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| **Programme Name** | **Bachelor of Technology in Textile Technology** | **Semester VII** |
| **Course Title** | **TECHNICAL TEXTILES - I** |
| **Course Code** | **PCC-TEX-401A** |
| **Course Purpose** | - To make student aware of non-apparel functions performed by textilesubstrates |
| **Course Outcomes** | After completing this course, students will be able to: CO1 – Define and classify the technical textile.CO2 – Explain the properties of technical textile materials. CO3–Explain the functioning and applications of textile material in filtration, geotextile and transportation.CO4 – Design the fabric for technical textile application |
| **Prerequisite** | Knowledge of textile materials and their production methods. |

# PCC-TEX-401A TECHNICAL TEXTILES - I

**L T P Sessional: 25 Marks**

# 4 1 - Exam: 75 Marks

**Total: 100 Marks**

# Time: 3 hrs

**Note**- *Nine questions will be set in the question paper i.e. two from each unit. The students will be required to attempt one question from each unit****.*** *Question no. 1 is compulsory. It is objective type 10 questions of multiple choices covering the entire four units.*

# Unit I

Introduction, definition and growth of technical textiles, Classification of Technical Textiles. Brief idea about technical fibres. Role of yarn construction, fabric construction and composite materials. Differentiate technical textile from traditional textile. Present market and future market trends of technical textile.

# Unit II Filtration:

Textile and other filter media for dry and wet filtration. Filtration parameters. Theory of dust collection and solid liquid separation. Filtration requirements. Role of fibre, fabric construction and finishing treatments. Concept of pore size and particle size. Nano filters. Fabric test equipments. Types of nonwoven filter media available in market and their usages and efficiencies.

# Unit III Geotextiles:

Scope, definition, Types of geo textiles and their uses. Functions and application areas of Geotextiles. Essential properties. Fibre and fabric selection criteria for geotextile applications. Advantages and disadvantages of woven, non-woven geotextiles, Mechanics of reinforcement, filtration and drainage by Geotextiles.

# Natural fibre Geotextiles.

Methods of long term prediction of geotextile life and survivability in soil. Geotextile testing and evaluation.

# Unit IV

**Textiles in Transportation:**

Introduction to automotive textile. Application of textiles in automobiles. Fibre requirements. Textile in passenger cars, tyres, airbags, seat belts, hoses and filters. Requirement and design options Textiles in other road vehicles. Railway application. Application in aircraft and marine. Textile as structural elements in transport vehicles.

# Suggested Text Books & References

1. “Handbook of Technical Textiles”, Ed. A R Horrcks and S C Anand, Woodhead Publication Ltd, Cambridge, 2000
2. “Handbook of Industrial Textiles”, Ed. Sabit Adanur, Technomic Publishing Co. INC

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| **Programme Name** | **Bachelor of Technology in Textiles Technology** | **Semester VII** |
| **Course Title** | **ADVANCED CHEMICAL PROCESSING** |
| **Course Code** | **PCC-TEX-403A** |
| **Purpose** | -To study the advance chemical processes and computer colour matching(CCM) system for textile materials |
| **Course Outcomes** | After completing this course student will be able to:CO1- Adapt the advance and ecofriendly methods of pretreatment and dyeing processes for superior processing quality.CO2-Explain the novel printing techniques and functional finishes. CO3-Understand the various light sources and colour matching functions used in CCM.CO4-Understand the working principle and use of spectrophotometer incolour matching and recipe prediction for textile materials. |
| **Prerequisite** | Basic knowledge of textile chemical processing |

# PCC-TEX-403A ADVANCED CHEMICAL PROCESSING

**L T P Sessional: 25 Marks**

# 4 1 - Exam: 75 Marks

# Total: 100 Marks

**Time: 3 hrs**

**Note**-*Nine questions will be set in the question paper i.e. two from each unit. The students will be required to attempt one question from each unit****.*** *Question no. 1 is compulsory. It is objective type 10 questions of multiple choices covering the entire four units.*

**Unit I:**

Continuous open width processing, use of eco-friendly enzymes in wet processing, Super critical CO2 dyeing, New reactive and disperse dyes, Grading and methods to determine fastness relating to washing, light, perspiration, sublimation and hot-pressing treatment.

**Unit II:**

Novel printing techniques like Ink Jet printing or digital printing, zero formaldehyde easy-care finishes, polysiloxanes based softener, Breathable water-proof fabrics, Antimicrobial finishing of textiles, Self- cleaning and Low wet pick-up techniques.

**Unit III:**

Fundamentals of colour science, Sources of natural and artificial light, CIE illuminants, absorption and scattering of l ig ht , B e e r -Lambert law, Additive and subtractive mixing, Standard observer color matching function, Tristimulus values, Chromaticity coordinates, Kubelka-Munk equation, Metameres.

**Unit IV:**

Principle of spectrophotometer, Colorimeter, Munsell system of color specification, Whiteness and yellowness indices, Computer aided color matching and recipe prediction.

# Suggested Text Books & References

1. “Instrumental Colour Measurements and Computer Aided Colour Matching for Textiles”, Shah

H.S. & Gandhi R.S., Mahajan Book Distributors.

1. “Computer Colour Analysis: Textile Applications” by Sule A.D.
2. “Computer Aided Colour Matching”, by Shore J, SDC U.K 1998, ISBN.
3. “Textile Finishing”, Heywood D.,
4. “Chemical Finishing of Textiles”, by Schindler W.D & and Hauser P.J.
5. Colourage Journal.
6. Asian Dyer
7. Asian Textile Journal
8. Man-made Textiles in India 10 AATCC Technical Manual.

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| **Programme Name** | **Bachelor of Technology in Textile Technology** | **Semester VII** |
| **Course Title** | **PROCESS CONTROL IN SPINNING & WEAVING** |
| **Course Code** | **PEC-TEX-409A** |
| **Purpose** | To study the process controls in spinning and weaving for achieving desired quality and efficiency |
| **Course Outcomes** | After completing this course, students will be able to:CO1- Understand the approach and methodology of process control.CO2- Identify various performance parameters to control spinning process. CO3-Identify various performance parameters for controlling weaving process.CO4-Calculate the machine productivity index, efficiency, labour andmachine allocation in spinning and weaving. |
| **Prerequisite** | Knowledge of textile manufacturing and process |

# PEC-TEX-409A

**PROCESS CONTROL IN SPINNING & WEAVING**

# L T P Sessional: 25 Marks

**3 1 - Exam: 75 Marks**

# Total: 100 Marks

**Time: 3 hrs**

**Note**- *Nine questions will be set in the question paper i.e. two from each unit. The students will be required to attempt one question from each unit****.*** *Question no. 1 is compulsory. It is objective type questions of multiple choices covering the entire four units.*

# Unit I

Introduction, importance of process control in spinning, key variables, establishing norms, collection & interpretation of data for process control, maximizing quality & cost evaluation of fibre quality, linear programming for cotton mixing, yarn realization, estimation & control of yarn realization, waste & their norms.

# Unit 2

**Process control in preparatory**: Control of cotton contamination, control of cleaning efficiency and waste in blow room and card, comber, control of neps in sliver at card draw-frame and comber stage. **Process control at yarn stage**: Control of yarn imperfections and faults in yarns, control of yarn count and count CV%., control of strength, and strength CV%., control of periodic mass variations, package faults, calculations pertaining to production, productivity indices and evaluation of indices in spinning efficiency and machine allocation in preparatory and ring spinning

# Unit 3 Weaving:

Approach, methodology and scope for process control in weaving.

**Process control in winding**: Knot quality, efficient removal of yarn faults and the control of productivity.

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

**Process control in sizing**: Choice and the control of size pick-up, yarn stretch and moisture in sized yarns. Improving weavability of the sized yarn and the control of productivity and size losses.

**Process control in pirn winding**: Minimizing end breaks and stoppages. Improving the build of the pirn and the productivity. Process control in Loomshed

# Unit 4

**Productivity**

Definition, idea of productivity calculations of weaving mill and factors affecting productivity, productivity indices used in weaving, relation between machine allocation and machine efficiency, calculations pertaining to production, efficiency and machine allocation in winding, warping, pirn winding, sizing and loom shed.

Material handling in spinning / weaving department, humidification and air-conditioning provisions, ventilation & air changes

# Suggested Text Books & References

1. Garde A R and Subramanian T A, “Process Control in Cotton Spinning,” ATIRA, Ahmedabad, 2nd Ed., 1978.
2. Paliwal M C and Kimothi P D,” Process Control in weaving”, ATIRA, Ahmedabad 2ndEd, 1978.
3. Gokhale S V and Modi J R, “Process and Quality Control in Chemical Processing of Textiles”, ATIRA, Ahmedabad, 1992
4. Ratanam T V, “Quality control in spinning”, SITRA, Coimbatore, 1994.
5. Salhotra K R, Chattopadhyay R and Ishtiaque S M, “Process control in spinning”, IIT, Delhi, CD cell, 2001
6. Thilagvathy G. and Kartik T., “Process control and yarn quality in spinning

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| **Programme Name** | **Bachelor of Technology in Textile Technology** | **Semester VII** |
| **Course Title** | **Process Control in Garment** |
| **Course Code** | **PEC-TEX-411A** |
| **Purpose** | -To understand the concept of automation based garment manufacturing.-To study quality control aspects in garment manufacturing. |
| **Course Outcome** | After completing this course students will be able to:CO1: Understand latest garment manufacturing technologies. CO2: Discuss the concept of production, planning and control.CO3: Select the sewing thread, stitch and seam for various applications. CO4: Describe quality control aspects of needle, sewing thread, stitch and seam.CO5: Understand the quality management in garment industry. |
| **Prerequisite** | Students should have basic knowledge of Garment Technology. |

# PEC-TEX-411A

**PROCESS CONTROL IN GARMENT**

L T P Sessional: 25 Marks

3 1 - Exam: 75 Marks

Total: 100 Marks

Time: 3 hrs

**Note**- *Nine questions will be set in the question paper i.e. two from each unit. The students will be required to attempt one question from each unit****.*** *Question no. 1 is compulsory. It is objective type 10 questions of multiple choices covering the entire four units.*

# UNIT-I

Automation in Garment Industry- Latest machinery in design, pattern making, marker making, cutting, sewing, embroidery and programmable machines.

Production planning in garment manufacturing-Apparel production systems and their comparative assessment, Quantitative Production Analysis viz. check list, Ergonomics in apparel industry.

# UNIT-II

Stitch application for woven and knitted garment, Proper stitch formation.

Common seam quality defect: Seam rupture on stretch knits, Seam grinning, Skipped stitches, Stitch Cracking and Seam slippage.

Seam puckering: Types, major causes and solution to puckering.

# UNIT-III

Sewing Thread selection: Right thread to optimize seam quality, fibre type, thread construction, thread size. Advantages of core-spun sewing thread, Quality aspect of industrial sewing thread, Needle size, needle numbering system, Needle cutting, Causes and remedies

Quality parameters for assessing sewability.

**UNIT-IV**

Define Quality, Quality Control and Quality Assurance, Different quality control methods used in garment industry, Quality tools viz. Control charts, Pareto charts, Fish bone diagram, Scatter plots, Histogram and Six Sigma

Inspection systems–raw material inspection, in process inspection, final inspection, Inspection standards

# Suggested Text Books & References

1. An Introduction to Quality Control for Apparel Industry by PV Mehta
2. Managing Quality for Apparel Industry by PV Mehta & SK Bhardwaj
3. Garment Technology, NCUTE Publication
4. Testing and Quality Management (Vol-1) by V.K. Kothari

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| **Programme Name** | **Bachelor of Technology in Textile Technology** | **Semester VII** |
| **Course Title** | **Process Control in Chemical Processing** |
| **Course Code** | **PEC-TEX-413A** |
| **Purpose** | To understand the various aspects of process and quality control in wetprocessing of textiles. |
| **Course Outcome** | After completing this course students will be able to:CO1: Understand process control parameters in grey fabric.CO2: Discuss the process control parameters in pretreatment process. CO3: Explain quality control parameters for dyeing, printing and finishing. CO4: Summarise evaluation test methods for dyes, chemicals, auxiliariesand pretreated fabrics. |
| **Prerequisite** | Students should have knowledge of Textile Chemical Processing I andTextile Chemical Processing II |

# PEC-TEX-413A

**PROCESS CONTROL IN CHEMICAL PROCESSING**

L T P Sessional: 25 Marks

3 1 - Exam: 75 Marks

Total: 100 Marks

Time: 3 hrs

**Note**- *Nine questions will be set in the question paper i.e. two from each unit. The students will be required to attempt one question from each unit****.*** *Question no. 1 is compulsory. It is objective type 10 questions of multiple choices covering the entire four units*.

# Unit I

Importance of process and quality control in chemical processing. Quality of grey fabrics, selvedge quality, stains in grey fabric, overall assessment of quality of grey fabrics.

Stitching of grey pieces, common stitching defects and method for assessing stitching quality. Process control in shearing and cropping.

# Unit II

**Singeing** - Process control in singeing, parameters to control the singeing process **Desizing** - Enzyme desizing, parameters to control the enzyme desizing process **Scouring** - Parameters to control the pressure boil scouring

**Mercerizing** – Parameters to control the mercerization process,

**Bleaching –** Sodium hypochlorite & Hydrogen peroxide, treatment on J-Box, pad roll bleaching, washing and drying.

Process control in Heat Setting process.

# Unit III

**Process control in Dyeing** - Fiber and yarn package dyeing.

**Fabric dyeing -** Satisfying basic needs, selection of dyes, process control in jigger dyeing, high temperature beam or jet dyeing, continuous dyeing.

**Process control in Printing**: Selection of thickening agent and preparation of printing paste, printing recipe, printing, fixation, after treatments.

**Process control in Finishing**: Stenter or felt calendar for temporary finishes. durable finishes: resin finishing, calendaring, weight reduction and carbonization.

**Unit IV:**

**Evaluation of dyes, textile chemicals and auxiliaries** - Dyestuff performance test, Wetting agents, Levelling Agents, Cross linking Agents, Thickeners & Binders for printing, OBA, Softeners etc.

**Evaluation of processed fabric at different stages**: desizing, scouring, bleaching mercerization, heat setting, dyed printed and finished fabric.

# References

1. ATIRA / BTRA Books and Journals.
2. “Process Control in Processing” by ATIRA.
3. Testing and Quality Management – Vol.-I by Dr. V.K. Kothari, IAFL Publication, S-351, Greater Kailash Part-I, New Delhi.

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| **Programme Name** | **Bachelor of Technology in Textile Engineering** | **Semester – VII** |
| **Course Code** | **OEC-TEX-415A** |
| **Course Title** | **Fundamental of Management** |
| **Purpose** | To study the principles and practices of management. |
| **Course Outcomes** | After completing this course, students will be able to: CO1 – Understand the concept of Financial management.CO2– Enumerate the various functions performed by personnel management. CO3 – Get idea of production management.CO4 – Describe nature, scope and importance of marketing management |
| **Prerequisites** | Basic idea of fundamental of management |

# OEC-TEX-415A FUNDAMENTAL OF MANAGEMENT

**L T P Sessional: 25 Marks**

# 4 1 - Exam: 75 Marks

**Total: 100 Marks**

# Time: 3 hrs

## Note:

*Nine questions will be set in the question paper i.e. two from each unit. The student will be required to attempt one question from each unit. Question No.1 is compulsory. It is objective type 15 questions of multiple choice covering all the four units.*

# UNIT-I Financial Management

Introduction of Financial Management, Objectives of Financial Decisions, Status and duties of Financial Executives. Financial Planning – Tools of financial planning. Management of working capital, Factors affecting requirements of working capital. Capital structure decisions. Features of appropriate capital structure. Sources of finance.

# UNIT-II Personnel Management

Personnel Management – Meaning, Nature and Importance; Functions of Personnel

Management – (a) Managerial Functions and (b) Operative functions. Job Analysis: Meaning and Importance; Process of Job Analysis; Job Description and Job specification. Human Resource Development- Meaning and concept.

# UNIT-III Production Management

Production Management: Definition and Objectives

Plant location: Ideal plant location. Factors affecting plant location. Plant Layout: Ideal plant layout, factors affecting plant layout.

Work Measurement: Meaning, Objectives and Essentials of work measurement.

Production Control: Meaning and importance of production control and steps involved in production control.

# UNIT-IV Marketing Management

Modern Nature, scope and importance of marketing management. Marketing concepts. Role of marketing in economic development. Marketing Mix. Marketing Information System. Meaning, nature and scope of International Marketing.

# Suggested Text Books and References

1. Principles and Practice of Management - R.S. Gupta, B. D. Sharma, N.S. Bhalla. (Kalyani Publishers)
2. Organization and Management - R.D. Aggarwal (Tata Mc Graw Hill)
3. Principles & Practices of Management – L.M. Prasad (Sultan Chand & Sons)
4. Management – Harold, Koontz and Cyrilo Donell (Mc.Graw Hill).
5. Financial Management - I.M. Pandey (Vikas Publishing House, New Delhi)
6. Management - James A.F. Stoner & R. Edward Freeman, PHI.
7. Marketing Management- Philip Kotler, PHI

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| **Programme Name** | **Bachelor of Technology in Textile Engineering** | **Semester – VII** |
| **Course Code** | **OEC-TEX-417A** |
| **Course Title** | **Statistics Analysis** |
| **Purpose** | To study different statistical tools useful for solving engineering problems. |
| **Course Outcomes** | After completing this course, students will be able to:CO1-Apply fundamentals of statistics in solving engineering problems. CO2-Understand concepts of probability theory and probability distributions CO3-Test for statistical hypothesis and its significanceCO4-Make use of control chart and ANOVA to solve the statistical problems. CO4- Analyse correlation and regression of given data. |
| **Prerequisites** | Knowledge of Mathematics |

# OEC-TEX-417A STATISTICAL ANALYSES

**L T P Sessional: 25 Marks**

# 4 1 - Exam: 75 Marks

**Total: 100 Marks**

# Time: 3 hrs

## Note:

*Nine questions will be set in the question paper i.e. two from each unit. The student will be required to attempt one question from each unit. Question No.1 is compulsory. It is objective type questions of multiple choice covering all the four units.*

# Unit I

**Foundations of statistics**:

Basic concepts of statistics, collection sampling, classification and graphical representation of data, Measures of central tendency. Numerical problems.

# Sampling Theory:

Population and sample, types of sampling, sampling classification and graphical representation of data, measures of central tendency, control charts.

# Unit II

Measures o f Dispersion Range, Quartile deviation, standard deviation, moments, skewness and kurtosis (Definition, properties and associated numerical only).Theory of Probability Different approaches to probability, Additive and Multiplicative, Laws of probability, Baye’s theorem.

# Unit III

**Tests of hypothesis and significance**:

Definition of Statistical hypothesis, Null hypothesis. Type me and II errors and Levels of significance, Standard error and sampling distribution, Tests of significance for Large and small Samples (discussion). Problems based on χ2-test for goodness of fit, Student’s t-Test and Analysis of variance (one way and two way classifications.

# Unit 4

**Regression & correlation**:

Karl Pearson’s coefficient of correlation, Rank correlation coefficient and lines of regression, Numerical problems, factorial design and analysis.

# Suggested Text Books and References

1. Ray and Sharma, “Mathematical Statistics”
2. Bowker, A.H., and Lieberman, G.J., “Engineering statistics”, Prentice Hall, N.J.1972
3. Murray P Spiegel, “Theory & Problems of Probability & Statistics”
4. Bhattacharya, G.K., and Johnson, R.A.,” Statistical concepts and methods”, John Wiley, New Delhi, 2002.
5. Hogg, R.V, Elliot, A.T., ”Probability and Statistical Inference”, Pearson Education, 6th Edition

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| **Programme Name** | **Bachelor of Technology in Textile Engineering** | **Semester – VII** |
| **Course Code** | **OEC-TEX-419A** |
| **Course Title** | **Theory and Design of Textile Machinery** |
| **Purpose** |  |
| **Course Outcomes** | CO1- To know about various machine parts, its mechanisms,CO2- Illustrate benefits of different cams and follower motions scheme CO3- To impart Knowledge on kinematic properties of gearsCO4- To understand the design of several types of belt and chain drives |
| **Prerequisites** |  |

# OEC-TEX-419A

**THEORY AND DESIGN OF TEXTILE MACHINERY**

L T P Sessional: 25 Marks

4 1 - Exam: 75 Marks

Total: 100 Marks

Time: 3 hrs

## Note:

*Nine questions will be set in the question paper i.e. two from each unit. The student will be required to attempt one question from each unit. Question No.1 is compulsory. It is objective type questions of multiple choice covering all the four units.*

# Unit I

**Basic concepts**: Kinematics of machine, kinematics link and their different type, types of kinematics pair, degree of freedom, kinematics chain, mechanism and inversion of four bar chain, single slider and double slider crank mechanism.

**Velocity Analysis**: Motion of a link, velocity of a point on a link by relative velocity method, velocities of four bar mechanism, single slider crank mechanisms, rubbing velocity at a pin joint. Velocity of a point on a link by instantaneous centre method, properties and types of I-centre, Kennedy theorem and methods of locating I-centres in a mechanism.

# Unit II

**Belt, rope and chain drive**: Types of belt drives, velocity ratio, law of belting, concept of slip and creep, length of belt, ratio of driving tensions for flat belt and vbelt, power transmitted, effect of centrifugal tension on power transmission, condition for maximum power transmission, initial tension in the belt. Use of Vbelt, rope, chain, chain length and angular speed ratio, relative advantage and disadvantage of chain and belt drives.

**Gears**: Classification of gears, terminology used in gear, law of gearing, velocity of sliding, forms of teeth, construction, properties and comparison of an involute and cycloidal teeth, effect of centre distance variation on the velocity ratio, length of path of contact, arc of contact, number of pairs of teeth in contact, interference, minimum number of teeth on the pinion and wheel to avoid interference, minimum number of teeth on the pinion for involute rack to avoid interference, undercutting, terminology of helical and worm gears.

# Unit III

**Gear trains**: Definition, types: simple, compound, reverted and epicyclic gear trains, velocity ratio of epicyclic and compound epicyclic gear trains.

**Cams and follower**: Types of cams and followers, cam terminology, types of motion of the follower, analysis of motion of the follower, analysis of motion of the follower for cams with specified contours.

# Unit IV

**Flywheels**: Turning moment diagram for steam engine, four stroke internal combustion engines, fluctuation of energy, maximum fluctuation of energy, coefficient of fluctuation of energy, energy stored in flywheel, use of flywheel.

Application in Textiles: Belts, chains and gear drives in textile machines. Different types of cam and followers used in textile machines.

# Suggested Text Books and References

1. Khurmi R.S and Gupta ―Theory of Machineǁ S. Chand Publisher, New Delhi.
2. Bansal R K, ―A text book of Theory of Machinesǁ, Laxmi Publication Pvt. Ltd, New Delhi.
3. Rattan S S, ―Theory of Machinesǁ, Tata McGraw Hill, New Delhi, 2001.
4. Ghosh A and Mallik A K, ―Theory of mechanism and machinesǁ, Affiliated East West Press Pvt. Ltd, New Delhi, 198
5. Bevan T, ―The Theory of Machines, CBS Publishers and Distributors, New Delhi, 2002

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| **Programme Name** | **Bachelor of Technology in Textiles Technology** | **Semester VII** |
| **Course Title** | **PCC-TEX-405LA** |
| **Course Code** | **ADVANCED CHEMICAL PROCESSING LAB** |
| **Purpose** | To provide hands-on experience to use Computer Colour Matching system in determination and evaluation of pretreated and dyed textile material. |
| **Course Outcomes** | After completing this course student will be able to:CO1. Make use of spectrophotometer for analysing properties of pretreated and dyed fabric sample.CO2. Evaluate fastness properties using computer colour matchingsystem. |
| **Prerequisite** | Knowledge about basics of Textile Chemical Processing |

# PCC-TEX-405LA

**ADVANCED CHEMICAL PROCESSING LAB**

L T P Practical/viva: 60 marks

- - 3 Sessional: 40 marks

Total: 100 marks Duration of Exam: 3

hours

# List of Experiment:

* 1. Calibration of a UV-visible reflectance and transmission- based spectrophotometer.
	2. Identification of dye on a dyed cotton sample.
	3. Assessment of color strength (K/S) of dyed samples.
	4. Estimation of colour strength difference.
	5. Determination L, a, b values and construction of hue and shades based on that.
	6. Comparison of bleaching methods using CCM.
	7. Assessment of whiteness and yellowness index of a scoured and bleached fabric.
	8. Determination of wash fastness of a dyed sample.
	9. Determination of rubbing fastness of a dyed sample.
	10. To identify & predict the recipe formulation of dyed sample.

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| **Programme Name** | **Bachelor of Technology in Textile Technology** | **Semester VIII** |
| **Course Title** | **TECHNICAL TEXTILES - II** |
| **Course Code** | **PCC-TEX-402A** |
| **Course Purpose** | To make student aware of non-aesthetic application of textiles i.e.medical textile, protective textile, sportech and e-textile. |
| **Course Outcomes** | After completing this course, students will be able to:CO1 – Explain the applications of textile material in medical field. CO2–Understand the protective textile functions and their applications.CO3 – Describe about sportech and agrotech.CO4 – Illustrate the innovations in technical textiles. |
| **Prerequisite** | Knowledge of Technical Textile- I |

# PCC-TEX-402A TECHNICAL TEXTILE - II

**L T P Sessional: 25 Marks**

# 4 1 - Exam: 75 Marks

**Total: 100 Marks**

# Time: 3 hrs

**Note**- *Nine questions will be set in the question paper i.e. two from each unit. The students will be required to attempt one question from each unit****.*** *Question no. 1 is compulsory. It is objective type questions of multiple choices covering the entire four units*.

**Unit I:**

**Medical Textiles:**

Introduction and classification of Medical Textiles, Fibres used for medical applications. Implantable

– sutures, soft tissue implants, hard tissue implants, vascular implants. Non-implantable – surgical dressing, bandages. Extracorporeal devices, Healthcare and Hygiene products.

**Unit II:**

**Protective Textiles:**

Different types of protective clothing, Functional requirements of defense clothing including ballistic protection, parachute, temperature and flame retardant clothing, Chemical and Biological protective clothing, Clothing for extreme climatic conditions viz. high altitude clothing.

**Unit III:**

**Sportech** – Sport uniforms, sporting equipments, textiles in sport surfaces

**Agrotech** – General applications and fibres used in agriculture, horticulture, fishing and animal husbandry

**Unit IV:**

Applications and innovations in Technical Textile viz. e-textile, biomimetic, nano-technology

# References and Text books

1. “Handbook of Industrial Textiles”, Ed. Sabit Adanur, Technomic Publishing Co. INC
2. “Handbook of Technical Textiles”, Ed. A R Horrcks and S C Anand, Woodhead Publication Ltd, Cambridge, 2000
3. “ Textiles for protection, Ed. Richard A. Scott, Woodhead Publication Ltd, Cambridge,
4. “ Wearable Electronics and Photonics, Ed. Xiaoming Tao, Woodhead Publication Ltd, Cambridge

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| **Programme Name** | **Bachelor of Technology in Textile Technology** | **Semester VIII** |
| **Course Title** | **POST EXTRUSION PROCESS** |
| **Course Code** | **PEC-TEX-408A** |
| **Course Purpose** | To illustrate the students about various post-spinning process forsynthetic fibers |
| **Course Outcomes** | After completing this course, students will be able to: CO1- Objective of post spinning operationCO2- Understanding operations involved in post spinningCO3- Concept of drawing and heat-settingCO4-Understanding process of production of bulk yarn CO5-Properties and applications of bulk yarn. |
| **Prerequisite** | Knowledge of Textile Fiber –II |

# PEC-TEX-408A

**POST EXTRUSION PROCESS**

L T P Sessional: 25 Marks

4 1 - Exam: 75 Marks

Total: 100 Marks

Time: 3 hrs

**Note**- *Nine questions will be set in the question paper i.e. two from each unit. The students will be required to attempt one question from each unit****.*** *Question no. 1 is compulsory. It is objective type questions of multiple choices covering the entire four units.*

# Unit –I

**Introduction**: Introduction and objective of post spinning operation. Operations involved in post spinning.

**Drawing**: Introduction of drawing filament/fibre: Theoretical considerations of drawing, Concept of neck drawing, Prediction of neck formation, Significance and stabilization of neck, drawing unit, draw behavior of thermoplastic polymers. Influence of drawing parameters on structure and properties of fibres. High speed spinning and spin draw process, drawing of pre-oriented yarns and draw-warping.

# Unit -2

**Heat-setting**: Introduction and concept of heat-setting, Objective of heat-setting, Different nature of set, Heat-setting behavior of fibres, Methods of heat-setting, Influence of heat setting parameters on structure and properties of fibres, Settability and measurement of set.

# Unit 3

**Tow conversion**: Introduction of Tow to Top conversion, Different methods for tow to top conversion. **Bulk yarn**: Introduction of bulk yarn. Objectives of producing bulk yarns. Different methods of producing bulk yarns. Principles of manufacturing acrylic high bulk yarn.

# Unit 4

**Yarn Texturing**: Concept and classification textured yarns. Different texturing methods and brief working principles of different texturing methods. Principles of false twist texturing. Material and Machine variables and their influence on the structure and properties of false twist textured yarn, Concept of air-jet texturing. Material and process variables in air-jet texturing and their influence on the structure and properties of air-jet textured yarns, Testing and evaluation of textured yarns, recent developments in texturing, Air entanglement process.

# Suggested Text Books and References

1. Gupta V B and Kothari V K, “Manufactured Fibre Technology”, Chapman and Hall, London, 1999.
2. Vaidya A A, “Production of Synthetic Fibres”1nd Ed., Prentice Hall of India, New Delhi, 1988.
3. Hearle J W S, Hollick L and Wilson D K, “Yarn Texturing Technology”, Woodhead Publishing Ltd., UK, 2002.
4. Goswami B C, Martindle J G and Scardino F L, “Textile Yarns Technology, Structure and Applications”, Wiley-Interscience Publication, New York, 1976.
5. Mark H F, Atlas S M, Cernia E, “Man Made Fibre Science and Technology”, 1st Ed., Vol. 1, 2, 3, Science Publishers, New York, 1967.

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| **Programme Name** | **Bachelor of Technology in Textiles Technology** | **Semester VIII** |
| **Course Title** | **HIGH PERFORMANCE FIBRES** |
| **Course Code** | **PEC-TEX-410A** |
| **Purpose** | To study the high performance fibers |
| **Course Outcomes** | After completing this course student will be able to:CO1-Understand polymerization, spinning properties and applications of aromatic polyamide and ordered polymeric fibers.CO2-Explain manufacturing process, structure and properties of carbon fibers.CO3-Describe manufacturing process of optical fibers, structure and properties of flexible chain high performance fibers and their application.CO4-Understand glass fibers, membrane technology, plasma treatment,and fibers used in medical textiles. |
| **Prerequisite** | Knowledge of Textile Fibers and basic chemistry |

# PEC-TEX-410A

**HIGH PERFORMANCE FIBRES**

L T P Sessional: 25 Marks

3 1 - Exam: 75 Marks

Total: 100 Marks

Time: 3 hrs

**Note**- *Total nine questions will be set in the question paper i.e two questions from each unit. The student will be required to attempt one questions from each unit. Question No.1 is compulsory. There will be questions of multiple choice covering entire four units.*

**Unit I:**

**Fully aromatic polyamide or aramid fibers:** Nomex and Kevlar - Polymerization, spinning properties and applications

**Ordered Polymeric Fibers:** High molecular weight polyester, rigid rod and ladder polymers such as PBL, PBZT, PBO, PBI.

**Unit II:**

**Carbon Fibers:** Manufacturing of carbon fibres from PAN precursors, viscose and pitch fibres. Pre- oxidation, carbonization and graphitization. Chemical and structural changes in structure during these fibers. Structure and Properties of these fibers.

Liquid crystal fibres, Gel spinning

**Unit III:**

**Flexible Chain based high performance fibers:** High and ultramolecular weight polyethylene. Structure and properties of these fibers.

**Optical Fibers:** Definition, working principle of optical fibers, different materials used for

manufacturing of optical fibers, different types of optical fibers. Manufacturing process of optical fibers and their applications. Hollow and profile fibres, design of spinnerets for such fibres.

**Unit IV:**

Glass fibres. PEEK fibers, Soyabean fibers etc. Membrane technology. Blended and bicomponent fibres. Medical textiles (fibers used in Medical textiles). Superabsorbent fibres.

Plasma modification. Radiation processing. Industrial tapes. Biaxially oriented films and film fibres. Barrier films and coatings.

# Suggested Text Books and References:

1. P. Bajaj & A.K. Sengupta, “High performance fibers”
2. M. Lewin & J. Preston, “High Technology Fibers (Part A, B, C,D)”
3. Lewin & Pearce, “Handbook of Fiber Chemistry”. CRC Press LLC; 2 edition (Feb 26 998)

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| **Programme Name** | **Bachelor of Technology in Textile Technology** | **Semester VIII** |
| **Course Title** | **NONWOVEN TECHNOLOGY** |
| **Course Code** | **PEC-TEX-412A** |
| **Purpose** | - To study the manufacturing process and applications of nonwovensstructures |
| **Course Outcomes** | After completing this course, students will be able to: CO1–Discover the nonwoven technology. Classify the nonwoven according to web formation techniques, bonding techniques and applications.CO2–State the requirements of fibre properties for web formation.CO3–Understand the process of needle punching, stitch bonding, adhesive bonding, hot calendaring and fusion bonding.CO4 – Explain the finishing and applications of nonwoven in different sectorsCO5 – Identify the test methods for nonwoven products |
| **Prerequisite** | **Knowledge of fibre properties and fabric formation.** |

# PEC-TEX-412A NONWOVEN TECHNOLOGY

L T P Sessional: 25 Marks

1. 1 - Exam: 75 Marks

Total: 100 Marks

Time: 3 hrs

**Note**- Nine questions will be set in the question paper i.e. two from each unit. The students will be required to attempt one question from each unit**.** Question no. 1 is compulsory. It is objective type questions of multiple choices covering the entire four units.

# UNIT-1

**Web Formation Technique**

Introduction, need for nonwovens in present scenario. History behind its origin, Definition of nonwoven as per INDA and ADNA, major fibres which are used for manufacturing of nonwovens, classification of nonwoven. Flowchart of its manufacturing technology.

Various web laying methods viz: dry, wet laying technique, spun-bond technique and melt-blown technique and their operating variables and products formed. Concept SMS fabrics.

# UNIT-2

**Bonding Techniques**

Stitch Bonding

Needle Punching: Needle design, needle board parameters, process involved, various factors influencing needle punching process, properties and applications.

Hydro-entanglement: Principle and process technology, properties and applications.

Thermal Bonding: Principle, technologies such as calender bonding, thorough air bonding, ultrasonic & IR bonding.

Chemical Bonding: Chemical binders. Mechanism of chemical bonding. Factors that affect the properties of calendar bonded products.

Limitation, Application areas.

# UNIT-3

**Finishing**

Dry finishing of nonwoven: Shrinkage, Wrenching, Creeping, and Glazing. Wet finishing of nonwoven: Washing, Dyeing and Printing.

Chemical finishing: Antistatic, Antimicrobial, Water repellent, Flame retardant, Water absorbency. Methods of applying chemical finishes.

Developing technologies: Plasma micro-encapsulation, biomimetic finishes and electrochemical finishes.

# UNIT-4

**Test Methods**

Defects of nonwoven fabrics. Test methods for nonwovens: weight, thickness, pore size, porosity, tensile properties, liquid permeability, water vapour permeability, liquid absorption, thermal conductivity and insulation. Usage of non-woven in different sector of technical textiles.

# Suggested Text Books and References:

1. Madhavamoorthy, P., Shetty, G. S., NONWOVEN, Mahajan Publishers Pvt. Ltd., 2005
2. Lunenschloss J and Albrecht W, “Non-woven Bonded Fabric”, Ellis and Harwood Ltd., UK(1985)
3. Krema Radco, “Manual of nonwovens”, Textile trade Press, UK (1971)
4. Albrecht W, Fuchs H and Kittelmann, “Nonwoven Fabrics”, Wiley-VCH Wenham (2003)

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| **Programme Name** | **Bachelor of Technology in Textile Technology** | **Semester VIII** |
| **Course Title** | **COMPUTER AIDED DESIGN** |
| **Course Code** | **PEC-TEX-414A** |
| **Course Purpose** | To explain the latest developments of CAD in apparel industry |
| **Course Outcomes** | After completing this course, students will be able to:CO1- Illustrate the concepts of CAD and its usage in garment manufacturing.CO2- Discuss the computerized pattern making process. CO3-Describe the computerized production planning and 3D technology in garment manufacturing.CO4- Understanding concept of e-marketing in apparel industry. |
| **Prerequisite** | Basics knowledge of computer and garment manufacturing process |

# PEC-TEX-414A COMPUTER AIDED DESIGN

**L T P Sessional: 25 Marks**

# 1 - Exam: 75 Marks

**Total: 100 Marks**

# Time: 3 hrs

**Note**- *Nine questions will be set in the question paper i.e. two from each unit. The students will be required to attempt one question from each unit****.*** *Question no. 1 is compulsory. It is objective type 10 questions of multiple choices covering the entire four units.*

# Unit 1

CAD definition, fundamentals of CAD - Introduction, general process of design, application of computers for design, benefits of CAD, CAD in today’s fashion industry. Computer graphics software in apparel industry.

# Unit 2

Design software - Introduction, features and its applications, resolution set up, saving files and file formats, vector graphics object vs raster graphics object.

Pattern design software (PDS), digitizing, grading and marker making systems.

# Unit 3

* 1. Modelling: Intelligent systems - 3D scanning technology.3Dbody scanners, imaging techniques for various designs. Automatic Pattern Generation Systems. 2D to 3D conversion technology. Draping 2D

# Unit 4

Fashion trend forecasting websites - Introduction, leading online trend-analysis and research service on creative and business intelligence for the apparel. Applications of CAD in multimedia and 3D presentation.

# Suggested Text Books and References:

* + 1. Kathleen Colursy M, “Fashion Design on Computers”, Prentice Hall, 2004.
		2. Radhakrishnan R, Subramanyan S, Raju V, “CAD/CAM/CIM Computer Aided Design & Manufacturing”, New Age International Publications, 2000.
		3. Renee Weiss Chase, “CAD for Fashion Design”, Prentice Hall Publications, 1997.
		4. Taylor P, “Computers in Fashion Industry”, Heinemann Publication, 1990.
		5. Voisinet Donald D. “Computer Aided Drafting & Design-Concept & Application”, McGraw- Hill, 1987.
		6. Winfred Aldrich, “CAD in Clothing & Textiles”, Blackwell Science, 1994.

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| **Programme Name** | **Bachelor of Technology in Textile Technology** | **Semester VIII** |
| **Course Title** | **APPAREL MARKETING & MERCHANDISING** |
| **Course Code** | **PEC-TEX-416A** |
| **Course Purpose** | To describe the apparel marketing and merchandising process |
| **Course Outcomes** | After completing this course, students will be able to: CO1- Describe the marketing and its mixCO2- Explain the organization of the apparel industryCO3- Understand the merchandising processCO4- Describe various documents required for exports. |
| **Prerequisite** | Knowledge of basic garment manufacturing process |

# PEC-TEX-416A

**APPAREL MARKETING & MERCHANDISING**

# L T P Sessional: 25 Marks

**4 1 - Exam: 75 Marks**

# Total: 100 Marks

**Time: 3 hrs**

**Note**- *Nine questions will be set in the question paper i.e. two from each unit. The students will be required to attempt one question from each unit****.*** *Question no. 1 is compulsory. It is objective type 10 questions of multiple choices covering the entire four units.*

# Unit-I Marketing:

Definition, steps involved in marketing, marketing evolution, selling vs marketing, marketing environment, marketing research, marketing objectives and strategies, marketing mix, fashion marketing planning.

# Unit-II

**Introduction to apparel industry** – Different types of organization structure.

# Various departments of garment unit:

Marketing, designing, merchandising, patternmaking, sampling, fabric & trim store, testing, cutting, sewing, finishing, IE, maintenance, quality control, account, HR, EDP

# Unit III

**Merchandising:**

Introduction to fashion merchandising and its process, roles and responsibilities of merchandiser in different organizations, categories of apparel merchandising, Buying cycles and tools of merchandising–buying cycle, time and action calender, range planning, critical path, Costing techniques and Spec Sheets. Visual Merchandising

# Unit IV

**Export Documentation:**

Various types of export documents, Pre-shipment Post-shipment documentation, Terms of sale,

payment, shipment etc. Export incentives: Duty drawback, DEPB, I/ E license - exchange control regulation – (FEMA) foreign exchange management acts - export management risk - export finance. Various INCO terms.

# Suggested Text Books and References:

1. Marketing Management by Philip Kotler. 15th edition Pearson Education. ISBN: 978- 9332557185
2. Cooklin's Garment Technology for Fashion Designers, 2nd Edition by Gerry Cooklin, Steven Hayes, John McLoughlin, Dorothy Fairclough, Blackwell Publications, ISBN: 978-1-4051- 9974-2
3. Garment Manufacturing: Processes, Practices and Technology by Prasanta Sarkar, Online Clothing Study. ISBN: 978-9383701759
4. Fashion Buying by Elaine Stone. McGraw-Hill In publication ISBN: 978- 0070617469
5. Apparel Merchandising by Kumar. Abhishek Publications, ISBN: 978-8182473010
6. Fashion Marketing by Mike Easey. John Wiley & Sons publication. ISBN: 978- 0632034598

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| **Programme Name** | **Bachelor of Technology in Textile Technology** | **Semester VIII** |
| **Course Title** | **QUALITY ASSURANCE IN APPAREL INDUSTRY** |
| **Course Code** | **PEC-TEX-418A** |
| **Course Purpose** | - To aware the students on about importance of quality in apparel sector |
| **Course Outcomes** | After completing this course, students will be able to: CO1- Understanding the basic concept of qualityCO2- Describe quality control and its commercial aspects CO3- Discuss various inspection processCO4- Illustrate different quality management systemsCO5- List the various care labelling systems |
| **Prerequisite** | Basic knowledge of textile testing and garment manufacturing process |

# PEC-TEX-418A

**QUALITY ASSURANCE IN APPAREL INDUSTRY**

L T P Sessional: 25 Marks

4 1 - Exam: 75 Marks

Total: 100 Marks

Time: 3 hrs

**Note**- *Nine questions will be set in the question paper i.e. two from each unit. The students will be required to attempt one question from each unit****.*** *Question no. 1 is compulsory. It is objective type questions of multiple choices covering the entire four units.*

# Unit I

Definition & importance of Quality, Tools of quality control,

# Unit II

Quality Control – Principles of Quality Control, total quality control, statistical quality control, quality circle, quality and profitability.

# Unit III

Inspection – Definition, inspection, loop, raw material inspection, in-process inspection, final inspection, comparability checks.

# Unit IV

ISO-9000 series of standards. Quality assurance, TQM, Six Sigma. Care labeling of apparel and textiles – American care labeling system, British care labeling system, and Japanese care labeling system.

# Suggested Text Books and References:

1. An Introduction to Quality Control for the apparel Pradip V Mehta
2. Industry Managing Quality in the Apparel Industry
3. Satish Bhardwaj & V Mehta, The Technology of Clothing Manufacture Harold Care & Barbara Latham

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| **Programme Name** | **Bachelor of Technology in Textile Technology** | **Semester VIII** |
| **Course Title** | **TEXTILE COSTING** |
| **Course Code** | **OEC-TEX-420A** |
| **Course Purpose** | -To aware the students on costing of textile products in industry |
| **Course Outcomes** | After completing this course, students will be able to: CO1 – Understand the basic concept of costingCO2 – Explain the financial terms used in costing department. CO3 – Describe the cost structure in textile industry.CO4 – Explain labour allocation and rationalization of labours intextile industries. |
| **Prerequisite** | Knowledge of textile production and management. |

# OEC-TEX-420A

**TEXTILE COSTING**

# L T P Sessional: 25 Marks

**4 1 - Exam: 75 Marks**

# Total: 100 Marks

**Time: 3 hrs**

**Note**- *Nine questions will be set in the question paper i.e. two from each unit. The students will be required to attempt one question from each unit****.*** *Question no. 1 is compulsory. It is objective type 10 questions of multiple choices covering the entire four units*.

# Unit I: Fundamentals of Costing

Cost concept. Classification of cost, elements of cost. Methods of costing. Unit and operating costing, preparation of cost sheet. Estimation of cost of production and component of total cost. Profit planning, job order, batch process, and conversion cost. Inventory costing.

**Unit II:**

Cost-Profit-Volume analysis, break-even point, contribution margin, margin of safety, angle of incidence. Capital budgeting.

# Unit III: Cost Structure in Textile Industry

Cost structure, cost of raw material/labour /utilities**.** Cost control, standard costs, determination of cost per kg of yarn, per meter of fabric, cost of dyeing/printing per meter of fabric, yarn realization, measures of cost reduction, selling price decision for yarn/fabric. Concept of depreciation.

# Unit IV: Labour Allocation and Rationalization of Labour

Labour allocation in different department of textile mill. Work-load standards for card tenters, speed frame and ring frame tenters, doffers and winders, weavers, etc. Costing of large package spinning and optimum package size. Costing of Open end spun and Air-jet spun yarns.

Waste and its control at spinning and weaving, Costing of shuttle-less looms like Sulzer, air-jet. Economics of shuttle loom,

# Suggested Text Books and References:

1. Textile Costing by SITRA.
2. Khan and Jain, “Management Accounting”, Tata McGraw-Hill Publication.
3. Owler, L. W. J., Brown, J. L., “Wheldon’s Cost Accounting and Cost Methods”, ELVS Publication.

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| **Programme Name** | **Bachelor of Technology in Textile Technology** | **Semester VIII** |
| **Course Title** | **MANAGEMENT OF TEXTILE PRODUCTION** |
| **Course Code** | **OEC-TEX-422A** |
| **Course Purpose** | To make the students aware of textile production management |
| **Course Outcomes** | After completing this course, students will be able to: CO1 – Define different sectors of Indian textile industryCO2 – Get idea about plant location and layout for textile industries. CO3–Describe the concept of production planning control and ERP CO4–Understand the concept of air conditioning, power consumption, maintenance and work management in textile industryCO5- Explain different measures to be taken for maintaining goodworking environment in industry |
| **Prerequisite** | Basic knowledge of textile production processes |

# OEC-TEX-422A MANAGEMENT OF TEXTILE PRODUCTION

L T P Sessional: 25 Marks

4 1 - Exam: 75 Marks

Total: 100 Marks

Time: 3 hrs

**Note**- Nine questions will be set in the question paper i.e. two from each unit. The students will be required to attempt one question from each unit**.** Question no. 1 is compulsory. It is objective type 10 questions of multiple choices covering the entire four units.

# Unit I: Indian Textile Industry

WTO / GATT / MFA - Functions and objectives, successes and failures.

Structure of Indian Textile Industry, Organized and Decentralized Sector, Handloom sector, Production and export, Sickness in Textile Industry.

**Location and Layout :** Plant location and site selection , Factors affecting location , plant lay- out, Different type of layouts, Layout plan for spinning, weaving and process house.

# Unit-II: Production, Planning and Control

Product mix decision, linear programming concept, Supply chain management, Concept of zero defects, Management information system.

**Inventory Management**: Inventory concepts, techniques to reduce inventory, ABC analysis, EOQ, P and Q systems.

**Enterprise Resource Planning**: ERP concept, Applications of ERP, Ways to use ERP.

# Unit-III:

**Air Conditioning and humidification:** Humidification systems used in textile mills, Development in humidification systems.

**Power Consumption:** Energy consumption in textile machines, Measure to reduce power

consumption.

**Maintenance Management:** Maintenance systems, Maintenance schedules.

**Work Management**: Basics of work load and work assignment, effect of end breaks on work assignment.

# Unit-IV

**Working Environment:** Measures of good working environment, Measures to minimize noise, terms related to lighting, illumination level required for different departments, Material handling equipments, Accidents and safety engineering, Fire prevention and protection.

# Suggested Text Books and References:

1. Dudeja V D , “Management of textile Industry” Textile Trade Press Ahmedabad (1981)
2. Ormerod A, “Textile Project Management” The Textile Institute , ManchesterUK(1992)
3. Talukdar M K ,Srirammulu P K and Ajgaokar D B , “Weaving – Machine , Mechanism and Management ,” Mahajan Publisher Private Ltd., Ahmedabad , India (1998)
4. Grade A R and Subramanian T A , “Process Control in Spinning,” 3rd Edition., ATIRA Ahmedabad, (1987)
5. Higgins, “Handbook of Maintenance Management,” Prentice Hall New York (1999).

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| **Programme Name** | **Bachelor of Technology in Textile Technology** | **Semester VIII** |
| **Course Title** | **PRODUCT DESIGN AND DEVELOPMENT** |
| **Course Code** | **OEC-TEX-424A** |
| **Course Purpose** | To make the students aware about of product design and developmentprocess |
| **Course Outcomes** | After completing this course, students will be able to:CO1 -Basic concepts and critical factors for product designCO2 -Basic elements and tools for conceptualization of product design CO3 –Understanding of product life cycle and its conceptualizationCO4 – Understand the various stages of sample development |
| **Prerequisite** | Basic knowledge of textile production processes |

# OEC-TEX-424A

**PRODUCT DESIGN AND DEVELOPMENT**

L T P Sessional: 25 Marks

4 1 - Exam: 75 Marks

Total: 100 Marks

Time: 3 hrs

**Note**- *Nine questions will be set in the question paper i.e. two from each unit. The students will be required to attempt one question from each unit****.*** *Question no. 1 is compulsory. It is objective type questions of multiple choices covering the entire four units.*

# Unit 1

Introduction, Characteristics of successful product design, Product development, process tools, Understanding customer needs, establishing product function and product specification.

# Unit 2

Product life cycle, phase of product development viz. Concept generation, Concept selection, Concept testing, Product architecture. Design for manufacturing.

# Unit 3

Types of products, study apparel product lines, brand management, idea generation, screening, commercialization, product positioning, major reasons for product failure, Product design economics.

**Unit 4**

Merchandiser’s role in product development, Pre-production & TNA meetings, sampling-developing samples, sample types, sample approvals, lab dip, yarn dip, bit loom, strike offs, pre-costing and order follow-up.

# Suggested Text Books and References:

1. Otto Kevin, and Wood Kristin, Product Design Techniques in Reverse Engineering and New product Development Pearson Education publication, Ist Ed, 2006.
2. Ulrich K T, Product Design and Development, TMG, 3rd Ed, 2004