

BIJU PATNAIK UNIVERSITY OF TECHNOLOGY, ORISSA

TEXTILE ENGINEERING

5 th Semester				6 th Semester			
Theory		Credit Hrs	Credit	Theory		Credit Hrs	Credit
HSSM3301	Principles of Management OR	3-0-0	3	HSSM3302	Optimisation Engineering OR	3-0-0	3
HSSM3302	Optimisation Engineering			HSSM3301	Principles Management		
PCTX4301	Fabric Manufacture-II	3-1-0	4	PCTX 4305	Textile Chemical Processing-II	3-0-0	3
PCTX4302	Textile Chemical Processing-I	3-0-0	3	PCTX4306	Fabric Manufacture-III	3-0-0	3
PCTX4304	Fabric Structure & Design Analysis	3-0-0	3		Professional Elective-I (Any One)	3-0-0	3
PCTX4303	Testing of Textile Materials	3-0-0	3	PETX5305	Technical Textile		
	Free Elective-I(Any one)	3-0-0	3	PETX5303	Manufacture of Special Textile	3-0-0	3
PETX5301	Computer Aided Garment Design				Professional Elective-II (Any One)		
HSSM3303	Environmental Engineering & Safety			PETX5304	Quality Management in Textile Mill		
PEIT5302	Data mining and Data ware housing.			PETX5302	Garment Technology	3-0-0	3
					Free Elective-II (Any One)		
				PEME5305	Robotics & Robot Application		
				FEFT6302	Intelligent & Functional Clothing		
	Total		19		Total		18
Practical / sessional				Practical / sessional			
PCTX7301	Fabric Manufacture-II Lab.	0-0-3	2	PCTX7305	Textile Chemical Processing-II Lab	0-0-3	2
PCTX7302	Textile Chemical Processing-I	0-0-3	2	PCTX7306	Fabric Manufacture-III Lab	0-0-3	2
PCTX7303	Testing of Textile Materials Lab	0-0-3	2	PCTX7307	Textile Design Lab-II	0-0-3	2
PCTX7304	Textile Design Lab-I	0-0-3	2		Total		6
	Total		8				
			27				24

HSSM3301 **PRINCIPLES OF MANAGEMENT** (3-0-0)

Module I: Functions of Management

Concept of Management, Management as an Art or Science, The Process of Management, Managerial Skills, Good Managers are Born, not Made, Management is concerned with Ideas, Things and People, How a Manager Induces Workers to Put in Their Best, Levels and Types of Management, **Evolution of Management Thought:** Managerial Environment, The process of Management-Planning, Organizing, Directing, Staffing, Controlling.

Module II: Marketing Function of Management.

Modern Concept of Marketing, The Functional Classification of Marketing, Functions of a Marketing Management, Marketing Mix, Fundamental Needs of Customers, The Role of Distribution channels in Marketing, Advertising, Marketing, Consumerism and Environmentalism.

Module III: Financial Function & HRM Functions.

Financial Functions, Concept of Financial Management, Project Appraisal, Tools of Financial decisions making, Overview of Working Capital.

HRM Function of Management: Human Resource Management, Human Resource Development, Importance of HRM, Overview of Job Analysis, Job Description, Job Specification, Labour Turnover. Manpower Planning, Recruitment, Selection, Induction, Training and Development, Placement, Wage and Salary Administration, Performance Appraisal, Grievance Handling, Welfare Aspects.

Reference Books:

1. *Business Organization & Management*, CR Basu, TMH
2. *Business Organization & Management*, Tulsia, Pandey, Pearson
3. *Marketing Management*, Kotler, Keller, Koshi, Jha, Pearson
4. *Financial Management*, I.M. Pandey, Vikas
5. *Human Resource Management*, Aswasthapa, TMH.
6. *Modern Business Organisation & Management* by Sherlekar, Himalaya Publishing House.

HSSM3302 **OPTIMIZATION IN ENGINEERING** (3-0-0)

Unit-I (10 Hours)

Idea of Engineering optimization problems, Classification of optimization algorithms, Modeling of problems and principle of modeling.

Linear programming: Formulation of LPP, Graphical solution, Simplex method, Big-M method, Revised simplex method, Duality theory and its application, Dual simplex method, Sensitivity analysis in linear programming

Unit-II (10 Hours)

Transportation problems: Finding an initial basic feasible solution by Northwest Corner rule, Least Cost rule, Vogel's approximation method, Degeneracy, Optimality test, MODI method, Stepping stone method

Assignment problems: Hungarian method for solution of Assignment problems

Integer Programming: Branch and Bound algorithm for solution of integer Programming Problems

Queuing models: General characteristics, Markovian queuing model, M/M/1 model, Limited queue capacity, Multiple server, Finite sources, Queue discipline.

Unit-III (10 Hours)

Non-linear programming: Introduction to non-linear programming.

Unconstrained optimization: Fibonacci and Golden Section Search method.

Constrained optimization with equality constraint: Lagrange multiplier, Projected gradient method

Constrained optimization with inequality constraint: Kuhn-Tucker condition, Quadratic programming

Introduction to Genetic Algorithm.

Recommended text books

1. A. Ravindran, D. T. Philips, J. Solberg, " *Operations Research- Principle and Practice*", Second edition, Wiley India Pvt Ltd
2. Kalyanmoy Deb, " *Optimization for Engineering Design*", PHI Learning Pvt Ltd

Recommended Reference books:

1. Stephen G. Nash, A. Sofer, " *Linear and Non-linear Programming*", McGraw Hill
2. A.Ravindran, K.M.Ragsdell, G.V.Reklaitis," *Engineering Optimization*", Second edition, Wiley India Pvt. Ltd
3. H.A.Taha,A.M.Natarajan, P.Balasubramanie, A.Tamilarasi, " *Operations Research*", Eighth Edition, Pearson Education
4. F.S.Hiller, G.J.Lieberman, " *Operations Research*", Eighth Edition, Tata McDraw Hill
5. P.K.Gupta, D.S.Hira, " *Operations Research*", S.Chand and Company Ltd.

PCTX4301 **FABRIC MANUFACTURE-II** (3-1-0)

Module – I (20 hours)

Secondary Motions and Auxiliary Motions of Plain loom: Take up and let-off motions used in power looms. Cloth wind-up system. Warp protector mechanism. Principle and working of loose reed and fast reed warp protector mechanism. Principle and working of weft fork motion and warp stop motion.

Functions and working principles of dobby and jacquards, electronic jacquards, Working of multiple box motions and Card saving device attachment

Module-II (10 hours)

Features of an automatic loom, Types of weft feeler mechanism (mechanical, electrical and photo electric type), Automatic cop changing mechanism, Automatic shuttle changing mechanism, Functions of shuttle eye and selvedge weft cutters, automatic weft replenishment-feelers, specialty of automatic shuttle

Module-III (15 hours)

Origin of shuttleless looms, Salient features and motions of shuttle less looms (Gripper, Rapier, Water Jet & Air Jet looms), Mechanisms of weft insertion by projectile, rapier, air jet and water jet. Techno-economics of shuttleless weft insertion systems. Weft accumulators and selvedges used in shuttle less looms.

Production Calculations related to various shuttle and shuttleless loom.

REFERENCE BOOKS:

1. Principle of Weaving , R. Marks and A. T. C. Robinson
2. Weaving Machine, Mechanism, Management, M. K. Talukdar, P. K. Sriramulu & D. B. Ajgaonkar
3. Weaving Mechanism, N.N. Banerjee
4. Weaving Calculation, Sengupta
5. Weaving – Technology and Operations, A. Ormerod & W. S. Sondhelm
6. Cotton Weaving, V. Goordev
7. Weaving Tablets, TAI
8. Weaving: Conversion from yarn to Fabric, P. R. Lord & Mohamad

PCTX4302 **TEXTILE CHEMICAL PROCESSING –I** (3-0-0)

Module-I (10 hours)

Dry preparatory process: Mending, Stamping, Shearing and cropping. Singeing- Different methods of singeing (Plate, Roller and Gas Singeing), drawbacks and advantages.

Desizing: Object, types, method details and mechanism of removal of starch. Efficiency of desizing.

Scouring: Objectives, mechanism of removal of impurities, recipe and controlling parameters. Scouring of textiles, evaluation of scouring efficiency. Scouring of natural, man-made and blended textiles.

Module-II (15 hours)

Bleaching: Objectives of bleaching, hypochlorite, peroxide and chlorite bleaching. Field of application - Bleaching of cotton, silk, wool, and man-made blended textiles by suitable bleaching agents. Controlling parameters and mechanism. Principles and application of optical brightening and blueing agents.

Mercerization: Objectives, Process parameters and operation, mechanism related to various physical and chemical changes in cotton during mercerization. Causticization, Barium activity number - its determination and interpretation. Brief idea of hot and cold ammonia mercerization.

Module-III (20 hours)

Theory of dyeing: Classification of Dyes, Dye-fibre interaction,. Dyeing technology of textiles of natural fibres (Cotton, Silk and Wool) with direct, reactive, vat, azoic, sulphur, acid and basic dyes.

Machineries used in wet processing: Jigger, Kier and J-Box system; Hydro-extractor, Drying processes of textile materials (Hot air stenter, cylinder dryer and infrared / RF dryer). Working principles of Winch, Jet, Beam, Hank and Package Dyeing machine.

Books for References:

1. Textile Chemistry, Part-I & II : R.H. Peters, Elsevier
2. Chemical Technology of Scouring and Bleaching: E. R. Trotman, Griffin.
3. Technology of Bleaching and Mercerisation: V.A. Shenai, Sevak Publication,
4. Technology of Dyeing: V.A. Shenai , Sevak Publication.
5. Dyeing & Chemical Technology of Textile Fibres : E. R. Trotman,
6. Chemistry of Dyes and Principle of Dyeing : V.A. Shenai , Sevak Publication
7. The Dyeing of Synthetic Polymer and Acetate Fibres: Nunn D M, Dyers Company Publication Trust, London (1979).
8. Chemical Processing of polyester / cellulosic Blends: Mittal R M and Trivedi S S, Ahamedabad Textile Industries Research Association, Ahmedabad, India (1983).

PCTX4304 **FABRIC STRUCTURE AND DESIGN**

ANALYSIS (3-0-0)

Module-I (15 Hrs)

1. Classification of fabrics; concept of fabric structure; representation of weave; use of point paper, repeat of weave; drafts and peg plan; relationship between weave, draft and peg plan;

Basic Weaves: Method of construction, features and uses of plain weave and its derivatives, twill weave and its derivatives, Satin and sateen weaves and their derivatives.

Module-II (15 hours)

Method of preparation, features and uses of Diamond weaves, Honey comb weaves-ordinary and brighton, Huck-a-back and Mockleno weaves, crepe weave.

Cord weaves: Method of construction, features, cross-sectional view, and uses – Bedford cord, welt and cork screw

Stripe and Check Weaves: Features, Methods of preparation and uses.

Extra warp and extra weft designs: Extra weft figuring-concepts of simple techniques; idea of continuous figuring in one extra warp and extra weft.

Module-III (15 hours)

Terry Weaves: Definition, classification, process of formation of pile, graphical representation of terry weaves.

Backed fabrics: Definition, features, classification and uses of backed fabrics. Graphical representation of warp backed, weft backed cloth, reversible backed fabric and wadded backed fabric.

Double Cloth: Definition, features, classification and uses. Method of preparation of self stitched and centre stitched double cloths, their salient feature and uses. Wadded double cloth.

Brief idea on cross-woven designs and floral designs.

Books Recommended

1. Groscicki Z J, "*Watsons Textile Design and Colour*", Newnes Buttersworth (1988).
2. Groscicki Z J, "*Watsons Advanced Textile Design*", Newnes Buttersworth (1989).
3. Klibbe J W, "*Structural Fabric Design*", Revised Edition, 1965, North Carolina State University.
4. Nisbeth H, "*Grammer of Textile Design*", 3rd Ed., D B Tarapore Wala sons and Co. (1994).
5. Gokarneshan N, "*Fabric Structure and Design*", New Age International, New Delhi (2004)

PCTX4303 **TESTING OF TEXTILE MATERIALS** (3-0-0)

Module- I (15 Hrs)

Introduction to textile testing: Relative and absolute humidity and standard testing atmosphere, conditioning

Yarn dimension: Yarn linear density-direct and indirect system; Conversion from one system to another, Measurement of yarn count, linear density of plied and cable structure, Yarn diameter and packing density. Yarn twist – its type and its relation with yarn strength, measurement of yarn twist.

Yarn Irregularity – types of irregularities, limit irregularity, irregularity index, causes of irregularity, short and long term irregularity, V-L curves, spectrograms, effects of doubling on irregularity. Testing of yarn irregularity - capacitance type and photoelectric type instruments. Calculations of yarn irregularity. ASTM yarn grading Definitions of yarn hairiness. Yarn fault analyzer (Uster Classimat).

Module-II (15 Hrs)

Fabric Dimension- Measurements of different dimensions properties like length, width, thread density, yarn number, yarn crimp, weave, cover factor, weight, and thickness.

Physical properties of fabrics- shrinkage, air permeability, water permeability, crease recovery, stiffness, drape and handle. Determination of abrasion resistance and pilling

Module- III (15 Hrs)

Mechanical properties of Textiles: Characterization of mechanical behaviour of textiles; stress strain curve; mechanics of CRT, CRE & CRL type testers and their comparisons,

Measurement of Yarn strength – lea strength, single yarn strength

Measurement of Fabric strength: Tensile strength, Tearing strength and Bursting strength of cloth.

Books for References:

1. Principle of Textile Testing: J.E. Booth
2. Textile Mathematics, Vol-I, II, III: J. E. Booth
3. Physical Properties of Textile Fibres: W.E. Morton & J.W.S. Hearle

Free Electives

PETX5301 **COMPUTER AIDED GARMENT DESIGN** (3-0-0)

Module – I (10 hours)

Elements of designs and their development using CAD software. Principles of motif generation on computers / motif for border, motif for all over design. Principles & elements of colour. Colour selection & application through CAD.

Module – II (10 hours)

Operational principles of various tools of CAD software for woven knitted & Printed design. Weave simulation, Draping & 3D image on CAD. Principles of Development of basic weave design & their derivatives. Concept of garment design developing & cutting in fashion studio using CAD software.

Module – III (10 hours)

Principles of CAD for pattern making , Pattern grading and pattern layout. Use of Anthropometric data for CAD based garment manufacturing. Detailed study on various Computer Aided Cutting & sewing machineries.

REFERENCE BOOK:

1.CAD/CAM by Groover & zimmer

HSSM3303 **ENVIRONMENTAL ENGINEERING & SAFETY** (3-0-0)

Module – I

Ecological Concepts: Biotic components, Ecosystem Process: Energy, Food Chain, Water cycle, Oxygen cycle, Nitrogen cycle etc., Environmental gradients, Tolerance levels of environment factor, EU, US and Indian Environmental Law. Chemistry in Environmental Engineering: Atmospheric chemistry, Soil chemistry. Noise pollution- Noise standards, measurement and control. Water Treatment: water quality standards and parameters, Ground water. Water treatment processes, Pre-treatment of water, Conventional process, Advanced water treatment process.

Module – II

(a)Waste Water Treatment: DO and BOD of Waste water treatment process, pretreatment, primary and secondary treatment of waste water, Activated sludge treatment: Anaerobic digestion, Reactor configurations and methane production.

(b)Air Pollution : Air pollution and pollutants, criteria pollutants, Acid deposition, Global climate change –greenhouse gases, non-criteria pollutants, air pollution meteorology, Atmospheric dispersion. Industrial Air Emission Control. Flue gas desulphurization, NO_x removal, Fugitive emissions.

(c) Solid waste, Hazardous waste management, Solid Waste Management, Source classification and composition of MSW: Separation, storage and transportation, Reuse and recycling, Waste Minimization Techniques. Hazardous Waste Management, Hazardous waste and their generation, Transportation and treatment: Incinerators, Inorganic waste treatment. E.I.A., Environmental auditing,

Module – III

Occupational Safety and Health Acts, Safety procedures, Type of Accidents, Chemical and Heat Burns, Prevention of Accidents involving Hazardous substances, Human error and Hazard Analysis. Hazard Control Measures in integrated steel industry, Petroleum Refinery, L.P.G. Bottling, Pharmaceutical industry. Fire Prevention – Detection, Extinguishing Fire, Electrical Safety, Product Safety. Safety Management- Safety Handling and Storage of Hazardous Materials, Corrosive Substances, Gas Cylinders, Hydro Carbons and Wastes. Personal Protective Equipments.

Text Book :

1. Environmental Engineering Irwin/ McGraw Hill International Edition, 1997, G. Kiely,
2. Environmental Engineering by Prof B.K. Mohapatra, Dhanpat Rai & Co Publication
3. Industrial Safety Management, L. M. Deshmukh, Tata McGraw Hill Publication.

Reference Books

1. Environmental Engineering by Arcadio P. Sincero & Gergoria A. Sincero PHI Publication
2. Principles of Environmental Engineering and Science, M. L. Davis and S. J. Masen, McGraw Hill International Edition, 2004
3. Environmental Science, Curringham & Saigo, TMH,
4. Man and Environment by Dash & Mishra
5. An Introduction to Environmental Engineering and Science by Gilbert M. Masters & Wendell P. Ela - PHI Publication.
6. Industrial Safety Management and Technology, Colling. D A – Prentice Hall, New Delhi.

PEIT5302 **DATA MINING & DATA WAREHOUSING** (3-0-0)

Module - I

12 Hours

Overview: Data warehousing, The compelling need for data warehousing, the Building blocks of data warehouse, data warehouses and data marts, overview of the components, metadata in the data warehouse, trends In data warehousing, emergence of standards, OLAP, web enabled data warehouse, Introduction to the data warehouse project, understanding data warehousing Architecture, Data warehousing implementation, from data warehousing to data mining.

Module - II

14 Hours

Introduction to Data mining, Data mining Functionalities, Data preprocessing (data summarization, data cleaning, data integration and transformation, data reduction, data discretization),

Mining frequent patterns, associations, correlations (market basket analysis, the apriori algorithm, mining various kinds of association rules, from association mining to correlation analysis)

Classification: classification by decision tree induction, Rule based classification, classification by neural networks, classification by genetic algorithm

Module - III

10 Hours

Cluster Analysis: types of data in cluster analysis, A categorization of major clustering methods(partitioning methods, hierarchical methods),clustering high dimensional data, outlier analysis

Advanced techniques: web mining, spatial mining, temporal mining, Data mining applications in (financial data Analysis, retail industry, telecommunication industry, Biological data analysis, intrusion detection, in other scientific applications)

Text Books:

1. Data warehousing Fundamentals: Paulraj Ponniah, Willey India.
2. Data Mining: Concepts and techniques: J.Han and M.Camber, Elsevier.

Reference books:

1. Data Mining: Arun Pujari, University Press
2. Data Mining –a Tutorial based primer by R.J.Roiger, M.W.Geatz, Pearson Education.
3. Data Mining & Data Warehousing Using OLAP: Berson, TMH.
4. Data Warehousing: Reema Thareja, Oxford University Press

PCTX7301 **FABRIC MANUFACTURE – II LAB** (0-0-3)

1. To study the working of five wheel take up mechanism and calculation of dividend.
2. To study the working of seven wheel take up mechanism and calculation of dividend.
3. To study the negative let off motion.
4. To study the loose reed and fast reed warp protector mechanism.
5. Study of side weft fork motion.
6. Study of warp stop motion.
7. Study of 4 x 1 drop box mechanism and preparation of pattern card.
8. Study of automatic cop changing mechanism with mechanical weft feeler.
9. To study and sketch the working of ordinary climax dobbie,
10. To study and sketch the working of ordinary paper dobbie.
11. To study pegging the lattice for the desired peg plan.
12. To study and sketch working of a double lift jacquard along with its types of needles, cylinders and their mounting.
13. To study the different mechanism of Air-jet loom.
14. To study the different mechanism of Rapiere loom.
15. To find out the loom speed and production calculation of different types of loom available in laboratory.

PCTX7302 **TEXTILE CHEMICAL PROCESSING –I Lab** (0-0-3)

Desizing and Scouring of Cotton yarn / Fabric.

Bleaching of Cotton yarn / Fabric with Bleaching powder , $\text{NaClO}_2/\text{NaOCl}$

3. Bleaching of Cotton yarn / Fabric with Hydrogen Peroxide.
4. Mercerisation of Cotton yarn / fabric.
5. Degumming of Silk
6. Scouring and Bleaching of Wool.
7. Dyeing of cotton yarn/fabric by Direct, Reactive, Vat, Azoic and Sulphur Dyes.
8. Dyeing of Wool yarn / fabric with Acid and reactive dyes.
9. Dyeing of Silk yarn / fabric with Acid dyes.
10. Measurement of fastness properties to washing, light , rubbing.

PCTX7303 **TESTING OF TEXTILE MATERIAL LAB** (0-0-3)

Yarn Testing

1. To determine the hank of a Drawing sliver and Roving by using physical balance
2. To determine the count of a yarn by using physical/electronic balance.
3. To measure the TPI of given yarn sample using Twist Tester.
4. To determine the Count and CSP by using Knowle's balance and lea strength tester
5. To determine the single yarn strength.
6. To measure U% /CV% of a yarn

Fabric Testing

1. To characterize a woven fabric with respect to its dimensional properties:
Thread density, yarn number, yarn crimp, weave, cover factor, weight(GSM), areal density, skewness, thickness
2. To determine the tensile strength of a woven fabric by strip test method. Draw load-elongation curve of a woven fabric.
3. To determine the tear strength of a fabric using Elmendorf tear tester or ballistic tester.
4. To determine the bursting strength of a fabric using hydraulic bursting tester.
5. To determine the abrasion resistance of a fabric.
6. To determine the bending length and flexural rigidity of a woven fabric using the Shirley tester.
7. To determine the crease recovery of fabric and observe the effect of loading time and recovery time on crease recovery.
8. To determine the drape coefficient of woven and knitted fabric using the drape meter.

PCTX7304 TEXTILE DESIGN LAB-I (0-0-3)

1. Analysis of the following Cloths in respect to fabric parameters and design with drafting and lifting plan, denting order, colour plan and use :

- Plain and its derivatives
- Twill and its derivatives
- Diamonds and Drapers
- Honey comb
- Huck-a-back
- Mockleno
- Welts and Piques
- Stripe and Cheques
- Satin / Sateen
- Terry pile
- Colour and Weave effect.
- Double Cloth
- Extra warp and weft
