Approved in Academic Council meeting held on 14/09/2022

Regulation,

R22

Scheme of Instruction, Examination and Syllabi (AICTE)

of

M.Tech. (Textile Technology)

for

The Batch Admitted in Academic Year 2022-23

University College of Techology (A)

Osmania University, Hyderabad,TS

Approved in Academic Council meeting held on 14/09/2022

M.Tech.(Textile Technology)(AICTE Scheme)
Specialization –Apparel Technology
Semester –I
(For the Batch admitted in Academic Year 2022-23)

Sr. No.	Course Type/Code	Course Name	Scheme of Instruction, Hours per week		Scheme of Examination			Credits
			L	P	Duration Hrs	CIE	SEE	
1.	Core 1	Apparel Production Technology -I	3	0	3	40	60	3
2.	Core 2	Apparel Pattern Designing	3	0	3	40	60	3
3.	Program Specific Elective-I	1.ATT 2.DTMP 3.APDPPC	3	0	3	40	60	3
4.	Program Specific Elective-II	1.SQCTP 2.SSLMFT 3.EDTS	3	0	3	40	60	3
Practicals								
5.	Lab1	Apparel Technology laboratory	0	4	4	40	60	2
6.	Lab2	Apparel Designing Laboratory	0	4	4	40	60	2
7	MC	Research Methodology and IPR	2		3	40	60	2
8	Audit 1	Audit course	2			40	60	0
		Total	16	8		320	480	18

Programme Specific Elective -I	Programme Specific Elective -II
ATT: Advances in Technical Textiles	SQC: Statistical Quality Control in Textile Production
DTMP: Denim Technology & Mill Planning	SSLM: Six Sigma and Lean Manufacture for Textile
APDPDC: Apparel Product Development & Production Planning & control	EDTS: Engineering Design of Textile Structures

M.Tech.(Textile Technology)(AICTE Scheme)
Specialization –Apparel Technology
Semester –II
(For the Batch admitted in Academic Year 2022-23)

S.NO.	Course type / Code	Course Title	SCHEME OF INSTRUCTION HOURS PER WEEK		SCHEME OF EXAMINATION			Credits
			L	P	Duration Hrs	CIE	SEE	
1	Core 3	Apparel Production Technology - II	3	0	3	40	60	3
2	Core 3	Process and Quality Control in Textiles	3	0	3	40	60	3
3	Program Specific Elective - III	1.AIAM 2.IAM 3.SAMA	3	0	3	40	60	3
4	Program Specific Elective - IV	1.SY 2.SAM 3.PG	3	0	3	40	60	3
Practicals								
5	Lab 3	Fabric Structure & Design lab	0	4	4	40	60	2
6	Lab 4	Textile & Apparel Testing Lab	0	4	4	40	60	2
7		Mini Project	2	-	-	100 R-50 P-50	-	2
8	Audit 2	Audit Course	2	-	-	-	-	-
		Total	16	8		340	360	18

AUDIT 1 and 2: ENGLISH FOR RESEARCH PAPER WRITING
AUDIT 1 and 2: DISASTER MANAGEMENT
AUDIT 1 and 2: SANSKRIT FOR TECHNICAL KNOWLEDGE
AUDIT 1 and 2: VALUE EDUCATION
AUDIT 1 and 2: CONSTITUTION OF INDIA
AUDIT 1 and 2: PEDAGOGY STUDIES
AUDIT 1 and 2: STRESS MANAGEMENT BY YOGA
AUDIT 1 and 2: PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS

Programme Specific Elective -III	**Programme Specific Elective -IV**
AIAM: Automation in Apparel Manufacture	SY: Specialty Yarns
IAM: Integrated Apparel Merchandizing	SAM: Sustainable Apparel Manufacture
SAMA: Sports and Medical Apparel	PG: Protective Garments

M.Tech.(Textile Technology)(AICTE Scheme)
Specialization –Apparel Technology
Semester –III
(For the Batch admitted in Academic Year 2022-23)

Sr.No.	Course Type/Code	Course Name	Scheme of Instruction, Hours per week		Scheme of Examination			Credits
			L	P	Duration Hrs	CIE	SEE	
1.	Program Specific Elective -V	1.CSIAI 2.TAF 3.EOA	3	0	3	40	60	3
2.	Open Elective	1. Business Analytics 2. Industrial Safety 3. Operations Research(TT) 4. Cost Management of Engineering Projects(TT) 5.Industrial Psychology (TT) 6. Composite Materials 7. Waste to Energy	3	0	3	40	60	3
3.	Dissertation	Dissertation Phase I	0	20	-	100 R-50 P-50	-	10
		Total	06	20		180	120	16

M.Tech.(Textile Technology)(AICTE Scheme)
Specialization –Apparel Technology
Semester –IV
(For the Batch admitted in Academic Year 2022-23)

Sr.No.	Course Type/Code	Course Name	Scheme of Instruction, Hours per week		Scheme of Examination			Credits
			L	P	Duration	CIE	SEE	
1.	Dissertation	Dissertation Phase II	0	32	-	40 Pre-viva: 20 Report: 20	60 Report: 30 Presentation: 30	16
Total			0	32		40	60	16

Core 1

APPAREL PRODUCTION TECHNOLOGY – I

Instruction per week : 3 Hrs CIE: 40 MARKS
Duration of SEE 3 Hrs SEE: 60 MARKS
Credits :3

Course Objectives

1.To learn about the differences about the Textile and Apparel units
2.To Learn about the Capacity Management and factors controlling upscaling and downscaling
3.To understand the techniques and methods of Sourcing and Spreading
4.To learn the details of Marker planning , Efficiency
5.To plan for the right type of Cutting strategy

UNIT – I

Introduction to Apparel Industry: Capacity of Apparel units, comparison of Apparel industry with other Textile units with respect to different aspects, Basic concepts of Apparel Production and Industry , Sectors in Apparel Industry, Type of Organisation(Organic and Mechanistic), Size of Apparel Units, Globalization Approach, Garment types , functions of various Departments in a typical Garment manufacture, Stages in Garment production, Production strategies, Human Relation Concepts in a Garment Industry, Plant capacity.
Facilities planning: PLC, Product selection process-new idea mortality curve, Product Design.

UNIT-II

Production Dynamics: types , selection & Economical criterion in selection -Production Vs Productivity, Productivity: meaning, importance & measurement, Role of NPC, Tools & Indices of productivity, factors affecting production, Economical size of the firm, factors governing size, small scale industries-reasons for survival and optimum firm, Input –Output Analysis .
Capacity Management: Meaning, Definition, Peak and Off-Peak Demand, Upscaling and Downsizing, Bottlenecks and Capacity Forecasting and Capacity Planning , Capacity and Breakdown costs, Capacity and Linear Programming , BEA and Capacity, measurement of capacity

UNIT – III

Apparel Technology: Scope , raw materials and support materials for apparels and their share in volume and cost
Sourcing : Need, Scope, role played by Sourcing manager, Criterion, methods and tools used.
Spreading : Need, Scope, Objectives, Overview of Spreading process, Nature of fabric packages, Spreading quality, requirements of spreading process, methods of spreading, Selection of Spreading devises , Setup for Spreading , Fabric Control devices, Spreading costs, Rational followed

UNIT – IV

Markers & Marker Planning: Need and scope of Markers, types, Marker quality , Marker efficiency, Marker dimensions, Marker making Methods (Manual and Automated), constraints on fabric width, constraints on grain direction, contribution of human factors: marker planner, methods of optimizing marker planning in production.
Marker utilization: Variations with striped and checked fabrics, Fabric losses outside the marker-analysis of direct losses and indirect losses, processing of fabric faults, framework of management control.

UNIT – V

Cutting: Objectives, requirements of cutting, methods of cutting ,cutting quality, cutting machines(Operator and machine controlled) : Types of cutting machines and applications, Detailed

study on straight knife, band knife and round knife cutting machines- Brief study on notchers, drills and thread markers, Specialised cutting machines, Cost elements in cutting , Off loading .

Cut order planning: Introduction, issue of cutting instructions, economic cut quantities, factors affecting economic cut quantities, cut order plan, costing the cut order plan, computerized cut order planning

Computer controlled cutting :Brief study on computer controlled cutting machine, Role of CNC machines in cutting, Laser, water Jet and Plasma cutting. Stickering, Bundling, Dispatch

Course Outcomes

1. An Ability to plan for the facilities required for Kids Garment production unit .
2. An Ability to plan for the facilities required for Men's Garment production unit .
3. An Ability to plan for the facilities required for Women's Garment production unit
4. Ability to understand the production dynamics and planning there of
5. Ability to plan for Souring , Spreading , & Cutting.
6. Ability to estimate the cost of Apparel production.

EXAMINATION: Question paper consists 8 Questions selecting atleast one from each unit and 5 to be answered out of 8.

REFERENCE BOOKS

1.Sewn Product Technology- Gerry Cooklin, 4th enlarged Edition Blackwell Publications, USA,2010

2.Introduction to clothing manufacture –Gerry Cooklin, Marshell ,6th enlarged Edition Blackwell Publications, USA,2007

3.Materials Management in clothing production – David .T.Tyler, Blackwell Publications, USA,2007

4.Introduction to Clothing Manufacture- Gerry Cooklin, 4th enlarged Edition Blackwell Publications,USA,2010

Mapping of Course Outcomes with Programme Outcomes :

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	✓	✓	✓		✓				✓			✓
CO2	✓	✓	✓		✓				✓			✓
CO3	✓	✓	✓		✓				✓			✓
CO4	✓	✓	✓		✓				✓			✓
CO5	✓	✓	✓		✓				✓			✓
CO6	✓	✓	✓		✓				✓			✓

Approved in Academic Council meeting held on 14/09/2022

Core 2

APPAREL PATTERN DESIGNING

Instruction per week : 3 Hrs CIE: 40 MARKS
Duration of SEE 3 Hrs SEE: 60 MARKS
Credits :3

Course Objectives:

1. To provide the knowledge of taking body measurements, tools required and method of cutting basic patterns.
2. To understand the basic concept of grading and pattern construction techniques.
3. To know the basic understanding of variation in human figure due to bone structure which leads to variation in figure shape.
4. To understand developments and modification in patterns according to variation in figure shape

UNIT –I

Tools for Apparel Engineering design: Tools required for patterning and cutting ,measuring tools , marking tools, general tools.

Preparation for measuring: Method of recording measurements for men and women.

Introduction to darts, tucks, pleats, flares, godets, gathers, frills.

Introduction to paper patterns: Principles of drafting and alteration, rules of laying patterns on fabric, pattern layout, transferring pattern markings on fabric.

Introduction to drafting: Considerations while cutting paper patterns, preparation of paper patterns, principles for pattern drafting, advantages of drafting, drafting basic pattern for bodice, sleeve, collar, yoke and skirt .

UNIT –II

Draping : Introduction, Draping fabric for various garments, advantages of draping. Different types of collars, sleeves, cuffs and pockets. Introduction to pattern cutting – planning, drawing and marker planning- requirements of panning Pattern construction: body and garment measurements; taking body measurement manually, computerized body measuring systems.

Size chart formulation: Standard size charts for Men, women's ,Kids. Pattern construction techniques: the positioning of computer patterns, creating pattern shapes by computer, techniques for construction pattern shapes. Block pattern construction: block patterns, garment balance, garment shaping suppression, ease allowance, influence of the fabric, drafting block patterns, testing block patterns Construction of primary block patterns: straight skirt block size 12.

UNIT –III

Computer pattern grading: Pattern grading: grading increments, grading point movement, methods of recording incremental growth, grade rules, constructing a grade rule table, variation in positioning the zero point, computer grading techniques. Grading primary block pattern: straight skirt grading that retains the same proportion, straight skirt grading that changes the proportion,

Pattern designing and grading: Pattern preparation for digitizing : setting up parameter tables, storage area, user environment.

Parameters tables: Notch parameter tables, drill hole parameter table, pattern annotation table. Checking master patterns.

UNIT - IV

Computer digitizing : Digitizing process, digitizing, graded nest of patterns, digitizing large pattern piece, verifying pattern grading .

Pattern design procedures: skirt styling: gathered skirt with flounce pleats, flared and gored skirts, construction of circular skirts, skirt style and yoke and pleats. Collar styling: section of a collar. Sleeve styling: relationship of the sleeve to the bodice, sleeve length.
Production patterns: checking the stitching line, seam allowances seam corners, hems, facings, approval of the sample garment and graded patterns.
Pattern modification for garment size and fit:
Assessing the figure shape and garment fit: variation in bone structure: height, shoulder slant, length of upper and lower torso stance.

UNIT –V
Variation in posture: garment balance, skirt waist level, trouser waist level and seat angle, and neck width sleeve pitch. Variation in body size and contour: small adjustment to the waist size, large adjustment to the waist size, incorrect suppression, prominence, shoulder blade prominence, prominence of the lower torso. straight skirt modification for a prominent seat, straight skirt modification for a flatter seat, straight skirt modification for a hip and thigh prominences, straight skirt modification for a stomach prominence, trouser modification for a seat prominence, trouser modification for a hip and thigh prominences, trouser modification for stomach prominence.

Course Outcomes
1. An ability to understand the method of taking body measurements by using the manual, and computerized body measuring systems.
2. An ability to understand the concept of pattern construction techniques and grading of basic pattern to create several range of pattern by using computer.
3. An ability to design the pattern for different styling (skirts, shirts and trousers)
4.An ability to understand the and assessing human figure shape due to variation in bone structure and posture

EXAMINATION: Question paper consists 8 Questions selecting atleast one from each unit and 5 to be answered out of 8.

REFERENCE BOOKS

1. Pattern cutting made easy-Gillian Holman,B.T.Batsford ltd.2005
2. More dress pattern designing-Natalie Bray, Black well publishers, 2004

Practical Clothing Construction : Part I , Mary Mathews, shanker Publishers, chamarajpet Bangalore , 2005

Mapping of Course Outcomes with Programme Outcomes :

PO / CO	PO1	PO 2	PO3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO1 2
CO1	✓	-	✓	-	✓	-	-	-	✓	-	-	-
CO.2	✓	-	✓	-	✓	-	-	-	✓	-	-	-
CO3	✓	✓	✓	-	✓	-	-	-	-	-	-	-
CO4	✓	✓	✓	-	✓	-	-	-	-	-	-	-
CO5	✓	✓	✓	-	✓	-	-	-	✓	-	-	-
CO6	✓	✓	✓	-	✓	-	-	-	✓	-	-	-

Programme Elective – I- 1- ATT

ADVANCES IN TECHNICAL TEXTILES

Instruction per week : 3 Hrs CIE: 40 MARKS
Duration of SEE 3 Hrs SEE: 60 MARKS
Credits :3

Course Objectives

1.To educate the students for the applicability of various fibers, yarns and fabrics in industrial textiles.
2.To provide the knowledge on textiles used in various fields in defense, medical, protective transportation textiles
3. To develop the knowledge about the sports and automobile textiles
4.To understand the role of Textile supplement in Agro applications
5.To Design the substrate meant for Aerospace and Civil Aviation applications

UNIT I

Scope of Technical Textiles: Modern Classification of textiles as 16 Technical Textiles , Role of Technical Textiles, Initiatives by Govt. of India, Components of TMTT, Various COE's for Technical Textiles in India and their progress.

Industrial sewing threads: Types , selection ,characteristics , and their manufacture.

Agro Tech. : Nomenclature, types , selection , materials , textiles in agriculture, diary and horticultural applications, textiles in cigarettes .

Medi Tech: Textiles in Surgical applications (Drapes , Gowns), Textiles in Orthopedics, Textiles in Ophthalmology, Textiles as replacement for Pancreas, Intestine, Heart and its valves , Textiles in Radiology, Hospital Textiles, Textiles in Urology, Textiles in Neo –Netology, Textiles in Tissue Engineering , Textiles in Bio-Medical Instrumentation.

Textiles in Aerospace and Marine applications: fabrics, Architectural fabrics , Building structure - application of GT in vertical dams Roofing materials - Awnings and Canopies - Flags. Rubberised fabrics for flexible dams

UNIT-II

Pro Tech :

Protection against cold: cold environment, convection; radiation; evaporation; airway heatExchange, Energy metabolism; heat production and physical work, The human heat balance equation Requirements for protection, Measurements of clothing performance: thermal insulation; evaporative resistance; wind resistance; water resistance; standards for protective clothing against cold and foul weather

Performance of clothing for cold protection: standard values for clothing insulation; influence of walking and wind; influence of water and moisture; effects of solar radiation; effects of treatments; prediction of protection, Specific materials and textiles for cold protection Textiles for defense & survival**:** Requirements , parade clothing, Canvas for defense, Combat clothing , Water vapour permeable clothing , Breathable clothing. Camouflage systems, Deceptions, Decoys ,Types and methods ,Colour and patterns, Camouflage for UV, IR, antiradar and multiple spectral camouflages.- cut resistant Conductive Textiles, Protective clothing for extremely cold region, sleeping bags, Ballistic protective armours and accessories, Aerospace Textiles, Fabrics for nuclear, biological and chemical protection.

UNIT-III

Sport Tech.: Sportswear design: seamless garments; stitch less seams, impact of advances in laminating, wearable technology, Material requirements for the design of performance sportswear, technical sportswear for women, garment development., application of technical textiles in performance sportswear.

Functional sport footwear: design aspects ,Functional fit, biomechanic of the foot; Functional materials and components, properties of materials and components; materials for sport footwear of upper sole

Innovative fibres and fabrics in sport: High performance and high functional fibres and textiles: Properties and design aspects, hydrophobic surface; dirt and oil repellence; Various types of finishing

Sportswear and comfort: Aspects of wear comfort, Measurement , Role of Elastic sport textiles, biofunctional textiles; foul weather protective clothing; textile combinations
Spinnaker fabrics: production and processing of nylon spinnaker; dyeing and finishing r
Textile use in sports shoes :Use of textiles in sport shoes: uppers, sole

UNIT-IV

Elastic textiles: Introduction, breathability; breathable stretch, breathable waterproof stretch; bi-component stretch as an alternative to elastanes; use of Lycra, garment engineering : in footwear, in Football, in rugby, hydrodynamics in swimwear, aerodynamics in track and field and cycling - Performance, recovery and wellbeing, enhanced performance and prevent injury; energising socks; performance and recovery; textronics; wellbeing through clothing
Textile composites in sports products: Materials, Design, Production technology – continuous processes, Applications: pole vault; fishing gear; bicycles; golf; baseball/softball; tennis; kayaks; skis and snowboards; hockey
Textiles in sailing: Polyester sailcloth, manufacture , preparation ,dyeing finishes and finishing of polyester sailcloth

UNIT- V

Textiles in Automobiles :fibres employed, Requirements, Interior design: Type of substrates and their manufacture ,Yarn and fabric processing: Dyeing and finishing, Printing, Coating and lamination, Quality assurance and testing: Quality assurance, Test method details,, Product engineering. Interior trim: Seats, Headliners, Door casings, Parcel shelves, Other interior trim, Complete modular interiors: Seat belts , Airbags, Carpets, Cabin air filters, Battery separators, Bonnet (hood) liners Wheel arch liners, Hood material for convertibles, Tyres, Hoses and belts
Textiles in other forms of transportation : Composite materials, Flame retardency, Fabric coating, Textiles in other road vehicles, Railway applications, Marine applications, Textiles in aircraft.

Course Outcomes: Graduate to have an

1.Ability to know the application of various fibers, yarns and fabrics in industrial textiles.
2.Ability to design fabrics for defense, medical, protective transportation textiles
3. Ability to develop the sports and automobile textiles
4.Ability to plan for Agro applications of Textiles
5Ability design the substrate meant for Aerospace and Civil Aviation applications
6.Ability to design an advanced Technical Textile

EXAMINATION: Question paper consists 8 Questions selecting atleast one from each unit and 5 to be answered out of 8.

REFERENCE BOOKS:

1. Kanna M.C., Hearle, O Hear., Design and manufacture of Textile Composites, Textile progress , Textile Institute, Manchester, April 2004.
2. Scott,Textile for production, Textile progress , Textile Institute, Manchester, Oct. 2005.
3. Shishoo,Textile in sports, Textile progress, Textile Institute, Manchester, Aug. 2005
4. Horrocks A. R., Anand S.C., "Handbook of Technical Textiles", Woodhead Publishing, Cambridge, 2000
5. Adanur S., "Handbook of Industrial Textiles", Technomic Publication, Lancaster, 2001

Mapping of Course Outcomes with Programme Outcomes :

PO / CO	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO1 2
CO 1	✓	-	✓	-	✓	-	-	-	-	-	✓	✓
CO 2	✓	✓	✓	-	✓	-	-	-	-	-	-	-
CO 3	✓	-	✓	-	✓	-	-	-	-	-	✓	✓
CO 4	✓	✓	-	-	✓	-	-	-	-	-	-	-
CO 5	✓	✓	-	✓	-	-	-	-	-	-	-	-
CO 6	✓	-	✓	-	✓	-	-	-	-	-	✓	✓

Programme Elective – I- 1I- DTMP

DENIM TECHNOLOGY AND MILL PLANNING

Instruction per week : 3 Hrs CIE: 40 MARKS
Duration of SEE 3 Hrs SEE: 60 MARKS
Credits :3

COURSE OBJECTIVES

1. To understand the concepts of Denim construction
2. To know the methods of Denim production
3. To know about the production planning using quantitative techniques
4. To understand the concept of Mill Planning
5. To know the applications of Work study in Textile and Apparel industry

UNIT-I

Introduction to Denim fabric: Types of Commercial Twill Weave, Characteristics of Denim, Denim Production plant capacity, Fibre selection ,Percentage of two cotton fibres in mixing (ATIRA method) role of LPP in cotton mixing - Spinning of Cotton Yarns: Ring Vs Rotor spun yarns , Multi count and Multi twist effect on Denim –Weaving preparatory for Denim(Winding , Warping , Sizing & Post Sizing),Weaving of Jeans fabric- Jeans manufacturing Process

UNIT-II

Denim Dyeing : Dyeing technology & process - Air flow Vs Soft Flow finishing ,Washing process for Jeans- **Finishing**: Steps in Finishing of Grey Denim(Detailed Discussion)

Washing of Denims: Denim Bleaching, Rinse wash, Cellulase wash, Ozone fading, Snow wash, Salt water denim, Flat finish, Over dye, Sun washing Super dark ,Wash down effects on Denim - Stone Wash, Enzyme Wash, Combined enzyme and stone wash, acid wash, antique wash, ball blast, whiskering, Sand blast, Ice wash.-Analysis of Transportation cost through VAM- Brief note on Energy Management in Denim Processing.- Effect of finishing on Denim fabric properties (brief Note)- Cost aspects of Denim production, Financial evaluation of Denim projects, Quality Assurance of Denim Manufacture,

UNIT-III

Introduction to Mill Planning: Capacity of Textile & Apparel Units, Capacity planning for various

Situations for a Spinning (Spin Plan for various lot sizes), Weaving (Planning of Winding , Warping, Sizing ,post sizing and Looms) and Processing Units (Planning for washing, scouring, bleaching ,dyeing, stentering).Location: Need, Types, Factors, Selection of best Location by Quantitative techniques –Numerical Examples

Layout for Textile & Apparels: Principles, types, Techno-Economic evaluation, Building for Textile and Apparel units-Lighting in various sections of Textile & Apparel units-Ventilation, types, Air conditioning , Psychometric Charts, Calculation of RH-Assignment of work

UNIT-IV

Work study: Need, Objectives from Apparel & Textile industry point of view.

Method study: steps in method study, tools of record,

Time study-Time & Motion Economy, steps, elements, allowances, work measurement and Derivation for Standard Minute Value (S M V or S A M) – Calculations from Apparel Industry

Ergonomics: Meaning, Scope in Apparel & Textile Industry, Impact on working conditions & Productivity, recommendations for better Ergonomical conditions. -Noise control

Plant Humidification in Textile mills: working of humidification Units, RH% selection

Plant Safety: Safety and its Significance, Costs of Accidents, Safety evaluation-Material Handling in Apparel & Textile Mills-Water Requirement for dye house & Sizing -ABC analysis in Textile & Apparel Units-Replacement analysis

UNIT-V

Project Planning (CPM & PERT- Crashing in networks)- Sequencing of Openers and Cleaners/Preparatory machines by Johnson's algorithm - Role of Assignment in Production planning(Simple, Unbalanced, profit type, formulation type)Mixing and Blending of fibres in Spinning : Application of Simplex routine (Maximisation, Minimisation, profit type)-Depreciation (Methods of calculation),Present & future worth, Engineering economics of Textile & Apparel units

Central and Sate Government Schemes ,Technology Up-gradation Fund Scheme (TUFS)-Textile Workers Rehabilitation Fund Scheme, Technology Mission on cotton, Group Work Shed Scheme, Integrated Scheme for Power loom Development-Group Insurance scheme- Scheme for Integrated Textile Parks, Hank Yarn Obligation(HYO) National Equity Fund Scheme- Credit Linked Capital Subsidy Scheme (CLSS), Textile policy of Andhra Pradesh.

Indian Textile Policy, Trade policy, Fiscal policy, NTC, STC, Textile committee , National Hand loom Development Corporation– Mills association – Research institutions –Technical Textile Units-11^{th} five year

COURSE OUTCOMES (Graduate to have)

1.Complete knowledge of Denim construction
2. knowledge of various finishing treatments of Denim
3.An ability to plan the balancing of machinery for yarn production
4.An ability to apply the quantitative techniques for shop floor production
5.An ability to derive SMV in Garment production
6.An ability to create new types of designs in Denim production

EXAMINATION: Question paper consists 8 Questions selecting atleast one from each unit and 5 to be answered out of 8.

REFERENCE BOOKS

1. Processing of Jeans an Over View- NCUTE- IIT Delhi, 2006
2. I L.O Work Study- I LO Genova, 2006
3. Industrial Engineering & Management-O.P.Khanna, Dhanpat rai & Sons, New Delhi,2008
4. Industrial Organisation & Engineering Economics-T.S.Banga & Sharma, Chand Publications, New Delhi,2008
5. Engineering Economics- Pannerselvam, PHI, New Delhi,2009

Mapping of Course Outcomes with Programme Outcomes :

PO /CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	✓	✓	✓	✓		✓					✓	✓
CO2	✓	✓	✓	✓		✓					✓	✓
CO3	✓	✓		✓		✓					✓	✓
CO4	✓	✓		✓		✓					✓	✓
CO5	✓	✓	✓								✓	
CO6	✓	✓	✓			✓					✓	✓

Programme Elective – I- 1II- APDPPC

APPAREL PRODUCT DEVELOMENT AND PRODUCTION PLANNING

Instruction per week : 3 Hrs — CIE: 40 MARKS
Duration of SEE 3 Hrs — SEE: 60 MARKS
Credits :3

Course Objectives
1.To educate the students about the concept and benefits of Product
2.To develop the students ability to understand the Product production
3.To educate the students for the production planning schedule in Textile and Apparel units
4.To educate the engineers about the process control in the shop floor
5.To plan for the product research process

UNIT –I
Product , Product Development : Introduction, types of Products, benefits of Products , Characteristics of an ideal Product ,Development of new products: need, scope idea generation, idea screening, concept testing, business analysis, the product development process, group product development, research, test marketing, commercialization

UNIT-II
Economic analysis of Products: Need, scope, Evolution of portfolio of product and projects , market potential, market demand, estimating sales, estimating cost and profit. Role of Operations Research , Role of Technology, politics and geography: apparel online, politics of apparel importing, the geography of manufacturing, meaning retail trade technology.

UNIT-III
Introduction to Production Control : Objectives of Production control- Relationship of production control to the functional areas of a manufacturing organization- Analyzing , Forecasting, Planning, Deputizing and Supervising.
Production System in Apparel Manufacture: Whole garment Production system- Unit flow system- Multiple flow and Progressive Bundle system- Principles for choosing a Production system- Evaluating production system

UNIT-IV
Operation Sequence Development: Operation required in garment construction - Operation specifications- Flow Process grid and charts
Plant Layout: Definition of Plant Layout- Types of Production Layout- Product and Process layout - Planning a layout- Calculation of minimum transport distance- Determining minimum space requirement for the layout- Formulating a layout for different styles of garments
Scheduling : Principles of Scheduling- Scheduling charts- Mathematical formula for scheduling

UNIT-V
Control Technique and Procedures: Distribution of documents and records- Types of control forms- Cutting order- Bundle Ticket Design- Bundle Control Sheet- Sewing and Pressing Department Projection Tally.
Method Engineering: Definition of Time study and Motion study- General approach for making a time and motion study in garment manufacture- Elements of a work cycle- Stop watch timing methods- Calculation for time study- Time study allowances- Leveling
Material Handling: Objective of material handling- Methods of classifying materials and handling equipment- Description and characteristics of material handling equipment- Specialized material handling equipment related to the apparel industry.

Course Outcome (Graduate have)

1.An ability to understand and design the process for a dedicated Product
2.An ability to design the material handling equipments for the product production
3.An ability to select a most suitable process and product layout
4 An ability to apply the concept of Time study in shop floor for material handling
5.An ability to assess the SMV for a product
6. An ability to estimate the standard time of a product

EXAMINATION: Question paper consists 8 Questions selecting atleast one from each unit and 5 to be answered out of 8.

REFERENCE BOOKS:

1. Apparel manufacturing Analysis- Jacob Solinger, Textile Book Publisher, New York- 2002.
2. Solinger Jacob, "Apparel Manufacturing Hand book - Analysis , Principles and Practice", Columbia Boblin Media Corp., 1988.
3.William K.Hodson "Maynard's Industrial Engineering Handbook", Fourth Edition McGraw-Hill, Inc., Newyork, 2002.
4..David J Tyler,"Materials Management in Clothing Production" 2010.
5.Apparel product development-M.J.Johnson & E.C. Moore, Prentice Hall, New jersey-2009.
6.Product management-Donald R. Lehmann, Mc graw Hill International Edition-2006.

Mapping of Course Outcomes with Programme Outcomes :

PO / CO	PO 1	PO 2	PO3	PO4	PO5	PO6	PO7	PO 8	PO9	PO 10	PO 11	PO12
CO1	✓	✓	-	✓	✓	-	-	-	-	✓	-	-
CO2	✓	✓	-	✓	✓	-	-	-	-	✓	-	-
CO3	✓	✓	-	✓	✓	-	-	-	-	✓	-	-
CO4	✓	✓	-	✓	✓	-	-	-	-	✓	-	-
CO.5	✓	✓	-	✓	✓	-	-	-	-	✓	-	-
CO6	✓	✓	-	✓	✓	-	-	-	-	✓	-	-

Programme Elective – II- 1- SQCITP

STATISTICAL QUALITY CONTROL IN TEXTILE PRODUCTION

Instruction per week : 3 Hrs CIE: 40 MARKS
Duration of SEE 3 Hrs SEE: 60 MARKS
Credits :3

Course Objectives

1.To understand the concepts of statistics and its applications
2. To know the sampling methods and sample size
3. To learn the method of Testing the population
4.To learn the applications of Design of Experiments
5. To know the concepts of Online and Offline quality control methods.

UNIT-I

Introduction – Applications of Statistical Techniques in Textile Process – Collection of Primary and Secondary data, Tabulation of data. **Construction of Frequency Distributions**: Graphical representation of frequency distributions. (Histogram, Frequency polygon, Frequency Curve, Ogives)**Measures of central tendency** : Mean by direct, Short cut methods ; Median and Mode Calculation in discrete, group data, graphical methods. **Measures of dispersion** : Range, With in and Between variations, PMR, Quartile Deviation, Box & Whisker Plots, Outliers, Mean deviation, standard deviation, variance and coefficient of variation. -– Sampling methods and sampling errors.

UNIT-II

Probability Distributions :Applications, Problems on Normal distribution , Binomial distribution and Poisson distribution .**Tests of significance**: introduction, need, scope, One tailed and two tailed tests, Interpretation and limitation - 't' test , 'F' test & Chi-Square test **Decision Theory** : Elements , decision under risk and uncertainty .

UNIT - III.

Control charts: Need , Principle, types, limits, interpretations , selection of control charts – shifting of mean ,rework, scrap. **Correlation:** Methods of studying Correlation – Coefficient of correlation– Rank correlation; **Regression** : Regression equations , correlation and regression coefficient , a brief note on Partial and Multiple regression.

UNIT-IV

Time series :components of time series – Measurement of trend – method of least squares, second degree parabola – measurement by logarithms – shifting the trend origin. **Non – Parametric Tests**: , Kruskal –Wallis test,, a brief note on Duncan's Multiple Range Test, Newman-Keuls test, Mann-Whitney U Test . **Analysis of variance**: elements , Interpretations, ANOVA of One way , Two way and, observations more than one per cell . Model adequacy testing .

UNIT-V

Design of Experiments: Introduction, Terminology , Principles , Randomised Block Design ,Completely Randomised Design, Latin Square Design, and Analysis of Co-Variance.

Factorial Experiments: Definitions, Interpretation of main effects and interactions, design with factors at two levels – Calculation of effects and Analysis of variance – Yate's algorithm, 2^K factional design in detail (2^2 ,2^3,2^4)- Confounding in Factorial Design a brief note on Response Surface Methodology, Online and off line quality control Taghuchi methods Experimental designs for fitting response surfaces Composite Designs. Mixture experiments.

Course Outcomes (Graduate to have an)

1. Ability to construct frequency distributions and measure central tendency, dispersion of chemical processes
2..Ability to apply probability distributions and perform tests of significance.
3. Ability to select control charts, estimate correlation & regression data.
4. Ability to trend the given data using parameter tests and ANOVA.
5. Ability to design experiments using factorial design and taguchi techniques

6.Ability to apply the f Duncan multiple range test for selection of break draft in spinning

Examination: Question paper consists 8 Questions selecting atleast one from each unit and 5 to be answered out of 8 .

Text Book

Design and Analysis of Experiments- Douglas C. Montgomery, 7th edition, 2010 John Wiley and Sons INC

Reference Book

1.Design and Analysis of Experiments- Douglas C. Montgomery, 5th edition, 2010 John Wiley and Sons INC.

2. Fundamentals of Applied Statistics- S.C.Guptha and V.K. Kapoor , Sultan Chand & Sons , New Delhi, 2012

Mapping of Course Outcomes with Programme Outcomes :

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	✓	✓	✓	✓	✓						✓	✓
CO2	✓	✓			✓							✓
CO3	✓	✓	✓	✓	✓						✓	✓
CO4	✓			✓	✓							✓
CO5	✓	✓	✓		✓						✓	✓
CO6		✓		✓	✓							✓

Programme Elective – II- II- SSLMT

SIX SIGMA AND LEAN MANUFACUTRE FOR TEXTILE

Instruction per week : 3 Hrs CIE: 40 MARKS
Duration of SEE 3 Hrs SEE: 60 MARKS
Credits :3

COURSE OBJECTIVES

1. To provide the fundamental knowledge of concepts of Six Sigma.
2. To provide knowledge of Phases and tools used Six sigma and their concepts.
3. To develop the understanding of statistical tools used in lean and six sigma concepts..
4. To provide the knowledge of lean tools and lean implementation.
5. To educate the students about modern methods of maintaining inventory and lean culture.
6. To educate the students about modern methods oflean culture

UNIT- I

Introduction to production process, variation in process, causes of variation, measurement of variation by SD or Sigma, spread of variation, process performance thro DPMO Triangle.

Meaning and scope of Six Sigma (SS): Basic concepts, scope , need and benefits of SS, Themes of SS, Key concepts of SS, Road map of SS. SS philosophy, TQM Vs SS, Road map of SS,

FOUNDATION PHASE: organizational structure of SS, Cost –Benefit analysis, Introduction to production process, types, Concept of Defect , Defectives, First pass Yield, Rolled throughput Yield, PPM, DPMO, DPU(simple numerical example.

UNIT –II

Customer dynamics Management: Types of Customer, Customer Window, Customer satisfaction model, Customer retention model, Kano model, Customer care and ways to get VOC

Six Sigma Statistical Tools: Data and types, construction of frequency distributions and diagrammatic representation, stem and leaf diagram, Normal plot, Range and its importance in relation to variation, Range method for With in and between CV , PMR, SD and CV, Time series, Significance testing (t,F, Z, Chi-Square).

UNIT- III

Six sigma Methodology: Expansion of DMAIC, DFSS, DMADV, DFMA, RPN, ROSS, ROI, and SS and leadership – COPQ- Meaning of DMAIC.

Various tools used in Define stage: Project Charter, A3, Process Flowchart and use of OPC and FPC, SIPOC Diagram, Stakeholder Analysis, Work Breakdown Structure, CTQ , Methods of Brainstorming , 6-3-5 , TOC and TIL, QFD , ABC analysis, Pareto Analysis, 5 Why analysis

Financial aspects of a project for Six sigma: Project selection by Pay back period, Net Present Value, Accounting Rate Return, Internal Rate of Return (Simple problems to be dealt)

UNIT- IV

Measure Phase : Gage R & R and a numerical example , Interpretation

Analyse phase: analyzing the source of variation -cause and effect diagram -box plots – statistical interference -regression -correlation -Design of Experiments (DOE)- Overview – ANOVA, Factorial experiments, Yates algorithm – Failure mode and effects analysis .

Improve and Control phases:
Improvement decisions , Control charts for Variables and Attributes, Shifting of average, Project control thro' CPM, PERT, Crashing in Networks., Control thro Cash budget and Flexible budget

UNIT – V

Lean Manufacture : Introduction to lean, Origin of lean, approach, elements, principles, benefits, , Waste and its types(Muda and its types – Mura – Muri), Visual Management – 5S – Six Big Losses- Concept of Standardised work, estimation of Standard Minute Value (SMV) ,simple numerical examples on CMV calculation- SAM in relation to productivity, methods to improve SAM - Takt time, Pitch time
– Comparison of overall efficiency with individual efficiency .
Brief note on: Common Layouts, JIT, Kanabn and its six rules, Value stream mapping– Three types of Pull Systems –JIDOKA and its implimentation, Kaizen and steps, Kaizen training, Poke Yoke (Common errors, Types and use of Poka-Yoke systems), Lean improvement and culture, Hoshin Planning, Hujinka Box.

COURSE OUTCOME(Graduate to have)

1. An ability to understand the concept of lean manufacturing in textile and apparel industry.
2.An ability to examine the role Six sigma and its concepts in making an error free environment in textile and apparel production systems.
3.An ability to understand the need and objectives of statistical tools in lean and six sigma applications.
4.An ability to understand the principles of lean tools and lean implementation.
5. An ability to understand and apply the knowledge of modern methods of inventory management and lean culture.
6.An ability to apply the concept of lean for spinning or weaving operations

EXAMINATION : Part-A for 40 Marks (with 10 Questions-Compulsory) & Part -B for 60 Marks (5 Questions to be answered out of 7 of equal weightage selecting atleast one from each Unit)

TEXT BOOKS:

1.Forrest W. Breyfogle, III, James M. Cupello, Becki Meadows, Managing Six Sigma: A Practical Guide to Understanding, Assessing, and Implementing the Strategy That Yields Bottom-Line
2. Fred Soleimannejed , Six Sigma, Basic Steps and Implementation, Author House,
3. James P. Womack, Daniel T.Jones, Lean Thinking, Free Press Business, 2003
4. Michael L.George, David Rownalds, Bill Kastle, What is Lean Six Sigma, McGraw – Hill 2003 Success, John Wiley & Sons, 2000
5. Thomas Pyzdek, The Six Sigma Handbook, McGraw-Hill, 2000.
6.Pascal Dennis, Lean Production Simplified: A Plain-Language Guide to the World's Most Powerful Production System, (Second edition), Productivity Press, New York, 2007.
7.Jeffrey Liker, The Toyota Way : Fourteen Management Principles from the World's Greatest Manufacturer, McGraw Hill, 2004.

REFERENCE BOOKS

1.Michael L. George, Lean Six SIGMA: Combining Six SIGMA Quality with Lean Production Speed, McGraw Hill, 2002.
2.Taiichi Ohno, Toyota Production System: Beyond Large-Scale Production,Taylor & Francis, Inc., 2010.
3.Field W M, "Lean Manufacturing: Tools, Techniques, and How to Use Them", St.Lucie Press, London, 2001.

Mapping of Course Outcomes with Programme Outcomes :

PO /CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	✓	✓	✓	✓		✓					✓	✓
CO2	✓	✓	✓	✓		✓					✓	✓
CO3	✓	✓		✓		✓					✓	✓
CO4	✓	✓		✓		✓					✓	✓
CO5	✓	✓	✓								✓	
CO6	✓	✓	✓			✓					✓	✓

Approved in Academic Council meeting held on 14/09/2022

Programme Elective – II- III- EDTS

ENGINEERING DESIGN OF TEXTILE STRUCTURES

Instruction per week : 3 Hrs — CIE: 40 MARKS
Duration of SEE 3 Hrs — SEE: 60 MARKS
Credits :3

COURSE OBJECTIVES

1.To understand the basic concepts of Yarn Engineering for Yarn formation
2.To study the distribution of fibres in drafting zone in spinning
3.To understand the stress and strain in fibres during yarn formation
4.To understand the aspects of Pierce plain fabric geometry
5.To study the behavior of woven and knits for Tensile deformation

UNIT -I.

Introduction to Yarn Engineering : Role of Engineering aspects in Yarn formation, Basic concepts of Engineering design of Textile Structures ,Geometry of twisted yarn , idealised helical yarn geometry, yarn count and twist factors , Limits of twists , Real and idealised yarns,– Schwarz Constant, Twist contraction, Contraction & retraction factor.

UNIT-II.

Packing of fibers – yarn idealised packing – concept of open and close packing – Deviations from ideal forms of packing – specific volume of yarns – Measurement of packing facts – yarn diameter concept as suggested by pierce Hamilton, Grosberg and Dickson.

UNIT -III.

Fiber migration – ideal migration – Tracer fibre technique – characteristics of migration – Strain mechanics: Strain in yarns – with and without lateral change – determination of twist angles before and after straining (simple numerical problems) – energy stored in fibre – blended yarn mechanics – Hambergers analysis.

UNIT -IV.

Elements of fabric geometry – pierce cloth geometry – Problems on Pierce geometry model. Concept of Kemp's race track model and Olefin mechanistic model – Derivation of formula of Arial density of fabrics. Problems on fabric weight , cover factor and fabric cover – Pierce & Balls weight factor – Fabric quality index.

UNIT -V.

Tensile properties of woven fabric – Geometrical changes during extension –the load extension modulus (without considering bending energy) – Geometry of plain knitted fabrics – Empirical dimensionless relation ships. Concept of Runners ratio. Structure ratio – Problems on dimensionless constants. Analysis of fabric shear.

COURSE OUTCOME(Graduate to have)

1. An ability to apply the basic engineering concepts to Textile Design
2. An ability to understand the packing of fibres in Yarn formation at Ring frame
3. An ability to apply the concept of fibre migration in understanding the yarn hairyness
4. An ability to apply the pierce fabric geometry in weaving of fabrics
5. An ability to design the textile supplement with necessary Tensile properties for woven and knitted fabrics.
6. An ability to judge the structure of fibre and decide the yarn and fabric properties there of .

REFERENCE BOOKS:

1. Structural Mechanics of Fibers, Yarns and Fabrics, Vol – I – Hearle, Grosberg and Backer, Wiley – Inter-science, New York 2011
2. Textile Yarns - B.C.Goswami, John Wiley & Sons, New York 2010.
3. Mechanics of Flexible fiber assemblies – J.W.S. Hearle, The Textile Institute, Manchester, 2009.
4. The Mechanics of Wool Structures – Ron Posal, DeJong, New South Wales university publication, New South Wales, Australia, 2008.

Mapping of Course Outcomes with Programme Outcomes :

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	✓	✓	✓	-	-	✓	-	-	-	-	-	-
CO2	✓	-	✓	-	-	-	✓	-	-	-	-	-
CO3	✓	✓		-	✓	-	-	-	-	-	-	-
CO4	✓	✓	-	-	✓	-	-	-	-	-	-	-
CO5	✓	✓	✓	-	-	-	-	-	-	-	-	-
CO6	✓	✓	✓	✓	-	-	-	-	-	-	✓	-

LAB 1 - ATL

APPAREL TECHNOLOGY LAB

Instruction per week :4 Hrs — CIE: 40 MARKS
Duration of SEE 3 Hrs — SEE: 60 MARKS
Credits :2

COURSE OBJECTIVES:

1. To educate the students about product development and execution of studies on costing and size chart.
2. To provide the knowledge on operation bulletin & Layout, consumption of materials.
3.To understand the concept of Size chart
4.To learn the operation bulletin for different sorts
5.To derive the elements of Garment costing

LIST OF EXPERIMENTS: (Minimum of 8 Experiments have to be performed)

1. Extraction of design of Apparel product (Knits, Woven)
2. Preparation of Size chart
3. Preparation and Development of a Pattern for an Apparel
4. Preparation of Operation Bulletin & Layout for knits
5. Preparation of Operation Bulletin & Layout for woven
6. Calculation of Thread consumption of products.
7. Garment costing for knits T- Shirts
8. Garment costing for knits Track
9. Garment costing for woven Shirt
10. Garment costing for woven Trouser

COURSE OUTCOME: (Graduate to have)

1. An ability to understand Product development and costing.
2. An ability to understand the process of working on operation bulletins & Layout, consumption of materials
3.An ability to design the Operation bulletin for producing kids wear
4.An ability to evaluate the Operation bulletin for men and women's wear
5.An ability to derive the overall costing of Garments
6.An ability to create the yarn consumption and cost aspects for a new style

Mapping of Course Outcomes with Programme Outcomes

PO / CO	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO12
CO1	✓	-	✓	✓	-	-	-	-	-	-	-	-
CO2	✓	✓	✓	-	✓	-	-	-	-	-	-	-
CO3	✓	✓	✓	-	✓	-	-	-	-	-	-	-
CO4	✓	✓	-	-	✓	-	-	-	-	-	-	-
CO5	✓	✓	-	✓	-	-	-	-	-	-	-	-
CO6	✓	✓	✓	-	-	-	-	-	-	-	-	-

LAB 1 - ADL

APPAREL DESIGNING LAB

Instruction per week :4 Hrs — CIE: 40 MARKS
Duration of SEE 3 Hrs — SEE: 60 MARKS
Credits :2

Course Objectives

1. To provide the basic knowledge of paper patterns and tools required for making of it.
2. To Educate the students about current fashion trend.
3.To provide the methodology of preparation of drafting procedure for particular style of garment.
3.To provide the concept of designing of kids wear
4.To educate the students about the designing of Men's wear
5. To educate the students about the designing of Women's wear

LIST OF EXPERIMENTS

1. Drafting of paper pattern for :Bodice &Collars,
2. Drafting of paper pattern for Pockets ,Yokes ,Cuffs ,Sleeves
3.Designing, drafting & constructing childern's apparel and designing, Drafting and Constructing Bib Variation in outline shape.
4. Designing, drafting & constructing childern's apparel and designing, Drafting and constructing Panty – Plain or plastic lined panty
5. Designing, drafting & constructing childern's apparel and designing, Drafting and Constructing Jabla – with or without sleeve with or without opening
6.. Designing, drafting & constructing childern's apparel and designing, Drafting and constructing Knicker – Elastic waist, without opening with elastic at thighs
7. Designing, drafting & constructing childern's apparel and designing, Drafting and Constructing Baba suit - Knicker with chest piece attached with straps.
8. Designing, drafting & constructing childern's apparel and designing, Drafting and Constructing A – Line petticoat with double pointed dart and other variations.
9. Designing, drafting & constructing childern's apparel and designing, Drafting and Constructing Summer frock - without sleeves & collars, suspenders tied at shoulder
10. Designing, drafting & constructing childern's apparel and designing, Drafting and Constructing Yoke Frock – with sleeve, with yoke, gathered or umbrella skirt, with or Without collar.
11 .Drafting, grading and constructing Ladies top and skirt,
12. Drafting, grading and constructing Salwar Kameez and Night Suit
13. Drafting, grading and constructing Jeans and Men's Full sleeve shirt

COURSE OUTCOME (Graduate to have)

1. An ability to understand pattern construction process and tools required.
2. An ability to prepare drafting procedure for construction of pattern.
3. An ability to prepare the patterns for different styles of garments.
4. An ability to design the patterns by using CAD marker software.
5. An ability to evaluate the cost of the garment thro design
6.An ability to design the dresswear

Mapping of Course Outcomes with Programme Outcomes

PO / CO	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO1 2
CO1	✓	-	✓	✓	-	-	-	-	-	-	-	-
CO2	✓	✓	✓	-	✓	-	-	-	-	-	-	-
CO3	✓	✓	✓	-	✓	-	-	-	-	-	-	-
CO4	✓	✓	-	-	✓	-	-	-	-	-	-	-
CO5	✓	✓	-	✓	-	-	-	-	-	-	-	-
CO6	✓	✓	✓	-	-	-	-	-	-	-	-	-

MC

RESEARCH METHODOLOGY AND IPR

Instruction per week :2 Hrs CIE: 40 MARKS
Duration of SEE 3 Hrs SEE: 60 MARKS
Credits :2

Unit 1: Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations
Unit 2: Effective literature studies approaches, analysis Plagiarism, Research ethics,
Unit 3: Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee
Unit 4: Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.
5: Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications.
Unit 6: New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs

Approved in Academic Council meeting held on 14/09/2022

M.Tech.(Textile Technology)(AICTE Scheme)
Specialization –Apparel Technology
Semester –II
(For the Batch admitted in Academic Year 2022-23)

S.NO.	Course type / Code	Course Title	SCHEME OF INSTRUCTION HOURS PER WEEK		SCHEME OF EXAMINATION			Credits
			L	P	Duration Hrs	CIE	SEE	
1	Core 3	Apparel Production Technology - II	3	0	3	40	60	3
2	Core 3	Process and Quality Control in Textiles	3	0	3	40	60	3
3	Program Specific Elective - III	1.AIAM 2.IAM 3.SAMA	3	0	3	40	60	3
4	Program Specific Elective - IV	1.SY 2.SAM 3.PG	3	0	3	40	60	3
5	Lab 3	Fabric Structure & Design lab	0	4	4	40	60	2
6	Lab 4	Textile & Apparel Testing Lab	0	4	4	40	60	2
7		Mini Project	2	-	-	40	60	2
8	Audit 2	Audit Course	2	-	-	-	-	-
		Total	16	8		280	420	18

AUDIT 1 and 2: ENGLISH FOR RESEARCH PAPER WRITING
AUDIT 1 and 2: DISASTER MANAGEMENT
AUDIT 1 and 2: SANSKRIT FOR TECHNICAL KNOWLEDGE
AUDIT 1 and 2: VALUE EDUCATION
AUDIT 1 and 2: CONSTITUTION OF INDIA
AUDIT 1 and 2: PEDAGOGY STUDIES
AUDIT 1 and 2: STRESS MANAGEMENT BY YOGA
AUDIT 1 and 2: PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS

Programme Specific Elective -III	**Programme Specific Elective -IV**
AIAM: Automation in Apparel Manufacture	SY: Specialty Yarns
IAM: Integrated Apparel Merchandizing	SAM: Sustainable Apparel Manufacture
SAMA: Sports and Medical Apparel	PG: Protective Garments

Core 3

APPAREL PRODUCTION TECHNOLOGY – II

Instruction per week : 3 Hrs — CIE: 40 MARKS
Duration of SEE 3 Hrs — SEE: 60 MARKS
Credits :3

Course Objectives:
1.To Understand the concepts of Sewing Technology
2.To learn about various types of Stitches
3To know more about different types of Sewing threads
4.To understand the various trouble shooting situations in Sewing section
5.To know the techniques of Garment Care

UNIT-I
Sewing technology: Introduction to sewing machines, makes of sewing machines , Needles: Types, size, geometry ,selection and their application. Sewing Machine- primary and secondary components, parts, functions and bed types (Flat bed - Cylinder bed - Post bed – Feed – off – the – arm) classification –SNLS, DNLS, chain lock, overlock, flatlock, button fixing and button holing-working principle, bar tacking and pocket folding machine ,mechanism and Timing diagram. Automatic work station - Selection of line, station control system, centralized control system, operation data base, style data base, operation efficiency. Embroidery machines – mechanism, stitch formation, Computer controlled embroidery sewing machine.
Feed systems: Types of feed mechanism: Drop feed – Differential feed – Variable top feed combined with drop feed - Variable top feed combined with differential feed – Compound feed – Unison feed. Variation in feed mechanism, machine speed and rate of feed.

UNIT-II
Stitches & Stitching Mechanism – classification (constructive stitches- temporary and permanent stitches) Lock-Stitch And Chain Stitch - Classification Of Stitches based On Federal Standards - Stitch Class 100,200,300,400,600,600 - Comparison of stitches and Its usage
Seams: definition, types of seams (Seam Types – Plain, Top Stitched Seam, Welt Seam, Lapped Seam, Slot Seam, Flat Fell Seam, Hemmed Flat Felm Seam, French Seam, Piped Seam Superimposed And Bound Seam.)Seam Finishes – Devices For Introducing Fullness, their suitability and applications to various garments, stitch size regulation
Sewing threads- types, selection of sewing threads, sewing problems. Sewing thread consumption ratio.

UNIT-III
SEWING MACHINE ATTACHMENTS: Types, guides- arm, cylindrical and flats guides, folders and binders, presser foot- compensating, gauge, zipper, cording and shirring foot, Details of stand, Table and motor for sewing machines. Seaming Operation Analysis-straight, curved and angular seaming Controllable quality factors.
***TROUBLE SHOOTING*:** Problems in sewing machines – control of oil stains, needle and thread breakage, Various Stitching, Sewing And Assembly Defects - Causes & Remedies: Skip Stitch, Unbalanced, Puckering, Gathering, Needle Defects, Needle Cutting Index ,feed mechanism problems and sewing operations, causes and their remedial measures.
***SEWING MACHINE MAINTENANCE*:** Preventive maintenance, break down maintenance, schedule- daily, weekly and monthly, thread stand assembly, belt insulation check up, feed mechanism, needle bar mechanism, setting and adjustment.
Lubrication System- Functions and types of lubricating system.

UNIT-IV

***SPECIAL PURPOSE SEWING MACHINE*:** Capvisors, shoes, belt and bags.

Fusing technology: Need, Scope, methods & Equipments, Basic materials, resin coating, fusing process, fusing machinery. quality control in fusing.

Pressing technology: Classification, machinery and equipment.

Ironing: Steam, Electric, Pressing Machines: buck press for shirt and pant, carousal press and tunnel press – working principles Garment finishing- fullness, neck finishes, pockets, collars, yoke, placket, sleeves. Garment folding-types Packaging-types, materials, method and equipments. Selection of packaging design

UNIT-V

Documentation and control of material usage: Introduction, fabric usage control, issue of materials, spreading audit, fabric reconciliation, fabric faults and claims for poor quality, documentation and management function.

Garment Accessories & Embellishments:

Role of Accessories - Buttons, Zipper, Labels, Lining. Interlining Labels Wadding, Lace, Braid & Elastic - Hook & Loop Fasteners -

GARMENT CARE: Types and characteristics of stains, Identification of stains, selection of stain removers, methods of stain removal, principles of laundering, different methods of washing. Washing machines - friction, suction and tumble wash.

COURSE OUTCOMES (Graduate to have)

1. Ability to decide the type of stitching machine required
2. Ability to stitch the substrates with different type of stitches and seams
3. Ability to plan for Garment Care
4. Ability to understand the effects of Ironing of Ready made fabrics
5. Ability to evaluate the Suppliers on different basis .
6. Ability to design a specific stitch for a particular Garment

Examination : Question paper consists 8 Questions selecting atleast one from each unit and 5 to be answered out of 8.

REFERENCE BOOKS

1. Sewn Product Technology- Gerry Cooklin, 4th enlarged Edition Blackwell Publications, USA,2010
2. Introduction to clothing manufacture –Gerry Cooklin, Marshell ,6th enlarged Edition Blackwell Publications, USA,2007
3. Materials Management in clothing production – David .T.Tyler, Blackwell Publications, USA,2007
4. Introduction to Clothing Manufacture- Gerry Cooklin, 4th enlarged Edition Blackwell Publications, USA,2010

Mapping of Course Outcomes with Programme Outcomes

PO /CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	✓	✓	✓	✓		✓					✓	✓
CO2	✓	✓	✓	✓		✓					✓	✓
CO3	✓	✓		✓		✓					✓	✓
CO4	✓	✓		✓		✓					✓	✓
CO5	✓	✓	✓								✓	
CO6	✓	✓	✓			✓					✓	✓

Core 4

PROCESS AND QUALITY CONTROL IN TEXTILES

Instruction per week : 3 Hrs CIE: 40 MARKS
Duration of SEE 3 Hrs SEE: 60 MARKS
Credits :3

COURSE OBJECTIVES

1. To provide the knowledge of testing of Fibres, fabrics and Apparels according Standards methods.
2. To Educate the students about importance of Apparel specifications, standards and quality issues in product line
3. To develop an understanding of various operations and testing conditions
4. To understand the Quality Control and Quality Assurance for raw material and finished products
5.To understand the concept of spin and weave plan

UNIT - I.

PQC in Spinning: Scope ,Control of mixing quality , control of yarn realization (Records and Accounting) , Control of waste and cleaning in Blow room and card, Process and Quality Control in Draw Frame -Control of comber waste. Measurement and analysis of productivity means to improve productivity – Process and Quality Control at Simplex-Process Control at Ring Frame: control of yarn quality, count, strength and their variability, yarn unevenness and imperfections, yarn faults and package defects, implementation of process control in cotton spinning.

UNIT - II.

Introduction to Process control in Weaving:

Process control in winding: Scope, Optimizing of Yarn tensioning and clearing (settings for different kinds of yarns) Producing good package, Breakage and snap study in Autoconer (formats) Approach to control of productivity.

Process control in Warping: Scope, Effort to minimize the breakage rate, quality of warper beams, breakage study in warping (norms), productivity, warping defects and remedies. Process control in Pirn winding: Scope, Minimizing the end breaks, improving the build of the yarn, control of speed, productivity.

UNIT - III.

Process control in Sizing: Scope, choice of size recipe and measurement of size pick up, control in size preparation, control of size pick up, controlling sizing conditions, stretch control in various zones, moisture control, quality of sized beams, positive feed to sow box, productivity, Dead loss and its control, hard waste and its control, testing of sized yarn. Selection of reeds and healds, care of reeds, effect of reed parameters on weaving performance.

UNIT - IV

Approach to process control in Loom shed: Non– auto shed: scope, control of speed, breakage and snap study in loom shed, Norms for breakage rate, No. of looms/operative, control of efficiency (concept of calculated and expected efficiency), control of loom stoppages (due to warp and weft break, shuttle change etc.): Auto Shed: elements of Auto loom working and their performance, breakage study, snap study , hard waste study.

UNIT - V.

Process control in Wet Processing: Scope, functions of control house, grey cloth inspection .Process control measures in Bleaching and mercerizing(method to estimate the concentration of caustic and silica in peroxide bleach, absorbency of bleached cloth, cuprammonium fluidity, ash content, barium activity no. luster no. fastness of bleaching).Process control in dye house: parameters for process control in different forms of dyeing (yarn and fabric), test method to determine the caustic and Hydros conc. In vat dye liquor. Process control in Printing and Finishing: Scope, Approach to process control, test for the suitability of thickener in the print paste formation, iodine absorption test for the evaluation of degree of resign cross linking, fastness properties of dyed and printed goods to wash, light perspiration and water. Fastness to rubbing, hot press. Optimal brightness test for the uniformity of cross linking, assessment of degree of heat setting in polyester by Iodine absorption method.

COURSE OUTCOMES (Graduate to have)

1. An ability to understand the customer requirements and made standard product.
2. An ability to use the modern techniques to improve the product quality.
3. An ability to standardized the processes to meet the customer standards.
4. An ability to identify the loop holes at the early stages of product manufacturing by testing.
5. An ability to design the number of machines required for spin plan
6.An ability to evaluate the quality of warp and weft and looms grey fabric

EXAMINATION : Five questions to be answered from Eight selecting atleast one from each unit.

REFERENCE BOOKS

1. Process & Quality Control in Spinning – ATIRA, 2014
2Process & Quality Control in Weaving – ATIRA, 2015
3 Process & Quality Control in Wet Processing – ATIRA, 2014

Mapping of Course Outcomes with Programme Outcomes :

PO / CO	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO1 2
CO 1	✓	-	✓	-	✓	-	-	-	-	-	✓	✓
CO 2	✓	✓	✓	-	✓	-	-	-	-	-	-	-
CO 3	✓	-	✓	-	✓	-	-	-	-	-	✓	✓
CO 4	✓	✓	-	-	✓	-	-	-	-	-	-	-
CO 5	✓	✓	-	✓	-	-	-	-	-	-	-	-
CO 6	✓	-	✓	-	✓	-	-	-	-	-	✓	✓

Programme Elective – III- 1- AIAM

AUTOMATION IN APPAREL MANUFACUTRE

Instruction per week : 3 Hrs CIE: 40 MARKS
Duration of SEE 3 Hrs SEE: 60 MARKS
Credits :3

COURSE OBJECTIVES

1. To learn about various mechanical and electrical drives used in automation of apparel manufacturing.
2. To understand the concept of various hybrid energy transfer power transmission drives
3. To learn about the working of automated elements in cutting, sewing and special machines.
4. To know the working of automated apparel finishing equipment.
5. To understand the role of automated material handling equipment.

UNIT- I

CONCEPT OF AUTOMATION

Base subject information, basic terms and definitions from mechanization area and automation area. Energy transfer in kinematic system, drive requests, types of drives, comparison, characteristics, fluid drives, characteristics, comparing, pneumatic drives, air properties as a medium for energy transfer. Hydraulic drives, schematic diagram, power packs, Proportional hydraulic system, servo-operated valves, circuits with PAS (power assisted steering). Electric drives, general view, characteristics, powers (outputs).

UNIT- II

AUTOMATION IN APPAREL DESIGNING AND FIT ANALYSIS

Automated elements in clothing production - cutting of fabric - cutting by water jet, laser, plasma - automated sewing machines - Types of driving mechanism of sewing machines – single needle lock stitch machine, over lock and flat lock machine. Automation in special machines – bar tack, pocket making and patterning machines, button holing and sewing machines.

UNIT- III

AUTOMATION IN APPAREL FINISHING:

Automation in fusing, pressing and folding machines. Automation in apparel packing equipments.

UNIT- IV

AUTOMATION IN MATERIAL HANDLING

Types of equipment- Automated storage and retrieval systems- Overview of conceptions of “Work Robots” and “Manipulators”. Conveyor systems – Unit production systems. Ply separation; Transportation - position and orientation, pick and place – clamping grippers and pinch grippers. Machine vision system – image acquisition, feature enhancement; Image segmentation – feature extraction, image understanding.

UNIT-V

ROBOTICS IN APPAREL INDUSTRY

Robotics in spreading and cutting; Robotics in sewing – double lock stitching, one side stitching, Tufting; Robotics for material handling; Robots as 2D and 3D folding machines; Robot control and simulation. Return on investment on automation.

COURSE OUTCOMES (Graduate to have)

1. Acquire knowledge on various mechanical and electrical drives used in automation of apparel manufacturing.
2. Gain knowledge on various hybrid energy transfer power transmission drives
3. Explain the working of automated elements in cutting, sewing and special machines.

4. Gains knowledge about automated apparel finishing equipment.
5. Describe the concepts of automated material handling equipment.
6. Explain the application robotics in various areas in apparel industry

EXAMINATION : Five questions to be answered from Eight selecting atleast one from each unit

REFERENCES

1.Berkstresser, G.A. & Buchanan, E.M., Automation and Robotics in the Textile and Apparel Industries, Noyes Publications, 1986.
2.M.G.Mahadevan,"Textile Robotics and Automation",Abhishek Publications, Chandigarh, 2001.
3.A.Gordan, et al., "Automation and Robotics in the Textile and Apparel Industries (Textile series)", Noyes Publication, UK, 1986.
4.G.A.Berkstresser, "Automation in the Textile Industry: From Fibers to Apparel", 1st Edition, Technomic Publishing Co., Inc, UK, 1995.
5.M.Acar, "Mechatronic Design in Textile Engineering", NATO Science Series, 1st edition, Springer, USA, 1994.
6. Carr, H. and Latham, B., 'The Technology of Clothing Manufacture', Wiley-Blackwell, 2009. Relis, N. & Strauss, G, 'Sewing for Fashion Design', Upper Saddle River, NJ: Prentice Hall, 1997.
7.Stylios G, 'Textile Objective Measurement and Automation in Garment Manufacture' Ellis Horwood Ltd., U.K., 1991

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CO1	✓	✓	✓	✓		✓					✓	✓
CO2	✓	✓	✓	✓		✓					✓	✓
CO3	✓	✓		✓		✓					✓	✓
CO4	✓	✓		✓		✓					✓	✓
CO5	✓	✓	✓								✓	
CO6	✓	✓	✓			✓					✓	✓

Programme Elective – III- 1- IAM

INTEGRATED APPAREL MERCHANDIZING

Instruction per week : 3 Hrs CIE: 40 MARKS
Duration of SEE 3 Hrs SEE: 60 MARKS
Credits :3

Course Objectives:

1.To understand the usefulness of Visual Merchandizing
2.To design a specific Mannequin for a retail room
3. To learn about the basic aspects of Export Credit
4.To learn about international trade
5.To understand the concept of Visual merchandizing

UNIT - I.

Merchandise, Merchandising :Types, functions, characteristics and requirements of a merchandiser, merchandise manager-functions , factors affecting merchandising function – merchandise hierarchy – merchandise mix – components of merchandise management – merchandise strategies -role of exporters, manufacturer, merchant exporter, job workers (CM/CMT), buying offices, buying agents, different types of buyers – communications with the buyers – awareness of current market trends – product development line planning – line presentation.- Functions, duties and responsibilities of merchandisers in garment unit, Career in Merchandising-Merchandise Planning-Time Management in Merchandising- production planning, vendor evaluation and rating, vendor based rationalization, order placement, in-house and sub contractor units, follow-up of yarn, fabric, processes and accessories, approvals, types of approvals, approval procedures, buyer approval and organizational approval, record maintenance**,** Merchandise performance- merchandise control- merchandise budgets and forecasting

UNIT-II

Export Credit

Export credit - Short term- Medium term –Long term. Anticipatory letter of credit- packing of credit. Negotiation of bills. Terms of payment in international marketing. Factors responsible for counter trade growth.

Trading: Domestic Vs international trade- Regional trade blocks- Foreign exchange market – Nature of foreign exchange market- Main functions. Business environment: Social environment- Logical environment- Business ethics.

Balance of Payment: Balance of payment: Deficit - Debits – Credits. Foreign exchange market - Credit for export trade. **Documentation** Order confirmation, various types of export documents, pre-shipment post-shipment documentation - terms of sale - payment - shipment.

Export incentives: Duty drawback - DEPB - Import – Export - license-exchange control regulation-foreign exchange regulation acts-export management risk-export finance. GATT/ WTO – functions and objectives - successes and failures.

Export Documents: Export Documents: International codes for products and services – Principal documents- Auxiliary documents- Documents for claiming export assistance.

UNIT III

VISUAL MERCHANDIZING

Display and Presentation

Different kinds of images, the four P's of marketing, store design, window displays, interior displays, image changes, style, business highlights, men, women, and children's wear feature projecting the correct image. Store – Types of retailers, locations of retailers, presentations in different types of retail stores. Fashion merchandise presentation – The American general store – 1800s-1960s, American department stores, Indian departmental stores and fashion centres. Design composition –

Two composition methods, basic design methods, creating attention, creating displays, design solutions, and the purpose of design.

Colour and Display

Color is one of the most important design tools, a mini color glossary, the color wheel, the five color families, color planning for the selling floor, communicating about color, customers, color and historical periods, business highlights, color features: is heaven really "linen white"? Display props – Props, choosing props, rent, buy, or build, Supplies-setting up shop – The display – hop studios, the toolbox, shop mate

UNIT IV

Store lighting

Seeing with light, light and the customer, a lighting mini glossary, the light bulb, the two light sources: daylight and electric light, creating the right mood with light and shadow, lighting the display window, special events, light planning – light and shadow, lighting all store types, electrical receptacles, business highlights, lighting features: grand hall gallery – the museum look. Fixtures – Merchandise fixtures, retail and apparel fixtures, the super market, the exclusive boutique, super mores and warehouse clubs, sales goals and floor planning.

The Mannequin

The mannequin, abstract mannequin**,** display forms, mannequin chronology, the function of mannequins, rigging forms, shirt and blouse forms, dressing mannequins, budgets and repairs, business highlights, mannequin features, body perfect. Importance of flower arrangements in stores, the florist, flower motifs, giant floral supply wholesalers.

UNIT V

Signs and Communication

Self-service creates need for signs, first customer contact, merchandise signs, alternative type face materials, departmental signs, sign production in supermarkets, sign production in fashion stores, sign sizes, merchandising staff, building signs, sign maintenance, business highlights, Vendors and markets – Finding display materials, the national association of display industries, other shows and sources, antique shops, flea markets, and auctions. Fashion news and communication – Industry news from magazines, newspapers, government publications, fashion reporting services, store communication.

Logistics & Logistics Management: Components, Missions of Logistics, Functions of LM, Logistic Providers, System Trade-Off, Reverse logistics,. A Logistics Engineering -I.T in Logistics: Emerging concepts, Global Logistics 3 PL Vs 4PL,

Supply Chain Management : Elements ,Functions of SCM- Bull whip effect- IT for SCM: Concept, Need, Tools, APS-Data Mining: E- Business & SCM

COURSE OUTCOMES: Graduates to have

1.An ability to understand the functions and the requirements of the merchandiser.
2.An ability to understand the formalities required (documentation, incentives by the govt) to export the goods.
3.An ability to understand the need and principles involved in visual merchandising.
4.An ability to understand the logistics and the supply chain management of the organization.
5.An ability to understand the usefulness of Visual Merchandizing
6. An ability to design a specific Mannequin for a retail room

EXAMINATION : Five questions to be answered from Eight selecting atleast one from each unit.

REFERENCE BOOKS

1.Robert Colborne, "Visual Merchandising: The Business of Merchandise Presentation", Delmar Learning, 1996
2.Fashion Marchadising-Eliane Stone and Jean A.Samples,Mc-Graw Hill Book Company,NY
David.J.Bloomberg(EEE) " Logistics", PHI, New Delhi, 2005
3.Donald.J.Bowersox & Davis J.Closs " Logistical Management" Printice Hall,2002
4.Sarika Kulkarni& Ashok Sharma "Supply Chain Management" Tata Mc-Graw Hill,New Delhi,2004

5.Rahul V.Altekar" Supply Chain Managemtn",_PHI, New Delhi, 2005

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CO1	✓	✓	✓	✓		✓					✓	✓
CO2	✓	✓	✓	✓		✓					✓	✓
CO3	✓	✓		✓		✓					✓	✓
CO4	✓	✓		✓		✓					✓	✓
CO5	✓	✓	✓								✓	
CO6	✓	✓	✓			✓					✓	✓

Programme Elective – III- 3- SAMA

SPORTS AND MEDICAL APPAREL

Instruction per week : 3 Hrs — CIE: 40 MARKS
Duration of SEE 3 Hrs — SEE: 60 MARKS
Credits :3

COURSE OBJECTIVES

1. To understand the role of sports apparels
2. To study the construction cross functional assemblies
3. To understand the role of bio materials of metals, ceramics, polymers, natural bio materials and specialty fibers.
4. To learn about the different types of healthcare and hygiene products, infection control and barrier materials and non woven products.
5. To analyse the properties of different types of bandaging materials and pressure garment produced with suitable construction techniques.

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UNIT- I

REQUIREMENTS FOR APPAREL:

Introduction to apparel design & types – Aesthetic, functional, Exploratory, Incremental. Requirements for clothing design - physiological, biomechanical, ergonomic, psychological requirements. Process, steps involved in clothing design. Emerging trends: smart clothes and wearable technology; biomimicry; environmental issues. Smart textile materials: auxetic materials; chromic materials; conductive fibres and textiles; other smart materials; holofiber; stomatex; d3o (dee-three-oh);

UNIT-II

SPORTS CLOTHING & CROSS FUNCTIONAL ASSEMBLIES

Test methods and standards for different sport clothing Vanity functional clothing- Body shaping, support and contouring for enhanced appearance. Multi functional performance, protection, life support, comfort, communication Clothing for special needs - enabling clothing for elderly, infants, and disabled.

UNIT- III

TISSUE ENGINEERING, BIOPOLYMERS & WOUND DRESSINGS

Biopolymers: classification and their properties, requirements and applications. Bio active dressing, Metals, ceramics, composites and textile materials; specialty medical fibres. Tissue engineering: properties and materials – scaffolds in tissue engineering. Testing methods; *In - vitro* tests, *In - vivo* assessment. Wound dressing - types - Traditional and advanced wound dressings. Testing of wound care materials.

UNIT-IV

FUNCTIONAL SMART MATERIALS & BIO SENSORS

Smart textiles in wound care; phase change and shape memory materials –applications. Monitoring pregnancy, children and cardio patients. Mobile health monitoring; electronics in medical textiles; Smart textiles in rehabilitation and applications; Sensors for healthcare, Wearable technology. Therapeutic rehabilitative clothing- pressure garments for lymphatic and venous disorders, scar management. Bio sensing- Monitoring of physiological parameters, heart rate, blood oxygenation, body temperature, telemedicine applications

UNIT-V

CLOTHING EVALUATION

Measurement of physiological, sensorial, tactile, thermal comfort: wear comfort as a measurable quantity; wearer trials; skin model; skin sensorial test apparatus. Standard test methods. Measurements of clothing performance: thermal insulation & conductivity; evaporative resistance; wind & air resistance; breathability, Moisture transport – wetting and wicking, water resistance; water vapour transfer.

COURSE OUTCOMES: (Graduate to have)

1.An ability to decide the requirements of apparel
2.An ability to evaluate the cross functional assemblies
3.An ability to correlate the substrate nature with the properties
4.An ability to select the bio sensors
5.An ability to explore the applications of wound dressings
6. An ability to design a Medical apparel .

EXAMINATION : Five questions to be answered from Eight selecting atleast one from each unit.

REFERENCES

1.S.C. Anand, M.M.Traftab, S. Rajendra, 'Medical Textiles & Biomaterial for Healthcare', Woodhead Publication, 2005
2.S. Rajendra, 'Advance Textile for Wound Care,' Woodhead Publication, 2009
3.J.F. Kennedy, S.C. Anand & F.Miraftab, 'Medical Textiles 2007: Proceedings of the Fourth International Conference on Health Care & Medical Textile. CRC Press, 1st Edition, 2009
4.Allison Mathews and Martin Hardingham, "Medical and Hygiene Textile Production – A hand book", Intermediate Technology Publications, 1994.
5.Joon B. Park.and Joseph D. Bronzino., "Biomaterials – Principles and Applications",CRC Press Boca Raton London, NewYork, Washington , D.C. 2002
6.Anand S., " Medical Textiles", Textile Institute, 1996, ISBN: 185573317X
7.Michael Szycher and Steven James Lee, "Modern Wound Dressing: A Systematic Approach to
8.Wound Healing", Journal of Biomaterials Applications, 1992
9.Shishoo R., 'Textiles in Sport', Woodhead Publishing Limited, CRC Press,, 2005
10.Jenkins M . 'Materials in Sports Equipment', Volume 1, Woodhead Publishing Limited, CRC Press, 2003.
11.J. W. S. Hearle, 'High Performance Fibres', Woodhead Publishing Limited, CRC Press, 2001
12.'Surfaces for Sports Areas. Determination of Resistance to Impact', B S I Standards, 2000
Y Li and A S W Wong , 'Clothing Biosensory Engineering', Woodhead Publishing Series in Textiles No. 51, 2006

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CO 1	✓	-	✓	-	✓	-	-	-	-	-	✓	✓
CO 2	✓	✓	✓	-	✓	-	-	-	-	-	-	-
CO 3	✓	-	✓	-	✓	-	-	-	-	-	✓	✓
CO 4	✓	✓	-	-	✓	-	-	-	-	-	-	-
CO 5	✓	✓	-	✓	-	-	-	-	-	-	-	-
CO 6	✓	-	✓	-	✓	-	-	-	-	-	✓	✓

Approved in Academic Council meeting held on 14/09/2022

Programme Elective – IV- 1- SY

SPECIALTY YARNS

Instruction per week : 3 Hrs — CIE: 40 MARKS
Duration of SEE 3 Hrs — SEE: 60 MARKS
Credits :3

Course Objectives

1.To provide an idea about the changes to be made in Ring frame to produce Fancy yarns
2.To educate the students about the production of yarns varying in cross section
3. To provide the education about the modifications in drafting system for speciality yarns.
4.To understand the quality parameters required for production of specialty yarns
5.To learn about the application of different types of specialty yarns.

UNIT-I

Facny Yarns: Introduction, importance, need of specialty yarns , Necessary changes to be made in Ring frame in spinning , technical parameters , & applications, Classification of yarns

Elastane Yarns: End use application, spinning of lycra yarns on ring spinning necessary modification on machine, process parameters, production, yarn properties.

Cover & Core yarns: Principles of formation of yarn, constructional details of machine, process description, production of different types of cover & core yarn, yarn properties & end uses

Twisted Yarns: Filament twisting, different types of twisted yarns, manufacturing & yarn properties, Fancy twisted yarns. Structures & properties of different filament twisted yarn. Twist setting of yarn

UNIT-II

Melange Yarn: Concepts of producing mélange yarn. Process and sequence used for production of Melange yarn. Suitability of yarn in different end uses

Special Yarns on Unconventional Spinning Technologies: - Manufacture Properties & end uses of, Siro, Bobtex, Self-twist, Twistless, etc. Concepts of composite yarns

Metalized Yarns: - Concepts of Metallic and Metalized yarns, Characteristics of metalized yarn – Manufacture of metalized yarns , Applications of yarns.

Sewing Threads: - Introduction to thread construction, Characteristics of sewing threads, production methods, Types of thread packages.

UNIT-III

Ropes, Cordage, & Twines: - Requirements of initial fibres & yarns, Manufacturing process, structures & properties of yarns.

Embroidery Yarns, Laces & Braids: - Introduction, Process sequence, Manufacturing details & Machines required. Properties & application of embroidery yarns, Laces & Braids.

Neppy and fleck yarn: - Production, properties of yarn & applications.

UNIT-IV

Manufacture of some special purpose yarns like:– Slub, double twist, Knop yarn, Chenille yarn, Diamond yarn, Eccentric yarn, Boucle yarn, Thick 'n' Thin Yarns.

Compact Yarns: Definition, Importance of compact yarns. Different techniques, used for the production of compact yarns, Machines and parameters used to make of compact yarns in different end uses

Hosiery Yarns: Requirement of hosiery yarn. Raw material for hosiery yarn Process sequence & process parameters to make hosiery yarn form Cotton Polyester, viscose & their blends. Properties and end use applications of hosiery yarns

Dyed Yarns: Requirement of dyed yarns. Types of dyed yarns – Fibre dyed yarn, dope dyed yarn. Dyed yarns from cheese, yarn dyeing. Process sequence & machine required for production of above yarns. Yarn properties & applications

UNIT-V

Singed Yarn: Hairy yarn Vs hair free yarn. Methods of singeing of yarn Machine description & process parameters to produce singed yarns. Change in properties of yarn after singeing
Mercerised Yarn: - Necessity of mercerization of yarn, Machine & sequence for yarn mercerization, . Yarn characteristics of mercerized yarn
Special Textured Yarn: Manufacture of specialty yarns from different filaments on Draw Texturisng, Air jet Texturising, and Chemical Texturising etc
Tyre Cords: Textiles in Tyres, Required properties of initial yarns. Structure of twisted cord yarns, Cord twisting, Cord fabric manufacturing. Properties of tyre
Film Yarns: Flat film yarns, fibrillated film yarn manufacture, Properties & applications

Course Outcome (Graduate to have)
1.An ability to apply the knowledge of yarns to fabrics
2. an ability to understand the suitability of fancy yarn for a specific end use
3.An ability to modify the process in spinning for producing fancy yarns
4. An ability to evaluate the quality aspects of specialty yarns
5.An ability to design a special type of yarn for Industrial applications
6.An ability to plan for Spinning machines and modifications required there of.

EXAMINATION : Five questions to be answered from Eight selecting atleast one from each unit.

REFERENCE BOOKS:
1..'Sewing Threads' Textile progress vol.30 no.3/4, by J.O. Ukponmwan, The Textile,2005
2. Fundamentals of staple yarn manufacture: Lawrence Carl, CRC , Publishers,2016
3.Fancy Yarns – M.H. Gong & Mukhyopadhyaya, Textile Progress, Vol.32 ,2008
4.Textile Yarns – B.C.Goswamy, Wiley Easter International Publisher, 2001

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CO 1	✓	-	✓	-	✓	-	-	-	-	-	✓	✓
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CO 3	✓	-	✓	-	✓	-	-	-	-	-	✓	✓
CO 4	✓	✓	-	-	✓	-	-	-	-	-	-	-
CO 5	✓	✓	-	✓	-	-	-	-	-	-	-	-
CO 6	✓	-	✓	-	✓	-	-	-	-	-	✓	✓

Programme Elective – IV- 2- SAM

SUSTAINABLE APPAREL MANUFACTURE

Instruction per week : 3 Hrs CIE: 40 MARKS
Duration of SEE 3 Hrs SEE: 60 MARKS
Credits :3

COURSE OBJECTIVES:

1 To understand the concept of sustainability
2 To understand features of product and process design with focus on sustainability
3 To learn about sustainable manufacture using modern technology tools
4 To learn about sustainable manufacturing of apparel and reuse and recycling in the apparel manufacturing to achieve sustainability
5 To understand Corporate Social Responsibility and mandatory certification towards sustainability.

UNIT- I
SUSTAINABLE DESIGN

Definition of Sustainability – need for sustainability. Factors influencing sustainability. Impact of ecology, economy, and culture on sustainability. Product Life Cycle. Product design sustainability using low - impact materials, recyclable material content. Energy efficient product design, design for longer-lasting and better-functioning products, product design for reuse and recycling. Assessing the product sustainability. Sustainable fibres – organic cotton, recycled polyester, alternative sustainable fibers.

UNIT- II
SUSTAINABLE PROCESS DEVELOPMENT

Sustainability through Manufacturing Resource Efficiency - raw material, plant and machinery, human resource, financial resource. Sustainable manufacture through application of alternative energy source, reuse and recycle of energy. Sustainable process through technology innovation – application of CAD / CAM / CIM in process innovation and improvement. Extending product life cycle through reuse and recycle of process waste. Assessing process sustainability

UNIT- III
SUSTAINABLE MANUFACTURE

Sustainable elements in manufacture – cost of production, power consumption, and waste creation – process waste and defects, operational safety and ergonomics, environmental friendliness. Sustainability in supply chain - supplier sustainability assessment. Safe and efficient care method for apparels to increase sustainability.

UNIT-IV
REUSE AND RECYCLE OF WASTE

Types of wastes in textile and apparel manufacture – material waste, human resource waste, energy waste. Scope of reuse and recycle of waste in textile and apparel manufacture. Waste elimination at source in textile and apparel manufacturing.

UNIT-V
COMPLIANCE FOR SUSTAINABILITY

Role of National and international regulating organizations in sustainability –,Worldwide Responsible Accredited Production (WRAP). mandatory requirements – benefits to company, labour and society.

COURSE OUTCOMES: (Graduate to have)

1.An ability to apply the knowledge of sustainability
2. An ability to design of product and process design with focus on sustainability
3.an ability to evaluate sustainable manufacturing with modern technology tools

4. An ability to explore the possibility of reuse and recycling in the apparel manufacturing to achieve sustainability
5.An ability to implement Corporate Social Responsibility and mandatory certification towards sustainability.
6. An ability to establish the norms for technical and social compliance requirements for apparel industry in domestic and international context.

EXAMINATION : Five questions to be answered from Eight selecting atleast one from each unit.

REFERENCES

1.Lewis, H. and Gertsakis, J. Design and Environment: A Global Guide to Designing Greener Goods, Greenleaf Publishing, Sheffield, 2001.
2.Dalcacio.R, Julius.W, 'Product Design in the Sustainable Era', Taschen Publication. 2000
3.Cynthia.L**, '**Apparel Product Design and Merchandising Strategies**',** Prentice Hall, 2007.
4.Janet Hethorn, Connie Ulasewicz, 'Sustainable Fashion: Why Now? A conversation exploring issues, practices, and possibilities', Fairchild Books, 2007.
5.Ann Paulins and Julie L. Hillery, Ethics in the Fashion Industry New York, Fairchild Books, 2009.
6.Bartlett N., Mc Gill I. and Morley N., Maximising the Reuse and Recycling of UK Clothing & Textiles, UK: Oakdene Hollins, 2009

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CO 2	✓	✓	✓	-	✓	-	-	-	-	-	-	-
CO 3	✓	✓	✓	-	✓	✓	-	-	-	-	-	-
CO 4	✓	✓	✓	-	-	-	-	-	-	-	✓	-
CO 5	✓	✓	✓	-	-	-	-	-	-	-	-	-
CO -6	✓	✓	✓	-	-	-	-	-	-	-	-	✓

Programme Elective – IV- 3- PG

PROTECTIVE GARMENTS

Instruction per week : 3 Hrs CIE: 40 MARKS
Duration of SEE 3 Hrs SEE: 60 MARKS
Credits :3

COURSE OBJECTIVES

1. To learn about chemical protection
2. To understand about the concept of Thermal protection.
3.To develop the new ideas to design and use different materials for creating innovative protective clothing.
4. To understand about the design of new protective clothing based on the requirement
5. To know about the different international standards for protective clothing

UNIT-I

CHEMICAL PROTECTION

Chemical Hazards- Need, evaluation of barrier effectiveness of protective clothing- performance of protective clothing. Material requirements- test methods.

UNIT-II

THERMAL PROTECTION

Thermal Protective Clothing-Thermal characteristics and combustion mechanism of fibres- Heat resistant and Flame retardant - Inherently flame retardant fibres and chemical modified fibres, Flame retardant finishes. Requirements of ballistic protection.

UNIT-III

MECHANICAL PROTECTION

Requirements-knife performance- fundamental principle of knife impact, protection levels- test methods-ballistic protection-requirements- materials used- test methods

UNIT-IV

ELECTRICAL AND RADIATION PROTECTION

Material Selection, production techniques: Nuclear Hazards, Protection from Electromagnetic radiation waves-UV and others. Electrical protective clothing and its evaluation

UNIT-V

HEALTH CARE AND HYGIENE CLOTHING

Material Selection, production and processing techniques: bedding, surgical wound dressings, bandages and sanitary napkins. Quality parameters.
Surgical drapes**,** Gowns for operating personnel, theatre masks, non-woven swabs, post operation dress-Materials and quality parameters.

COURSE OUTCOMES (Graduate to have)

1. An ability to apply the required knowledge on different functional requirements of protective clothing and technology used in the manufacture of protective clothing.
2. Design and select materials for new protective clothing
3. Explore new ideas to design and use different materials for creating innovative protective clothing.
4. Evaluate and design new protective clothing based on the requirement
5. Understand the different international standards for protective clothing
6. Gain knowledge material selection, production of heathcare and hygiene apparels

EXAMINATION : Five questions to be answered from Eight selecting atleast one from each unit.

REFERENCES

1. Bajaj.P., and Sengupta.A.K., "Protective clothing", The Textile Institute, 1992.
2. Richard A.Scott., "Textile for Protection"Woodhead Publishing Ltd., 2005.
3. Eugene W Ilusz., "Military Textiles" Woodhead Publishing Ltd., 2008.
4. L.Van Langenhove., "Smart Textile For Medicine And Health Care" Woodhead Publishing ltd
5. Johnson J.S., and Mansdork.S.Z., "Performance of Protective Clothing", American Society for Testing and Materials (ASTM),1996.
6. P.W.Harrison., "The Design of Textiles for industrial Application", The Textile Institute, Manchester, 1998
7. Sabit Adanur,Wellington Sears Handbook of Indusrial textiles,Technomic publishing company,1995, ISBN 1-56676-340-1
8. J T Williams, De Montfort University, UK., "Textile for cold weather apparel" Woodhead Publishing Series in Textiles No. 93

Mapping of Course Outcomes with Programme Outcomes :

PO / CO	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO12
CO 1	✓	✓	✓	-	✓	-	-	-	-	-	✓	✓
CO 2	✓	✓	✓	-	✓	-	-	-	-	-	-	-
CO 3	✓	✓	✓	-	✓	-	-	-	-	-	✓	✓
CO 4	✓	✓	-	-	✓	-	-	-	-	-	-	-
CO 5	✓	✓	-	✓	-	-	-	-	-	-	-	-
CO 6	✓	-	✓	-	✓	-	-	-	-	-	✓	✓

LAB 3 - FSD

FABRIC STRUCTURE AND DESIGN LAB

Instruction per week :4 Hrs — CIE: 40 MARKS
Duration of SEE 3 Hrs — SEE: 60 MARKS
Credits :2

COURSE OBJECTIVES

1.To educate the students in analyzing the plain fabrics for manufacturing data
2. To educate the students about the use of complex fabrics such that they decide the requirements of the fabrics for a particular application
3.To educate the students about the loom particulars like Reed count , Pick Wheel etc.,
4. To educate the students about the special features of all varieties of Plain fabrics
5. To educate the students about the role of sample data like TPI, Cloth cover , Diameter to relate the properties with end uses.

LIST OF EXPERIMENTS

1. Identification of basic features of fabrics and Need for Analysis
2. Analysis of different types of warp faced , weft faced and equi faced Plain fabrics
3. Analysis of different types of Twill fabrics
4. Analysis of different types of Sateen fabrics
5. Selection of Reed and Pick for different simple fabrics
6. Application and Identification of ISI standards.
7. Preparation of simple patterns using Pigment and Light theory of color on geometric base
8. Preparation of complex patterns using Pigment and Light theory of color on all over base
9. Preparation of stripes and checks using 2 or more colors with and with out plain weave
10. Preparing of designs for shirting and Suiting from different blended materials
11. Preparation of patterns for bed sheet, upholstery, furnishing fabrics
12. Preparing of curtain clothes on all over concept with different basis using drop devices.
13. Analysis of data for compound structures.
14. Planning of loom equipment to produce simple and complex fabrics.
15. Analysis of plain, dobby patterns using computer aided textile design
16. Analysis of extra warp and extra weft and other complex structures.

COURSE OUTCOME (Graduate to have)

1.An ability to judge the fabric required for the Specific end use.
2. An ability to analyse the fabric for manufacturing and sample data
3. An ability to link the fabric design parameters to the design aspects of Loom
4. An ability to apply the special features of fabrics in relation to end use .
5. An ability to link fabric parameters with loom machine conditions to produce the fabric.
6. An ability to design the fabric on engineering principle from the basic knowledge

Mapping of Course Outcomes with Programme Outcomes :

PO / CO	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO12
CO 1	✓	✓	✓	-	✓	-	-	-	-	-	✓	✓
CO 2	✓	✓	✓	-	✓	-	-	-	-	-	-	-
CO 3	✓	✓	✓	-	✓	-	-	-	-	-	-	✓
CO 4	✓	✓	-	-	✓	-	-	-	-	-	-	-
CO 5	✓	✓	✓	✓	-	-	-	-	-	-	-	-
CO 6	✓	✓	✓	✓	✓	-	-	-	-	-	✓	✓

LAB 4 - TAATL

TEXTILE AND APPAREL TESTING LAB

Instruction per week :4 Hrs
Duration of SEE 3 Hrs
Credits :2

CIE: 40 MARKS
SEE: 60 MARKS

COURSE OBJECTIVES

1.To Educate the student for standard testing conditions for different fabric properties.
2. To develop an understanding of scope, principle behind testing of fabric samples w.r.t end uses applications.
3. To train the students for understanding the result and interpret the conclusion.
4. To provide student with technical knowledge of fabric testing
5. To learn the method of sampling of fabrics in relation to method of test

LIST OF EXPERIMENTS

1. Determination of crease recovery angle of cotton, man-made and silk fabrics.
2. Determination of Drape co-efficient for textile fabrics.
3. Determination of fabric Tensile strength and elongation.
4. Determination of fabric Tear strength
5. Determination of Ballistic strength of fabrics.
6. Testing of fabrics for pilling.
7. Determination of stiffness parameters of fabrics.
8. Study of dimensional stability of woven fabrics.
9. Determination of Air permeability of woven fabrics.
10. Wash fastness for different dyed and printed fabrics.
11. Determination of abrasion resistance of fabrics.
12. Testing the fabrics for bursting strength.
13. Blend analysis of fabric by chemical methods.

COURSE OUTCOME (Graduate to have)

1.An ability to understand the fabric properties & relate them with standards.
2.An ability to improve the fabric testing procedures.
3. An ability of giving conclusions for different applications
4. An ability to enable to design a specific fabric based on the end use.
5. An ability to enable to standardize the process parameters in relation to end product quality
6. An ability to design the application based on the properties of the fabric.

Mapping of Course Outcomes with Programme Outcomes

PO /CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	✓	✓	✓	✓		✓	✓					✓
CO2	✓	✓	✓	✓		✓	✓					✓
CO3	✓	✓		✓		✓	✓					✓
CO4	✓	✓		✓		✓	✓					✓
CO5	✓	✓	✓				✓					✓
CO6	✓	✓	✓			✓	✓					✓

MINI PROJECT

Teaching Scheme
Lectures: 2 hrs/week :2 credits

Course Outcomes:

At the end of the course:
1. Students will get an opportunity to work in actual industrial environment if they opt for internship.
2.In case of mini project, they will solve a live problem using software/analytical/computational tools.
3. Students will learn to write technical reports.
4. Students will develop skills to present and defend their work in front of technically qualified audience.

Syllabus Contents:

☐ Students can take up small problems in the field of design engineering as mini project. It can be related to solution to an engineering problem, verification and analysis of experimental data available, conducting experiments on various engineering subjects,material characterization, studying a software tool for the solution of an engineering problem etc

AUDIT 1 and 2: ENGLISH FOR RESEARCH PAPER WRITING

Instruction per week : 2Hrs — CIE: 40 MARKS
Duration of SEE - 2 Hrs — SEE: 60*
Credits :0

Course objectives:
Students will be able to:
1. Understand that how to improve your writing skills and level of readability
2. Learn about what to write in each section
3. Understand the skills needed when writing a Title
Ensure the good quality of paper at very first-time submission

Unit-I
Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness
Unit-II
Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticising, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts. Introduction
Unit-III
Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check.
Unit-IV
Key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature,
Unit-V
Skills are needed when writing the Methods, skills needed when writing the Results,skills are needed when writing the Discussion, skills are needed when writing the Conclusions useful phrases, how to ensure paper is as good as it could possibly be the first- time submission

Examination: Question paper consists 6 Questions selecting atleast one from each unit and 4 to be answered out of 6

References

1. Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books)
2. Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press
3. Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM. Highman'sbook .
4. Adrian Wallwork , English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011

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AUDIT 1 and 2: DISASTER MANAGEMENT

Instruction per week : 2Hrs — CIE: 40 MARKS
Duration of SEE - 2 Hrs — SEE: 60*
Credits :0

Course Objectives: -Students will be able to:

1. Learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.
2. Critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
3. Develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
4. Critically understand the strengths and weaknesses of disaster management approaches, planning and programming in different countries, particularly their home country or the countries they work in

Unit-I

Introduction

Disaster: Definition, Factors And Significance; Difference Between Hazard And Disaster; Natural And Manmade Disasters: Difference, Nature, Types And Magnitude.

Unit-II

Repercussions Of Disasters And Hazards: Economic Damage, Loss Of Human And Animal Life, Destruction Of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts And Famines, Landslides And Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks And Spills, Outbreaks Of Disease And Epidemics, War And Conflicts.

Unit-III

Disaster Prone Areas In India

Study Of Seismic Zones; Areas Prone To Floods And Droughts, Landslides And Avalanches; Areas Prone To Cyclonic And Coastal Hazards With Special Reference To Tsunami; Post-Disaster Diseases And Epidemics

Unit-IV

Disaster Preparedness And Management

Preparedness: Monitoring Of Phenomena Triggering A Disaster Or Hazard; Evaluation Of Risk: Application Of Remote Sensing, Data From Meteorological And Other Agencies, Media Reports: Governmental And Community Preparedness.

Unit-V

Risk Assessment

Disaster Risk: Concept And Elements, Disaster Risk Reduction, Global And National Disaster Risk Situation. Techniques Of Risk Assessment, Global Co-Operation In Risk Assessment And Warning, People's Participation In Risk Assessment. Strategies for Survival.

Disaster Mitigation

Meaning, Concept And Strategies Of Disaster Mitigation, Emerging Trends In Mitigation. Structural Mitigation And Non-Structural Mitigation, Programs Of Disaster Mitigation In India.

Examination: Question paper consists 8 Questions selecting atleast one from each unit and 5 to be answered .

References

1. R. Nishith, Singh AK, "Disaster Management in India: Perspectives, issues and strategies New Royal book Company.
2. Sahni, PardeepEt.Al. (Eds.)," Disaster Mitigation Experiences And Reflections", Prentice Hall Of India, New Delhi.
3. Goel S. L. , Disaster Administration And Management Text And Case Studies" ,Deep & Deep Publication Pvt. Ltd., New Delhi.

AUDIT 1 and 2: SANSKRIT FOR TECHNICAL KNOWLEDGE

Instruction per week : 2Hrs — CIE: 40 MARKS
Duration of SEE - 2 Hrs — SEE: 60*
Credits :0

Course Objectives

1. To get a working knowledge in illustrious Sanskrit, the scientific language in the world
2. Learning of Sanskrit to improve brain functioning
3. Learning of Sanskrit to develop the logic in mathematics, science & other subjects enhancing the memory power
4. The engineering scholars equipped with Sanskrit will be able to explore the huge knowledge from ancient literature

Unit -I

Alphabets in Sanskrit, Past/Present/Future Tense, Simple Sentences

Unit-II

Order, Introduction of roots, Technical information about Sanskrit Literature

Unit-III

Technical concepts of Engineering-Electrical, Mechanical,

Unit-IV

Technical concepts of Engineering- Architecture,

Unit-V

Technical concepts of Engineering- Mathematics

Examination: Question paper consists 6 Questions selecting atleast one from each unit and 4 to be answered out of 6

References

1. "Abhyaspustakam" – Dr.Vishwas, Samskrita-Bharti Publication, New Delhi
2. "Teach Yourself Sanskrit" Prathama Deeksha-VempatiKutumbshastri, Rashtriya Sanskrit Sansthanam, New Delhi Publication
3. "India's Glorious Scientific Tradition" Suresh Soni, Ocean books (P) Ltd., New Delhi.

Course Output

Students will be able to

1. Understanding basic Sanskrit language
2. Ancient Sanskrit literature about science & technology can be understood
3. Being a logical language will help to develop logic in students

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AUDIT 1 and 2: VALUE EDUCATION

Instruction per week : 2Hrs — CIE: 40 MARKS
Duration of SEE - 2 Hrs — SEE: 60*
Credits :0

Course Objectives

Students will be able to

1.Understand value of education and self- development
2. Imbibe good values in students
3. Let the should know about the importance of character

Unit -I

Values and self-development –Social values and individual attitudes. Work ethics, Indian vision of humanism. Moral and non- moral valuation. Standards and principles. Value judgements

Unit-II

Importance of cultivation of values. Sense of duty. Devotion, Self-reliance. Confidence, Concentration. Truthfulness, Cleanliness. Honesty, Humanity. Power of faith, National Unity. Patriotism. Love for nature, Discipline

Unit-III

Personality and Behavior Development - Soul and Scientific attitude. Positive Thinking. Integrity and discipline. Punctuality, Love and Kindness. Avoid fault Thinking. Free from anger, Dignity of labour. Universal brotherhood and religious tolerance. True friendship. Happiness Vs suffering, love for truth. Aware of self-destructive habits. Association and Cooperation. Doing best for saving nature

Unit-IV

Character and Competence –Holy books vs Blind faith. Self-management and Good health. Science of reincarnation. Equality, Nonviolence ,Humility, Role of Women. All religions and same message.

Unit-V

Mind your Mind, Self-control. Honesty, Studying effectively

Examination: Question paper consists 6 Questions selecting atleast one from each unit and 4 to be answered out of 6

References

1. Chakroborty, S.K. “Values and Ethics for organizations Theory and practice”, Oxford University Press, New Delhi

Course outcomes

Students will be able to

1.Knowledge of self-development
2.Learn the importance of Human values
3.Developing the overall personality

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AUDIT 1 and 2: CONSTITUTION OF INDIA

Instruction per week : 2Hrs — CIE: 40 MARKS
Duration of SEE - 2 Hrs — SEE: 60*
Credits :0

Course Objectives: Students will be able to:

1. Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
2. To address the growth of Indian opinion regarding modern Indian intellectuals’ constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.

3. To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.

Units -I

History of Making of the Indian Constitution: History Drafting Committee, (Composition & Working) **Philosophy of the Indian Constitution:**Preamble, Salient Features

Unit-II

Contours of Constitutional Rights & Duties:

Fundamental Rights, Right to Equality, Right to Freedom, Right against Exploitation Right to Freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies, Directive Principles of State Policy, Fundamental Duties.

Unit-III : Organs of Governance:

Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Governor ,Council of Ministers,Judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions

Unit-IV :Local Administration:

District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation. Pachayati raj: Introduction, PRI: Zila Pachayat. Elected officials and their roles, CEO ZilaPachayat: Position and role. Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy

Unit-V : Election Commission: Election Commission: Role and Functioning. Chief Election commissioner and Election Commissioners.□ State Election Commission: Role and Functioning. □ Institute and Bodies for the welfare of SC/ST/OBC and women.

Examination: Question paper consists 6 Questions selecting atleast one from each unit and 4 to be answered out of 6

References

1. The Constitution of India, 1960 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

Course Outcomes: Students will be able to:

1. Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
2. Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
3. Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
4. Discuss the passage of the Hindu Code Bill of 1956.

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AUDIT 1 and 2: PEDAGOGY STUDIES

Instruction per week : 2Hrs — CIE: 40 MARKS
Duration of SEE - 2 Hrs — SEE: 60*
Credits :0

Course Objectives: Students will be able to:

4. Review existing evidence on the review topic to inform programme design and policy making undertaken by the DfID, other agencies and researchers.
5. Identify critical evidence gaps to guide the development.

Units -1: Introduction and Methodology: Aims and rationale, Policy background, Conceptual framework and terminology Theories of learning, Curriculum, Teacher education. Conceptual framework, Research questions. Overview of methodology and Searching.

Unit-II : Thematic overview: Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries. Curriculum, Teacher education.

Unit-III : Evidence on the effectiveness of pedagogical practices

Methodology for the in depth stage: quality assessment of included studies. How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy? Theory of change. Strength and nature of the body of evidence for effective pedagogical practices. Pedagogic theory and pedagogical approaches. Teachers' attitudes and beliefs and Pedagogic strategies.

Unit-IV : Professional development: alignment with classroom practices and follow up support: Peer support , Support from the head teacher and the community.
Curriculum and assessment, Barriers to learning: limited resources and large class sizes

Unit-V : Research gaps and future directions : Research design, Contexts, Pedagogy, Teacher education Curriculum and assessment, Dissemination and research impact.

Examination: Question paper consists 6 Questions selecting atleast one from each unit and 4 to be answered out of 6

References

1. Ackers J, Hardman F (2001) Classroom interaction in Kenyan primary schools, Compare, 31 (2): 245-261.
2. Agrawal M (2004) Curricular reform in schools: The importance of evaluation, Journal of Curriculum Studies, 36 (3): 361-379.
3. Akyeampong K (2003) Teacher training in Ghana - does it count? Multi-site teacher education research project (MUSTER) country report 1. London: DFID.
4. Akyeampong K, Lussier K, Pryor J, Westbrook J (2013) Improving teaching and learning of basic maths and reading in Africa: Does teacher preparation count? International Journal Educational Development, 33 (3): 272–282.
5. Alexander RJ (2001) Culture and pedagogy: International comparisons in primary education. Oxford and Boston: Blackwell.
6. Chavan M (2003) Read India: A mass scale, rapid, 'learning to read' campaign.
7. www.pratham.org/images/resource%20working%20paper%202.pdf.

Course Outcomes: Students will be able to understand:

1. What pedagogical practices are being used by teachers in formal and informal classrooms in developing countries?
2. What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners?
3. How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?

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AUDIT 1 and 2: STRESS MANAGEMENT BY YOGA

Instruction per week : 2Hrs CIE: 40 MARKS
Duration of SEE - 2 Hrs SEE: 60*
Credits :0

Course Objectives

1. To achieve overall health of body and mind
2. To overcome stress

Unit-I

Definitions of Eight parts of yog. (Ashtanga)

Uni-II

Yam and Niyam. Do`s and Don't's in life.

Unit-III

i) Ahinsa, satya, astheya, bramhacharya and aparigraha
ii) Shaucha, santosh, tapa, swadhyay, ishwarpranidhan

Unit-IV

Asan and Pranayam i) Various yog poses and their benefits for mind & body

Unit-V

ii)Regularization of breathing techniques and its effects-Types of pranayam

Examination: Question paper consists 6 Questions selecting atleast one from each unit and 4 to be answered out of 6

References

1. 'Yogic Asanas for Group Tarining-Part-I" :Janardan Swami Yogabhyasi Mandal, Nagpur
2. "Rajayoga or conquering the Internal Nature" by Swami Vivekananda, AdvaitaAshrama (Publication Department), Kolkata

Course Outcomes:

Students will be able to:

1. Develop healthy mind in a healthy body thus improving social health also
2. Improve efficiency

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AUDIT 1 and 2: PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS

Instruction per week : 2Hrs CIE: 40 MARKS
Duration of SEE - 2 Hrs SEE: 60*
Credits :0

Course Objectives

1. To learn to achieve the highest goal happily
2. To become a person with stable mind, pleasing personality and determination
3. To awaken wisdom in students

Unit -I

1 Neetisatakam-Holistic development of personality
Verses- 19,20,21,22 (wisdom), Verses- 29,31,32 (pride & heroism)

Unit-II

Verses- 26,28,63,65 (virtue), Verses- 52,53,59 (dont's), Verses- 71,73,60,78 (do's)

Unit-III

Approach to day to day work and duties. Shrimad Bhagwad Geeta: Chapter 2-Verses 41, 47,48, Chapter 3-Verses 13, 21, 27, 35, Chapter 6-Verses 5,13,17,23, 35,□ Chapter 18-Verses 45, 46, 48.

Unit-IV

Statements of basic knowledge. Shrimad BhagwadGeeta: Chapter2-Verses 56, 62, 68
Chapter 12 -Verses 13, 14, 15, 16,17, 18

Unit-V

Personality of Role model. Shrimad Bhagwad Geeta:Chapter2-Verses 17, Chapter 3-Verses 36,37,42, Chapter 4-Verses 18, 38,39, Chapter18 – Verses 37,38,63

Examination: Question paper consists 6 Questions selecting atleast one from each unit and 4 to be answered out of 6

References

1. "Srimad Bhagavad Gita" by Swami SwarupanandaAdvaita Ashram (Publication Department), Kolkata
2. Bhartrihari's Three Satakam (Niti-sringar-vairagya) by P.Gopinath, Rashtriya Sanskrit Sansthanam, New Delhi.

Course Outcomes

Students will be able to

1. Study of Shrimad-Bhagwad-Geeta will help the student in developing his personality and achieve the highest goal in life
2. The person who has studied Geeta will lead the nation and mankind to peace and mankind to peace and prosperity
3. Study of Neetishatakam will help in developing versatile personality of students.

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M.Tech.(Textile Technology)(AICTE Scheme)
Specialization –Apparel Technology
Semester –III
(For the Batch admitted in Academic Year 2022-23)

Sr.No.	Course Type/Code	Course Name	Scheme of Instruction, Hours per week		Scheme of Examination			Credits
			L	P	Duration Hrs	CIE	SEE	
1.	Program Specific Elective -V	1.CSIAI 2.TAF 3.EOA	3	0	3	40	60	3
2.	Open Elective	1. Business Analytics 2. Industrial Safety 3. Operations Research(TT) 4. Cost Management of Engineering Projects(TT) 5.Industrial Psychology (TT) 6. Composite Materials 7. Waste to Energy	3	0	3	40	60	3
3.	Dissertation	Dissertation Phase I	0	20	-	150	-	10
		Total	06	20		230	120	16

Programme Specific Elective -V
Compliance Standards in Apparel Industry
Technology of Apparel Finishing
Engineering of Apparels

Programme Elective – V- 1- CSIAI

COMPLIANCE STANDARDS IN APPAREL INDUSTRY

Instruction per week : 3 Hrs CIE: 40 MARKS
Duration of SEE 3 Hrs SEE: 60 MARKS
Credits :3

COURSE OBJECTIVES

1. To acquire knowledge on concept and need for compliance in Apparel industry.
2.. To acquire knowledge on social compliance followed in Apparel industry.
3 .To gain knowledge on health and safety compliance followed in Apparel industry.
4 .To understand on environmental compliance to be adhered by Apparel industry.
5 .To comprehend technical compliance norms followed in Apparel industry.

UNIT- I
COMPLIANCE - INTRODUCTION

Scope and Need for different compliances Social, health and safety, environmental, technical, international compliance - concept, need, benefits for industry, workers, and society. Social accountability and Corporate Social responsibility - scope and need. Social Compliance in supply chain management.

UNIT- II
SOCIAL COMPLIANCE

Conventions on Gender and caste discrimination, forced labour, child labour, minimum age convention. SA 8000 – Elements, Worldwide Responsible Apparel Production (WRAP). Ethical Trading Initiative (ETI). Corporate Social Responsibility (CSR) Compensation – norms applicable in India, Code of conduct, Minimum wages Act, remuneration, Trade Union Acts.

UNIT- III
HEALTH AND SAFETY

Environment and climate, health and safety – safety norms and measures to be enforced for safe working environment – protection against fire, water facilities, rest rooms, working Hours - conventions on Acquired Immune Deficiency Syndrome (AIDS). Requirements of local statutory bodies - PF, ESIetc, OHSAS 18001

UNIT-IV
ENVIRONMENTAL COMPLIANCE

Environmental Laws and Regulations, The Regulations Related to Handling, Recycling, and Disposal of Hazardous Materials. Requirements of Pollution Control Board, ISO 14000 – elements and certification. Eco standards, Eco labels, REACH, OEKO TEX, GOTS Certification requirements for apparel industry

UNIT-V
TECHNICAL COMPLIANCE

Elements and requirements of ISO 9000, Meeting vendor compliance – WALMART, JC PENNY, etc. Needle policy, maintenance of safety data of materials in stain removal, Poly bags, Children wear requirements.

COURSE OUTCOMES (Graduate to have)

1 An ability to acquire knowledge on concept and need for compliance in Apparel industry.
2 An ability to evaluate the need of social compliance followed in Apparel industry.
3 An ability to apply knowledge on health and safety compliance followed in Apparel industry.

4 An ability to suggest on environmental compliance to be adhered by Apparel industry.
5 An ability to create technical compliance norms followed in Apparel industry.
6 An ability to comprehend compliance norms followed by various international sourcing companies

EXAMINATION : Five questions to be answered from Eight selecting atleast one from each unit.

REFERNCES

Das.S, Li & Fung, "Product safety and restricted substances in apparel', Woodhead Publishing
Christie. R, "Environmental aspects of textile dyeing", Heriot-Watt University, UK Woodhead Publishing Series in Textiles No. 66 SA 8000 – NITRA Tablet
Rajesh Chhabara, "Social Accountability", Ava Softech Pvt. Ltd., 2005
http://www.labour.nic.in
http://www.unicef.org
http://www.indianchild.com
http://www.paycheck.in
http://www.sa-intl.org.

Mapping of Course Outcomes with Programme Outcomes

PO /CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	✓	✓	✓	✓		✓	✓					✓
CO2	✓	✓	✓	✓		✓	✓					✓
CO3	✓	✓		✓		✓	✓					✓
CO4	✓	✓		✓		✓	✓					✓
CO5	✓	✓	✓				✓					✓
CO6	✓	✓	✓			✓	✓					✓

Programme Elective – V- 2- TAF

TECHNOLOGY OF APPAREL FINISHING

Instruction per week : 3 Hrs CIE: 40 MARKS
Duration of SEE 3 Hrs SEE: 60 MARKS
Credits :3

COURSE OBJECTIVES

1. To learn about the pre-treatment and surface modification techniques
2. To understand advanced printing and garment finishing techniques.
3 To learn advanced finishing techniques and unconventional finishing techniques.
4.To lean to choose advanced finishing techniques for different finishing applications.
5. To understand the eco parameters for eco-friendly finishing processes and chemicals.

UNIT- I

SURFACE MODIFICATION OF SYNTHETICS

General methodology for surface modification , Need for Surface modification of synthetics, approaches in vogue, Process details , parameters of the process, surface modification of Nylon, Polypropylene .

Surface modification of Polyester and its Blends

Need for surface modification of polyester, approaches followed in industry, mechanism of alkaline hydrolysis, parameters of the alkaline hydrolysis, A critical Literature review , role of different types of bases, enzymes, primary treatment conditions, role of substrate, effect on physical, comfort, aesthetic , functional and low stress mechanical properties- Repeated hydrolysis and study on polyester- Action of Ethylene di amine on Polyester .

Alkaline oxidation of P/C Blends- Mechanism , process, role of treatment conditions , evaluation of surface oxidised products for different properties.

UNIT – II

PRE-TREATMENT AND SURFACE MODIFICATION:

Plasma for Surface Modification: Types of Plasma - low pressure, atmospheric pressure and high pressure plasmas, Methods of plasma generation for treatment of textiles and apparels; mechanism of plasma-surface interactions, plasma-aided functionalization, etching, grafting/deposition, implantation and polymerization; plasma modification of cellulosic, protein, and synthetic fibres; Advantages and limitations of plasma surface modification of textile materials.

UNIT- III

Enzyme surface modification: Role and action of various enzymes in the surface modification of cellulosic, protein and synthetic fibres - reaction of textile surfaces to enzymatic treatments – Strengths and weaknesses of enzyme surface modification.

ADVANCED DYEING

Advanced Dyeing Techniques: Modified reactive dyes, HF dyes, low and no salt reactive dyes, multifunctional dyes, neutral fixing and acid fixing reactive dyes, and Natural dyes. Microwave, Electrochemical, low liquor ratio dyeing techniques, Ultrasonic assisted dyeing, dyeing using Supercritical carbon dioxide.

UNIT- IV

Advanced Printing: Digital printing, Xerographic printing, Developments in transfer printing.

Eco-friendly Processing & Finishing: Problems faced in the Conventional processing. Recent developments in eco-friendly dyeing, printing and finishing for natural and synthetic textiles.

ADVANCED GARMENT FINISHING

Apparel finishing process sequence. Easy care finishes- Durable press finish, Wrinkle free finish, Bio Finishing.

UNIT- V

Functional finishes - water repellent, water proof, flame retardant, anti-microbial, soil resistance, anti-static, UV repellent finish, cool finish, deodorizing finish.

Advanced finishing and coating techniques - Microencapsulation techniques, finishing using micro capsules; preparation of nano-particles for apparel finishing, nano-finishes; Electro chemical treatment of textile materials. Film coating, spray coating, powder coating, foam coating. Coating materials for functional finishes. Process conditions and chemicals used.

COURSE OUTCOMES(Graduate to have)

1..An ability to apply the knowledge on pre-treatment and surface modification techniques
2.An ability to select the advanced printing and garment finishing techniques.
3.An ability to evaluate the advanced finishing techniques and unconventional finishing techniques.
4.An ability to Identify advanced finishing techniques for different finishing applications.
5.an ability to estimate the eco parameters for eco-friendly finishing processes and chemicals.
6.an ability to suggest and adopt eco friendly measures for dyeing, printing and finishing for sustainable development

EXAMINATION : Five questions to be answered from Eight selecting atleast one from each unit.

REFERENCES

1.. Surface Modification of Polyester by alkaline treatments- Textile Progress, Vol 80, 1989
2..Wei. Q., 'Surface modification of Textiles', Woodhead Publishing, 2009.
3.Michael A. Lieberman, Allan J. Lichtenberg, 'Principles of Plasma Discharges and Materials Processing', John Wiley & Sons, 1994.
4. Roshan Shishoo, 'Plasma Technologies for Textiles', Woodhead Publishing, 2007.
5. Michael A. Lieberman, Alan J. Lichtenberg "Principles of Plasma Discharges and Materials Processing", John Wiley & Sons,2005.
6.Rory A. Wolf, 'Atmospheric Pressure Plasma for Surface Modification, John Wiley & Sons, 2012

Mapping of Course Outcomes with Programme Outcomes

PO /CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	✓	✓	✓	✓		✓	✓					✓
CO2	✓	✓	✓	✓		✓	✓					✓
CO3	✓	✓	✓	✓		✓	✓					✓
CO4	✓	✓	✓	✓		✓	✓					✓
CO5	✓	✓	✓	✓		✓	✓					✓
CO6	✓	✓	✓	✓		✓	✓					✓

Programme Elective – V- 3- EA

ENGINEERING OF APPARELS

Instruction per week : 3 Hrs CIE: 40 MARKS
Duration of SEE 3 Hrs SEE: 60 MARKS
Credits :3

COURSE OBJECTIVES

1. To understand the basic concept of apparel product engineering .
2. To learn the objective and subjective methods for assessing fabric parameters for making-up quality
3. To understand the apparel aesthetic and functional requirements
4. To understand factors influencing selection of materials and their influence on product performance
5. To Learn and appreciate the correlation between fabric and sewing parameters and product performance.

UNIT- I

CONCEPTS OF APPAREL ENGINEERING : Introduction to the Concepts of Apparel Engineering Relating apparel design and manufacture process to end use requirements - comfort, workmanship, appearance and appearance retention, durability, aftercare and other special functional requirements. Freedom to body movement, the effect of aesthetic factors to personal preference. Evaluation of Making-up Quality and Analysis of Making-up Problems Subjective and objective methods for evaluating the making-up quality of garments (including quality in terms of fusing, sewing, and finishing etc). Relationship between sewing quality and fabric, thread and sewing machine parameters. Solutions to sewing problems. Application of Kawabata and FAST systems for assessing fabric making-up performance.

UNIT- II

SELECTION OF MATERIALS: Selection of fabric, yarn, fibre and fabric finishing techniques for specific end-uses. Fabric design appreciations in relation to aesthetic, fashion and functional requirements. Influence of Mechanical properties of fabrics on tailorability: Weight, thickness, tensile, shear, bending (drape),compression, stretchability.Understanding relationship of these mechanical properties with the end use of requirements both in woven and knits. Effect of fabric characteristics of Tailorability - seam appearance, puckering, thermal or mechanical damage, and seam slippage. Understanding the major characteristics of various fabric types (woven and knits) in relation to their end use/applications.

UNIT- III

CO-RELATION BETWEEN FABRIC CHARACTERISTICS AND SEWING PARAMETERS: Understanding of co-relation between fabric characteristics and sewing process parameters. Comparison of various types of seam finishing for industrial use in relation with performance and cost effect. Relation between end use of fabric and seam performance in regards to sewn materials. Understanding of seam properties and their application in relation to different fabrics and apparels

UNIT- IV

ANALYSIS OF STITCHES AND SEAMS: Identification of Stitches and Seams in different types of garments. Seams and their effect on performance, costs and quality in industrial sewing process Understanding of Stitch Types and Stitch Formation processes and its impact on garment performance. Suitability of different stitch types in relation to fabric behavior. Machinery used for formation of various stitch types according to classification.

UNIT- V

COMPATIBILITY OF SEWING NEEDLE AND SEWING THREAD : Compatibility of Sewing Needle and Sewing Thread in relation with other sewing parameters. Understanding the structure and

specifications of sewing machine needles and their importance in sewing processes. Needle size and its relation to fabric and sewing quality requirements. Co relation between sewing thread and fabric and its impact to stitch performance. Controlling stitch performance and quality and minimizing of defect occurrence.

COURSE OUTCOMES (Graduate to have)

1.An ability to apply knowledge on the concept of apparel product engineering based on aesthetic and functional requirements
2. An ability to evaluate objective and subjective methods for assessing fabric parameters for making-up quality
3. An ability to design the apparel based on aesthetic and functional requirements
4. An ability to estimate the factors influencing selection of materials and their influence on product performance
5. An ability to establish the correlation between fabric and sewing parameters and product performance.
6. An ability to acquire knowledge on influence of sewing materials on sewn product.

EXAMINATION : Five questions to be answered from Eight selecting atleast one from each unit.

REFERENCES

1. Burns.L.D., Bryant.N.G., 'Business of Fashion – Designing, Manufacturing and Marketing,' Fairchild NewYork, 2008
2. Barbara Stewart, Beverly Kemp-Gatterson, 'Apparel Concepts and Practical Applications', Fairchild New York, 2010
3. J Fan, "Engineering Apparel Fabrics and Garments", Wood Head Publishing Limited, 2012.
4. Wang, Postle And Zhang: "The Tailorability of Lightweight Wool and Wool-Blend Fabrics", Journal Of Textile Institute, Vol 94, Part I, No 3/ 4 , 2003, pp 212-222.

Mapping of Course Outcomes with Programme Outcomes

PO / CO	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO12
CO 1	✓	✓	✓	-	✓	-	✓	-	-	-	✓	✓
CO 2	✓	✓	✓	✓	✓	-	-	-	-	-	-	-
CO 3	✓	✓	✓	✓	✓	-	-	-	-	-	✓	✓
CO 4	✓	✓	✓	✓	✓	-	-	-	-	-	-	-
CO 5	✓	✓	✓	✓	✓	-	-	-	-	-	-	-
CO 6	✓	✓	✓	-	✓	-	-	-	-	-	✓	✓

OPEN ELECTIVES
Business Analytics
Teaching scheme

Course objective

1. Understand the role of business analytics within an organization.
2. Analyze data using statistical and data mining techniques and understand relationships between the underlying business processes of an organization.
3. To gain an understanding of how managers use business analytics to formulate and solve business problems and to support managerial decision making.
4. To become familiar with processes needed to develop, report, and analyze business data.
5. Use decision-making tools/Operations research techniques.
6. Mange business process using analytical and management tools.
7. Analyze and solve problems from different industries such as manufacturing, service, retail, software, banking and finance, sports, pharmaceutical, aerospace etc.

Unit1:

Business analytics: Overview of Business analytics, Scope of Business analytics, Business Analytics Process, Relationship of Business Analytics Process and organisation, competitive advantages of Business Analytics.
Statistical Tools: Statistical Notation, Descriptive Statistical methods, Review of probability distribution and data modelling, sampling and estimation methods overview.

Unit 2:

Trendiness and Regression Analysis: Modelling Relationships and Trends in Data, simple Linear Regression.
Important Resources, Business Analytics Personnel, Data and models for Business analytics, problem solving, Visualizing and Exploring Data, Business Analytics Technology.

Unit 3:

Organization Structures of Business analytics, Team management, Management Issues, Designing Information Policy, Outsourcing, Ensuring Data Quality, Measuring contribution of Business analytics, Managing Changes.
Descriptive Analytics, predictive analytics, predicative Modelling, Predictive analytics analysis, Data Mining, Data Mining Methodologies, Prescriptive analytics and its step in the business analytics Process, Prescriptive Modelling, nonlinear Optimization.

Unit 4:

Forecasting Techniques: Qualitative and Judgmental Forecasting, Statistical Forecasting Models, Forecasting Models for Stationary Time Series, Forecasting Models for Time Series with a Linear Trend, Forecasting Time Series with Seasonality, Regression

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Forecasting with Casual Variables, Selecting Appropriate Forecasting Models.
Monte Carlo Simulation and Risk Analysis: Monte Carle Simulation Using Analytic Solver Platform, New-Product Development Model, Newsvendor Model, Overbooking Model, Cash Budget Model. 10

Unit 5:

Decision Analysis: Formulating Decision Problems, Decision Strategies with the without Outcome Probabilities, Decision Trees, The Value of Information, Utility and Decision Making.

Recent Trends in : Embedded and collaborative business intelligence, Visual data recovery, Data Storytelling and Data journalism.

COURSE OUTCOMES

1. Students will demonstrate knowledge of data analytics.
2. Students will demonstrate the ability of think critically in making decisions based on data and deep analytics.
3. Students will demonstrate the ability to use technical skills in predicative and prescriptive modeling to support business decision-making.
4. Students will demonstrate the ability to translate data into clear, actionable insights.

Reference:

1. Business analytics Principles,Concepts, and Applications by Marc J. Schniederjans Dara G.
Schniederjans, Christopher M. Starkey, Pearson FT Press.
2. Business Analytics by James Evans, persons Education.

OPEN ELECTIVES

Industrial Safety

Teaching scheme

Lecture: - 3 h/week

Unit-I: Industrial safety: Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1948 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and fire fighting, equipment and methods.

Unit-II: Fundamentals of maintenance engineering: Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment.

Unit-III: Wear and Corrosion and their prevention: Wear- types, causes, effects, wear reduction methods, lubricants-types and applications, Lubrication methods, general sketch, working and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.

Unit-IV: Fault tracing: Fault tracing-concept and importance, decision treeconcept, need and applications, sequence of fault finding activities, show as decision tree, draw decision tree for problems in machine tools, hydraulic, pneumatic,automotive, thermal and electrical equipment's like, I. Any one machine tool, ii. Pump iii. Air compressor, iv. Internal combustion engine, v. Boiler,vi. Electrical motors, Types of faults in machine tools and their general causes.

Unit-V: Periodic and preventive maintenance: Periodic inspection-concept and need, degreasing, cleaning and repairing schemes, overhauling of mechanical components, overhauling of electrical motor, common troubles and remedies of electric motor, repair complexities and its use, definition,need, steps and advantages of preventive maintenance. Steps/procedure for periodic and preventive maintenance of: I. Machine tools, ii. Pumps, iii. Air compressors, iv. Diesel generating (DG) sets, Program and schedule of preventive maintenance of mechanical and electrical equipment, advantages of preventive maintenance. Repair cycle concept and importance

Reference:

1. Maintenance Engineering Handbook, Higgins & Morrow, Da Information Services.
2. Maintenance Engineering, H. P. Garg, S. Chand and Company.
3. Pump-hydraulic Compressors, Audels, Mcgrew Hill Publication.
4. Foundation Engineering Handbook, Winterkorn, Hans, Chapman & Hall London.

OPEN ELECTIVES
OPERATIONS RESEARCH

Teaching Scheme Lectures: 3 hrs/week

Course Outcomes: At the end of the course, the student should be able to

1. Students should able to apply the dynamic programming to solve problems of discreet and continuous variables. 2. Students should able to apply the concept of non-linear programming
3. Students should able to carry out sensitivity analysis
4. Student should able to model the real world problem and simulate it.

Syllabus Contents:

UNIT -I

Introduction: Definition of OR , Objectives, Scope, Phases and Different models of OR, Role of Operations Research in Engineering , Essential requirements of a problem

Linear Programming Model : Characteristics, Assumptions, formulations and graphical solution , Special cases of Graphical solution.

UNIT – II.

Simplex : contents of a simplex problem, types of simplex problem, Maximisation, Minimization, two-phase method, duality and its objective, writing a dual problem for LPP and solving by simplex, dual simplex

Assignment Model: objective, types of assignment problems, Hungerian method, profit maximisation, Airline crew problem, special assignment problem.

UNIT – III.

Transportation model: objectives, types of transportation problems, lowest cost entry method and north west corner method

Replacement models – waiting line models – optimum replacement of age of items that deteriorate with time – optimum replacement of items that fail completely

Decision Theory: Need, elements of decision theory, simple problems with Risk and Uncertainty

UNIT – IV

Queuing systems and their classification – characteristics of queuing systems – problems on Queuing theory

Inventory Control: Need, Def, Significance types of decisions, types of Inventories,EOQ : elements, derivation for EOQ, simple problems with and without EOQ, A brief note on Production Model, Shortages

UNIT – V

Sequencing: Need , Assumptions , Types of problems (n-job on 2 machines, n-job on three machines and 2 jobs on n-machines

Project scheduling by PERT and CPM – introduction to network analysis – Construction of network diagrams – calculation of floats- A brief note on Crashing of Networks

References:

1. H.A. Taha, Operations Research, An Introduction, PHI, 2008
2. H.M. Wagner, Principles of Operations Research, PHI, Delhi, 1982.
3. J.C. Pant, Introduction to Optimisation: Operations Research, Jain Brothers, Delhi, 2008
4. Hitler Libermann Operations Research: McGraw Hill Pub. 2009
5. Pannerselvam, Operations Research: Prentice Hall of India 2010
6. Harvey M Wagner, Principles of Operations Research: Prentice Hall of India 2010

Open Elective
Cost Management of Engineering Projects
Teaching scheme : Lecture: - 3 h/week

Course Objectives

1. To provide the fundamental knowledge of cost and financial accounting in textile production.
2. To develop the formats of financial aspects dealt by the Textile and Apparel sectors.
3. To train the students for preparing Cash and other budgets
4. To provide the knowledge of handling the job orders and analysing the costs at every process.
5. To educate the students about the standard costing and budgeting control in textile production

UNIT I.

Introduction: Meaning ,scope in Projects and production, cost and costing - cost, financial and management accounting relation – elements of cost and their classification, methods and techniques of costing – cost sheet and cost/item – simple problems from different fields.

Material cost: material pricing by LIFO, FIFO and Weighted average methods. calculation of raw cotton cost – waste multiplier – clean cotton cost – labour cost : elements and classification -different wage and incentive plans

UNIT II

Financial Management: Introduction to Financial Management – Scope -Financial section Organisation and Finance Officer

Financial Statements: Introduction, Trading and Profit & Loss A/C, Balance sheet – Formats – Simple problems with and without adjustments

Capital Budgeting :Introduction to Decisions in Investments – Approaches – Capital Budgeting – proposals under pay back period, Discounted Pay Back – Accounting Rate of return – Net present value – Profitability index – Internal rate of return – Conflict between IRR & NPV – Decision under risk – Cost of capital.

UNIT III

Introduction to working capital management – Calculation of working capital – Receivables Management: Meaning – parameters – credit policy – cost of debtors – Optimum level of credit – credit standards – credit period – credit discount.

Cash Management: Introduction and scope ,Management of cash by Receipts and payments method ,simple problems.-Stock market and their structure and working

UNIT IV

Management of overheads – accounting of overheads - classification of overheads – primary distribution summary and secondary distribution summary by simultaneous equations and repeated distribution methods - LHR, MHR – absorption of overheads - percent on material cost, labor cost, prime cost.

Process costing and job costing – process account simple problems – problems with abnormal gain, abnormal loss, - normal loss, work in progress and concept of equivalent production.

UNIT V.

Marginal costing – Introduction to cost – volume – profit analysis – Assumptions – BE Point – significance – calculation of P / V ratio, BEP etc.

Ratio Analysis: Meaning and scope, significance – Classification of Ratios – Interpretation – Simple problems

Standard costing: Meaning , concept of variances

Budgetary Control : preparation of material, sales, purchase, flexible budgets.

References:

1. Cost Accounting A Managerial Emphasis, Prentice Hall of India, New Delhi
2. Charles T. Horngren and George Foster, Advanced Management Accounting
3. Robert S Kaplan Anthony A. Alkinson, Management & Cost Accounting
4. Ashish K. Bhattacharya, Principles & Practices of Cost Accounting A. H. Wheeler publisher

5. N.D. Vohra, Quantitative Techniques in Management, Tata McGraw Hill Book Co. Ltd.

Open Elective
Composite Materials
Teaching scheme
Lecture: - 3 h/week

UNIT–I: INTRODUCTION: Definition – Classification and characteristics of Composite materials. Advantages and application of composites. Functional requirements of reinforcement and matrix. Effect of reinforcement (size, shape, distribution, volume fraction) on overall composite performance.

UNIT – II: REINFORCEMENTS: Preparation-layup, curing, properties and applications of glass fibers, carbon fibers, Kevlar fibers and Boron fibers. Properties and applications of whiskers, particle reinforcements. Mechanical Behavior of composites: Rule of mixtures, Inverse rule of mixtures. Isostrain and Isostress conditions.

UNIT – III: Manufacturing of Metal Matrix Composites: Casting – Solid State diffusion technique, Cladding – Hot isostatic pressing. Properties and applications. Manufacturing of Ceramic Matrix Composites: Liquid Metal Infiltration – Liquid phase sintering. Manufacturing of Carbon – Carbon composites: Knitting, Braiding, Weaving. Properties and applications.

UNIT–IV: Manufacturing of Polymer Matrix Composites: Preparation of Moulding compounds and prepregs – hand layup method – Autoclave method – Filament winding method – Compression moulding – Reaction injection moulding. Properties and applications.

UNIT – V: Strength: Laminar Failure Criteria-strength ratio, maximum stress criteria, maximum strain criteria, interacting failure criteria, hygrothermal failure. Laminate first play failure-insight strength; Laminate strength-ply discount truncated maximum strain criterion; strength design using caplet plots; stress concentrations.

TEXT BOOKS:

1. Material Science and Technology – Vol 13 – Composites by R.W.Cahn – VCH, West Germany.
2. Materials Science and Engineering, An introduction. WD Callister, Jr., Adapted by R. Balasubramaniam, John Wiley & Sons, NY, Indian edition, 2007.

References:

1. Hand Book of Composite Materials-ed-Lubin.
2. Composite Materials – K.K.Chawla.
3. Composite Materials Science and Applications – Deborah D.L. Chung.
4. Composite Materials Design and Applications – Danial Gay, Suong V. Hoa, and Stephen W.Tasi.

Open Elective
Waste to Energy
Teaching scheme
Lecture: - 3 h/week

Unit-I: Introduction to Energy from Waste: Classification of waste as fuel – Agro based, Forest residue, Industrial waste - MSW – Conversion devices – Incinerators, gasifiers, digestors

Unit-II: Biomass Pyrolysis: Pyrolysis – Types, slow fast – Manufacture of charcoal – Methods -Yields and application – Manufacture of pyrolytic oils and gases, yields and applications.

Unit-III: Biomass Gasification: Gasifiers – Fixed bed system – Downdraft and updraft gasifiers –Fluidized bed gasifiers – Design, construction and operation – Gasifier burner

arrangement for thermal heating – Gasifier engine arrangement and electrical power – Equilibrium and kinetic consideration in gasifier operation.

Unit-IV: Biomass Combustion: Biomass stoves – Improved chullahs, types, some exotic designs, Fixed bed combustors, Types, inclined grate combustors, Fluidized bed combustors, Design, construction and operation - Operation of all the above biomass combustors.

Unit-V: Biogas: Properties of biogas (Calorific value and composition) - Biogas plant technology and status - Bio energy system - Design and constructional features - Biomass resources and their classification - Biomass conversion processes - Thermo chemical conversion - Direct combustion - biomass gasification - pyrolysis and liquefaction - biochemical conversion - anaerobic digestion - Types of biogas Plants – Applications - Alcohol production from biomass - Bio diesel production - Urban waste to energy conversion - Biomass energy programme in India.

References:

1. Non Conventional Energy, Desai, Ashok V., Wiley Eastern Ltd., 1990.
2. Biogas Technology - A Practical Hand Book - Khandelwal, K. C. and Mahdi, S. S., Vol. I & II,
Tata McGraw Hill Publishing Co. Ltd., 1983.
3. Food, Feed and Fuel from Biomass, Challal, D. S., IBH Publishing Co. Pvt. Ltd., 1991.
4. Biomass Conversion and Technology, C. Y. WereKo-Brobby and E. B. Hagan, John Wiley & Sons, 1996.

Open Elective

INDUSTRIAL PSYCHOLOGY

Teaching scheme

Lecture: - 3 h/week

Course Objectives

1. To understand the concept of Industry, industry atmosphere and its nature
2. To learn about the role of Group Dynamics and its impact on productivity
3. To learn about concept of Industrial Relations and Industrial peace
4. To learn about the types of Supervision and its effects
5. To understand the various levels of Worker participation in Industry

UNIT-I

Introduction to Industrial Psychology-Need and objectives, Scope of Industrial Psychology-Indian Industrial scenario-Principles of Industrial Psychology-Modes Operandi of Industrial Psychology-Organisation of Industrial Psychology-Causation of Behaviour

Human Factor at work: Nature of Human factor, Theory of X , Theory of Y ,Rational Vs Complex Man, Knowledge Vs Wisdom of Worker, Human behavior models (A brief Note)

UNIT-II

Group Dynamics: Concept, Nature and Types of Work- Groups, Significance of Group, Group norms and Determinants-Group Cohesiveness and factor affecting – Cohesiveness & Productivity.

Concept of Industrial Relations: Concept , Parties to Industrial relations, Significance of Industrial peace –Manifestation of Industrial Unrest – Industrial Disputes and Machinery for prevention and settlement - Integration of Industrial relations with HRD functions

UNIT-III

Supervision & Leadership : Need for Supervision, Types of Supervision, Functions of Supervisor, Tasks and Processes of Supervision- Span of Supervision-Factors influencing Span of Supervision and its impact on Organsiation structure – Relationship Strategy for Supervision

Leadership & Leadership Styles: Need for Leader and Leadership, Manager Vs Leader, Styles of Leadership, Managerial Grid and its impact-Leadership and Group performance.

UNIT-IV

Employees Maintenance: Types of Working environment and Employee Health- Role of Ergonomics Employee care, Employee Safety, Employee security and legal provisions

Labour Welfare: Concept , scope, significance, Principles of of Labour Welfare-Agencies of Labour Welfare, Types of Welfare services, various provisions under Factories Act, Labour Welfare Machinery

UNIT-V

Employee Counseling: Need, Concept ,Functions and procedure, extent, forms of Counseling, Causes of Counseling Need, vocational guidance and its principles, Techniques of Counseling.

Workers Participation in Management : Meaning, Objectives, need and Significance ,factors influencing Participation, Role of Work Committee, JMC, Worker Director, Worker Participation schemes, Worker Shareholders,

Course Outcome: (Graduate to have)

1.An ability to understand the industrial set up
2. An ability to ensure Industrial peace by understanding the psychology of a worker
3.An ability to excel as good leader and understand the Group dynamics
4An ability to design a suitable labour welfare
5.An ability to Counsel employee and improve his morale .

REFERENCE BOOKS

1.Industrial Psychology – P.K.Ghosh and M.B. Ghorpade, Himalaya Publishing House, Mumbai, 10 th Edition, 2013
2.Human Resource Management- T.N. Chabra,, Dhanpat Rai & Co, New Delhi, 2012
3.Personnel Management & industrial Relations- Tripathi, Sultan Chand & Sons, New Delhi, 2011

M.Tech.(Textile Technology)(AICTE Scheme)
Specialization –Apparel Technology
Semester –IV
(For the Batch admitted in Academic Year 2022-23)

Sr.No.	Course Type/Code	Course Name	Scheme of Instruction, Hours per week		Scheme of Examination			Credits
			L	P	Duration	CIE	SEE	
1.	Dissertation	Dissertation Phase II	0	32	-	200 Pre-viva: 100 Report: 100	300 Report: 200 Presentation: 100	16
Total			0	32		200	300	16