Joseph-Armstrong**
Relevance: This book provides an in-depth understanding of patternmaking techniques and various methods of block construction, body analysis, and pattern manipulations. It's an essential resource for both beginners and advanced learners in pattern designing. related to unit 1,2

2. **The Art of Fashion Draping" by Connie Amaden-Crawford**
Relevance: This book complements the patternmaking process with insights into draping and the creation of garments, providing both theoretical and practical perspectives for students. Related to unit,2

3. **Patternmaking for Fashion Design" by Valerie C. Bates**
Relevance: This book explores different patternmaking methods, including the metric pattern method and industrial block method, and offers practical exercises on block preparation, drafting, and pattern alterations. related to unit,2,3

4. **Introduction to Clothing Production Management" by C. S. V. Murthy**
Relevance: This book discusses the overall structure of the apparel industry, its size, product types, and technological advancements in garment manufacturing. It ties into the syllabus content related to the apparel industry scenario and garment manufacturing processes. related to unit 1,3

5. **Computer-Aided Fashion Design" by M. S. Deshmukh**
Relevance: This book addresses the role of CAD-CAM systems in modern garment manufacturing and provides practical insights into the use of these technologies, aligning with the syllabus outcome related to analyzing production systems and technology in garment production. Related to unit 1,2,3

6. **Fashion Design: The Complete Guide" by John Hopkins**
Relevance: Hopkins' book covers various aspects of fashion design, including basic construction techniques, the manipulation of basic blocks, and adding fullness and style lines. This will be useful for students when studying the manipulation of basic blocks and pattern-making fundamentals. Related to unit 1,2,3

7. **Garment Manufacturing Technology" by K. R. Rengarajan**
Relevance: This book provides a comprehensive understanding of the garment manufacturing process, including pattern making, cutting, sewing, and finishing, which complements the syllabus sections on garment production. Related to unit,2.

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COURSE: TEXTILE TESTING AND EVALUATION-I

Course Code: 4TX215VS Course Hours: 1 Th, 2 Pr. Course Credits: 2

Course Description:
This course serves as vocational skill course of the program. It aims to enhance vocational skills by blending theoretical knowledge with practical applications, aims to provide students with a comprehensive understanding of fiber and yarn properties. The focus on both the scientific principles and the technical aspects prepares students for hands-on roles in textile testing and product development.

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

1) Understand important knowledge of fibre length measurement.

2) Explain the various methods of measurement of Transverse dimension of fibre.
3) Understand technical significance of fibre maturity.
4) Explain the various modern methods of fibre testing.
5) Demonstrate knowledge of yarn numbering and its measurement.
6) Understand technical significance and measurement of yarn twist.

SECTION A

Unit I: Longitudinal dimensions (Fibre length)

- Concept, Technical Significance of fibre length, Staple length of cotton, Length- frequency diagrams
- Fibre length measurement - Oil plate method, Comb sorter method,
- Scanning method - Digital Fibrograph.

Unit II: Transverse dimensions (Fineness)

- Concept, Measures of fineness, Technical significance of fineness
- Measurement of fineness - Microscopic method, Gravimetric method,
- Airflow method - Sheffield Micronaire.

Unit III: Fibre Maturity

- Concept, Measures of maturity, Technical significance of maturity,
- Measurement of maturity - Caustic soda method, Polarized light method, Differential dyeing method.

SECTION B

Unit IV: Miscellaneous testing and modern fibre testing

- Trash: Classification of trash, Technical significance of trash, estimation of trash content in cotton by Trash analyser.
- Neps – Concept, Classification of Neps, importance, Neps in card web –Shirley template method, nepping potential.
- Fibre Density – Concept, Measurement of fibre density.
- Fibre Quality Index and its significance.
- Modern fibre testing instruments**: -**
  High Volume Instrument (HVI), Advanced Fibre Information System (AFIS).

Unit V: Yarn Number:

- Yarn Dimension Concept, Count, Direct and indirect systems
- Count conversion, countcalculation: Spun and plied yarns.
- Measurement of yarn number: - Knowles balance, Beesley balance, Quadrant balance,
- Measurement of Yarn diameter. Relation between yarn count and yarn diameter.

Unit VI: Yarn Twist:

- Terms and definitions Function of twist in yarn structure
- Effect of twist on yarn and fabric properties, factor affecting twist
- Measurement of twist in single and double yarns – Straightened fibre method, Twist contraction method, Twist to break method, Optical method.

TEXT BOOKS AND REFERENCES:

1) **Principles of Textile Testing -J.E. Booth, CBS Publishers & Distributors, 1996.**

- **Relevance:** This book covers various aspects of statistics. The detailed content makes it a valuable reference for students, educators, and professionals in the textile industry for measurement and investigation of Textile material Physical and mechanical properties, which is crucial for understanding Units 1, 2, ,3, 4, 5 and 6 of your syllabus.

2) **Physical Testing of Textiles - B. P. Saville**

- **Relevance:** This book provides various concept, factors and effect of moisture on textile martial. The detailed content makes it a valuable reference for students, educators, and professionals in the textile industry, which is crucial for understanding Units 5 and 6 of your syllabus.

3) **Textile Testing - Grover and Hamby:**

- **Relevance:** This book is a comprehensive resource that delves into the importance of Textile Testing, method, result collection and analysis of sample data for prediction of population value which is crucial for understanding Units 1, 2 and 6 of your syllabus.

4) **Handbook of Technical Textiles - Anand and Harrocks.**

- **Relevance:** This major handbook provides comprehensive coverage of the manufacture, processing and applications of high tech textiles for a huge range of applications .Handbook of technical textiles is an essential guide for textile yarn and fibre manufacturers for new or novel applications as well as lecturers and graduate students on university textile courses, which covers unit no 6 of syllabus

5) **Handbook of Indian Standards.**

- **Relevance:** This book provides various concept, factors and effect of moisture on textile martial. The detailed content makes it a valuable reference for students, educators, and professionals in the textile industry, which is crucial for understanding Units 1 and 2

6) **Manuals of HVI, AFIS**

- **Relevance:**This Manual provides various module incorporated in the HVI and AFIS instrument for measurement physical and mechanical properties of fibre. It a valuable reference for students, educators, and professionals in the textile industry, which is crucial for understanding Units 4

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COURSE: PRINCIPLES OF MANAGEMENT

Course Code: 4TX217EM **Course Hours: 2 Th** **Credits: 2**

Course Description:

Principles of Management Objectives: To enable the students to study the evolution of Management. To study the functions, principles and application of management in an organization.

Course Outcomes:

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

1. Understand the core principles and functions of management.
2. Analyze the role of management in different organizational contexts.
3. Apply management theories to solve business problems.

Unit I : Introduction To Management:

- Definition of Management – Science or Art – Manager Vs Entrepreneur - types of managers - managerial roles and skills – Functions of Management:
- Planning, Organizing, Directing Controlling; Evolution of Management, Management thoughts: Peter Drucker's Analysis Thoughts – Scientific Management Theory by F. W. Taylor – Administrative Management Theory by Henri Fayol – Human Relations Theory by Elton Mayo and Hawthorne Experiments – Henry Mintzberg Managerial Roles.

Unit II: Planning:

- Nature and purpose of planning – planning process – types of planning – objectives – setting objectives – policies – Planning premises – Strategic Management – Planning Tools and Techniques – Decision making steps and process.
- Organizing: Nature and purpose – Formal and informal organization – organization chart – organization structure – types – Line and staff authority – departmentalization – delegation of authority – centralization and decentralization – Job Design - Human Resource Management – HR Planning, Recruitment, selection, Training and Development, Performance Management , Career planning and management.

Unit III : Directing

- Foundations of individual and group behaviour – motivation – motivation theories – motivational techniques – job satisfaction – job enrichment – leadership – types and theories of leadership – communication – process of communication – barrier in communication – effective communication .
- Controlling: System and process of controlling – budgetary and non-budgetary control techniques – Productivity problems and management – control and performance – direct and preventive control – reporting.

TEXT BOOKS AND REFERENCES:

1. **Principles of Management by P. C Tripathy & P N Reddy.**
   Relevance: This book meets the scope and sequence requirements of the introductory course on management. This is a traditional approach to management using the planning, organizing, leading and controlling approach which directly relates with Unit 1, 2.
2. **Management by Stephen P. Robbins & Mary Coulter**.
   Relevance: By blending theory with stimulating, pertinent case studies and innovative practices, this book encourages students to develop the managerial skills by understanding and applying management theories which directly relates with Unit 1.
3. **Principles of Management by David S. Bright, Anastasia H. Cortes, Open Stax Textbooks**
   Relevance: This book meets the scope and sequence requirements of the introductory course on management. This is a traditional approach to management using the planning, organizing, leading and controlling approach which directly relates with Unit 1, 2, 3.
4. **Fundamentals of Managements by R. W. Griffin**
   Relevance: This book provides up-to-date coverage to key functional areas (planning, organizing, leading, and controlling) plus new research and examples, all in a brief format. It also focuses on ethical issues and questions facing by today's managers which directly relates with Unit 1, 2, 3..
5. **The Evolution of Management Thought, 9th Edition, Daniel A. Wren, Arthur G. Bedeian**
   Relevance: This book describe the information about historical development of modern management's many roots, and explains how ideas about the nature of work, the nature of human beings, and the nature of organizations have changed throughout history which directly relates with Unit 1, 2, 3..

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EXIT COURSE: CHEMICAL PROCESSING OF TEXTILE MATERIALS

Course Hours: 60 Credits: 4

Duration: To be undertaken after the 2nd semester
Prerequisites: Basic knowledge of textile fundamentals

Course Description:
This course provides an in-depth understanding of the chemical processes involved in the treatment and finishing of textile materials. It explores preparatory processes, dyeing techniques, finishing operations, and innovations in textile chemical treatments. The course bridges theoretical principles and practical applications, enabling students to design, analyze, and optimize processes used in the textile industry.

Course Outcomes:
Upon successful completion of the course, students will be able to:

1. Understand the fundamental chemistry and techniques involved in the processing of textile materials.
2. Analyze and apply preparatory processes, such as desizing, scouring, bleaching, and mercerizing, to various textile fibers.
3. Examine principles and methods of dyeing, printing, and finishing, including their influence on fabric properties.
4. Demonstrate the principles and methods of dyeing,
5. Demonstrate the principles and methods of printing,
6. Eco friendly methods of various processes.

Unit 1: Introduction to Textile Chemical Processing;

- Sequence of wet processing in the textile value chain. Preparatory Processes: -Desizing- Purpose, methods, and chemicals used;

Unit 2: Preparatory Processes;

- Scouring- Removal of natural impurities; alkali treatment of cotton; Bleaching -Optical brighteners and whitening agents;
- Mercerization- Principle, process, and effects on properties of cotton fibers.

Unit 3: Dyeing Techniques:

- Classification of dyes- natural, synthetic, direct, reactive, disperse, vat, acid, and basic dyes.
- Dyeing of natural and synthetic fibers.
- Dyeing machinery: winch, jigger, jet, and beam dyeing machines. Colorfastness properties and testing.

Unit: 4 Printing of Textiles

- Printing methods: block printing, screen printing (manual, flat-bed, rotary),
- Transfer printing, and digital printing.
- Printing pastes and thickeners. Fixation of prints and after-treatments.

Unit: 5 Finishing Processes

- Mechanical Finishes: Calendaring, sanforizing, raising, shearing.
- Chemical Finishes- Wrinkle-free, softening, water repellent, flame retardant, anti-static finishes.
- Innovations in functional finishes: antimicrobial, UV-protective, and temperature-regulating finishes.

Unit: 6 Eco friendly Processes

- Eco friendly processes of desizing, scouring, bleaching.
- Natural dyes, Novel dyeing and printing processes.

RECOMMENDED TEXT BOOKS AND REFERENCES:

1. **Chemical Processing of Textiles by Dr. V. A. Shenai**.
   Relevance: This book provides textile chemical processing which is directly related with units 1, 2, 3.
2. **Principles of Textile Finishing by Dr. J. T. Marsh**.
   Relevance: This book provides principles of textile finishing which is directly related with unit 4.
3. **Technology of Textile Processing Series by R. H. Peters**.
   Relevance: This book provides technology of textile processing which is directly related with units 1, 2, 3
4. **Journals and research articles on recent advances in textile wet processing.**
   Relevance: This journal provides recent advances in textile wet processing which is directly relates with Unit 4.

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EXIT COURSE: FABRIC AND GARMENT INSPECTION

Contact Hrs: 60 **Credits:** 4 **Duration:** To be undertaken after the 2nd semester.

Prerequisites: Basic knowledge of textile fundamentals

Coursed Description:
This course provides foundational knowledge of fabric and garment inspection techniques, emphasizing industry standards and quality control procedures. Students will develop understanding about identifying and assessing defects in textiles and garments. Also they will gain the expertise to recommend corrective actions for improving manufacturing processes.

Course Outcomes:
Upon successful completion of the course, students will be able to:

1. Understand the fundamental involved in the fabric and garment inspection techniques.
2. Analyze and apply industry standards and quality control procedures.
3. Analyze and apply measures to control garment defects
4. Explain the need and application of advanced inspection technologies
5. Demonstrate knowledge of ethical practices in defect reporting and certification.
6. Understand sustainability and apply related practices in the textile and apparel industry

Course Content:

Unit 1: Introduction to Fabric and Garment Inspection
- Importance of inspection in the textile industry.
- Overview of fabric and garment production processes.
- Key concepts: Defects, tolerances, and quality standards.

Unit 2: Fabric Inspection
- Types of fabric defects (weaving, dyeing, printing).
- Fabric inspection systems: 4-point and 10-point grading systems.
- Fabric testing techniques: Strength, colourfastness, dimensional stability etc.

Unit 3: Garment Inspection
- Garment defects: Measurement, stitching, finishing, and fit issues.
- Inspection techniques: Visual inspection, dimensional checks, and testing tools.
- Role of inspection in garment manufacturing and exports.

Unit 4: Industry Standards and Certifications
- Quality standards: ISO, ASTM, AATCC, and OEKO-TEX.
- Documentation and reporting of inspection results.
- Importance of eco-friendly and sustainable practices in quality control.
- Role of inspection in ensuring adherence to standards like Fair Trade and SA8000

Unit 5: Advanced Inspection Technologies (Weeks 11-12)
- Automated inspection systems for fabrics and garments.
- Use of AI and machine learning in defect detection.
- Role of digital tools like CAD and CAM in quality control.
- Emerging trends: Smart textiles and their inspection challenges.

Unit 6: Introduction to Sustainability in Quality Control (Weeks 12 -16)
- Importance of sustainability in the textile and apparel industry.
- Reducing waste in inspection processes.
- Insights into circular economy principles in defect management.
- Ethical considerations in defect reporting and certification.
- Key compliance standards for sustainability and ethics.

RECOMMENDED TEXT BOOKS AND REFERENCES :

1. Textiles: Fiber to Fabric" by Bernard P. Corbman
- **Relevance:** Provides a solid understanding of textile processes, fabric characteristics, and quality control fundamentals, which are essential for understanding fabric and garment inspection which directly relates with unit 1.

2. Introduction to Clothing Production Management" by A. J. Chuter
- **Relevance**: Covers garment manufacturing processes, including inspection and quality control, with practical insights into defect identification and correction which directly relates with units 1, 2 and 3.

3. Quality Management Handbook for the Apparel Industry" by Pradip V. Mehta and Satish K. Bhardwaj
- **Relevance:** Focuses on quality standards, inspection techniques, and defect rectification strategies specific to the apparel industry which directly relates with unit 1, 2 and 3

4. Textile Testing and Quality Control" by Elliot B. Grover and D. S. Hamby
- **Relevance**: Offers comprehensive coverage of fabric and garment testing methods, including industry standards like ISO, ASTM, and AATCC3 which directly relates with unit 3 and 4

5. Garment Manufacturing Technology" by RajkishoreNayak and Rajiv Padhye
- **Relevance:** Discusses garment defects, inspection practices, and the role of advanced technologies like AI and automation in defect detection which directly relates with unit 1, 2 and 3

6. ISO 9001: 2015 – A Complete Guide to Quality Management Systems" by ItayAbuhav
- **Relevance**: Explains the principles of quality management and certification relevant to fabric and garment inspection which directly relates with unit 4

7. Smart Textiles: Fundamentals, Design, and Interaction" by Stefan Schneegass and Oliver Amft

- **Relevance**: Covers emerging trends and challenges in inspecting smart textiles, as discussed in the advanced inspection technologies unit 6.

8. Automation in Garment Manufacturing" by Rajkishore Nayak and Rajiv Padhye

- **Relevance**: Details automated inspection systems and digital tools like CAD/CAM, linking directly to the course's advanced technologies unit 6.

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EXIT COURSE: INTERNSHIP IN DESIGNING AND QUALITY CONTROL IN GARMENT INDUSTRY

Credits: 8 **Duration:** To be undertaken after the 2nd semester of Minimum 6 Weeks

Prerequisites: Basic knowledge of textile fundamentals

Internship Description:
This internship offers hands-on experience in garment design and quality control, providing students with practical exposure to industry workflows. Students will get real time exposure in design software, tools, and techniques. Eventually it will help to develop the ability to identify and address quality issues. The internship emphasizes real-world applications and industry best practices to prepare students for professional roles in garment design and production**.**

Internship Outcomes:
After completing the internship, students will be able to:

1. Apply theoretical knowledge in practical industry settings.
2. Use garment design software (e.g., CAD tools) for creating patterns and layouts.
3. Conduct quality checks for garments and recommend corrective measures.
4. Document findings and present solutions to industry professionals.

Internship Activities:
Week 1: Orientation and Familiarization

- Introduction to the organization’s departments and workflows.
- Overview of designing tools (e.g., CAD software) and quality control equipment.

Week 2 & 3: Designing Department Activities

- Understanding garment design principles.
- Pattern-making, grading, and layout creation.
- Assisting in design projects under supervision.

Week 4 &5: Quality Control Department Activities

- Learning inspection techniques for garments.
- Identifying defects in stitching, measurement, and finishing.
- Analyzing quality reports and suggesting improvements.

Week 6: Consolidation and Reporting

- Integration of design and quality control findings.
- Preparing a comprehensive report summarizing experiences and learning outcomes.
- Presentation to faculty and industry mentors.

Assessment Criteria:

1. **Internship Logbook:** 20%
2. **Final Internship Report:** 40%
3. **Presentation and Viva:** 40%

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EXIT COURSE - MODERN YARN AND FABRIC MANUFACTURING TECHNOLOGY

Contact Hrs: 60 Credits: 4

Course Description:

This course serves as a core subject of the program. This course focuses on fundamental concepts related to advance yarn manufacturing processes. Through a series of lectures, students will be briefly introduced to key terms, principles, and modern processes involved in yarn and fabric production.

Course Outcomes:
By the end of this course, students should be able to:

1. Demonstrate the principle of rotor, friction spinning and constructional details of rotor and friction spinning machines.
2. Illustrate Demonstrate the concept of air jet, air vortex spinning and constructional details of air jet and air vortex spinning machines

3. Evaluate process parameters influencing performance of rotor, friction, air jet, air vortex spinning.
4. Describe the theories of picking power, complexities and performance limitations of shuttle loom. Also will able to demonstrate the knowledge about various technical requirements of shuttle -less weaving technology.
5. Recall the technical features, design and working principle of projectile weaving machine.
6. Recall the technical features, design and working principle of rapier weaving machine.

Course Topics:

SECTION 'A'

Unit 1: Rotor Spinning

- Introduction, open end spinning principle, sequence of operations,
- Advantages and limitation of ring and rotor spinning,
- Construction details of rotor spinning machines,
- Process parameters influencing yarn quality,
- Properties of rotor yarn, details of yarn structure,
- Applications of rotor yarn, comparison of properties of rotor and ring yarn

Unit 2: Friction Spinning

- Introduction, principle of friction spinning, sequence of operation in fiction spinning,
- Construction details of different friction spinning machines-dref-I, dref-II, dref-III, dref-2000 and dref-3000.
- Advantages and limitations of friction spinning,
- Process parameters influencing yarn quality,
- Details of yarn structure, properties of friction yarn,
- Applications of friction yarn, recent developments in friction spinning.

Unit 3: Air Jet & Air Vortex Spinning

- Air jet spinning: Introduction, principle of air jet spinning,
- Construction details of air jet spinning machines,
- Details of yarn structure, properties and applications of air jet yarn
- Air vortex spinning- Introduction, principle of air vortex spinning,
- Construction details of air vortex spinning machine,
- Details of yarn structure, properties and application of air vortex yarn.

SECTION 'B'

Unit 4: Projectile Weaving

- Limitations and complexities of shuttle loom:
- Introduction to shuttle-less weaving - Classification of shuttle-less weaving machines,
- Theories of weft velocities and acceleration, weft accumulator, weft measuring systems, cam beat up, selvedges formation on shuttle-less weaving machines,
- Projectile weaving: Introduction, technical features, advantages,
- Design of projectile, phases of weft insertion, projectile picking mechanism,
- Timing cycle of projectile weaving, weft tension variation, energy utilization, scope.

Unit 5: Rapier Weaving

- Rapier weaving: Classification of rapier weaving machines, rigid and flexible rapiers,
- Methods of weft insertion viz. Dewas and Gabbler, rapier driving mechanism,
- Design of rapier heads ,displacement and velocity of rapiers, weft control mechanism,
- Weaving timings, utilization, scope,
- Latest developments in rapier weft insertion, shedding, take up,
- Selvedge formation and quick style change.

Unit 6: Air Jet and Multi Phase Weaving

- Air jet weaving: Theories of fluid flow applicable to fluid based weft insertion,
- Air stream, friction/ drag forces, principle of air weaving, phases of weft insertion,
- Air requirements, air jet nozzles, buckling of weft, traverse aids for air flow,
- Profile reed and relay nozzles, methods of air jet control,
- Timings of air jet loom, scope and limitations of air jet weaving.
- Introduction to multi phase weaving

TEXT BOOKS & REFERENCE BOOKS :

1. **Klein W, Manual of New Spinning System Vol. I – III, The Textile Institute, UK, 1987.**

- **Relevance:** This book provides comprehensive information on new spinning process including rotor spinning, friction spinning and air jet spinning, which are crucial for understanding Units 1 to 3 of your syllabus.

2. **Oxtoby E, Spun Yarn Technology, by Butterworth and Co. Ltd. publication, 1987**.

- **Relevance:** This book covers various spinning process such as new spinning system which relates to Unit 1, 2 and Unit 3.

3. **Lord P R, Handbook of Yarn Production The Textile Institute, Woodhead Publication Limited.**

- **Relevance:** This book offers detailed information on various advance yarn production methods, including rotor spinning, friction spinning and air jet spinning which relates to unit 1, 2and 3.

4. **Allen Armord, Handbook of Weaving operations**

- **Relevance:** This book discusses principles of shuttleless weaving, constructional details of modern weaving machines which supports the topics covered in Unit 4,5,6 (Projectile weaving, Rapier Weaving, Air jet weaving and Multi phase weaving).

5. **SabitAdnur Handbook of Weaving**

- **Relevance:** This book discusses principles of shuttleless weaving, constructional details of modern weaving machines which supports the topics covered in Unit 4,5,6 (Projectile weaving, Rapier Weaving, Air jet weaving and Multi phase weaving).

6. **R.Marks, A.T.C.Robinson, Principle of Weaving**

- **Relevance:** This book provides comprehensive information on weaving principles and process and including shuttle weaving and shuttleless weaving which are crucial for understanding Units 4 to 6 of your syllabus.

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