Bharathiar University – Coimbatore – 641046
B.Sc Apparel Production Technology Degree Course
(Syllabus for the students admitted during the academic year 2019-2020 Batch onwards)
Scheme of Examination

Part	Study Components	Course Title	Hours per week	Examinations				Credit
				Dur. Hrs.	CIA	Marks	Total Marks	
Semester – I								
I	Language I		6	3	25	75	100	4
II	English I		6	3	25	75	100	4
III	Core Paper I - Basic Textiles		4	3	25	75	100	4
	Core Paper II - Apparel Manufacturing Technology		4	3	25	75	100	4
	Core Paper III - Practical I - Yarn & Fabric Analysis Practical		4	3	20	30	50	2
	Allied Paper I - Fabric Manufacturing Technology		4	3	25	75	100	4
IV	Environmental Studies #		2	3	-	50	50	2
Semester – II								
I	Language II		6	3	25	75	100	4
II	English II		6	3	25	75	100	4
III	Core Paper IV – Garment Machines & Equipments		4	3	25	75	100	4
	Core Paper V - Practical II - Garment Construction I - Practical		4	3	20	30	50	2
	Core Paper VI – Practical III- Basics of Computer Application - Practical		4	3	40	60	100	4
	Allied Paper II - Textile Chemical Processing		4	3	25	75	100	4
IV	Value Education – Human Rights #		2	3	-	50	50	2
Semester III								
III	Core Paper VII – Garment Accessories & Trims		5	3	25	75	100	4
	Core Paper VIII - Industrial Engineering - I		5	3	25	75	100	4
	Core Paper IX - Practical IV – Garment Construction II - Practical		5	3	30	45	75	3
	Core Paper X - Practical V - Pattern Making Practical		5	3	30	45	75	3
	Allied Paper III - Apparel Quality Control & Quality Assurance		5	3	25	75	100	4
	Skill based Subject I – Internship - I (Operator Training Practical)		3	3	30	45	75	3
IV	Tamil @ / Advanced Tamil# (OR) Non-major elective - I (Yoga for Human Excellence)# / Women's Rights#		2	3	50		50	2

	Semester IV						
III	Core Paper XI - Industrial Engineering - II	5	3	25	75	100	4
	Core Paper XII – Production Planning , Control and Inventory Management	5	3	25	75	100	4
	Core Paper XIII - Operational Costing	5	3	25	75	100	4
	Core Paper XIV - Practical VI - Plant Layout Practical	5	3	30	45	75	3
	Allied Paper IV - Human Resource Management	5	3	25	75	100	4
	Skill based Subject II – Mini Project (Industrial Engineering)	3	3	30	45	75	3
IV	Tamil @ /Advanced Tamil # (OR) Non-major elective - II (General Awareness #)	2	3	-	50	50	2
	Semester V						
III	Core Paper XV – Industrial Engineering - III	4	3	25	75	100	4
	Core Paper XVI – Practical VII - Operational Costing Practical	5	3	30	45	75	3
	Core Paper XVII - – Practical VIII - Performance Management System – Practical	5	3	30	45	75	3
	Core Paper XVIII – QMS in Apparel Production	4	3	25	75	100	4
	Core Paper XIX — Practical IX - Problem Solving – Practical	5	3	30	45	75	3
	Elective Paper I	4	3	25	75	100	4
IV	Skill based Subject III – Behavioral Intervention Skills	3	3	30	45	75	3
	Semester VI						
III	Core Paper XX – Lean six sigma	5	3	25	75	100	4
	Elective Paper II -	5	3	25	75	100	4
	Elective Paper III -	5	3	25	75	100	4
IV	Skill based Subject IV – Production Management - Project Work & Viva Voce	15	3	35	140	175	7
V	Extension Activities @	-	-	50	-	50	2
	Total					3500	140

@ No University Examinations. Only Continuous Internal Assessment (CIA)

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List of Elective papers (Colleges can choose any one of the paper as electives)		
Elective – I	A	Technology advancements in apparel production
	B	ERP in Apparel Industry
	C	TQM in Apparel Industry
Elective – II	A	Entrepreneurship
	B	Leadership & Emotional Intelligence
	C	Interpersonal Skills
Elective - III	A	Training & Development
	B	Factory Compliance
	C	Value Stream Mapping

Semester – I - Core Paper I - Basic Textiles

Objectives

- **To study about types of textile fibre**
- **To study about the methods of producing yarn from fibres**
- **To know about the fibre and yarn quality parameters**

Unit I - Natural Fiber

Classification of textile fibres - Properties of textile fibres. Cotton: Grading of cotton - Properties. Production & properties of Flax & Jute fibres. Production and Properties of silk - varieties of silk. Wool fibre grading -– Properties– comparison of Woollen & Worsted Yarns.

Unit II - Regenerated fiber

Manufacturing process sequence of viscose fibre. Properties of viscose & Lyocell fibres. Production process & properties of acetate fibres. Brief study about Bamboo, banana & Soyabean fibres. Filament Spinning Techniques.

Unit III - Synthetic Fiber

Polymer & its types. Requirements of fibre forming polymer. Study about manufacturing process of Polyester, Nylon, Acrylic & Spandex fibres & Properties. Brief study about texturization.

Unit IV - Yarn Formation

Introduction to yarn classification – Staple spinning system – Production sequence for cotton yarn – Comparison of carded and combed yarn – Yarn winding – waxing – Study of yarn quality parameters – Various yarn & package defects. Introduction to blended textiles. Ply yarn production. Yarn numbering systems.

Unit V - Latest trends in textile fibers and yarns

Introduction to organic cotton. Brief study about micro fibre & hollow fibres. Brief study about OE & Air jet spinning. Study about Fancy yarns. Sewing threads manufacturing process. Introduction to sustainable textiles.

References:

1. *Mishra, S.P*. A Text Book of Fibre Science and Technology, New Age International (P) Ltd Publishers, New Delhi (2000).
2. *Goswami.J.C., Martindale.J.G, Scardino.K.L.*, Textile Yarns,Technology, Structure & Applications, Mahajan Book Distributors, Ahmedabad (1995).
3. Hand book of textile fibres by J.Gordon & Cook
4. The technology of short-shape staple spinning – W. Klein
5. Spun yarn technology – Oxtoby
6. New Spinning Technology Vol. 4 & 5 –W.Klien

Outcome:

After completion of this course students will be able to

- **Understand various fibres and their properties**
- **Know yarn manufacturing process**
- **Know yarn quality parameters**

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Semester – I - Core Paper II – Apparel Manufacturing Technology

Unit I
Different departments & their role in garment industry. Product types and its influence. Garment analysis and its classification - measurement and size charts for men, women, and children - requirement and breakdown of garments - flow process - torso and bifurcated garments.

Unit II
Fabric Receipt & Cutting process: fabric checking for quality – cutting process & its types – Ticketing & bundling – sewing process -Stitches and seams: basic principles of stitch formation – classification of stitches based on federal standards -– detailed study of application of all stitches - comparison of stitches.

Unit III
Detailed study on seams classification as per federal standards –seam finishes – devices for introducing fullness. Thread consumption for various types of stitches and garments. Fabric selection techniques – Additional dress making techniques-trimming details for quality look.

Unit IV
Detailed study on various stitching, sewing and assembly defects - causes & remedies: skip stitch, unbalanced, puckering, gathering, needle defects, thread problems – quality of threads and its impact on sewing quality – sew ability and its influencing factors – needle cutting index.

Unit V
Fusing and its requirements– interlinings – fusible resin types. Introduction to trims and accessories attachments -label, zips, fasteners – Sewing ticket numbering. Packaging types and materials. **Finishing & Packing - Dispatching.**

References:
1. Apparel Manufacturing – Hand Book – Jacob Solinger
2. Technology Of Clothing Manufacture – Herold Carr & B.Latham
3. Knitted Clothing Technology – T.Bracken Berry
4. Technology of Stitches & Seams – Coats Viyella Limited
5. Apparel Manufacturing Management System – Roche Daniel
6. Knitting and Apparel Manufacture – Sureshkumar, SSMITT Stores

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Semester – I - Core Paper I – Yarn & Fabric Analysis Practical

Objectives

- **To learn about testing of yarn quality parameters**
- **To learn about testing fabric physical properties**

1. Determination of count of yarn using wrap reel & weighing scale.
2. Determination of lea strength & CSP using lea strength tester.
3. Determination of yarn count from fabric swatch using Beesley balance.
4. Determination of twist of single yarn using electronic twist tester.
5. Fabric Analysis for determining Weight, CPI, WPI, SL, CL & Yarn Count.
6. Analysis of Blend composition of given fabrics.
7. Determination of Fabric Pilling Using ICI Pill Box
8. Determination of Fabric Bursting Strength.

9. Determination of color fastness of given sample to washing by using launderometer.
10. Determination of color fastness of given sample to rubbing by using crock meter
11. Determination of dimensional stability % of a given fabric / garment to washing.
12. Determination of fabric Spirality & bowing

Outcome:

After completion of this course students will be able to do various tests to assess the quality of yarns and fabrics, and its importance importance

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Semester – I - Allied Paper I – Fabric Manufacturing Technology

OBJECTIVES: To make the students to understand

- Fundamentals of knitting and Weaving process
- Basic differences between the processes & the types of machines used
- Applications of woven & knitted fabrics

Unit – I

Different fabric forming methods. Introduction to weaving - Weaving preparatory processes and its objectives (Winding, Warping, Sizing & drawing in).

Unit-II

Passage of material through a plain power loom – Basic mechanisms of a weaving – Primary, secondary & auxiliary motions – Fabric defects, causes & remedies. Brief study about shuttle less looms. Study Basic weaves (Plain weave, Twill & Satin) and its derivatives

Unit-III

Comparison of weaving and knitting processes. Principles of weft and warp knitting. Knitting machine elements and description. Classification of knitting machines. Yarn passage diagram of a circular knitting machine. Knitting cycle of latch needle with sinker.

Unit-IV

Terms and definitions in knitting. Principal weft knit stitches - Knit, tuck and miss stitch formation and properties - Representation of weft knit stitches – Study of Basic weft knit structures - Needle gating -– Characteristics of basic weft knit structures. Brief study about derivatives of weft knit structures.

Unit V

Knitted fabric faults – Causes and Remedies. Comparison of circular and Flat Knitting – Yarn passage diagram of a flat knitting machine. Warp knitting terminologies – Open lap and closed lap. Basic lapping variations - Study of knitting elements of Tricot and Raschel machines. Comparison of weft and warp knitting

References:

1. *D.B. Ajgaonkar,* Knitting Technology
2. *David .J.Spencer*, Knitting Technology
3. *Dr.Samuel Raz* , Flat Knitting
4. *R.Marks, A.T.C. Robinson*, Principles of Weaving, The Textile Institute, Manchester (1976).
5. *Prof.N.N.Banerjee*, Weaving Mechanism, Vol. I & Vol. II, Published by Smt.Tandra Banerjee, West Bengal (1999).
6. *Prof.J.L.Chakravorty*, Mechanism of Weaving Machines,Smt.B.Chakravorty, Serampore, W.B. (1984).
7. *Sabit Adanur*, Handbook of Weaving, Technomic Publishing Company, Inc, USA (2001).

8. . *Z.Grosicki,* Watson‟s Textile Design and Color and Advanced Textile Design and Color , Newnes – Butter Worth, Universal Publishing Corporation, Bombay (1988).
9. Blinov.I, Belay.S, Design of Woven Fabrics, MIR Publishers, Moscow (1988).

OUTCOMES: Upon completion of this course, the student shall be able to understand the

- Principle of weaving & knitting processes
- Basic structures of weaving & Knitting
- Concept of flat knitting & warp knitting

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Semester –II - Core Paper IV – Garment Machines & Equipments

UNIT: I

Apparel Production:- Definition- fundamentals- basic types of process.-Pattern making- Drafting – Draping – Grading & Marker planning - Marker efficiency-Factors affecting marker efficiency.-Marker duplicating methods – Computer aided marker making.Spreading-Introduction - Requirements of the process- Methods of spreading- Spreading quality specification - Equipments and tools.

UNIT: II

Fabric cutting – Objective- method. - Cutting equipment and tool analysis- Fabric cutting machineries- Vertical reciprocity cutting machine - rotary cutting machine- band knife cutting machine- die-cutting machine - clickers& pressers - cutting drills- laser cutting, plasma cutting - water jet cutting - ultrasonic cutting-cutting method analysis- computerized cutting machine, shade ticketing machine.

UNIT: III

Concept of Sewing, seaming& stitching.- Seam and stitch – Classification. Sewing machine – Parts and functions, identification and classification, bed types, classification of stitching mechanism, presser feet, feed mechanism, rotary feed, platform feed, other types prime feed and auxiliary feed. Special attachments in sewing machines

UNIT: IV

Sewing machinery& Equipments- Tables& auxiliary equipment – Types, basic sewing machine-general sewing, –SNLS, DNLS, over lock, blind stitching, buttonholes, bar tacking, button sewing, label sewing, special sewing machine, Embroidery sewing machines, mechanized work place, work aids and its types. Latest developments in sewing machines. Sewing machine maintenance.

UNIT: V

Fusing-Introduction, process, means of fusing, fusing equipment, methods of fusing.Pressing-Introduction, means of pressing, pressing equipment and methods: iron, steam press, steam air finisher, steam tunnel, pleating, permanent press.Garment folding-types Packaging- method and equipments.

References:

1. Harold Carr& Barbara latham, “The Technology of Clothing Manufacture”, Black well Sciences, 1996
2. Jacob Solinger., “Apparel Manufacturing Handbook “, Van Nostrand Reinhold Company, 1980
3. Shaeffer Claire, “Sewing for the Apparel Industry”, Prentice Hall, New Jersey, 20015. Technical Advisory Committee of AAMA, “A New Look at Apparel Mechanization”, 1978.
4. Ruth E. Glock and Grace I. Kunz, “Apparel Manufacturing Sewn Product Analysis”, Pearson, Prentice Hall, 2005.
5. Gerry Cooklin, “Introduction to clothing Manufacture”, Black well Sciences.

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Semester –II - Core Paper – Computer Application Basics - Practical

Objectives

- **To learn about application of MS word and to do exercise**
- **To learn about MS excel and creation of charts using excel**
- **To learn about the use of Corel draw and HTML**

MS Office

1. Prepare an interview call letter and send using mail merge in MS Word.
2. Design the given advertisement using in MS word. Apply various fonts and pictures.
3. Create an organizational chart in MS word.
4. Create line, bar and pie charts for the given data using MS Excel.
5. Prepare students mark statement with the following fields Roll No, Name, Sub1, Sub2, Sub3, Sub4, Sub5. Calculate Total, Average, Result and Grade. Apply Conditional formatting.
6. Prepare employee salary list with fields Employee No, Employee Name, Experience, Basic Pay, HRA,DA,LIC,PF. Calculate Gross Salary & Net Salary based on the following conditions

Experience	HRA	DA	LIC	PF
5 Years & Above	30%	15%	3%	700
Less than 5 Years	15%	5%	3%	700

7. Create a fortnight report using pivot table in Excel
8. Prepare a employee table and apply financial functions.
9. Prepare a power point presentation about a product. Apply animation and slide timing.
10. Create Reports using MS Access.
11. Create Queries and Labels in MS Access
12. Create an E- Mail ID and use various mail features

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Semester –II - Core Paper – Garment Construction I - Practical

Objectives

- **To practice and learn sewing various shapes**
- **To learn about drafting of patterns for various components**
- **To learn about sewing of various components**

1. Threading practice for SNLS machine Over Lock machine, Flat Lock machine
2. Sample preparations for SNLS machine Over Lock machine, Flat Lock machine.
3. Preparation of samples for seam (any 5)-plain, Top Stitched, Flat fell, piped seam.
4. Preparation of samples for seam finishes (any 3) - overcast, Hem, Edge stitched, bound.
5. Preparation of samples for fullness-darts, tucks (any 3)-pin, cross, group tucking with scalloped effect, Pleats (any 3)-knife, box, kick, gathering by machine, elastic. Ruffles-single, double.
6. Preparation of samples for facing and binding-bias facing, shaped facing, binding.
7. Preparation of samples for plackets -continuous, bound, faced and zipper plackets, Tailored Placket, button and buttonhole, press, button, hook and eye.

8. Preparation of samples for sleeves-plain sleeve, puff sleeve , raglon and kimono sleeve
9. Preparations of samples with yoke –simple yoke, yoke supporting fullness.
10. Preparation of samples for collar - peter pan collar , shirt collar
11. Preparation of samples for pocket-patch Pocket
12. Safety practices while working on sewing machine. Care and maintenance on sewing machine.

Outcome:

After completion of this course students will be able to make various garment components using different types of sewing machine

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Semester –II - Allied Paper II – Textile Chemical Processing

Objectives

- **To study about preparatory processes for coloration**
- **To learn about color concept of dyeing , Printing & Finishing**
- **To study about machines used in processing industry**

Unit 1: Introduction to wet processing & Preparatory processes:

Water: water hardness – types - softening process. Preparatory process sequence for woven & knitted fabrics and its objectives(Singeing, Desizing, scouring, Bleaching & Mercerization)– Role of Textile auxiliaries used in processing industry

Unit 2: Dyeing process

Concept of colour - classification of dyes – Dyeing of cotton with reactive dyes. Dyeing of polyester with disperse dyes –Dyeing of blended textile materials – Principles of different dyeing machines: soft flow – Cheese and HTHP beam machines – merits & demerits. Brief study of Garment dyeing

Unit 3: Printing process

Introduction to printing - Various methods of printing – Screen Preparation process –Digital printing concept. Styles of printing. After treatment of printed materials.

Unit 4: Finishing

Ob**jectives – Types.** Mechanical finish: Calendaring – Compacting –Raising – Shearing & Cropping – Sueding – Stentering – Sand blasting - Novel trends in finishing: Acid, Stone, Enzyme, Peach finish, & Aroma finish. Brief study about chemoical finishing

Unit 5: Latest techniques, Eco process & Quality control

Computer Colour Matching – Airflow dyeing techniques – Effluent Treatment Proicess – Application of enzymes in processing industry.

Reference

1. Principles of Textile Finishing - Asim Kumar Roy Choudhury – woodhead publishing
2. Chemical finishing of textiles -W. D. Schindler and P. J. Hauser - woodhead publishing
3. Handbook of textile and industrial dyeing Volume 1: Principles, processes and types of dyes - M. Clark - woodhead publishing
4. Handbook of textile and industrial dyeing Volume 2: Applications of dyes - M. Clark - woodhead publishing
5. Digital printing of textiles - Edited by H. Ujiie - woodhead publishing
6. The Printmaking Handbook: The Complete Guide to the Latest Techniques, Tools, and Materials by Louise Woods
7. Technology of printing – S,Prayag

8. Dyeing and Screenprinting on Textile by Joanna Kinnersly-Taylor
9. Print, Pattern and Colour by Ruth Issett
10. From Print to Stitch: Tips and Techniques for Hand-printing and Stitching on Fabric by Janet Edmonds

Outcome:

- **Understand objectives of preparatory processes for coloration**
- **Know the types of dyes and its application for textiles**
- **Learn the various types of fabric and garment printing &finishing**

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Semester –III - Core Paper VII – Garment Accessories & Trims

Unit 1: Introduction & Accessories for children apparels

Introduction to garment accessories - Selecting garment accessories - Types of garment accessories : Basic accessories - Decorative accessories - Finishing accessories –Accessories for children's wear - Design development for different accessories - Safety issues for different accessories in children's garment - Small parts: choking hazards - Decorative trims and embellishments

Unit II Sewing and embroidery threads:

Sewing threads – Textile fibers used for making sewing threads – Thread Construction – Ticket Number – Quality parameters applicable to sewing threads and testing– Thread packages - Embroidery threads – Quality requirements – Fibers used for embroidery threads - Quality evaluation of embroidery threads

Unit III: Closures

Zippers – Component parts - Types – Application techniques - Quality parameters and testing - Buttons – types – Quality requirements & testing procedures –Elastic – Application techniques – Types – Quality requirements and testing procedures. Draw strings – Method of application - Quality parameters – velcro - Method of application techniques – Quality parameters – Snap fastness –Types – Method of application - Quality parameters- Hooks – types – Methods of application –Quality Norms

Unit IV : Supporting & Decorative Trims

Lining : Importance - Method of application – Quality requirements – Interlining : Importance - Types - Method of application – Quality requirements - Fusing foam : importance – Types – Method of application – Quality requirements – Label and its types – Method application on garment – Quality requirements – Lace – Importance and its types – Quality parameters – Method of application – Appliqué : Importance – Types of materials – Applique cutting techniques – Application methods – Quality requirements . Sequins : Introduction about various sequins and their types – Application techniques – Quality requirements.

Unit V : Packing Accessories

Tags and its types – Quality requirements – Poly bags and its types - Quality norms pertaining to poly bags – Hangers and its types – Cartons and its types –Testing required for apparel export Cartons –

Factors to be considered for export cartons - Wrappers and Tissues – Pouches for inner wear – Latest innovation in packing accessories

References:

1. Apparel Manufacturing: Sewn Product Analysis - Glock & Kunz – Pearson publishing
2. Sewing for the Apparel Industry - Claire Shaeffer - Pearson publishing
3. Technology Of Clothing Manufacture – Carr & Latham
4. Apparel Manufacturers Handbook – Jacob Solinger
5. Introduction To Clothing Manufacture – Gerry Cooklin

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Semester –III - Core Paper VIII –Industrial Engineering – I

Unit – I Individual process standardization – Overview

Introduction to Industrial Engineering – Need of IE – Different time measurement techniques – Individual process standardization procedure – Its impact in factory costing and performance improvement

Unit - II Method Study

Movements – Rules of right and wrong movements – Stages – Skill Analysis – Attention points – Work station layout – How to draw work station layout, Principles of Work station layout – Method study procedure – Method improvements tools

Unit – III Time Study procedure

Introduction to work measurement – Time study procedure – GSD (General Sewing Data) – How to take observe timing – Performance rating – Performance rating using cards and walking – Normal Time – Allowances and its different types – Deriving Standard Time (Standard Allowed Minute/ Standard Minute Value)

Unit – IV Production calculations

Standard Time calculation practice – Time study sheet – Capacity calculation procedure and the practice – Efficiency calculation and the practice – Potential production pieces calculation and the practice

Unit – V Operator training methodology

New trainees training – Steps involved – Induction – Machine knowledge and Maintenance – Foundation skills – Loop exercise and steps – Operation skills training – Operation skills identification – Training exercise development – Effective instruction – Sequence of Instruction – Trainability assessment – Low performer improvement steps

REFERENCES:

1. Industrial Engineering in Apparel Production : V.Ramesh Babu Woodhead Publishing India in Textiles
2. Glock R E and Kunz G I, “Apparel Manufacturing: Sewn Product Analysis”, Prentice Hall, New York, 1995.
3.. William K Hodson, “Maynard’s Industrial Engineering Handbook”, Mc Graw-Hill, Inc., New York,1992.

4. David J Tyler, "Materials Management in Clothing Production", Prentice Hall, New Jersey, 1991.
5. Harold Carr "Fashion design and Product development", John Wiley and Sons Inc., New York, 1991.
6. Patty Brown, Janett Rice, "Ready To Wear Apparel Analysis", Prentice Hall, 1998.
7. AOTS PEGASUS Technical Manual

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Semester –III - Core Paper IX - Garment Construction II - Practical

Objectives

- **To practice and learn the construction of various styles of garment.**

Using different kind of manufacturing machineries construct the following with details mentioned with it:

I. Men's Style.

1. Basic T shirt with front patch pocket
2. Formal shirt full sleeve
3. Men's kurta with stand collar & side kurta pocket
4. Hooded T shirt with front pocket
5. Vest RN, RNS
6. Briefs, Trunks
7. Baggy pant with pouch pocket/ Formal trouser with side and welt pocket
8. Track pant

II. Women's Style.

1. High neck T shirt with full sleeve
2. Simple salwar + modification
3. Simple kameez with side slit + modification/Legging
4. Sari blouse
5. Skirt
6. Full gown/Maxi + modification
7. Night pajama set

III. Kid's Style.

1. Sleeveless jabla
2. Overall with full sleeve
3. Bloomer with elastic hem
4. Chemise
5. frock variations + modification in sleeves
6. Pedal pusher

Outcome:

After completion of this course, students will be able to construct various garment styles

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Semester –III - Core Paper X – Pattern Making Practical

Objectives

- **To learn about creation of patterns manually or various styles.**
- **To learn about making patterns using software & grading of patterns for different sizes**
- **To learn about marker making, lay length estimation and fit analysis of patterns.**

1. Create pattern for the following styles manually
2. CAD software is used to practice the following on the styles mentioned

Part A

1. Create Pattern on computer screen, adding details to patterns.
2. Saving, extracting & editing patterns from stock library of Patterns.
3. Grading patterns on different size scale.
4. Making Marker plan for cutting fabrics.
5. Estimating lay length and calculating marker efficiency.
6. Fit analysis of the given pattern.

Part B –

Styles

1. Men's Basic T Shirt 2. Raglan with Pocket 3. Men's Polo T Shirt
4. Men's Trouser 5. Men's T-Shirt with hood 6. Men's Inner Garment – Vests RN / RNS
7. Brief 8. Ladies Skirt 9. Women's Nightwear
10. Kid's Wear – Romber 11. Kid's Wear – A Line frock
12. Children's Suits and Pyjama

Outcome:

After completion of this course students will be able to create, grade patterns and prepare marker.

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Semester –III - Allied Paper III – Apparel Quality Control & Quality Assurance

Objectives

- **To learn about evolution of quality concepts and its importance**
- **To learn about quality assessment of products at different stages of production**
- **To learn about AQL concept and inspection procedures**

Unit I

Importance of Quality. Quality terminologies. Objectives of Testing - atmospheric conditions for testing lab. Quality problems in fabric, sewing threads & other accessories. Introduction to inspection - Definition - Types of Inspection

Unit II

Fabric inspection systems Testing of Sewing thread, zippers, Buttons, elastic waist bands and fusible interlinings**.** In process inspection and its significance in apparel quality.

Unit III

Defects in pattern making, spreading, Sewing, Ironing & Packing. Assembly defects in sewing. Testing of Seam strength & seam slippage, needle cutting / yarn severance, sewability of fabrics.

Unit IV

Concept of AQL. Final inspection procedures & MIL STD standards. Categories of defects. Package quality testing.

Unit V

Tools of quality control. Introduction to Care labels. Brief study about Testing Standards. Brief study about Oeko-Tex Standards.

References

1. *J.E. Booth,* Principles of Textile Testing
2. *Elliot b. Grover & D.S. Hamby* -Hand book of textile Testing & Quality Control
3. *B.P.Saville* Physical testing of Textiles
4. *Pradeep V Metha & Satish k. Bhardwaj,* Managing Quality in Apparel Industries

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Semester –III - Skill based subject I - Internship (Operator training practical)

Students have to select a factory and train 3 new operators on single operation with 50% production performance and 90% quality performance.

The observations, procedures implemented and the results obtained have to be documented and to be prepared as a report. In the examination, the students have to make a presentation and they will be assessed by viva voce examination.

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Semester IV – Core Paper – XI - Industrial Engineering – II

UNIT I -Group process standardization – Overview

Introduction to group process and its importance – Need of group process improvement – Its impact in factory costing and performance improvement

UNIT II -Production systems

Different production systems – Its advantages and disadvantages – Line production system – Progressive bundle system and Single piece flow – Modular production system – Batch production system – Unit production system – Eton system

UNIT III -Takt time concept

Takt time introduction – Importance of takt time in lean methodology –How to derive Takt time – Yamazumi chart with FTT (First Time Through) – Plotting sequence of operation using Takt time cart – Initial line balancing – Operation bulletin development

UNIT IV -Bottle neck management

Importance of bottle neck management – Impact of un-balanced/ balanced line – Different bottle neck management techniques and its cost impact – Hourly production capturing – Dynamic line balancing and frequency of dynamic line balancing

UNIT V -Factors affecting production efficiency

Introduction to Non-productive Time (NPT) – Capturing Non-productive time – Machine breaktime – Feeding delays – Style changeover time – Rework impact in production efficiency – Methods of operator and the skill level

REFERENCES:

1. Industrial Engineering in Apparel Production : V.Ramesh Babu Woodhead Publishing India in Textiles
2. Glock R E and Kunz G I, "Apparel Manufacturing: Sewn Product Analysis", Prentice Hall, New York, 1995.
3.. William K Hodson, "Maynard's Industrial Engineering Handbook", Mc Graw-Hill, Inc., New York,1992.
4. David J Tyler, "Materials Management in Clothing Production", Prentice Hall, New Jersey, 1991.
5. Harold Carr "Fashion design and Product development", John Wiley and Sons Inc., New York, 1991.
6. Patty Brown, Janett Rice, "Ready To Wear Apparel Analysis", Prentice Hall, 1998.
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Semester IV – Core Paper – XII - Production Planning, Control and Inventory Management

UNIT I - Pre-production activity and its timeline for apparel production

Different stages of pre-production – Complete order T&A understanding with Fabric, trims and accessories in-house timelines – Role of T&A in influencing production efficiency

UNIT II -Production T&A

T&A in cutting, production and finishing – T&A for printing and embroidery – Standards and issues faced in industry in meeting timelines – Critical path analysis

UNIT III -Capacity Planning

Introduction to capacity planning – Planning of capacity using minutes in Industrial Engineering – Learning curve in production development – Calculation of monthly capacity planning chart – Requirement vs. actuals – How to allot capacity and do style allocation in lines

UNIT IV -Thread consumption

Different sewing thread consumption measuring techniques – Sewing thread consumption for different types of stitches and seams – Standard – How to calculate thread consumption for knit and woven garments and its procedures

UNIT V -Inventory Management

Importance of inventory management in production floor – Allowed Work In Progress for the department and inside the workstation of different production departments – Scientific inventory management

techniques – Kanban system – Super market model – WIP monitoring template in floor and steps to ensure the WIP

REFERENCE BOOK

1. Sharma S. C., "Management of Systems", Khanna Publishers, Delhi 1996.
2. Kenneth C., Laudon and Jane Price Laudon, "Management Information systems Managing the digital firm", Pearson Education Asia.
3. Technology Of Clothing Manufacture – Carr & Latham
4. Apparel Manufacturers Handbook – Jacob Solinger
5. Introduction To Clothing Manufacture – Gerry Cooklin
6. Introduction To Production Management – A. J. Chuter
7. Personal Management And Industrial Relations – Tripathi
8. Industrial Engineering And Management – OP. Khanna

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Semester IV – Core Paper – XIII - Operational costing

UNIT I - Introduction to Cost per Minutes (CPM)

Cost per Minute concept – CPM standards across different countries – Actual CPM – Different categories in calculating CPM and its importance

UNIT II - Direct salary contribution

Plotting direct salary in CPM chart – Cutting, Sewing and Finishing labour requirement – Salaries as per Industry Standard and Minimum Wages Act – Provident fund and ESI – Bonus – Government contribution of PF for new workers

UNIT III - Indirect salary contribution

Plotting indirect salary in CPM chart – Plotting Staff requirement for all department – Identification of staff quantity as per the standard – Fixing up of salary as per the industry standard and minimum wages act

UNIT IV - Other costs

Expenses – Factory rent, Electricity, Genset consumption, Boiler wood, Needle, Phone, Office stationeries – Vehicle cost – Labour and material transportation – Depreciation – Machinery, Furniture – Maintenance cost – Interest on working capital – Welfare expenses – Miscellaneous expenses

UNIT V - CPM format

Understanding of CPM format in MS Excel – Plotting of all costs in CPM format – Efficiency calculation to derive CPM

References

1. Industrial Engineering in Apparel Production : V.Ramesh Babu Woodhead Publishing India in Textiles
2. Glock R E and Kunz G I, "Apparel Manufacturing: Sewn Product Analysis", Prentice Hall, New York, 1995.
3.. William K Hodson, "Maynard's Industrial Engineering Handbook", Mc Graw-Hill, Inc., New York,1992.
4. David J Tyler, "Materials Management in Clothing Production", Prentice Hall, New Jersey, 1991.
5. Harold Carr "Fashion design and Product development", John Wiley and Sons Inc., New York, 1991.
6. Patty Brown, Janett Rice, "Ready To Wear Apparel Analysis", Prentice Hall, 1998.
7. AOTS PEGASUS Technical Manual

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Semester IV – Core Paper – XIV - Plant Layout – Practical

Learning of Auto CAD tools and Developing of factory layout using Auto CAD for state of art apparel manufacturing unit of 250 sewing machineries.

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Semester IV – Allied Paper – IV - HUMAN RESOURCE MANAGEMENT

UNIT I

Human Resource Management – concept- evolution – scope and objectives - functions.Role of Human Resource manager – Qualities of human resource manager - human Resource policies.

UNIT II

Human Resource Planning – importance – forecasting HR requirements – matching demand and supply of Human Resources – Recruitment – sources and methods of recruitment – employee selection – steps in selection process – selection tests and its types – induction and socialization.

UNIT III

Employee training – need, types and benefits of training – Executive development – Career Planning and development.

UNIT IV

Performance appraisal – need for appraisal – steps and methods involved in appraisal - Employee compensation – methods of compensation – factors determining compensation. Impact of Absenteeism & Labour turnover –Scientific way of Capturing and analyzing Absenteeism and Labour turnover – Control measures

UNIT V

Employee grievance – forms of grievance – causes – steps in grievance handling. Grievance handling mechanism – Procedure in recording and handling grievances – Role of welfare officer in grievance

handling – model grievance procedure .Employee Discipline – its approaches – causes of indiscipline – steps in disciplinary action.

Reference books

1. Rao V.S.P Human Resource Management, 3rd Edition, Excel Books, 2010
2. Ashwathappa, K., Human Resource Management, 6th Edition, Tata McGraw Hill, 2010
3. DeCenzo, D.A. and Robbins, S.P., DeCenzo, D.A. and Robbins, S.P., 1th Edition, Wiley India, 2011
4. Dessler, G., Human Resource Management, 12th Edition, Pearson, 2011.
5. Mamoria, C.B and Gaonkar,S.V, Personnel Management, Himalaya Publishing House, 2011

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Semester IV – Skill based subject II – Mini Project

Development of Takt time Operation Bulletin (OB) for one product in apparel factory with proper establishment of method study and time study procedure.
Students have to prepare report and assessment is done by viva voce examination.

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Semester V – Core Paper – XV - Industrial Engineering III

Unit I- Man – Machine Ratio
Procedure to derive actual Man – Machine Ratio – Importance of Man – Machine Ratio – International standard – How to reduce MMR – Self checking – Self trimming concept – Staff allocation using MMR Concept

Unit II- Operator Skill Matrix
Capturing skill level of the operators – Capacity Vs. Actual production difference – Plot of skill level in skill matrix – Skill demand analysis – Potential skill gap identification – Training of workers using skill gap analysis

Unit III- Line setting – Style changeover
Line setting checklist – Allotment of staff of line setting – Style changeover techniques using SMED concept – Procedure in SMED concept – Internal and external timing – Time allocation for each operation – Capturing of line setting time, throughput time and its analysis – Zero hour output strategy

Unit IV- Multi skilling – Floater strategy
Need of floaters – Absenteeism and Labour turnover – Skill requirement during style change – Calculating floaters requirement – Floaters development strategy – Deployment of floaters in the factory floor

Unit V- Advancements
Folders/ Aid availability – Developments – Poka-yoke (Error proofing techniques) – De-skilling aids – Engineering work station layout

References
1. Industrial Engineering in Apparel Production : V.Ramesh Babu Woodhead Publishing India in Textiles
2. Glock R E and Kunz G I, "Apparel Manufacturing: Sewn Product Analysis", Prentice Hall, New York, 1995.
3.. William K Hodson, "Maynard's Industrial Engineering Handbook", Mc Graw-Hill, Inc., New York,1992.
4. David J Tyler, "Materials Management in Clothing Production", Prentice Hall, New Jersey, 1991.
5. Harold Carr "Fashion design and Product development", John Wiley and Sons Inc., New York, 1991.
6. Patty Brown, Janett Rice, "Ready To Wear Apparel Analysis", Prentice Hall, 1998.
7. AOTS PEGASUS Technical Manual

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Semester V – Core Paper – XVI - Operational costing – Practical

Calculating Cost per Minute (CPM) of a factory with give inference to the factory on the expenses and efficiency part. Students have to prepare report and assessment is done by viva voce examination.

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Semester V – Core Paper – XVII - Performance Management System – Practical

Importance of Data – KPIs to be tracked – process and its authority – Real time monitoring mechanism – Performance reviews – Visual display management and its importance-Development of one PMS tools for factory performance improvement – Implementation of the tool in the factory and analyze the impact. Consolidated report preparation of the above.

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Semester V – Core Paper – XVIII - QMS in Apparel Production

UNIT I - QMS structure
Introduction to Quality Management System (QMS) – Importance and Need – Flow in QMS – Vision & Mission – Short term goals – Organization Hierarchy – Job description – Process flow – SOP – Performance Management System

UNIT II - Development of JD
Understanding of Job description template – Understanding of roles and responsibilities – Job alternatives – Key performance indicators for Staff – Reports/ MIS to be followed

UNIT III - Process Flow designing
Understanding of process flow – Importance – Symbols in process flow and its uses – Process flow sequence – Plotting of checklist, sub processes, files, decision making with corrective actions

UNIT IV - SOP development

Importance of Standard Operating Procedure – Linking process flow with SOP – Basics points in SOP – Who, When, Where, How – Designing and communication of SOP to respective – Implementation of SOP

UNIT V - Training and Development plan

Training importance and needs – Skills analysis using JD – Development of training calendar – Types of training – Class room training and On the job training – Training methodology – Monitoring of training impact using PMS

REFERENCE BOOK

1. Sharma S. C., "Management of Systems", Khanna Publishers, Delhi 1996.
2. Kenneth C., Laudon and Jane Price Laudon, "Management Information systems Managing the digital firm", Pearson Education Asia.
3. Technology Of Clothing Manufacture – Carr & Latham
4. Apparel Manufacturers Handbook – Jacob Solinger
5. Introduction To Clothing Manufacture – Gerry Cooklin
6. Introduction To Production Management – A. J. Chuter
7. Personal Management And Industrial Relations – Tripathi
8. Industrial Engineering And Management – OP. Khanna

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Semester V – Core Paper – XIX - Problem Solving – Practical

7 Steps in problem solving – Identify – Explore – Set goals – Alternatives – Select – Implement – Evaluate – More focus on root cause analysis.

Identify 2 problems in factory and take necessary actions and show the impact. Consolidated report preparation of the above.

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Semester V – Skill based subject – III- Behavioral Intervention Skills

UNIT I

Organizational behavior –definition, nature and scope – contributing disciplines to Organizational behavior – models of Organizational behavior.

UNIT II

Learning – definition – theories of learning – classical conditioning, operant conditioning, social learning and cognitive theory. Attitude – types and components of attitude.Personality – determinants – personaliy traits- MBTI & Big five model – theories of personality – factors influencing personality.Perception – process – factors influencing perception.

UNIT III

Motivation – early and contemporary theories of motivation – motivation at work place. Leadership – theories of leadership. Organizational Power and Politics.

UNIT IV

Group – basic concepts and types of groups- causes for group formation. Work teams- types of teams – stages in team development.

UNIT V

Organizational stress – factors causing stress – stress reduction techniques. Organizational culture – concepts – types of culture – methods of learning culture.

Reference books

1. Stephen P Robbins, Organizational behavior, 14th edition, Pearson, 2011.
2. Fred Luthans, Organizational behavior, 11th edition, McGraw Hill, 2001.
3. Khanka, S.S., OrganisationalBehaviour, 4th Edition, S. Chand, 2010.
4. New Strom & Davis, "Organizational Behaviour", McGraw Hill, 2004
5. Udai Pareek, Understanding Organisational Behaviour, 2nd Edition, Oxford Higher Education, 2004.

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Semester VI – Core Paper XX – Lean Six Sigma

- **To learn about principles of lean & six sigma**
- **To learn about tools and techniques of lean**

UNIT I - EVOLUTION OF LEAN SIX SIGMA

Introduction to Lean Principles and Six Sigma Concepts-Similarities and differences – Synergy-Evolution of Lean Six Sigma

UNIT II - LEAN SIX SIGMA APPROACH

Lean Six Sigma Methodology- Phases of Lean Six Sigma Method, Managing Lean Six sigma Project, Six sigma Methodologies (DMAIC, DMADV, DFSS)

UNIT III - SIX SIGMA TOOLS AND TECHNIQUES

Advanced Statistical Tools - Statistical Process Control-Process Capability Analysis Sigma computation - Hypothesis Testing-ANOVA-Design of Experiments- chi-square test, Regression analysis –Case studies

UNIT IV - LEAN TOOLS

Value Stream Mapping – Poka Yoke-5S-Cycle Time Analysis-Push-Pull Systems- Waste Elimination-Total Productive Maintenance- Failure Mode Effect Analysis- Standard Work Practices-Control Plans, SMED , Kanban , Visual control , Kaizen – Case studies

UNIT V - LEAN SIX SIGMA IMPLEMENTATION

Identifying Lean Six Sigma Projects, Define Scope, Planning for Implementation, Selection of tools and techniques for each phase, Measuring the Benefits

REFERENCES:

1. Michael L. George, David Rowlands, Bill Kastle ,What is Lean Six Sigma,McGraw-Hill, 2003
2. Thomas Pyzdek,The Six Sigma Handbook ,McGraw-Hill, 2000
3. James P. Womack , Daniel T. Jones ,Lean Thinking, Free press business,2003.
4 Forrest W. Breyfogle III ,Implementing Six Sigma: Smarter Solutions UsingStatistical Methods ,1999.
5. Liker, Jeffrey; Meier, David ,Toyota Talent , Tata Mcgraw Hills

Outcome:

After completion of this course students will be able to

- **Understand the concept of lean and six sigma**
- **Learn about the tools of lean six sigma**

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Semester VI – Skill based subject IV - Production Management - Project work & Viva voce

Production Management of cutting, sewing and finishing – Job description of production manager – KPI of production manager – Skill required for production manager – Team under production management – Daily works management of production manager - Resource requirement and fulfillment – On time arrival of garments cut panels, trims and accessories – Workers requirement – Skills availability and requirement – Line balancing – Bottle neck management – Efficiency improvement – Cost reduction using CPM – Supporting department for effective production management – Team management skills

Application of all concepts for managing production floor in apparel industry and prepare a detailed project report. Students have to manage a sewing floor of 100 machines/ cutting floor/ finishing floor for 3 months time.

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Semester V Elective I – A – Technology Advancements in Apparel Production

Unit 1: Application of artificial intelligence in apparel sector

Application of artificial intelligence in fabric production - Predicting fabric properties - Color solutions - Fabric fault detection - Computer-aided design systems - Body dimensions and garment sizing -3D body scanners - Virtual fit of garments - International standardization activities of garment sizing - garment manufacturing- Performance of sewn seam - Production planning and control - . Final garment inspection

Unit II : Automation for Spreading & Cutting room

Introduction - role of automation in textile material spreading and cutting - - Automated lay planning - Automated spreading methods and machines - Automated fabric fault registration - Automated fabric pattern matching - Automated cutting methods and cutting systems - Automatic Fusing of cut components - Advanced fusing technologies to avoid fabric shrinkage - Future trends in automation of textile material spread

Unit III : Automated Material Handling

Introduction - Definition of material handling - Properties of material and processes - Gripping technologies for textile handling - Automation in material handling related to high-performance textiles - New conveyer systems - Digital tracking with radio-frequency identification

Unit IV: Automation and robotics for sewing room

Introduction - Computer numerical control technologies for sewing process - Sewing automats and sewing units - Robotics for three-dimensional sewing operations - Real-time sewing cell with two lightweight industrial robots - Advantages and disadvantages of automation in sewing - Sewing machines with under bed trimmer - Sewing machine with automatic bobbin changer - Sewing automats for gent's and lady's shirts - Sewing automats for casual bottom wear - Sewing automats for formal wear - Sewing automats for knitwear and intimate wear - Sewing automats for non apparel sewn products - Sewing preparatory machines with automatic control system

Unit V : Automation in PPC & Quality Monitoring

Introduction - Automation in production systems - Reasons for automation and advanced tools - Strategies for automation and production systems - Advantages and disadvantages of automation - Advancements in production planning - Application of different software and planning tools in production planning and control - Computerized manufacturing support systems - Quality monitoring of fabrics - Detection methods - . Defect classification methods - Quality monitoring of seams - Two-dimensional process - pattern recognition - Photogrammetry - Laser triangulation and light-section method - Comparison of measurement methods - Quality monitoring of welded seams

Reference:

1. Automation in Garment Manufacturing, Rajkishore Nayak, Rajiv Padhye
2. International Journal of Production Economics, B. Dai, Neville K. S. Lee
3. Fundamentals of artificial intelligence techniques for apparel management applications Z. X. Guo, W. K. Wong

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Semester V Elective I – B : ERP in Apparel Industry

Objectives

- **To learn about role and importance of ERP in apparel business**
- **To learn about various business models of ERP package and its management**
- **To learn about the MIS**

UNIT I

Enterprise Resource Planning - principle, framework, application and suitability in garment production - Introduction: ERP: An Overview, enterprise – an overview, types of Enterprises, need for ERP, benefits of ERP, ERP and related technologies, Business Process Reengineering (BPR), Benefits of BPR

UNIT II

Client/Server architecture; technology choices; SCM, CRM – concepts, Business Process Re engineering, Data ware Housing, Data mining, ERP system packages - Implementation of ERP: ERP

implementation lifecycle, implementation methodology, hidden costs, organizing the implementation, vendors, consultants and users, contracts with vendors, consultants and employees, project management and monitoring

UNIT III

ERP implementation strategies – organizational and social issues, data safety & security, ERP implementation in a garment production facility - The Business Modules: Business modules in an ERP package - finance, manufacturing, human resources, plant maintenance, materials management, quality management, sales and distribution. Significance and advantages of each of the modules

UNIT IV

Management Information System IN Garment Industry – management, key aspects of management, functions, management as a control system, levels of management. ERP in apparel industry:Production resource planning – principles and management of and demand chain analysis– quick response strategy - material management for 'Quick Response' – 'Just in Time (JIT) Technology'; Production planning, costing and merchandising software

UNIT V

Information – requirements, properties and scope, information economics, types and characteristics. Computer Applications – EDI in garment technology; Use of Computers in Designing, Pattern making, computerized production systems, communicating with vendors and buyers; Telephone, fax, video conferencing, intranet, internet, etc; Export documentation, retailing; Methods of communicating with consumers.

References

1. Alexis Leon, "ERP Demystified", Tata McGraw Hill, New Delhi, 2000.
2. Glock Ruth E. and Kunz Grace I., "Apparel Manufacturing - Sewn Product Analysis", Blackwell Scientific Publications, 1996.
3. Joseph A. Brady, Ellen F. Monk, Bret Wagner, "Concepts in Enterprise Resource Planning", Thompson Course Technology, USA, 2001.
4. Garg Vinod Kumar and Venkitakrishnan N. K., "Enterprise Resource Planning – Concepts and Practice", PHI, New Delhi, 2003.

Outcome:

After completion of this course students will be able to

- **Understand the need for ERP**
- **Learn about the modules in ERP**
- **Learn about the sales and distribution**

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Semester V – Elective I - C – TQM in Apparel Industry

Objectives

- **To learn about concept and importance of TQM**
- **To learn about various quality improvement tools and its application**
- **To learn about International standards such as ISO, OHSAS, SA 8000**

Unit I

Introduction: Definition of Quality **–** Dimensions of Quality **–** Quality Planning **–** Quality costs **—** Basic concepts of Total Quality Management **–** Quality Statements **–** Strategic Planning, Deming Philosophy **–** Juran Trilogy **–** Crosby philosophy, 5S, Kaizen. Quality Circles

Unit II - TQM Principles

Principles of TQM, Leadership – Concepts – Quality Trilogy – Four pillars of TQM – PDCA cycle & PDSA cycle. Role of Senior Management – Quality Council, customer satisfaction – Customer Perception of Quality, Customer Complaints, Employee Involvement – Motivation, Empowerment, Teams, Recognition and Reward, Performance Appraisal, Benefits, Continuous Process Improvement

Unit III - Control charts

Concepts and uses – Control limits – Control charts for Variables and Attributes: X Charts – R chart – P chart – NP chart – C chart – Acceptance sampling – Types of sampling plans: Single, Double and Multiple Sampling plans – OC curves – AQL and LTPD – Sampling errors and sampling risks – Producer's risk and Consumer's risk

Unit IV - TQM Tools

Benchmarking – Reasons to Benchmark – Benchmarking Process, Quality Function Deployment (QFD) – House of Quality, QFD Process, and Benefits – Taguchi Quality Loss Function – FMEA & Stages of FMEA.

Unit V - Standards

Elements of ISO – Benefits of ISO 9000 System. ISO 9001:2008: Guidelines and Standard Clauses – Implementation Procedures and requirements– Quality Manual and its contents. Accreditation and Certification agencies. Quality audit :Types of quality audit – Audit procedure. Environmental Management System (EMS): Elements of EMS – Benefits– Environmental Policies. Studies on SA8000, OHSAS 18000, WRAP.

References

1. *Dr. S.P.Gupta*, "Statistical Methods"
2. *J.M. Juran*, "Quality Control Handbook"
3. *V.K.Kapoor*, "Statistics"
4. Total Quality Management – *Bhaskar, S* - Anuradha Publications, Kumbakonam.
5. Total Quality Management – *Shridhara Bhat, K* -, Himalaya Publishing Corporation New Delhi

Handbook of Total Quality Management - *Armstrong* , Jaico Publications, New delhi.

Outcome:

After completion of this course students will be able to

- **Concept of TQM**
- **Learn about the tools of TQM**
- **Learn about the various standards**

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Semester VI Elective II - A - Entrepreneurship

Objectives

- **To learn about traits required for an entrepreneur**
- **To learn about criteria for selecting a product, studying the feasibility and project finalization**
- **To understand the role of various financial institutions in support of entrepreneurship**

Unit I

Entrepreneurship: Concept and Definitions; Entrepreneurship and Economic Development; Classification and Types of Entrepreneurs; Entrepreneurial Competencies; Factor Affecting Entrepreneurial Growth – Economic, Non-Economic Factors; EDP Programmes; Entrepreneurial Training; Traits/Qualities of an Entrepreneurs; Entrepreneur; Manager Vs. Entrepreneur.

Unit II

Opportunity / Identification and Product Selection: Entrepreneurial Opportunity Search and Identification; Criteria to Select a Product; Conducting Feasibility Studies; Project Finalization; Sources of Information.

Unit III

Small Enterprises and Enterprise Launching Formalities : Definition of Small Scale; Rationale; Objective; Scope; Role of SSI in Economic Development of India; SSI; Registration; NOC from Pollution Board; Machinery and Equipment Selection; Project Report Preparation; Specimen of Project Report; Project Planning and Scheduling using Networking Techniques of PERT / CPM; Methods of Project Appraisal.

Unit IV

Role of Support Institutions and Management of Small Business : Director of Industries; DIC; SIDO; SIDBI; Small Industries Development Corporation (SIDC); SISI; NSIC; NISBUD; State Financial Corporation SIC; Marketing Management; Production Management; Finance Management; Human Resource Management; Export Marketing; Case Studies.

Unit V

Incentives and subsidies – Subsidized services – subsidy for market. Transport – seed capital assistance – Taxation benefit to SSI role of entrepreneur in export promotion and import substitution.

References

1. *Desai, Vasant* (2003). Small-Scale Industries and Entrepreneurship. Himalaya Publishing House, Delhi.
2. *Kaulgud, Aruna* (2003). Entrepreneurship Management. Vikas Publishing House, Delhi.
3. *Cynthia, L. Greene* (2004). Entrepreneurship Ideas in Action. Thomson Asia Pvt. Ltd.,Singapore.
4. *Chandra, Ravi* (2003). Entrepreneurial Success: A Psychological Study. Sterling Publication Pvt.

Ltd., New Delhi.
5. *Balaraju, Theduri* (2004). Entrepreneurship Development: An Analytical Study. Akansh aPublishing House, Uttam Nagar, New Delhi.
6. *David, Otes* (2004). A Guide to Entrepreneurship. Jaico Books Publishing House, Delhi.
7. *Taneja* (2004). Entrepreneurship. Galgotia Publishers.

Outcome:

After completion of this course students will be able to

- **Understand the concept of entrepreneurship**
- **Learn about the identification of a project and project report preparation**
- **Learn about the role of support institutions**

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Semester VI- Elective II – B: Leadership and Emotional Intelligence

UNIT-I

Emotional Intelligence and Self-awareness-Self-awareness and Mindfulness-Emotional Intelligence Core competencies-Johari's window-Enneagram Personality Test. Interpersonal Skills and Communication-Developing polished interpersonal skills with staff and colleagues -Listening Skills - Getting along with my manager -Transactional Analysis - Deal with tension and conflict more constructively - Conflict Management techniques - Good interpersonal behaviors - The iceberg model – the Enneagram compulsions

UNIT-II

High Performing Teams - The Glen Parker Team Player Types - Team Roles - Stages of Team Development - Team development model - 5 Squares game - Characteristics of high performing teams - Module 4: Building Trust in Teams - Building Trust and Cooperation - Building trust between team members

UNIT-III

Self-regulation: managing negative emotions - The skills of self-regulation - The skill of shifting focus and attention - Recognizing negative emotions & their negative impact - Temper negative responses - Techniques for managing and controlling one's negative emotions - Managing anger – the Amygdala hijack - Learn how to work more effectively with difficult people - The ability to heal – the healing process - Finding the gift in difficult times -Managing stress.

UNIT-IV

Developing a positive emotional focus – Gratitude - Counting your blessings- The law of positive attraction - Channel energy and enthusiasm to motivate - Developing empathy - Empathy in the workplace - Emotional Intelligence Test.

UNIT-V

My Purpose and Goal Setting- Aim-Leadership Attitudes - Identifying my soul purpose or life purpose – Hard Work – Smart Work – Speed Process – Non Emotional behavior in Industry - Reflections on my talents, gifts and core genius - Motivation, passion and energy- Decision Making with intelligence.

References

1) Bennis, W. (2003). Learning to lead: A workbook on becoming a leader (3rd ed.). Cambridge: Perseus Books Group.
2) Bolman, L., & Deal, T. (2008). Reframing organizations: Artistry, choice and leadership (4th ed.). San Francisco: Jossey-Bass. Bradberry, T., & Greaves, J. (2009).
3) Emotional intelligence 2.0. San Diego: TalentSmart. Bradberry, T., & Greaves, J. (2012). Leadership 2.0.
4) San Diego: TalentSmart. Dalziel, M. M., & Schoonover, S. C. (1988). Changing ways: A practical tool for implementing change within organizations.
5) Managing the non-profit organization. New York: Harper Collins. Ekman, P. (2001). Telling lies: Clues to deceit in the marketplace, politics, and marriage. New York: W. W. Norton. Ekman, P. (2003-2006).
6) Vital lies, simple truths: The psychology of self-deception. New York: Simon and Schuster. Goleman, D. (2005).
7) Emotional intelligence: Why it can matter more than IQ. New York: Bantam Books.

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Semester VI- Elective II – C: Interpersonal Skills

Objectives

- Equip students with the English language skills.
- Provide guidance and practice in general conversation and to improve general and academic listening skills
- Make effective presentations.

UNIT I

Listening as a key skill- its importance- speaking – give personal information – ask for personal information – express ability – enquire about ability – ask for clarification Improving pronunciation – pronunciation basics taking lecture notes – preparing to listen to a lecture – articulate a complete idea as opposed to producing fragmented utterances.

UNIT II

Listen to a process information- give information, as part of a simple explanation – conversation starters: small talk – stressing syllables and speaking clearly – intonation patterns – compare and contrast information and ideas from multiple sources- converse with reasonable accuracy over a wide range of everyday topics.

UNIT III

Lexical chunking for accuracy and fluency- factors influence fluency, deliver a five-minute informal talk – greet – respond to greetings – describe health and symptoms – invite and offer – accept – decline – take leave – listen for and follow the gist- listen for detail

UNIT IV

Being an active listener: giving verbal and non-verbal feedback – participating in a group discussion – summarizing academic readings and lectures conversational speech listening to and participating in conversations – persuade.

UNIT V

Formal and informal talk – listen to follow and respond to explanations, directions and instructions in academic and business contexts – strategies for presentations and interactive communication – group/pair presentations – negotiate disagreement in group work.

OUTCOMES:

At the end of the course Learners will be able to:

- Listen and respond appropriately.
- Participate in group discussions
- Make effective presentations
- Participate confidently and appropriately in conversations both formal and informal

TEXT BOOKS:

1. Brooks,Margret. Skills for Success. Listening and Speaking. Level 4 Oxford University Press, Oxford: 2011.
2. Richards,C. Jack. & David Bholke. Speak Now Level 3. Oxford University Press, Oxford: 2010

REFERENCES:

1. Bhatnagar, Nitin and MamtaBhatnagar. Communicative English for Engineers and Professionals. Pearson: New Delhi, 2010.
2. Hughes, Glyn and Josephine Moate. Practical English Classroom. Oxford University Press: Oxford, 2014.

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Semester VI- Elective III – A:Training & Development

Objective:

The course aims at exposing the learner to the Concept and practice of training and development in the modern organisational setting through the pedagogy of case discussions and recent experiences.

Unit I-Introduction: Concepts and Rationale of Training and Development; overview of training and development systems; organizing training department; training and development policies; linking training and development to company's strategy; Requisites of Effective Training ; Role of External agencies in Training and Development.

Unit II- Training Needs Assessment (TNA): Meaning and purpose of TNA, TNA at different levels, Approaches for TNA, output of TNA, methods used in TNA.

Unit III- Training and Development Methodologies : Overview of Training Methodologies- Logic and Process of Learning; Principles of Learning; Individual differences in learning, learning process, learning curve, learning management system; Criteria for Method Selection; Skills of an Effective Trainer; Use of Audio-Visual Aids in training; Computer Aided Instructions- Distance Learning, Open Learning, E-Learning; Technologies Convergence and Multimedia Environment. Development Techniques for enhancing decision–making and interpersonal skills, Case-study, in-basket exercise, special projects, multiple management Programme Learning, Action learning, Syndicate Work, Games, Action Maze, Role

Play; Demonstration and Practice Monitoring; Coaching; Self Diagnostic Skills, Experience Learning, Discovery Learning, Brain Storming, Counselling, Position Rotation, Team Building, and Sensitivity Training .

Unit IV-Designing Training and Development Programs: Organisation of Training and Development programs, Training design, kinds of training and development programs- competence based and role based training; orientation and socialization; diversity training, choice of training and development methods, Preparation of trainers; developing training materials; E-learning environment; Flexible learning modules; Self development; Training process outsourcing.

Unit V-Evaluation of Training and Development: Reasons for evaluating Training and development programs, Problems in evaluation; Evaluation planning and data collection, different evaluation frameworks, Problems of Measurement and Evaluation; Costing of training, measuring costs and benefits of training program, obtaining feedback of trainees; Methods of evaluating effectiveness of Training Efforts ; Kirkpatrick Model of Training Effectiveness; Training issues resulting from the external environment and internal needs of the company.

Unit VI-Emerging Trends in Training and Development: Gamification, team training and six sigma training; Electronic Enabled Training Systems (EETS)-Concept and types, benefits and challenges in using EETS; concerns in implementation of EETS – availability, incorporation, extension, and learning renewals for EETS; use of EETS and its up scalability; follow up activities; Training and development initiatives of some selected companies from private and public sectors and MNCs.

References

1. Prior, John, Handbook of Training and Development, Jaico Publishing House, Bombay.
2. Trvelove, Steve, Handbook of Training and Development, Blackwell Business.
3. Warren, M.W. Training for Results, Massachusetts, Addison-Wesley.
4. Craig, Robert L., Training and Development Handbook, McGraw Hill.
5. Garner, James, Training Interventions in Job Skill Development, Addison-Wesley.
6. Kenney, John; Donnelly, Eugene L. and Margaret A. Reid, Manpower Training and Development, London Institute of Personnel Management.
7. Noe, Raymond A., and Amitabh Deo Kodwani, Employee Training and Development, Tata McGraw Hill.
8. Blanchard, P. Nick, James W. Thacker and V. Anand Ram, Effective Training: Systems, Strategies, and Practices, Dorling Kindersley (India) Pvt. Ltd.
9. Rolf, P., and Udai Pareek, Training for Development, Sage Publications Pvt. Ltd.
10. Michalak, Donald, and Edwin G. Yager, Making the Training Process Work, Writers Club Press.
11. Jack J. Phillips, Hand book of Training Evaluation and Measurement Methods, Routledge.
12. Dayal, Ishwar, Management Training in Organisations, Prentice Hall.

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Semester VI- Elective III – B: Factory Compliance

Unit 1

Employee Welfare - Meaning, Objectives, Scope, Limitations and Types of Employee Welfare- Statutory and Non-statutory Welfare measures, Fringe benefits.

Unit II

Social Security - Concept, Need, Types and Schemes for the organized sector in India-Maternity, ESI Scheme, EPF Scheme, Industrial health and Hygiene, Accident and Compensation.

Unit III

Basic Principles of Accident Prevention – Basic philosophy of industrial accidents – near miss reporting and learning lessons. Safety and Health Policy. Types of hazards – Role of supervisor in promoting safety & health. Prevention and Control Techniques - Hierarchy of Controls Dilution & Substitution, etc. Segregation, Enclosure, Isolation, Barricading, Guarding, Interlocks.

Unit IV

Chemical Hazards and Specific Control Measures –Storage, handling and transportation of chemicals. Chemical Safety Data Sheets/ MSDS. House Keeping. Personal Protective Equipment. Fire and Explosion Hazards – Fire Prevention and Control; Portable and fixed fire fighting systems - Hazards area classification.

Unit V

The onsite Emergency Plan - Key persons and their responsibilities - Alarms - Control room - Evacuation - Assembly points - Emergency Control Centre – Rehearsals. Off-site Emergency Plan . Safety audit – OHSAS – EMS - Environmental Management System.

References

1. Compliances Under Labour Laws - A User's Guide to Adhere with the Provisions Under Various… by H L Kumar
2. Labour and Industrial Laws by P. K. Padhi Paperback
3. Law Relating to Leave Holidays and Absenteeism in Industries - H.L. Kumar

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Semester VI- Elective III – C: Value Stream Mapping

Unit I - Introduction

Purpose of value stream mapping – Need – Steps in Value Stream Mapping – Current state – Future state mapping – Principles of value stream mapping – Lean concepts in Value stream mapping

Unit II - Symbols in Value Stream Mapping

Customer/ Supplier Icon – Dedicated process flow icon – Shared process flow – Icon – Data box icon – Work cell Icon – Inventory icons – Shipments icon – Push arrow icon – Supermarket icon – Material pull icon – Production control icon

Unit III - Advanced Symbols in Value Stream Mapping

Manual Info Icon – Electronic Info Icon – Production Kanban Icon – Withdrawal Kanban Icon – Signal Kanban icon – Kanban post icon – Sequenced pull icon – Load levelling icon – MRP/ ERP Icon – Go see Icon – Verbal information icon – Operator icon – Timeline icon

Unit IV - Stating current state

Selecting the product (family) to map – VSM Symbols – Defining the process boundaries – The Process Steps – Information Flows – Process Data – Calculating the Time Line – Multiple Suppliers and Customers – Interpreting the Data

Unit V - Developing Future state

Reduce Cycle Time – Reduce setups / reduce batches – Improve quality performance – Change delivery schedules – Implement Kanban – Moving from current to future state map

REFERENCES:

1. Michael L. George, David Rowlands, Bill Kastle ,What is Lean Six Sigma,McGraw-Hill, 2003
2. Thomas Pyzdek,The Six Sigma Handbook ,McGraw-Hill, 2000
3. James P. Womack , Daniel T. Jones ,Lean Thinking, Free press business,2003.
4. Forrest W. Breyfogle III ,Implementing Six Sigma: Smarter Solutions UsingStatistical Methods ,1999.
5. Liker, Jeffrey; Meier, David ,Toyota Talent , Tata Mcgraw Hills