

**MOTHER TERESA WOMENS UNIVERSITY
KODAIKANAL**

SYLLABUS

FOR

Ph.D in TEXTILES AND CLOTHING

2021 onwards

MOTHER TERESA WOMENS UNIVERSITY
KODAIKANAL
Ph.D. in TEXTILES AND CLOTHING

Paper No.	Subject	Credit	Marks
1	Research Methodology	4	100
2	Compulsory Paper-Introduction to Women Studies	4	100
3	Special paper related to project	4	100

Special paper related to project

S. No	Course work papers
1	Textile Fibres
2	Yarn Technology
3	Yarn Technology
4	Fabric Manufacturing and Design
5	Textile Chemical Processing
6	Speciality Fabrics and Technology
7	Technical Textiles
8	Environment And Sustainability in Textiles
9	Textile Finishing
10	Apparel Production Planning and Control
11	Apparel Size and Fit Analysis
12	Directed Study*

*Any new courses can be added as a special paper by getting permission Doctoral Committee, BOS and Academic Council.

Course work papers

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TEXTILE FIBRES

UNIT-I

NATURAL FIBRES: Classification of Textile Fibres – natural and synthetic. Requirements and characteristics of textile fibres Morphological structure, properties, sourcing and end uses of cotton, jute, and flax. Wool: Different qualities, morphological structure, properties and end uses. Silk: different types, structure, properties and end uses. Organic cotton and coloured cotton, Banana fibre – properties and end use. Unconventional

UNIT-II

SYNTHETIC FIBRES: Principle of fiber formation by dry, wet, melt spinning and

solution spinning techniques. Manufacture, sourcing and properties of polyamide, polyester, polypropylene and polyacrylonitrile fibres. Drawing and heat setting process. Mono and multi filaments. High performance fibres- elastomers, glass, aramid, carbon fibres: properties, sourcing and applications. Bi component fibres - micro fibres, ultra-fine denier fibres: properties and end uses. Dope dyed fibres, Nano fibres - production, properties and applications.

UNIT-III

REGENERATED FIBRES: Cellulosic Fibers- Viscose rayon, lyocell, modal and Bamboo – Raw Material, production, structure & properties, sourcing and end uses. Polynosic fibres- types, structure, properties, end uses. Regenerated Protein Fibres: Milk, soybean - structure & properties, sourcing and end uses.

UNIT-IV

IDENTIFICATION OF FIBRES: Feeling Test, Burning test, Microscopic test, Staining Test, Chemical test and Density measurement.

UNIT-V

PRODUCT VARIATION AND FIBRE SELECTION: Fibre selection for apparels – casual, formal and party wears. Home textiles – safety and aesthetic properties. Basic properties and fibre selection for Sportswear, intimate garments, medical garments and protective clothing.

Text Books:

1. Mishra S. P., —Text book of Fibre Science and Technology, Newnes-HV Butterworths & Co. Publishers Ltd., Oxford, 2000.
2. Premamoy Ghosh, —Fibre Science and Technology, McGraw Hill, India, 2004.
3. Deepali Rastogi and Sheetal Chopra, Textile Science, Orient Black-Swan Private Limited, Hyderabad.(2017).
4. Bernard P. Corbman, Textiles Fiber to Fabric, Sixth edition, McGraw Hill International Editions, New Delhi.(2005).
5. Kaplan, N.S. Textile Fibres, Abhishek Publications, Chandigarh., (2008).

References:

1. Gupta V. B. and Kothari V. K. —Manufactured Fibre Technology, Chapman & Hall, London, 1997.
2. Sreenivasamurthy H.V., —Introduction to Textile Fibres, The Textile Association India, Mumbai, (1998.)
3. Morton W. E. and Hearle J. W. S., —Physical Properties of Textile Fibres, Textile

Institute, Manchester, (1993).

4. Deepali Rastogi and Sheetal Chopra, Textile Science, Orient Black-Swan Private Limited, Hyderabad. (2017).

5. Bernard P. Corbman, (2005). Textiles Fiber to Fabric, Sixth edition, McGraw Hill International Editions, New Delhi.

6. Kaplan, N.S., Textile Fibres, Abhishek Publications, Chandigarh (2008).

7. Premony Ghosh Fibre science and Technology, Tata McGraw- Hill Publishing Company limited, New Delhi., (2004).

8. Kothari, V. K, Progress in Textile Science, Vol I, II and III, IAFL Publications, New Delhi. (2010).

9. Seema Sekhri., Textbook of Fabric science, Fundamentals to finishing, PHI Learning Private limited, New Delhi., (2011).

YARN TECHNOLOGY

UNIT-I

YARN MANUFACTURING PROCESS: Introduction: Types of yarn- spun and filaments. Yarn numbering system. Ginning – objectives, types and working principle. Short staple system: objective, working principle, application and sequence of manufacturing process adopted for ring and compact yarns. Comparison of carded, combed and blended yarns.

UNIT-II

LONG STAPLE SPINNING: objective, working principle, application and sequence of manufacturing process adopted for woollen, worsted yarn, silk filament and spun silk. Applications of long staple yarns. Yarn selection criteria for woven and knitted garments, yarn and package faults: Causes and remedies.

UNIT-III

UNCONVENTIONAL SPINNING TECHNIQUES: Objective, working principle of rotor spinning, air - jet spinning, air vortex spinning, Self-twist spinning, DREF spinning, Electrostatic Spinning, wrap spinning. Comparison of yarn properties produced from different spinning processes. Applications of different unconventional yarns.

UNIT-IV

FANCY YARNS: Fancy yarns: types, manufacturing and application of marl yarn, spiral or corkscrew yarn, gimp yarn, diamond yarn, loop yarn, snarl yarn, knop yarn, slub yarn, fascinated yarn, tape yarn, chenille yarn, ribbon yarns, composite yarns, covered yarns, slub yarns, milange yarns and metallic yarns.\

UNIT-IV

SEWING AND EMBROIDERY THREAD MANUFACTURE: Fibres used, essential quality requirements, package types, ticket number, manufacturing process, properties and applications of different types of sewing threads. Embroidery thread: types, manufacturing process, properties and applications.

Text Books:

1. Deepali Rastogi and Sheetal Chopra .Textile Science, Orient BlackSwan Private Limited, Hyderabad., (2017).
2. The complete Technology book of Textile Spinning, Weaving, Finishing and Printing, by NIIR board, Asia Pacific Business Press, New Delhi.(2017),
3. Seema Sekhri, Textbook of Fabric science, Fundamentals to finishing, PHI Learning Private limited, New Delhi.(2011).
4. Klein W.G., —The Technology of Short Staple Spinning, Textile Institute, Manchester, (1998.)
5. Mahendra Gowda, R.V., —New spinning systems, NCUTE publication, New Delhi, (2006)

References:

2. Wynne A., —The Motivate Series, Macmillan Education Ltd., London, (1997)
3. Oxtoby E., —Spun Yarn Technology, Butterworth and Co., London, (1987.)
4. Lawrence C.A., —Advances in Yarn Spinning Technology, Woodhead publishing, Cambridge, (2010).
5. Meenakshi Rastogi, Textile forming, Sonali Publications, New Delhi.(2009).
6. Bev Ashford, Fibers to fabrics, Author house, USA.(2014).
7. Peter. R. Lord Hand book of yarn production, Wood head Publishing Ltd, End, (2003).

FABRIC MANUFACTURING AND DESIGN

UNIT-I

WEAVING: Introduction, Process flow and objectives of winding, warping, sizing, looming. Types of weaving. Working principle of loom - Primary, secondary and auxiliary motions. Working principle of dobby and jacquard. Production calculation, Limitations of shuttle weaving.

UNIT-II

SHUTTLELESS WEAVING: Basic principles of weft insertion – projectile, rapier, air jet. selvedge – objectives, types. merits and demerits of shuttleless looms. woven fabric defects - types, causes and remedies. Commercial fabrics

UNIT-III

NON-WOVENS: Definition, Classification, raw materials, Web formation techniques - dry laid, wet laid, air laid. Bonding techniques –mechanical, thermal and chemical. Properties of nonwoven fabrics, products and its applications.

UNIT-IV

WOVEN STRUCTURES: Elements of woven design – design, repeat, draft, peg plan and denting plan. Classifications. Design and characteristics of elementary weaves – plain and its derivatives, twill and its derivatives, sateen and satin. Honey comb and its types, huck-a-back, mock leno. Special woven structures: Bed ford cord, welt and pique. Pile fabrics – Velvet and velvet. Concept of double cloth and its application. Extra thread figuring. Concept of 3D woven structure.

UNIT-V

COLOUR AND WEAVE COMBINATION: Simple colour and weave effects. Arrangement of figures – drop, ogee, diamond and sateen. Applications. Commercial Weaves: Design and Specifications – Voile, Poplin, Corduroy. Chambray, Georgettes, Crepe, Chiffon. Gabardine.

Text Books:

1. Lord P. R. and Mohamed M. H., —Weaving: Conversion of Yarn to Fabric, Wood Head Publishing Limited, England, (2001.)
2. Grosicki Z. J., —Watson 's Textile Design and colour, Newness-Butterworth and Co., London, (2005.)
3. Gokarneshan, N Fabric structure and design, New Age International Publishers, New

Delhi, (2004).

4.Gokerneshan.N, Weaving Preparation Technology, Abishek Publications, Chandigarh.(2009).

5.Barker, A. F, Handbook of Textiles, Abhishek publications, Chandigarh.(2009).

References:

1. Marks P. and Robinson A. T. C., Principles of Weaving, Textile Institute, Manchester, (1998.)

2. Hu J., 3 D Fibrous Assemblies: Properties, Applications and Modeling of Three-Dimensional Textile structures, Woodhead Publishing, (2008).

3. Russel S., —Handbook of Nonwovens, Textile Institute, Manchester, (2004).

4. Grosicki Z. J., —Watson 's Advanced Textile Design, Newness-Butterworth and Co., London, (2005)

5.Seema SekhriTextbook of Fabric science, Fundamentals to finishing, PHI Learning Private limited, New Delhi., (2011).

6.Deepali Rastogi, Sheetal Chopra, Textile Science, Orient Blackswan Private Limited, Hyderabad.(2017).

7.Prabir Kumar BanerjeePrinciples of Faric Formation, CRC press, U.S., (2015).

TEXTILE CHEMICAL PROCESSING

UNIT-I

Chemical Processing Sequence: Sequence of processing for cotton, silk, wool, rayon, polyester, polyamide, elastomeric and cellulosic blend materials.

UNIT-II

Cellulosic Material Preparatory Processes: Singeing, desizing, scouring, bleaching, mercerization, optical whitening, - types, mechanism, applications and conditions. Machineries used for pretreatments of woven and knitted cloths. Process and quality control measures involved in preparatory processes.

UNIT-III

Protein and Synthetic Material Preparatory Processes: Degumming of silk, degreasing of wool, bleaching, heat setting - types, mechanism, applications and conditions. Machinery used for pretreatments for woven and knitted cloths. Process and quality control measures involved in preparatory processes.

UNIT-IV

Fabric Dyeing: Introduction to theory of dyeing, properties and applications of direct, reactive, vat, azoic, sulphur, acid, mordant, metal complex, disperse, basic and natural dyes, after treatment of dyed goods, Concept of computer colour matching. Process and quality control measures in dyeing.

Dyeing Machinery: Machineries used for loose fibre dyeing, yarn and hank dyeing, jigger, winch, padding machines, Airflow dyeing machines with aerodynamic flow system, soft flow dyeing and garment dyeing machineries. Methods and machineries used for micro denier materials.

UNIT-V

Fabric Printing: Printing methods, styles of printing, printing paste constituents, printing with direct, reactive, acid, disperse dyes and pigments, after treatment of printed goods, advances in printing. Process and quality control measures in printing, Specialty printings – pigment, khadi, metallic, plastic, rubber, foam, pearl, flock, and foil printings.

Printing Machineries: Objective and working principle of roller, flat bed, rotary screen printing, transfer printing, ink jet and digital printing machines.

Text Books:

1. Clark M —Handbook of Textile and Industrial Dyeing: Principles, processes and types of dyes Wood head publications, England, (2011).

2. Bhagwat R S —Handbook of Textile Processing Machinery| Colour Publications, Mumbai, (1999.)
- 3.Kapoor Seema,. Dyeing of Textile material, Sonali Publication, New Delhi.(2012)
- 4.Arora. ATextbook of Dyes, Sonali Publications, New Delhi., (2011).
- 5.Niyati Bhattacharya, Natural dyes for Textiles and their eco-friendly application, IAFL Publication, New Delhi.(2010).

References:

1. Shenai V A, Technology of Dyeing|, Sevak Publications, Mumbai, (1995).
2. Richard Aspland J,‘ Textile dyeing and coloration, AATCC, (1997).
3. Miles L W C, Textile Printing|, SDC, England, (1994).
4. Shenai V A, Technology of Bleaching and Mercerizing – Vol III|, Sevak Publications, Chennai, (1991).
5. Vaidya A A and Trivedi S S, Textile Auxiliaries and Finishing Chemicals|, ATIRA, Ahmedabad, (1985).
6. Sule, A.D.,| Computer Colour Analysis: Textile Applications|, Newage International, (2008)
7. Chakraborty J N, —Fundamentals and Practices in Colouration of Textiles|, (2009)
- 8.Jamshed A Khan, Eco-Friendly Textile Dyeing and Finishing, Scitus Academics LLC,(2016).
- 9.T.L. Vigo, Textile Processing and Properties: Preparation, Dyeing, Finishing and Performance, Elsevier, Netherland.(2013).
- 10.M.L. Gulkajami, Advanced in the Dyeing and Finishing of Technical Textiles, Wood Head Publishing, Oxford Cambridge, Philadelphia, and New Delhi (2013).

SPECIALITY FABRICS AND TECHNOLOGY

UNIT-I

Speciality Textiles: Scope, fibres, yarns and fabric selection for the manufacture of speciality textiles. Speciality yarns: Fancy yarns: manufacturing concept - spun, spiral, diamond, gimp, chenille, cloud, knop, loop, snarl, spiral stripe. Coloured yarns: solid shades, mixture shades, mixing in drawing. Speciality colored yarns: twist shades, single marl, half marl and double marl.

UNIT-II

Narrow Width Fabrics: Narrow width fabrics: material used, process of manufacture of narrow width fabrics using crochet machines, needle loom and double needle bed warp knitting machines- narrow width products: different types of tapes, laces, elastic, ribbons, labels and its properties.

UNIT-III

Knitted Fabrics: Weft knits: fleecy fabrics, plush structures and high pile fabrics. Warp knits: directionally oriented structures – weft insertion, co-we-knit. String vests, plush, waffle fabrics.

Braided Structures: Braided structures: classification – circular and flat braids – production techniques, properties and applications.

UNIT-IV

Interlinings: Woven, knitted and non-woven interlinings-Interlinings for shape and support, stabilizing/stiffening, providing bulk. Requirements of fusing interlinings to garments, factors determining the properties of the fused laminate; the base fabric of the interlining, the type of fusible resin, method of applying resin to base cloths, the means of fusing (time, temperature and pressure), fusing equipment's, methods of fusing, quality control in fusing.

UNIT-V

Coating Technology: Coating by direct method - foam finishing - foamed and crushed foam coating - transfer coating - coagulated polyurethane coating - ball licking roller technique - hot melt extrusion coating - calendar coating - rotary screen coating - fabric impregnation method.

Text Books:

1. Harold Carr and Barbara Latham, The Technology of Clothing Manufacture, Blackwell Science, Oxford, (2002).
2. McKenn H A, Hearle J W S and Hear NO, Handbook of fibre rope technology, Wood head

publishing Limited, Cambridge, (2004).

References:

1. SabitAdanur, Wellington Sears Handbook of Industrial Textiles, Technomic publishing company Inc. USA, (1995).
2. Russel.S, Handbook of Nonwovens, The Textile Institute Publication, Manchester, (2004).
3. Horrocks.. A. R &Anand..S. C, Handbook of Technical Textiles, Woodhead Publishing and Textile Institute, UK, (2000.)
4. Oxtoby E., Spun Yarn Technology, Butterworths, London, (2002).
5. Walter Fung , — Coated and Laminated Textiles, Wood head publishing Limited, Cambridge, England, (2000).

TECHNICAL TEXTILES

UNIT-I

Introduction: Definition Classification of Technical Textiles. Market growth and potential, Application of Technical textiles, fiber consumption, fiber requirements and properties

Industrial Textile: Typ

es - Tire Cord Yarns and Fabrics - Quality requirements- Fibre properties - Manufacturing techniques. Belts - Conveyor and power transmission, Composition of belts, Carcass cords, fabrics. Hose fabrics - Definition and characteristics of hoses, reinforcement, Construction and types.

UNIT-II

Filter Fabrics: Introduction, selection considerations - fiber, fabric, design. Principle, mechanism and types of filtration. Textiles in dry filtration, wet filtration, Filtration equipment- design consideration. Filter media for Paper Industry – design and manufacturing techniques, Cigarette filters.

Protective Textiles: Definition – basic requirements – Garment design and choice of materials in protection from hazards due to thermal, flame, chemical, mechanical, ballistic, nuclear and extreme climate. Footwear textiles.

UNIT-III

Medical Textiles: Classification of Medical textiles - non-implantable materials, extracorporeal devices, Implantable materials, Healthcare and hygiene products. Design and characteristics required in textiles for medical and hygiene applications.

Agro Textiles – - Introduction, fibers used Types, functions and properties, Characteristics and Applications in Agro products and in its field

UNIT-IV

Coated Fabrics: Textiles commonly used in coated fabrics, coating materials and polymers. Coating methods – direct coating, indirect coating. Lamination methods – flame bonding, Adhesive lamination – aqueous based and solvent based, heat lamination, film lamination. Applications of coating and laminated textiles.

UNIT-IV

Sports Textiles: Introduction, fibers used, Types, functions and properties, Characteristics and Applications of Sports Tech.

Geo-Textiles: Introduction- Geo textile, Geo synthetics. Property requirements. Fibres and fabrics for geo textiles Functions - Geotextile materials and manufacturing, Geotextile

functions. Geotextile properties and testing. Application of geotextiles.

Text Books:

1. Horrocks. A R & Anand S C, "Handbook of Technical Textiles", Woodhead Publishing and Textile Institute, USA, (2000)
2. Technical Textiles and its Application, Dr.S. Grace Annapoorani, LASER Park Publishing House, India, (2017)
3. Textiles for Industrial Applications, R Senthil Kumar, CRC Press, (2013)
4. Agro Textiles and its Application, Dr.S. Grace Annapoorani, Wood head publishing ltd, India
5. , (2018)
6. Hand book of Technical textiles, A. R. Horrocks and S. C. Anand, Wood head publishing ltd, England, (2000)

References:

1. David B. Wootton, "The Application of Textiles in Rubber", Rapra Technology Limited, UK, (2001).
2. Textiles for Industrial Applications, R Senthil Kumar, CRC Press, (2013)
3. Textile Fibers: Developments and Innovations, Kothari, V., New Delhi: IAFL Publications, (2000).

ENVIRONMENT AND SUSTAINABILITY IN TEXTILES

UNIT-I

Sustainability: Significance and need, factors influencing sustainability, Impact of ecology, economy and culture. Product life cycle design: Design sustainability using low impact materials, recyclable material content, energy efficient, reuse, recycling and assessment. Sustainable fibres: organic cotton, recycled polyester, alternative sustainable fibers-organic silk and wool.

UNIT-II

Environment Friendly Processing: Modern approaches to eco-friendly wet processing of woven and knitted clothing. Red listed textile chemicals, their sources and remedies. Eco-friendly dyes and method of dyeing, reduction of carbon footprints, enzymes and natural dyes. Eco-labeling, eco-audit and certification

UNIT-III

Pollution Control: Identification and reduction of pollution sources in textile wet processing, Primary and secondary pollutants: emission standard, criteria pollutant. Sources and effect of different air pollutants. Suspended particulate matter. Depletion of ozone layer: CFC, destruction of ozone layer by CFC, impact of other greenhouse gases, effect of ozone modification.

UNIT-IV

Waste Management: Cleaner production technologies, solid waste management. Concepts and utilization of PET waste, Recovery from yarn waste: Nylon 6, Nylon 66, Polypropylene and Acrylic. Effluent treatment: Norms, characteristics, types of effluent and methods of treatment and analysis of effluents.

UNIT-V

Sustainable Apparel Manufacture: 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. Development of organic and sustainable clothing, 3P's concepts in apparel manufacture. Quality Standards and Testing: Oekotex 100, STeP, GOTS: certification procedures and implementation, ISO 14000 & EMS: guidelines and implementation, WRAP, OSHAS, REACH & SA 8000. Testing for banned chemicals and dyes, principle of instruments used for eco-testing.

Text Books:

1. Tobler-Rohr M I, —Handbook of sustainable textile production, Woodhead Publishing

Ltd, UK, 2011.

2. Slater K., —Environmental impact of textiles: Production Processes and Protection, Woodhead Publishing Ltd, UK, 2003.

References:

1. —Ecofriendly Textiles, Challenges to the Textile Industries, Textile Committee, India, 2000.

2. Chritie R., —Environmental aspects of textile dyeing, Woodhead Publishing Ltd, UK, 2007.

3. Trivedi R.K., —Handbook of Environmental laws, Acts, Guidelines, Compliances and Standards, Vol. 1, Enviro Media, India, 1996.

4. Blackburn R S, ‘Sustainable textiles: Life cycle and environmental impact’, Woodhead Publishing, Ltd, UK, 2009.

TEXTILE FINISHING

UNIT-I

Finishing: Introduction. Classification of finishes. Chemical and Mechanical finishing of textiles. Mechanical Finishing- Calendaring. Shrink proofing of woven fabrics. Raising. Shearing. Dimensional stabilization of knitted goods. Properties of finished fabrics.

UNIT-II

Chemical Finishing: Introduction. Easy care and Durable finishing of cellulose – Formaldehyde and non-formaldehyde cross linking agents. Starching and softening. Water and Oil repellent finishes. Soil release finishing. Flame retardant finishing. Quality Evaluation of Finished Fabrics. Finished fabric realization.

Apparel and Denim Processing: Preparatory processes. Apparel dyeing, printing and finishing processes. Apparel dyeing machines. Biopolishing and stone washing of apparels. Denim Processing- Dyeing of denim materials. Fading of Denim fabrics. Finishing and washing of denim fabric.

UNIT-III

Enzymes & Proteins – Sources and Applications - Application of enzymes in Textile Chemical Processing - Mechanism of enzyme reactions – Bio scouring - Bio- bleaching, Combined bio - processing, bio washing, bio polishing, anti odour and anti-microbial finishes, bio finishing and other applications - Evaluation of enzyme treated fabrics

UNIT-IV

Effluent Treatment: Introduction. Characteristics and treatment of cotton and Synthetic Textiles (woven and knitted) processing effluents. Zero discharge processing. Flow chart of effluent treatment processes. Primary, Secondary and Tertiary treatments. Reverse osmosis and Evaporation.

Text Books:

1. Schindler W D and Hauser P J, “Chemical Finishing of Textiles”, Woodhead Publishing, Cambridge, 2004.

References:

1. Manivasakam N, “Treatment of Textile Processing Effluents”, Sakthi Publication, Coimbatore, 1995.
2. Parmar M S., Satsangi S S and Jai Prakash, “Denim – A Fabric for All”, Northern India Textile Research Association Ghaziabad, 1996.
3. Nierstrasz V and A Cavaco-Paulo, “Advances in textile biotechnology”, Woodhead Publishing, Cambridge, 2010.

4. Charles Tomasino, "Chemistry & Technology of Fabric Preparation & Finishing", Department of Textile Engineering, Chemistry and Science, College of Textiles, North Carolina State University, Raleigh, 1992.
5. Heywood D, "Textile Finishing", Woodhead Publishing, UK, 2003.
6. Manivasakam, N, Treatment of Textile Processing Effluents, Sakthi Publication, Coimbatore, 1995
7. Finishing of Garments and Knits, NCUTE – Programme series held at Ichalkaranchi, IIT, Delhi, 2003.

APPAREL PRODUCTION PLANNING AND CONTROL

OBJECTIVES:

- To emphasis onthe improved methods of material control in apparel production
- To acquaint student with quality concepts for implementing quality in apparel production

UNIT I Production planning

Control parameters and basic data of styles and generalized garment types, new programanalysis, style wise design wise analysis on production parameters, product development andduplication. Production planning andtime and action calendar, steps between prototypes to approved sample-production sample,product data management and understanding specification sheets and effective communication.

UNIT II Production sequence

Operation break down and production sequence, identification of bottle necks and critical area,operation wise machinery allocation, usage of special attachments and tools for operationsimplifications, production grid and flow chart.

UNIT III Cutting techniques

Cutting techniques, cutting room controls, lay lot planning, bundle distributions, modern methods incut piece distribution and tracking different manufacturing systems, mass customization and madeto order manufacturing systems, advantages, disadvantages and control measures in sewing.

UNIT IV Production planning

Production planning -Production floor balancing, line balancing, allocation of man power,production set up planning for a shirt factory, production set up planning for a bottoms and jacketfactory, production set up planning for a fully integrated apparel manufacturing plant, conveyorsystem and control parameters.

UNIT V Quality control

Quality control in product development, quality control in printing, embroidery, washing and otheraccessories, quality planning, preproduction meetings and quality procedures, productionmeetings,in line inspection, final inspection, rescreening conditions and final inspections. Packing- Ratio packing, solid packing, short shipment, excess shipment, calculation of volumetric weight,carton dimension other requirements.

TEXTBOOKS:

1. Jacob Solinger, "Apparel Production Handbook", Reinhold Publications, 1998

2. Carr H and Latham B., "The Technology of Clothing Manufacturing", Blackwell Science, U.K.,1994
3. Ruth E. Glock, Grace I. Kunz, "Apparel Manufacturing, Sewn Product Analysis", Fourth Edition, Pearson Education.
4. Chuter A.J., "Introduction to Clothing Production Management", Blackwell Scientific Publications, Oxford 2001.

REFERENCES:

1. Laing R.M., Webster J, "Stitches & Seams", The Textile Institute, India, 1998
2. Shaeffer Claire, "Sewing for the Apparel Industry", Prentice Hall, New Jersey, 2001
3. Singer, "Sewing Lingerie", Cy DeCosse Incorporated, 1991
4. Patty Brown & Janett Rice, "Ready-To-Wear Apparel Analysis", Third Edition, Prentice-HallInc., New Jersey.

APPAREL SIZE AND FIT ANALYSIS

UNIT-I

HUMAN ANTHROPOMETRICS: Ergonomics in design of clothing, Anthropometry- ,selection of anthropometric data for clothing design, errors and variability in anthropometric data, selection of anthropometric design approach, Anthropometric methods - Traditional and 3 dimensional methods, international standards, land marking, body measurement devices and techniques, Body scanning – operations, applications

UNIT-II

FIGURE EVALUATION: Body shape analysis, classification of body shapes, characteristic differences among figures, posture – types, figure types- vertical, horizontal, Sizing and shape requirements of children, male, female, old age, pregnant and intimate wears, clothing style selection for figure types. Overcoming unrealistic body image.

UNIT-III

SIZING SYSTEMS AND SIZE STANDARDISATION: Existing sizing systems- strength and weakness, sizing system development- importance, size and shape surveys, anthropometric analysis, size analysis, key or control measurements, developing and validating sizing system, statistics used in sizing system development, apparel size designation and labeling, international sizing system development, size categories in men's, women's and children's wear. (6+6)

UNIT-IV

METHODS OF FITTING AND EVALUATION: Fit -Definition, Importance, standards, influences of clothing fit, Methods of testing fit- fit models, fitting futures, measured methods, pinned pattern / tissue methods, trial garment, guide to fitting problems. Alternative methods for evaluating fit-using structural line, grain line, wrinkles, pinch test, inside measurement. Evaluating fit: subjective, objective, rating scales, subjective fitting guide, Objective method- moiré optics, algebraic evaluation of clothing fit, clothing waveform, pressure evaluation of clothing fit , 3D modeling of pressure fit.

UNIT-V

PATTERN ALTERATION: General procedure, standards, methods - seam method, pivot

method, corrected slash method. Pattern alteration for bodice, sleeves, skirts and pants. Analyzing the causes for poor fit and solving fitting problems in trouser, sari blouse, skirt, ladies' top, sherwani , Virtual garmenting - three dimensional apparel design systems for pattern generation and garment fit.

EFFECT OF MATERIALS AND BODY MOVEMENT: Human performance in clothing system, Wearing comfort – interaction between body motion and clothing as a shell, fit and allowance for comfort and wearability, thermal aspects of fit, Effect of materials on fit and sizing, non-stretch materials, stretch materials, fit assessment.

TEXT BOOKS:

1. Deepti gupta and Norsaadah Zakaria, —Anthropometry, sizing and design|| Textile Institute, Wood head Publishing Limited, England, 2004.
2. FanJ, Yu W and Hunter L, —Clothing Appearance and Fit||, Textile Institute, Wood head Publishing Limited, England , 2004

REFERENCES:

1. Lynn Macintyre and Mary Tilton, —Easy Guide to sewing||, Taunton press, USA, 2009.
2. Sandra Betzina ,||Fast Fit-Easy pattern alterations for every figure||, The Taunton Press, Inc., Singapore, 2003
3. Ashdown S P, —Sizing in clothing-Developing effective sizing system for ready to wear||. Textile Institute, Wood head Publishing Limited, England , 2007.
4. Editors of Creative publishing,|| The Perfect Fit- classic guide to alter patterns||, Creative publishing international, USA, 2005.