NEW	STRUCTURE W.E.F. :	JULY 2017 Corrected									
	T.Y.B.TEXT. (TT) SEMESTER-I										
SR.	COMMTTON TO		TE	ACHING	G SCHE	ME		EXAMIN	ATION	SCHEN	ΛE
NO.	COURSES	SUBJECTS	L	Т	DR	PR	TP	τw	OE	PE	SUB.
											TOTAL
5.1	TT/MMTT/TPE/TC	TEXTILE ELECTRONICS-II	3	-	-	2	100			50	150
5.2	тт	YARN FORMING TECHNOLOGY-V	4		1	2	100	50			150
5.3	тт	FABRIC FORMING TECHNOLOGY-V	4		1	2	100	50			150
5.4	ТТ/ММТТ	CHEMICAL PROCESSING OF TEXTILES-II	3		1	2	100	25		50	175
5.5	тт	FIBRE SCIENCE	3		1	2	100	25			125
5.6	ТТ/ММТТ	MECHANICS OF TEXTILE MACHINES	3		1		100	-			100
5.7	TT/MMTT/TPE/TC/FT	INPLANT TRAINING-I			-		1	50			50
			20			10	600	200		100	900
		L =LECTURES	TP=THEORY PAPER								
		T =TUTORIALS	TW=TERM WORK								
		DR=DRAWING	OE=OI	RAL EX		TION					
		PR=PRACTICALS	PE=PRACTICAL EXAMINATION								

T.Y.B.TEXT. (TT) SEMESTER-II

SR.	COMMTTON TO		TE	ACHING	G SCHE	ME		EXAMIN	ATION	SCHEN	ΛE
NO.	COURSES	SUBJECTS	L	Т	DR	PR	TP	тw	OE	PE	SUB.
											TOTAL
6.1	TT/MMTT/TPE/TC/FT	COMPUTER PROGRAMMING & APPLICATION	3			2	100	50		50	200
6.2	тт	MANMADE FIBRES AND YARNS	3				100				100
6.3	TT/MMTT/TPE/TC/FT	INDUSTRIAL ENGINEERING	3				100				100
6.4	тт	STRUCTURAL MACHANICS OF YARNS	3			2	100	50		50	200
6.5	тт	UNCONVENTIONAL SPINNING TECHNOLOGY	4			3	100	50			150
6.6	тт	KNITTING TECHNOLOGY	4			3	100	50			150
			20			10	600	200		100	900
		L =LECTURES	TP=T⊦	IEORY	PAPEF	R					
T =TUTORIALS TW=TERM WORK											
		DR=DRAWING	OE=O	RAL EX		TION					
PR=PRACTICALS PE=PRACTICAL EXAMINATION											

NEW	STRUCTURE W.E.F. :	JULY 2017 Corrected									
		T.Y.B.TEXT. (MMTT) SE	MESTE	R-I							
SR.	COMMTTON TO		TE	ACHING	G SCHE	ME		EXAMIN	ATION	SCHEN	ME
NO.	COURSES	SUBJECTS	L	т	DR	PR	ТР	тw	OE	PE	SUB.
											TOTAL
5.1	TT/MMTT/TPE/TC	TEXTILE ELECTRONICS-II	3	1		2	100			50	150
5.2	ммтт	TEXTURED YARN MANUFACTURING	3	l		3	100	50			150
5.3	ммтт	MAN MADE FABRIC FORMING TECHNOLOGY -V	4	1		2	100	50			150
5.4	ТТ/ММТТ	CHEMICAL PROCESSING OF TEXTILES-II	3	1		2	100	25		50	175
5.5	ммтт	MAN MADE FIBRE TESTING	3	1		2	100	25			125
5.6	ТТ/ММТТ	MECHANICS OF TEXTILE MACHINES	3	l			100				100
5.7	TT/MMTT/TPE/TC/FT	INPLANT TRAINING-I		1				50			50
			19			11	600	200		100	900
		L =LECTURES	TP=THEORY PAPER								
		T =TUTORIALS	TW=TERM WORK								
		DR=DRAWING	OE=OI	RAL EX		TION					
		PR=PRACTICALS	PE=PRACTICAL EXAMINATION								

T.Y.B.TEXT. (MMTT) SEMESTER-II

SR.	COMMTTON TO		TE	ACHING	G SCHE	ME		EXAMIN	ATION	SCHEN	ΛE
NO.	COURSES	SUBJECTS	L	Т	DR	PR	TP	тw	OE	PE	SUB.
											TOTAL
6.1	TT/MMTT/TPE/TC/FT	COMPUTER PROGRAMMING & APPLICATION	3			2	100	50		50	200
6.2	ммтт	MANMADE FIBRE SCIENCE	4				100	50			150
6.3	TT/MMTT/TPE/TC/FT	INDUSTRIAL ENGINEERING	3				100				100
6.4	ммтт	YARN AND FABRIC TESTING	4			3	100	50		50	200
6.5	ммтт	HIGH PERFORMANCE FIBRES AND COMPOSITES	4				100				100
6.6	ммтт	MANMADE STAPLE YARN MANUFACTURE-V	4			3	100	50			150
			22			8	600	200		100	900
		L =LECTURES	TP=TH	IEORY	PAPER	R					
T =TUTORIALS TW=TERM WORK											
		DR=DRAWING	OE=OI	RAL EX		TION					
PR=PRACTICALS			PE=PF	RACTIC			ΓΙΟΝ				

NEW	STRUCTURE W.E.F. :	JULY 2017 Corrected									
		T.Y.B.TEXT. (TPE) SE	MESTEF	R-I							
SR.	COMMTTON TO		TE	ACHING	G SCHE	ME		EXAMIN	ATION	SCHEN	ЛЕ
NO.	COURSES	SUBJECTS	L	т	DR	PR	ТР	тw	OE	PE	SUB.
											TOTAL
5.1	TT/MMTT/TPE/TC	TEXTILE ELECTRONICS-II	3			2	100			50	150
5.2	TPE	YARN MANUFACTURING MACHINERY-V	4			2	100	50			150
5.3	TPE	FABRIC MANUFACTURING MACHINERY-V	4	-		2	100	50			150
5.4	ТРЕ	PHYSICAL TESTING OF TEXTILE- II	3			2	100			50	150
5.5	ТРЕ	ANALYSIS OF MECHANICAL ELEMENTS	3			2	100	50			150
5.6	ТРЕ	METALLURGY	3				100				100
5.7	TT/MMTT/TPE/TC/FT	INPLANT TRAINING-I						50			50
			20			10	600	200		100	900
		L =LECTURES	TP=TH	IEORY	PAPEF	R					
		T =TUTORIALS	TW=TERM WORK								
		DR=DRAWING	OE=OI	RAL EX	AMINA	TION					
		PR=PRACTICALS	PR=PRACTICAL EXAMINATION								

T.Y.B.TEXT. (TPE) SEMESTER-II

SR.	COMMTTON TO		TE	ACHING	G SCHE	ME		EXAMIN	ATION	SCHEN	ΛE
NO.	COURSES	SUBJECTS	L	Т	DR	PR	TP	тw	OE	PE	SUB.
											TOTAL
6.1	TT/MMTT/TPE/TC/FT	COMPUTER PROGRAMMING & APPLICATION	3			2	100	50		50	200
6.2	ТРЕ	THEORY OF TEXTILE MACHINES-I	4			2	100	50			150
6.3	TT/MMTT/TPE/TC/FT	INDUSTRIAL ENGINEERING	3				100				100
6.4	ТРЕ	ENGINEERING DESIGN OF TEXTILE MACHINES-I	3			3	100	50	50		200
6.5	TPE	TRIBOLOGY	3	1			100				100
6.6	TPE	CHEMICAL PROCESSING MACHINERY	3			3	100	50			150
			19	1		10	600	200	50	50	900
		L =LECTURES	TP=TH	IEORY	PAPER	R					
T =TUTORIALS TW=TERM WORK											
		DR=DRAWING	OE=OI	RAL EX		TION					
PR=PRACTICALS PE=PRACTICAL EXAMINATION											

T.Y.B.TEXT. (TC) SEMESTER-I

			TE	ACHING	S SCHE	ME		EXAMIN	ATION	SCHEM	ΛE
R. N	COURSES	SUBJECTS		т	ΠP	DD	тр	τw	OF	DE	SUB.
			Ŀ	•	DK	ГЛ	IF	IVV		FE	TOTAL
5.1	TT/MMTT/TPE/TC	TEXTILE ELECTRONICS-II	3			2	100			50	150
5.2	тс	TECHNOLOGY OF DYEING-I	3	-		3	100	25	1	50	175
5.3	тс	TECHNOLOGY OF PRINTING-I	3	1	-	3	100	25	1	50	175
5.4	тс	TECHNOLOGY OF FINISHING-I	3	1	-	2	100	25	1		125
5.5	тс	CHEMICAL ENGINEERING OPERATIONS	3	1	-		100	-	1		100
5.6	тс	PHYSICAL PROPERTIES OF TEXTILE FIBRES	3	1	-	2	100	25	1		125
5.7	TT/MMTT/TPE/TC/FT	INPLANT TRAINING-I			-		-	50	1	-	50
			18			12	600	150		150	900
		L =LECTURES	TP=TH	IEORY	PAPER	R					
		T =TUTORIALS	TW=TE	ERM W	ORK						
		DR=DRAWING	OE=ORAL EXAMINATION								
		PR=PRACTICALS	S PE=PRACTICAL EXAMINATION								

T.Y.B.TEXT. (TC) SEMESTER-II

			TE	ACHING	G SCHE	ME		EXAMIN	ATION	SCHEN	ΛE
R. N	COURSES	SUBJECTS		т		DD	тр	тм/	OF	DE	SUB.
			L	-		FN	IF	1	UE	ΓĽ	TOTAL
6.1	TT/MMTT/TPE/TC/FT	COMPUTER PROGRAMMING & APPLICATION	3			2	100	50		50	200
6.2	тс	TECHNOLOGY OF DYEING-II	3			3	100	25		50	175
6.3	TT/MMTT/TPE/TC/FT	INDUSTRIAL ENGINEERING	3				100				100
6.4	тс	TECHNOLOGY OF PRINTING-II	3			3	100	25		50	175
6.5	тс	TECHNOLOGY OF FINISHING - II	3			2	100	25			125
6.6	тс	PHYSICAL PROPERTIES OF YARNS AND FABRICS	3			2	100	25		-	125
			18			12	600	150		150	900
		L =LECTURES	TP=TH	IEORY	PAPER	2					
		T =TUTORIALS	TW=TERM WORK								
		DR=DRAWING	OE=ORAL EXAMINATION								
		PR=PRACTICALS	PE=PRACTICAL EXAMINATION								

NEW	STRUCTURE W.E.F. :	JULY 2017 Corrected									
	T.Y.B.TEXT. (FT) SEMESTER-I										
SR.	COMMTTON TO		TE	ACHING	G SCHE	ME		EXAMIN	ATION	SCHE	ИE
NO.	COURSES	SUBJECTS	L	Т	DR	PR	TP	τw	OE	PE	SUB.
											TOTAL
5.1	FT	INTELLECTUAL PROPERTY RIGHTS	3				100				100
5.2	FT	KNITTING TECHNOLOGY	3			2	100	25			125
5.3	FT	GARMENT PROCESSING	4			2	100	25			125
5.4	FT	EMBROIDERY AND SURFACE ORNAMENTATION	3			2	100	25		50	175
5.5	FT	APPAREL MACHINERY AND EQUIPMENTS	4			2	100	25		50	175
5.6	FT	FASHION ART AND DESIGN	3			2	100	50			150
5.7	TT/MMTT/TPE/TC/FT	INPLANT TRAINING - I						50			50
			20	0	0	10	600	200	0	100	900
		L =LECTURES	TP=THEORY PAPER								
		T =TUTORIALS	TW=TERM WORK								
		DR=DRAWING	OE=O	RAL EX	(AMINA	TION					
		PR=PRACTICALS	PE=PRACTICAL EXAMINATION								

T.Y.B.TEXT. (FT) SEMESTER-II

SR.	COMMTTON TO		TE	ACHING	G SCHE	ME		EXAMIN	ATION	SCHEN	ΛE
NO.	COURSES	SUBJECTS	L	Т	DR	PR	ТР	тw	OE	PE	SUB.
											TOTAL
6.1	TT/MMTT/TPE/TC/FT	COMPUTER PROGRAMMING & APPLICATION	3			2	100	50		50	200
6.2	FT	ADVANCED STYLING AND FORCASTING	3				100	25			125
6.3	TT/MMTT/TPE/TC/FT	INDUSTRIAL ENGINEERING	3				100				100
6.4	FT	CAD – CAM FOR APPAREL MANUFACTURING	3			3	100	25			125
6.5	FT	APPAREL MERCHANDISING	4				100				100
6.6	FT	MEN, WOMEN AND CHILDREN'S WEAR	3			3	100			50	150
6.7	FT	DESIGN COLLECTION AND PRESENTATION				3	-	50	50		100
			19			11	600	150	50	100	900
		L =LECTURES	TP=THEORY PAPER								
		T =TUTORIALS	TW=TERM WORK								
		DR=DRAWING	OE=ORAL EXAMINATION								
		PR=PRACTICALS	PE=PF	RACTIC	AL EX		ΓΙΟΝ				

THIRD YEAR B.TEXT. - SEMESTER - I

5.1 TEXTILE ELECTRONICS-II (TT/MMTT/TPE/TC)

Lectures	:	3 hrs/week
Practical	:	2 hrs/week
Theory Paper	:	100 marks
Practical Exam.	:	50 marks
Subject Total	:	150 marks

Course Objectives:

- 1. To understand number systems, digital circuits, architecture and related sections of 8085 microprocessor, 8051 microcontroller, PLC
- 2. To write 8085 assembly language programs.
- 3. To describe interfacing of peripherals and I/O devices to 8085 microprocessor
- 4. To explain applications of microprocessor and microcontroller in textiles.

1) Digital Electronics and Number System

Introduction, difference between analog and digital electronics, digital gates, digital Circuits:- Introduction to Multiplexers, Demultiplexers, Encoders, decoders, Flip Flop – R-S, D and J – K, Registers,Latches, asynchronus counters, buffers, Tri-state devices, Memory- types- RAM, ROM, Introduction to Number systems: Decimal, Binary, Hexadecimal,conversion of numbers from one system to other.

Binary arithmetic – addition, subtraction, two's complement representation.

2) 8085 Microprocessor and Programming

Introduction to microprocessor, features of 8085, Architecture of 8085 –Register section, ALU, Timing and Control etc., Demultiplexing of address and data bus. Generation of control signals.

Instruction classification, instruction and data formats, addressing modes, complete instruction set, assembly language programming, Execution of programs, Time delay's and counters, Stack, subroutine, call and Return instructions

3) Interrupts

Concept of interrupts, software and hardware interrupts, Description of interrupt process, vectored interrupts.

4) Interfacing Input / output devices and Peripherals

Basic interfacing concept, interfacing output displays, interfacing input devices, difference between peripheral Input/output mapped I/O and memory mapped I/O, 8255 PPI interfacing and programming, interfacing of keyboard (matrix) and display, interfacing of thumbwheel switches, stepper motor, D/A and A/Dconverters, Relays etc.

5) Introduction to Microcontroller and PLC

Introduction to microcontroller, Block diagram of microcontroller, Difference between microprocessor and microcontroller, Features of 8051 microcontroller, Introduction to PLC and its applications.

6) Applications of Microprocessor in Textiles

Automatic textile control system, use of Microprocessor / Microcontroller in Sizing Machine, Jet dyeing machine, advanced looms, Spinning machines, Ring data System, Auto levelers, On-line monitoring systems, Evenness tester.

List of Experiments :-

- 1) Study of Number Systems.
- 2) Realization of digital gates.
- 3) Realization of flip flops
- 4) 8085 assembly language programms (6 to 8)
- 5) Interfacing of 8255 in simple I/O mode and BSR mode.
- 6) Interfacing of Seven segment display
- 7) Interfacing of stepper motor.
- 8) Interfacing of D/A converter.
- 9) Interfacing of A/D converter.
- 10)Interfacing of thumbwheel switch.

Reference Books:-

- 1) Digital Principles and applications by Malvino and leach
- Microprocessor Architecture, Programming and applications with 8085 by Ramesh Gaonkar.
- 3) 8 bit microprocessor, Vibhute and Borole, Techmax publication

- 4) The 8051 Microcontroller Architecture, Programming and Applications by Kenneth J, Ayala.
- 5) Machine manuals of USTER, LOPHE, PREMIER
- 6) Electronic Controls for Textile Machine Hiren Joshi and Gouri Joshi, NCUTE

Course Outcomes:

Student will be able to,

- 1. Understand number systems, digital circuits, architecture and related sections of 8085 microprocessor, 8051 microcontroller, PLC.
- 2. Write 8085 assembly language programs.
- 3. Describe interfacing of peripherals and I/O devices to 8085 microprocessor.
- 4. Explain applications of microprocessor and microcontroller in textiles.

THIRD YEAR B. TEXT. – SEMESTER – I

5.2 YARN FORMING TECHNOLOGY- V (TT)

Lectures	:	4 Hours / Week
Practical	:	2 Hours / Week
Theory Paper	:	100 Marks
Termwork	:	50 Marks
Subject Total	:	150 Marks

Course Objectives

- 1. Understand the manufacturing process and characteristics of Blended Yarns
- 2. Understand the classification, characteristics Speciality yarns
- 3. Understand the manufacturing of core spun yarns
- 4. Understand maintenance of spinning machines

Course Contents

Unit 1: Blend Spinning:-

Fibre characteristics and spinnability, fibre properties and end uses, objectives of blending, measures of blending, migration, tinting, selection of blend constituents, and mechanics of blending, blending techniques, and modification of cotton spinning machineries for processing of manmade fibres. Prediction of blended yarn strength.

Unit 2: Blend Spinning:-

Common faults in blended and 100% manmade spun yarn. Blending of manmade fibres with wool. Processing of manmade fibres and its blends on Rotor Spinning Machines. Spinning of dyed fibres

Unit 3: Specialty Yarns:-

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

Melange Yarn: - Concepts of producing mélange yarn. Process and sequence used for production of Melange yarn.

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

Unit 4: Sewing Threads: -

Introduction to thread construction, Characteristics of sewing threads, production methods, Types of thread packages, 6. Ropes, Cordage, & Twines: - Requirements of initial fibres & yarns, Manufacturing process, structures & properties of yarns.

Unit 5: Embroidery Yarns, Laces & Braids: -

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

Unit 6: Maintenance ofspinning-

Concept, importance, objectives of maintenance, Breakdown & planned maintenance. Maintenance of spinning preparatory machines - schedules, staff, precautions & methods to be followed during maintenance activities, tools & gauges used for maintenance. Maintenance of Ringframe & Compact Spinning Mechanisms - schedules, staff, precautions & methods to be followed, Tools & gauges used, Maintenance of Rotor Spinning Machines – Schedules, Precautions, Methods etc. Machine audit – concept and auditing of spinning machines. Energy conservation in spinning

List of Experiments

- 1. Demonstration of process flow charts for various fibre blending systems
- 2. Demonstration of tinting and channelization of material in spinning
- 3. Study of yarn faults in blended yarns
- 4. Demonstration of blended yarn production on Rotor
- 5. Processing of any Blend on cotton system
- 6. Demonstration of Air covering machine and manufacturing of Elastic Air covered yarn.
- Effect of various processing parameters of Air covering machine on the structure and properties of air-covered yarns.
- 8. Tools and Gauges used for maintenance of spinning machines

- 9. Auditing of spinning preparatory and study of card room maintenance machines.
- 10. Auditing of Ring frame and its settings.
- 11. Visit to the Blend Spinning plant.
- 12. Visit to the Spinning plant.

Reference Books

- 1. Textile Yarn, Technology, Structure and Application" Goswami B.C., Martindale, J.G., Scardino F.L., Wiley Interscience publication, 1977, U.S.A
- K R Salhotra , "Spinning of man made fibres and blends on cotton systems", The textile Association, India 2004.
- V.B.Gupta and K.K.Kothari (Ed), Man-made Fibres Production, Processing Structure, Properties and Applications, Vol. I and II, Dept. of Textile Technology, IIT, New Delhi 1988
- Hamburger, W. J., "The Industrial Application of the Stress-Strain Relationship", J. Textile Inst. 40, 700 (July 1949).
- 5. BTRA monograph series
- 6. Spinning machinery maintenance by SITRA

Course Outcomes

At the end of the course students will be able to

- 1. Demonstrate the manufacturing process and characteristics of Blended Yarns
- 2. Explain the classification, characteristics and need for speciality yarns
- 3. Demonstrate the manufacturing of core spun yarns
- 4. Demonstrate the maintenance of spinning machines

THIRD YEAR B. TEXT. - SEMESTER- I

5.3 FABRIC FORMING TECHNOLOGY- V (TT)

Lectures	:	4 Hrs / Week
Practical	:	2 Hrs / Week
Theory Paper	:	100 Marks
Term Work	:	50 Marks
Subject Total	:	150 Marks

Course Objective

- 1. To explain high speed shedding mechanism
- 2. To explain weaving technologies like air jet, water jet
- 3. To explain multiphase & circular weaving technology
- 4. To explain unconventional weaving methods

1. High Speed Shedding Mechanism :-

- a. Limitations of Tappet shedding motion, positive cam shedding concept and need, constructional and working details (Ruti-C, Projectile, Rapier and Air jet), Adjustments essential during weave change and timing. Mounting possibilities, pitch of heald frames.
- b. Limitation of lever and cam negative dobby, positive rotary cam concept, Rotary mechanical and electronically controlled dobby, mounting possibilities, pitch of heald frames, capacity, data transfer, adjustments during weave change, various models available in the markets.
- c. Limitations of mechanical Jacquard, concept of electronic Jacquard, details of construction and working of electronic Jacquard, comparison between various Jacquard (Bonas, Staubli, Grosse) working principles, adjustment for various weaves, Jacquard capacity, mounting, suitability for various end uses, data transfer and management, Networking with looms
- 2. Air Jet weft Insertion: Machines for air jet weaving, Introduction, overview of weft insertion elements, main nozzle designs, relay nozzle designs, stretch nozzle design. Configurations, loom timing of picking elements and settings, constructional details of profile reed. Air supply and energy consumption, Air flow in nozzles and guide channel, performance of yarns in air jet insertion,

Optimization of settings, Weft stops and breaks, application of air jet weaving. Drive, Pneumatic circuit for air supply. Technical features of modern air jet weaving machines, (Dornier, Smit, Picanol, Sulzer) Quality of Air.

- 3. Water Jet Weft Insertion: Introduction, Design requirements, Picking mechanism, weft insertion elements, loom timing and settings, features of water jet looms, applications of water jet weft insertion system. Comparison with air jet, maintenance. Technical features of modern water jet weaving machines, (Nissan, Tsudokoma, Inventor). Comparison of various shuttle less weaving technologies with respect to reed width, loom speed, WIR and capital cost.
- 4. Multiphase Weaving:- Introduction, Classification, Methods to form warp wise and weft wise sheds, methods of picking, methods of beat up, limitations of multiphase weaving, applications, features of modern multiphase weaving machines e.g. M 8300.
- 5. Circular Weaving:- Introduction, Classification as per number of shuttles, shedding, picking, beating, cloth collection, supply of warp yarn, stop motions for warp and weft, productivity. Technical features of Circular weaving machines, (Sterlings, Lohiya)

6. Other Unconventional Weaving Methods :

Triaxial Weaving: Structure and Properties of triaxial woven fabrics, applications, weaving equipment for triaxial weaving.

Narrow Fabric Weaving

- a. Introduction, Scope of narrow fabric weaving, applications
- b. Preparation Machines and processes for assembling warps, various warping processes, weft preparation.
- c. Technology of narrow fabric weaving Machine construction, Shuttle looms, needle looms, warp feed systems from beams, creel for elastomeric yarns, shedding by cam and links, pattern chain preparation for different weaves, weft insertion systems(needle loom), various selvedge forming systems on needle loom, drives to different elements, take up.
- d. Application of weaves in narrow fabric weaving.

Manufacture of Labels: Applications, labels with woven selvedge and cut selvedge. Printed labels, fabric specifications, specifications of jacquard used, feed material specifications.

Braiding:Introduction, classification (rounds and flat braids), applications, raw material used for braids, machines used for braiding (drive, yarn supply, Braiding technology, take up.)

List of Experiments:-

- 1. Study, dismantling and resetting of positive cam motion.
- 2. Study of Electronic rotary dobby
- 3. Study of electronic jacquard
- 4. Study of Jacquard design software creation of weave
- Study of let-off motions of all shuttle less weaving machines and operations of looms.
- 6. Study of style change of SMIT Air Jet weaving machine
- Study of control panel of SMIT Air Jet weaving machine and fabric production with changed parameters.
- 8. Study of Dobby CAD software
- 9. CAD software application Creation of weaves
- 10. CAD software application Creation of weaves.
- 11. Study of style change on Dornier
- 12. Study of sample weaving equipment
- 13. Visit to Air jet weaving unit.
- 14. Study of various motions of needle loom and production of fabric on it
- 15. Study of Braiding machine and production of fabric on it
- 16. Visit to circular loom unit

Reference Books:-

- 1. Handbook of weaving Sabit Adanur.
- 2. Modern preparation and weaving machinery A Ormerod
- 3. Shuttleless Looms J. J. Vincent
- 4. Shuttless weaving machine O. Talavasele, V. Svaty
- 5. Narrow Fabric Weaving Sauer Lander Verlag

- 6. Narrow Fabric Group Conference Textile Institute
- 7. Braiding and Braiding Machinery W. A. Douglass

Course Outcome

Students will be able to

- 1. Differentiate between various high speeds shedding mechanism.
- 2. Understand air jet and water jet technology.
- 3. Understand the multiphase & circular weaving technology.
- 4. Understand unconventional weaving methods.

THIRD YEAR B.TEXT. - SEMESTER - I

5.4 CHEMICAL PROCESSING OF TEXTILES-II (TT/MMTT)

Lectures	:	3 Hrs/week
Practical	:	2 Hrs/week
Theory Paper	:	100 marks
Term Work	:	25 marks
Practical Exam.	:	50 marks
Subject Total	:	175 marks

Course Objectives

- 1. To describe the objects of coloration of textile fibres and corresponding methodology used.
- 2. To describe the various types of machinery for dyeing and significance of fastness properties.
- 3. To describe the objects, process and machinery used for printing of various fabrics.
- 4. To explain the objectives and effects of finishing treatments on textiles.

Unit 1.ELEMENTS OF DYEING

Definition & Principles of dyeing, Classification of dyes based on the method of application, dye fibre interactions and concepts like exhaustion, expression, percentage shade, affinity and Substantivity

Unit 2.DYEING OF NATURAL FIBRES

Dyeing of cellulosic fibres with direct, vat, reactive and sulphur dyes, Principle steps involved in dyeing, Dyeing of silk and wool with acid and basic dyes. Factors affecting the dyeing process.

Unit 3.DYEING OF SYNTHETIC FIBRE & BLENDS

Dyeing of Polyester and its blends like polyester-cotton, polyester-viscose, polyesterwool, Dyeing of acrylic and nylon. Importance of fastness, Evaluation of fastness properties like washes fastness, rubbing fastness and light fastness.

Unit 4.PRINTING

Concept of printing. Various ingredients used in preparation of printing paste. Various styles of printing such as Direct, Resist and Discharge by using direct, reactive and disperse dyes. Printing with pigments. Concept of inkjet / digital printing.

Unit 5.FINISHING

Objects of finishing, classification of finishes. Resin finishing, mechanism of resin finishing. Concept of anti crease, wash-n-wear and durable press. Heat setting and weight reduction of polyester material. Concept of specialty finishes like soil release, water repellent and flame retardant finishes.

Unit 6. MACHINERY

Introduction to package dyeing machine. Jigger dyeing machines, winch dyeing machine, padding mangles, jet dyeing and soft flow dyeing machines. Introduction to various methods of printing such as table, flat bed and rotary screen printing. Study of stenter, calendars, sanforiser and cylinder drying machine.

List of Experiments:

- 1. Dyeing of cotton with direct dyes.
- 2. Dyeing of cotton with reactive dyes.
- 3. Dyeing of cotton with vat dyes.
- 4. Dyeing of cotton with sulphur dyes.
- 5. Dyeing of 100% polyester with disperse dye by using HTHP beaker dyeing machine.
- 6. Dyeing of polyester-cotton blends.
- 7. Dyeing of wool and silk with acid dyes.
- 8. Printing of cotton with reactive dyes for direct and discharge style.
- 9. Printing of cotton with pigments.
- 10. Evaluation of light, washing and rubbing fastness.
- 11. Chemical identification of fibres.
- 12. Chemical identification of dyes on fibres.

Reference Books

- 1. Dyeing Of Polyester and Its Blends by M.L. Gulrajani.
- 2. Dyeing Of Chemical Technology Of Textile Fibres by E.R. Trotman.
- 3. Technology Of Dyeing by V.A. Shenai.
- 4. Textile Printing by L.W.C. Miles.
- 5. An Introduction To Textile Printing by W. Clarke.
- 6. Textile Finishing by A.J. Hall.
- 7. Introduction To Textile Finishing by J.T. Marsh
- 8. Technology of Finishing by V.A. Shenai.

Course Outcomes

At the end of the course students will be able to

- 1. Understand elements of dyeing, dyeing of cellulosic, polyamide, polyester, acrylic & their blends with suitable dyes.
- 2. Understand working principle & procedure of dyeing machinery such as jigger, winch, padding mangle, jet and soft flow and analyse process of colour fastness property against agencies such as washing, rubbing and light fastness.
- 3. Understand concept of Printing and functions of ingredients used, working of printing machines like Flat Bed, Rotary and Ink-jet.
- 4. Understand objects of finishing, classification and objects of various mechanical and chemical finishes.

THIRD YEAR B. TEXT. – SEMESTER – I

5.5 FIBRE SCIENCE (TT)

Lectures	:	3 Hours / Week
Practical	:	2 Hours / Week
Theory Pa	per:	100 Marks
Term Work	< :	25 Marks
Subject To	tal :	125Marks

Course Objectives

- 1. To describe fibre structure.
- 2. To describe analytical techniques for study of fibre structure.
- 3. To explain significance of mechanical properties of fibres.
- 4. To deliberate importance and measurement of thermal and electrical properties.

1. Fibre structure:

Requirements of fibre formation, molecular weight and molecular weight distribution, degree of polymerization- useful limits of polymerization, crystalline and amorphous regions, morphological models - one phase, two phase, three phase models, morphology of cotton, viscose, jute, acetate, wool, silk, nylon 6, nylon 66, polyester, acrylic, polypropylene fibre.

2. Techniques for investigation of fibre structure:

- A) Optical properties of textile fibres: refractive index, double refraction, birefringence. Optical heterogeneity in fibres, factors influencing birefringence of a fibre, measurement of birefringence – Becke line method, compensator method, refractometer method, significance of birefringence, optical dichroism and its importance.
- B) X-ray diffraction: Production and origin of X-rays, Bragg's law of X-ray diffraction, crystal structure, miller indices, study of fibre structure- X-ray diffractometer method, fibre diagram method.
- C) Electron microscopy: Principle of electron microscope, Transmission and scanning electron microscope Principle, working and applications.

 D) Infrared Spectroscopy: Spectroscopy, Beer-Lambert law, Principles of IR-Spectroscopy, Principle and working of IR spectrophotometer, Applications, IR-Dichroism and its importance.

3. Mechanical properties of fibres:

- A) Tensile properties: Terms and definitions, stress-strain curve, importance of tensile properties, factors influencing tensile properties of fibres
- B) Elastic recovery:Terms and definitions, effects of test conditions on elastic recovery of fibres, recovery properties of different fibres, mechanical conditioning of fibre, swelling recovery.
- C) Fibre Friction: Laws of friction in textiles, consequence of friction in textiles, measurement of friction, empirical results, nature of friction.

4. Variability and Directional Effects:

- A) Effects of variability: Weak link effect, derivation of Pierce formula, Spencer-Smith theory, composite specimen effect, variability in practice
- B) Directional effects: Bending and twisting of fibres, derivations of flexural and torsional rigidity, significance of flexural and torsional rigidity, shear modulus, shear strength, general elastic deformation, compression.

5. Theories of mechanical properties and viscoelasticity:

Approaches, structural effects in fibres, theories of time dependencethermodynamic effects, Boltzmann super position principle, WLF equation, creep stress relaxation, stress-strain curve, dynamic mechanical properties, their measurement and importance. Model theory of viscoelasticity- linear viscoelasticity, viscoelastic models, features of Eyring model.

6. Thermal and electrical properties:

- A) Thermal properties: Specific heat capacity, thermal conductivity, structural changes in fibres on heating, transitions in fibre- first and second order transition, degradation and decomposition, thermal expansion of fibre, heat setting of fibre, principle and working of DSC, DTA, DMA.
- B) Electrical properties: Static electricity- causes and consequences in textiles, measurement of static electricity, electric resistance, specific resistance,

measurement of resistance, factors influencing the electrical resistance of fibres.

List of Experiments

- 1. Study of norms for fibre properties.
- 2. Cutting combing ratio of sliver.
- 3. Determination of tensional rigidity of fibre.
- 4. Determination of flexural rigidity of fibre.
- 5. Assessment of performanceof carding machine using AFIS.
- 6. Determination of moisture by oven dry and Shirley moisture meter.
- 7. Measurement of elastic recovery of fibre.
- 8. Hot air and hot water shrinkage of filament.
- 9. Determination of single fibre strength.
- 10. Study of creep.
- 11. Study of stress relaxation.
- 12. Determination of work of rupture of filament.

Reference Books

- 1. Fibre science- edited by J.M. Preston, published by the textile institute, Manchester.
- Physical methods of investigation of textiles, edited by Meredith R. And Hearle J.W.S.-published by textile book published inc. New York.
- 3. Physics of fibres- an introductory survey-Woods H. J. Published by the institute of physics-London, 1955.
- 4. Applied fibre science- vol I, edited by F. Happey published by academic press, London.
- 5. Physical properties of textile fibres-Morton W. E. and Hearle J.W.S. Published by the textile institute Manchester.
- 6. Fibre microscopy-Stores J. L. Published by London national trade press.
- 7. Structure/property relationship in textile fibres-textile progress vol. 20, no. 4 the textile institute Manchester.
- Instrumental analysis of cotton cellulose and modified cotton cellulose by Robert T.O'Conner.
- 9. Fibre science by S. P. Mishra.

10. Fibre Science Steven B. Warner.

Course Outcomes

At the end of the course students will be able to

- 1. Describe fibre structure.
- 2. Interpret fibre structure through analytical techniques.
- 3. Evaluate the mechanical properties of fibres.
- 4. Measure thermal and electrical properties of fibres.

THIRD YEAR B.TEXT. - SEMESTER - I

5.2 MECHANICS OF TEXTILE MACHINES (TT/MMTT)

Lectures	:	3Hrs/week
Theory Paper	:	100 marks
Subject Total	:	100 marks

Course Objectives

- 1. To identify principles of mechanics and mechanisms of textile machines and textile processes.
- 2. To describe constructional details and design aspects of machine parts and mechanisms involved in machines.
- 3. Explanation to evaluate design parameters involved in mechanisms.
- 4. Describe selection criterion and process of selecting mechanisms as per need.

Unit 1.Frictional Drives:

Introduction, Frictional drive to cheese and cone, Belt drives –Basics, Conditions of critical slippage of belts – maximum power condition, texturising by belt and friction disc, the timing belt drive, cone drum belt drives.

Positive Drives:-

Chain and sprocket drive - Gear drives – types of gears – terms used in study of gears – pitch measurement, ratio of gear trains – features of change wheels, Epicyclic gear trains – velocity ratio – differential gearing in comber and Speed frame. Planetary mechanisms in Coiling.

Cams and Eccentric: -

Introduction – Basic types of cams, types of followers, Motion of cam follower – Displacement, Velocity and Acceleration diagrams for linear, S.H.M., uniform acceleration and retardation cams. Uses of linear cam, positive cams, conjugate cams, Cylindrical Cam in Textile machines. Eccentric and its uses.

Unit 2.Linkage Mechanisms:-

Introduction – The four bar linkage, its geometry– Equations of Displacement, Velocity and Acceleration of a point, SHM, calculation of dwell clearance on a loom

with linear cam, SHM and modified SHM, Sley eccentricity, Multiple Bar Linkage – Double Beat up mechanism, Combined ratchet and linkage mechanisms, complex combined mechanism – driving of detaching rollers of comber.

Intermittent Rotary Motion:-

Introduction – Ratchet and pawl mechanisms – Let off and take up motions in weaving machines – variation in pick spacing – Geneva wheel.

Unit 3.Balancing of Machines:-

Introduction, Vibrations of machine, Balancing of machinery – Unbalance and its causes, Production balancing, Field balancing, Theoretical considerations in balancing – Static and Dynamic balancing, Various cases of balancing, Numerical examples based on different cases. Balancing of rotor, Cards cylinder and practical aspects of balancing. Measurement and control of unbalance- Static and Dynamic balancing machines.

Unit 4.Clutches and Brakes:-

Introduction – Clutches – Jaw / toothed clutches, Friction clutches, Materials for friction lining, Cone Clutches. Torque and power transmission capacity of clutches. Numericals.

Brakes - Classification of brakes, Constructional details of band, block and differential brakes, braking torque, Internal expanding brake, Application of brakes in Textile machines. Numerical examples

Unit 5. Selection Mechanisms:-

Introduction – methods of storing information – the grouping of machine parts for selection – converting information into movement – some mechanical switching mechanisms – Dobby selection mechanisms – high speed mechanical switching mechanisms – additional complex mechanical switches – the movement of the information store.

Control Mechanisms:-

Introduction – the elements of control mechanisms, open loop and closed loop system –Detection of broken ends, control of yarn tension and cloth tension, detection of full and empty packages

Unit 6. Mechanics of Spinning and Weaving Machines:-

Construction of Beater and Chamber, Inertia of Carding, Card Wires, Drafting force and friction field in roller drafting, coils spacing in speed frame, Centrifugal force of flyers, Arrangement in two rows, Yarn tension in ring spinning, Balloon theory,

Study of mechanisms in winding, Build of various packages. Screw traversing mechanism. Design of grooved drums for various packages. Design changes in Beam warping drive for high speed. Sectional warping drum design. Mechanism of squeezing, sow box design. Review of design changes of shedding mechanism. Picking mechanism theories for different shuttleless weaving techniques.

Reference Books

- 1. Textile Mathematics, Vol-I, II and III By J.E. Booth, The Textile Institute, Publication.
- Control Methodology in Textile Engineering and Economics By John W.s. Hearle, Journal of the Textile Inst. Vol.83, No.3, 1992, The Textile Institute Publication
- 3. Textile Mechanics Vol.I, II By K. Slater, The Textile Inst. Publication.
- 4. Mechanics of Spinning Machines By R.S. Rengasamy, NCUTE Publication
- 5. An Introduction to Textile Mechanisms By P. Grosberg, The General Publishing Company.
- 6. Theory of Machines by Sharma Agarwal.

Course Outcomes

At the end of the course students will be able to

1. Describe principles of mechanics and mechanisms of textile machines and textile processes.

- 2. Describe constructional details and design aspects of machine parts and mechanisms involved in machines.
- 3. Evaluate design performance parameters involved in mechanisms.
- 4. Select criterion and selection process for mechanisms as per need.

THIRD YEAR B. TEXT - SEMESTER-I 5.7 INPLANT TRAINING - I (TT/MMTT/TPE/TC/FT)

Term Work : 50 Marks

Course Objective

- 1. To expose the students to the industrial environment and its work culture.
- 2. To expose the students to machineries and processes.
- To develop understanding of techniques like production planning. Quality Assurance, Maintenance practices, Environment and Pollution Control, Management Information System.
- 4. To provide hands-on training on machines and instruments

Training Period:

Four weeks after completion of second semester of Second Year B.Text.

Industry:

Spinning, Weaving, Garment, Processing, Synthetics, Textile Chemicals and Auxiliaries, R & D, Machinery Manufacturing, Marketing etc. as per the course.

Training:

Observe working of industry and collect data as per guidelines in the daily diary, manual, study machineries / systems / practices.

Training Report:

Report should be prepared as per following guidelines and submitted for evaluation -

- * Report should have Title on Cover of Report as per Format.
- * Report should be prepared as per following sequence -
 - I Page Certificate from Institute as per Format.
 - II Page Acknowledgement
 - III Page Programme of Training
 - IV Page Introduction of Industry
 - V Page Index with Page Numbers
 - VI Page Plant/Dept. Layout
 - VII Page Organizational Structure.
 - VIII Page Department wise/Product wise Report

This report should be based on

- Own Observations made, data collected during Inplant Training like study of Machinery, Actual Production and Efficiency, Production Control, Modern Developments in Machines/Process, Flow Chart of Processes, Speed of Important Parts, Labour Allocation, Maintenance Practices, Process Control and Quality Control Activities etc. roles and responsibilities of various Workers/TechnicalStaffs'
- Special Study like Mini Project Undertaken, Costing, ProductionPlanning and Control, Target Achievement, Information regardinghumidification plant, Utility, Electrical Supply, Store, Purchase, Marketing, Sales, Samples, Lay-out of Mill etc.

Course Outcomes

Students will be able to,

- 1. Understand the industrial environment and work culture.
- 2. Understand the machineries and processes of industries.
- Reproduce the techniques like production planning, Quality Assurance, Maintenance practices, Environment and Pollution Control, Management Information System.
- 4. Use hand on training skills.

THIRD YEAR B. TEXT. - SEMESTER - I

5.2 TEXTURED YARN MANUFACTURING (MMTT)

Lectures	:	3 Hours / Week
Practical	:	3 Hours / Week
Theory Paper	:	100 Marks
Term Work	:	50 Marks
Subject Total	:	150 Marks

Course Objectives

- 1. Explain scientific principles and methods of manufacturing texturured yarns.
- 2. Explain structure and properties of textured yarns.
- 3. Describe the developments in texturising methods
- 4. Demonstrate manufacturing of textured yarns

Course Content:

Unit 1:

Introduction: Draw backs of flat filament yarns, Definition and concept of texturising, Classification and characteristics of textured yarns.

Unit 2:

False Twist Texturising: -scientific principle in twist texturising, Methods of production of stretched (single heater) and modified stretched (double heater) yarns by conventional methods

Unit 3:

False Twist DrawTexturising: Draw Texturising concepts, sequential and simultaneous draw texturising, Study of simultaneous draw texturising process. Draw Texturising Machine Details: -Machine profiles, Twisting devices, Heaters, Cooling devices, Coning oil application, Process variables, Defects in draw textured yarns. Quality of draw textured yarns. Technological developments in draw-texturising technology. Double density machine and multiple input shaft machines,

Unit 4:

Air Jet Texturising:- Principle of loops formation, Air-jet texturising machine, air-jets, wetting systems, stabilizing devices, process variables in air texturising, Quality of air textured yarns, blending of filaments in air texturising.

Unit 5:

BCF Processes and Yarns: - BCF draw texturising machines, process variables.

Unit 6:

Other Texturising methods: Edge crimping, Stuffer box crimping, Knit-de-knit, Gear Crimping, Chemical Texturising.

List of Experiments:-

- 1. Demonstration of draw texturising machine (Himson HDS-CX₂).
- Effect of various processing parameters of draw texturising (Himson HDS-CX₂) on structure and properties of textured yarns.
- Comparison of properties of draw textured yarns manufactured by using single heater and double heater.
- 4. Demonstration of Himson HJT-1000 Air-jet texturising machine.
- 5. Effect of various processing parameters of Air-jet texturising (HJT-1000) on structure and properties of air-jet textured yarns.
- 6. Production of blended filament yarn using air-jet texturising machine and study the properties of blended filament yarn.
- Effect of various processing parameters of high speed Himson draw winder on characteristics of drawn filament yarns.
- 8. Demonstration of Air covering machine and manufacturing of Elastic Air covered yarn.
- 9. Effect of various processing parameters of Air covering machine on the structure and properties of air-covered yarns.
- 10. Demonstration of Crepe-TFO machine.
- 11. Visit to the texturising plant.
- 12. Visit to filament yarn twisting unit

List of References:-

- 1. Yarn Texturing Technology by J.W.S. Hearle, L. Hollick, D.K. Wilson Woodhead Publishing Ltd, England.
- 2. Textile Yarn, Technology, Structure and Application" Goswami B.C., Martindale, J.G., Scardino F.L., Wiley Interscience publication, 1977, U.S.A.
- 3. Hes L. Ursiny P., "Yarn Texturing Technology", Eurotex, U.K., 1994.
- M. Acar and G.R. Wray., "An analysis of the air jet yarn texturing process Part-I: A Brief history of developments in the process", Journal of Text. Institute, Vol.77,No.1, p19-27, (1986).
- Wilson D.K. and Kollu T., "Production of Textured Yarns by the False Twist Technique", Textile Progress, Vol. 21, No.3, Textile Institute, Manchester, U.K.,1991.
- Gupta V.B. (Edr.), "Winter School on Man-made Fibers Production, Processing, Structure, Properties and Applications", Vol. 1, 1988.

Course Outcomes

Students will be able to:

- 1. Explain scientific principles and methods of manufacturing of texturured yarns.
- 2. Analyze structure and properties of textured yarns
- 3. Describe the developments in texturising methods
- 4. Manufacture textured yarn
THIRD YEAR B. TEXT. - SEMESTER- I

5.3 MAN MADE FABRIC FORMING TECHNOLOGY- V (MMTT)

Lectures	:	4 Hrs / Week
Practical	:	2 Hrs / Week
Theory Paper	:	100 Marks
Term Work	:	50 Marks
Subject Total	:	150 Marks

Course Objective

- 1. To explain high speed shedding mechanism
- 2. To explain weaving technologies like air jet, water jet
- 3. To explain multiphase & circular weaving technology
- 4. To explain unconventional weaving methods

1. High Speed Shedding Mechanism :-

- d. Limitations of Tappet shedding motion, positive cam shedding concept and need, constructional and working details (Ruti-C, Projectile, Rapier and Air jet), Adjustments essential during weave change and timing. Mounting possibilities, pitch of heald frames.
- e. Limitation of lever and cam negative dobby, positive rotary cam concept, Rotary mechanical and electronically controlled dobby, mounting possibilities, pitch of heald frames, capacity, data transfer, adjustments during weave change, various models available in the markets.
- f. Limitations of mechanical Jacquard, concept of electronic Jacquard, details of construction and working of electronic Jacquard, comparison between various Jacquard (Bonas, Staubli, Grosse) working principles, adjustment for various weaves, Jacquard capacity, mounting, suitability for various end uses, data transfer and management, Networking with looms
- 2. Air Jet weft Insertion: Machines for air jet weaving, Introduction, overview of weft insertion elements, main nozzle designs, relay nozzle designs, stretch nozzle design. Configurations, loom timing of picking elements and settings, constructional details of profile reed. Air supply and energy consumption, Air flow in nozzles and guide channel, performance of yarns in air jet insertion,

Optimization of settings, Weft stops and breaks, application of air jet weaving. Drive, Pneumatic circuit for air supply. Technical features of modern air jet weaving machines, (Dornier, Smit, Picanol, Sulzer) Quality of Air.

- 3. Water Jet Weft Insertion: Introduction, Design requirements, Picking mechanism, weft insertion elements, loom timing and settings, features of water jet looms, applications of water jet weft insertion system. Comparison with air jet, maintenance. Technical features of modern water jet weaving machines, (Nissan, Tsudokoma, Inventor). Comparison of various shuttle less weaving technologies with respect to reed width, loom speed, WIR and capital cost.
- 4. Multiphase Weaving:- Introduction, Classification, Methods to form warp wise and weft wise sheds, methods of picking, methods of beat up, limitations of multiphase weaving, applications, features of modern multiphase weaving machines e.g. M 8300.
- 5. Circular Weaving:- Introduction, Classification as per number of shuttles, shedding, picking, beating, cloth collection, supply of warp yarn, stop motions for warp and weft, productivity. Technical features of Circular weaving machines, (Sterlings, Lohiya)

6. Other Unconventional Weaving Methods :

Triaxial Weaving: Structure and Properties of triaxial woven fabrics, applications, weaving equipment for triaxial weaving.

Narrow Fabric Weaving

- a. Introduction, Scope of narrow fabric weaving, applications
- b. Preparation Machines and processes for assembling warps, various warping processes, weft preparation.
- c. Technology of narrow fabric weaving Machine construction, Shuttle looms, needle looms, warp feed systems from beams, creel for elastomeric yarns, shedding by cam and links, pattern chain preparation for different weaves, weft

insertion systems(needle loom), various selvedge forming systems on needle loom, drives to different elements, take up.

d. Application of weaves in narrow fabric weaving.

Manufacture of Labels: Applications, labels with woven selvedge and cut selvedge. Printed labels, fabric specifications, specifications of jacquard used, feed material specifications.

Braiding:Introduction, classification (rounds and flat braids), applications, raw material used for braids, machines used for braiding (drive, yarn supply, Braiding technology, take up.)

List of Experiments:-

- 1. Study, dismantling and resetting of positive cam motion.
- 2. Study of Electronic rotary dobby
- 3. Study of electronic jacquard
- 4. Study of Jacquard design software creation of weave
- Study of let-off motions of all shuttle less weaving machines and operations of looms.
- 6. Study of style change of SMIT Air Jet weaving machine
- 7. Study of control panel of SMIT Air Jet weaving machine and fabric production with changed parameters.
- 8. Study of Dobby CAD software
- 9. CAD software application Creation of weaves
- 10. CAD software application Creation of weaves.
- 11. Study of style change on Dornier
- 12. Study of sample weaving equipment
- 13. Visit to Air jet weaving unit.
- 14. Study of various motions of needle loom and production of fabric on it
- 15. Study of Braiding machine and production of fabric on it
- 16. Visit to circular loom unit

Reference Books:-

- 1. Handbook of weaving Sabit Adanur.
- 2. Modern preparation and weaving machinery A Ormerod
- 3. Shuttleless Looms J. J. Vincent
- 4. Shuttleless weaving machine O. Talavasele, V. Svaty
- 5. Narrow Fabric Weaving Sauer Lander Verlag
- 6. Narrow Fabric Group Conference Textile Institute
- 7. Braiding and Braiding Machinery W. A. Douglass

Course Outcome

- 1. Differentiate between various high speed shedding mechanism.
- 2. Understand air jet and water jet technology.
- 3. Understand the multiphase & circular weaving technology.
- 4. Understand unconventional weaving methods.

THIRD YEAR B. TEXT. - SEMESTER - I

5.5 MANMADE FIBRE TESTING (MMTT)

Lectures	:	3 Hours / Week
Practical	:	2 Hours / Week
Theory Pap	er:	100 Marks
Term Work	:	25 Marks
Subject Tota	al :	125 Marks

Course Objectives

- 1. To explain significance and selection of sample
- 2. To discuss technical significance of fibre properties.
- 3. To describe testing methodologies for evaluation of fibre properties.
- 4. To explain significance of moisture in textiles and it's testing.

1. Sampling for determination of fibre properties

Necessity of sampling, Terms: Population, Sample, Random sample, biased sample, Factors governing sampling, Sampling methods - Zoning method, squaring method, Cut squaring method.

2. Longitudinal dimensions (Fibre length)

Concept, Technical Significance of fibre length, Staple length of cotton, Lengthfrequency diagrams, Fibre length measurement - Oil plate method, Comb sorter method, Scanning method - Digital Fibrograph.

3. Transverse dimensions (Fineness & Maturity)

Fibre Fineness: Concept, Measures of fineness, Technical significance of fineness, Measurement of fineness - Microscopic method, Gravimetric method, Airflow method - Sheffield Micronaire, Vibroscope method.

Fibre Maturity: Concept, Measures of maturity, Technical significance of maturity, Measurement of maturity - Caustic soda method, Polarized light method, Differential dyeing method.

4. Fibre strength

Terms and definitions, Stress-strain curve, Importance of Tensile properties, Factors influencing fibre strength, Types of loading, Measurement of fibre strength - Single fibre strength –Strain gauge transducer principle, Bundle fibre strength – Pendulum lever principle, Comparison of Single fibre strength and Bundle strength.

5. Moisture relations and testing

Terms and definitions, Effect of moisture on textiles, Measurement of atmospheric conditions- dry and wet bulb hygrometer, hair hygrometer, electrolytic hygrometer, regain–humidity relationships, factors affecting moisture regain, measurement of regain –oven dry method, methods based on resistance and capacitance principle.

6. Miscellaneous testing

- A. Trash: Classification of trash, Technical significance of trash, measurement of trash in cotton by Trash analyser.
- B. Neps: Concept, Classification of Neps, importance, Neps in card web –Shirley template method, nepping potential.
- C. Honey dew Content: Concept, Significance and estimation of honey dew content
- D. Fibre Density: Concept, Measurement of fibre density.
- E. Fibre Quality Index and its significance
- F. Modern fibre testing instruments: High Volume Instrument (HVI), Advanced Fibre Information System (AFIS).
- G. Testing of Manmade Fibres: Crimp in staple fibre, Crimp Rigidity and Crimp Contraction, Shrinkage

List of Experiments

- 1. Study of norms for fibre properties
- 2. Study of Zoning technique for selection of fibre sample
- 3. Fibre Length by using Grease Plate Method
- 4. Comb Sorter method for estimation of fibre length parameters
- 5. Fibre Fineness by Cut-Weight Method
- 6. Measurement of fibre fineness by airflow instrument
- 7. Fibre Maturity Measurement by Caustic Soda Method

- 8. Determination of trash content in cotton using Trash Analyser
- 9. Study of fibre parameters on AFIS
- 10. Determination of moisture content and regain by oven dry method and Shirley Moisture meter
- 11. Determination of tensile strength of manmade filament
- 12. Evaluation of crimp rigidity and crimp contraction of man-made fibre.

Reference Books

- 1. Physical Testing of Textiles by J.E. Booth.
- 2. Physical Properties of Fibres, Morton and Hearle
- 3. Manuals of HVI, AFIS
- 4. Manual of Spinning by P. Lord.
- 5. Textile Testing by Skinkle.
- 6. Handbook of Indian Standards.

Course Outcomes

- 1. To able to select sample.
- 2. To understand technical significance of fibre properties.
- 3. To test and interpret results of fibre properties.
- 4. To understand moisture-testing relations.

THIRD YEAR B.TEXT. - SEMESTER - I

5.2 YARN MANUFACTURING MACHINERY-V (TPE)

Lectures	:	4 Hrs/week
Practical	:	2 Hrs/week
Theory Paper	:	100 marks
Term Work :		50 marks
Subject Total	:	150 marks

Course Objectives

- 1. Understand the manufacturing process and characteristics of Blended Yarns
- 2. Understand texturing process, process parameters and yarn characteristics.
- 3. Understand the texturing machines, accessories and techniques.
- 4. Understand unconventional spinning technologies, scope and advantages.

Unit 1.PREPARATION FOR BLEND SPINNING:-

Objectives of blending, Fibre characteristics and blend compatibility and end uses, Measures of blending, migration, selection of blend constituents, and mechanics of blending, Blending techniques, tinting and modification of cotton spinning machineries for processing of manmade fibres. Prediction of blended yarn strength.

Unit 2.BLEND SPINNING:-

Common faults in blended and 100% manmade spun yarn. Blending of manmade fibres with wool. Processing of manmade fibres and its blends on Rotor Spinning Machines. Spinning of dyed fibres.

Unit 3.TEXTURISING

Definition and concept of texturising, classification and characteristics of textured yarns.

Methods of production of stretch(single heater) and modified stretch (double heater) yarns by conventional methods.

Edge crimping, Stuffer box crimping, Knit-de-knit, Gear Crimping, Chemical Texturising.

Draw Texturising concept, sequential and simultaneous draw texturising, Study of simultaneous draw texturising process. Draw Texturising Machine Details: -Machine profiles, Twisting devices, Heaters, Cooling devices, Coning oil application, Process variables, Defects in draw textured yarns. Quality of draw textured yarns, technological developments in draw-texturising technology. Double density machine and multiple input shaft machines

Unit 4.Air Jet Texturising:- Principle of loops formation, Air-jet texturising machine, air- jets, wetting systems, stabilizing devices, process variables in air texturising, Quality of air textured yarns, blending of filaments in air texturising.

Unit 5. UNCONVENTIONAL SPINNING TECHNOLOGIES

Air Jet Spinning:-

Basic concept, evoluation of air jet spinning.

Raw material requirement, stages involved, operating principle of air jet spinning.

Principles of MJS, MTS and MVS.

Specifications and working of different air jet spinning systems.

Yarn properties, process variables, limitations.

Friction Spinning:-

Operating principle and raw material requirements, stages involved in friction spinning.

Working principle of different friction spinning systems.

Development in various stages of friction spinning.

Yarn properties, application, process variables.

Unit 6. UNCONVENTIONAL SPINNING TECHNOLOGIES

Introduction to cover spinning, SIRO spinning, Self- twist spinning, Twist less spinning.

Raw material requirements, operating principles and yarn properties produced from these spinning systems.

Advantages and limitations of these spinning systems.

List of Experiments

- 1. Demonstration of process flow charts for various fibre blending systems
- 2. Study of process parameters in blend spinning.
- 3. Study of Air jet spinning machine.
- 4. Demonstration of blended yarn production on preparatory machine
- 5. Processing of any Blend on cotton system
- 6. Study of Draw texturing machine.
- 7. Study of effect of process parameters on quality of draw textured yarn.
- 8. Study of Air texturing machine.
- 9. Study of effect of process parameters on quality of air textured yarns.
- 10. Study of siro spinning.
- 11. Study of effect of process parameters on air jet spun yarns.
- 12. Visit to the Blend Spinning plant.

Reference Books

- 1. Yarn Texturing Technology by J.W.S. Hearle, L. Hollick, D.K. Wilson Woodhead Publishing Ltd, England.
- 2. K R Salhotra , "Spinning of manmade fibres and blends on cotton systems", The textile Association, India 2004.
- V.B.Gupta and V.K.Kothari (Ed), Man-made Fibres Production, Processing Structure, Properties and Applications, Vol. I and II, Dept. of Textile Technology, IIT, New Delhi 1988
- Hamburger, W. J., "The Industrial Application of the Stress-Strain Relationship", J. Textile Inst. 40, 700 (July 1949).
- The Textile Institute Manual of Textile Technology Short staple spinning Series Vol.V – New Spinning System by W. Klein.
- Textile progress vol. 10 No.2 The Production and properties of staple fibre, Yarns made by Recently developed Techniques by L. Hunter.

Course Outcomes

- 1. Demonstrate the manufacturing process and characteristics of Blended Yarns
- 2. Explain the methods, characteristics and need of textured yarns.
- 3. Describe different unconventional spinning technologies.
- 4. State machines and accessories involved in above processes.

THIRD YEAR B. TEXT. - SEMESTER-I 5.3 FABRIC MANUFACTURING MACHINERY- V (TPE)

Lectures	:	4 Hrs / Week
Practicals	:	2 Hrs / Week
Theory Paper	:	100 Marks
Term Work	:	50 Marks
Subject Total	:	150 Marks

Course Objectives

- 1 To explain the construction and working of Circular weft knitting machine
- 2. To explain the construction and working of Flat knitting machine
- 3. To explain the construction and working of Warp knitting machine
- 4. To understand the structure and calculation of knitting

1. Basics of Knitting

Types of knitted fabrics, their applications, properties and basic structure of warp and weft knitting. Terms and definitions used in knitting. Comparison of knitting with woven fabric with respect to production and properties. Concept of hand knitting. Evolution of knitting from hand to machine knitting. Concept of flat and circular knitting.

2. Circular Weft Knitting

- a. Knitting cycle and basic elements of knitting. Essential elements of knitting machine – yarn supply arrangement, loop forming arrangement and fabric take down mechanism.
- b. Passage of yarn through circular weft knitting machine. Study of elements of knitting machines such as :
- 1. Creel Construction, types, capacity and their suitability.
- Yarn feeding Need, construction, drive, types of positive and negative feeders, stop motions, indicators, tensioners etc.
- Loop forming mechanism Knitting cycle, types of needles and their comparison. Study of essential elements of loop forming such as cylinder, sinker, cam, dial, yarn guide.
- 4. Take down motion Spreader, Nip roller, cloth roller, Drive mechanism and its types, cloth roller capacity. Machine and material monitoring systems.

3. Weft Knit – Structure and Calculations

- a. Principle stitches such as knit, Tuck, miss and their representation and their effect on fabric properties.
- b. Types and properties of knitted fabrics such as single jersey, double jersey (interlock, Rib and purl). Manufacturing process of these fabrics. Conditions for the use of delayed and synchronized timings.
- c. Fabric analysis method, representation of design, Needle order, Cam order. Basic designs and the derivatives (1. Single Jersey – cross - miss, Lapique, longitudinal tuck stripes, plain pique. 2. Rib – Milano, half Milano, cardigan, half cardigan, double cardigan, Swiss and French double pique. 3. Interlock- Interlock Pique, Texi pique, Pin tuck, Interlock Super Roma, Bourrelet).
- d. Concept of colour Jacquard structures.
- e. Weft Knitted Fabric Calculations

4. Flat Knitting Technology

- a. Basic elements and their functions of flat knitting machine. Hand and machine operated flat knitting machines and their knitting actions.
- b. Machine operation for various stitches such as Miss, Tuck, Transfer, Drop Stitch.
- c. Design with and without needle selection, bed racking, new formed and transfer loop for hand and power operated machines.

5. Warp Knitting Technology

Introduction :

Structure, properties and applications of warp knitting. Knitting cycle and basic elements of warp knitting, Essential elements of warp knitting machine like: yarn supply, loop forming and fabric take down mechanism. Warp preparation for warp knitting.

Warp Knitting Machine:

- a. Passage of yarn through warp knitting machine.
- b. Essential elements of warp knitting machine such as yarn supply arrangement, loop forming mechanism and fabric take down mechanism.
- c. Knitting cycle of Tricot and Raschel warp knitting machine.

6. Warp Knitting – Structure and Calculation

Warp Knitted Fabric Structure: Study and representation of single, two guide-bar and multi guide-bar (Tricot, Raschel) structures.

Warp Knitting machine production and Fabric Calculations.

List of Experiments:-

- 1. Study of single jersey circular weft knitting machine yarn supply arrangements, loop forming mechanism, takedown motion, Production calculation.
- Study of double jersey circular weft knitting machine yarn supply arrangements, loop forming mechanism, takedown motion, Production calculation.
- Study of warp knitting machine yarn supply arrangements, loop forming mechanism, takedown motion, Production calculation.
- Study of flat knitting machine yarn supply arrangements, loop forming mechanism, takedown motion, Production calculation.
- 5. Design setting on single jersey circular weft knitting machine- Machine operation, cam and needle arrangements, yarn feeding and take down setting.
- Design setting on Double jersey circular weft knitting machine- Machine operation, cam and needle arrangements, yarn feeding and take down setting.
- 7. Design setting on warp knitting machine- Machine operation, pattern chain and guide arrangements, yarn feeding and take down setting.
- 8. Knitted fabric analysis.
- 9. Knitted fabric analysis.
- 10. Knitted fabric analysis.
- 11. Visit to knitting unit.
- 12. Study of needle loom technology and production of fabric on it
- 13. Study of Braiding machine and production of fabric on it.
- 14. Visit to circular loom unit.
- 15. Operating the circular knitting machine
- 16. Operating hand knitting and motor operated flat knitting machine

Reference Books

- 1. Knitting Technology by Prof. D.B. Ajgaonkar.
- 2. Circular Knitting by Dr. Chandrashekhar lyer.
- 3. Knitting Technology by Mr. D. Spenser.
- 4. Warp Knitting by Dr. S. Raz.
- 5. Flat Knitting by Dr. S. Raz.

Course Outcome

Student will be able to:

- 1. Understand the construction and working of Circular weft knitting machines
- 2. Understand the construction and working of Flat knitting machines
- 3. Understand the construction and working of Warp knitting machines
- 4. Understand the fabric structure and calculation of knitted fabric.

THIRD YEAR B. TEXT. – SEMESTER – I

5.4 PHYSICAL TESTING OF TEXTILE-II (TPE)

Lectures	:	3 Hours/Week
Practical	:	2 Hours/Week
Theory Paper	:	100 Marks
Practical Exam	:	50 Marks
Subject Total	:	150Marks

Course Objectives

- 1. To explicate significance of yarn and fabric properties.
- 2. To highlight factors affecting yarn and fabric properties.
- 3. To describe principle and testing methodology of yarn.
- 4. To explain principle and testing methodology of fabric.

1. Yarn number and twist:

A) Yarn number: Concept, direct and indirect systems, measurement of yarn number-Knowles balance, Stubbs balance, Beesley balance, quadrant balance.
B) Twist: Terms and definitions, function of twist in yarn structure, effect of twist on yarn and fabric properties, measurement of twist in single and double yarns–straightened fibre method, twist contraction method, twist to break method, optical method, twist take up method.

2. Evenness of yarn:

Concept, classification of irregularity, causes of irregularity, measures of irregularity, basic irregularity, index of irregularity. Addition of irregularity, measurement of yarn irregularity - visual examination, cutting & weighing method, electronic capacitance principle, analysis of irregularity– variance-length curves, spectrogram, importance of yarn uniformity. Imperfections – concept, causes and importance.

Seldom occurring faults: classification of faults and its causes. Principle& working of Classimat tester. Hairiness in spun yarn - concept, causes, remedies&measurement of hairiness- photoelectric method.

3. Strength Testing:

Terms and Definitions, Effect of fibre properties on the yarn strength, factors affecting the tensile properties of textiles, single yarn strength - The pendulum lever principle, Strain gauge transducer principle, machines working on these principles, interpretation of test results.

Lea Strength - The lea CSP or Break factor & its significance – description of lea strength tester, comparison of lea & single yarn test results, Ballistic test & its importance.

Fabric Strength – Importance of fabric strength test, sampling of fabric, Tensile strength testing – cut strip method, ravelled strip method, grab test, comparison of strip test & grab test, tear strength, bursting strength.

4. Thickness, Cover and Serviceability of fabric:

A) Thickness – definition, significance, fabric thickness by Shirley method.

B) Cover factor – definition, derivation of cover factor, significance.

C) Serviceability and wear– Concept, factors affecting abrasion resistance, assessment of abrasion damage, BFT abrasion testing machine, Martindale abrasion tester. Pilling of fabrics: Concept, mechanism of pilling, factors affecting fabric pilling, ICI pill box tester.

5. Aesthetic& Tactile Comfort of Fabric:

A) Fabric stiffness &drape: Concept, importance of stiffness and drape, measurement of stiffness: Shirley stiffness tester (cantilever principle), heart loop test, measurement of drape by drape meter, factors affecting stiffness and drape.
B) Crease resistance & crease recovery: Concept, measurement of crease recovery, factors affecting crease recovery.

6. Transport Properties:

A) Air permeability - Concept, importance, Shirley air permeability tester, factors affecting air permeability.

B) Water fabric relations -Concept, importance, mechanics of wetting, wetting time test, spray test, drop penetration test, Bundesmann test, water head test.

List of Experiments

- 1. Determination of yarn linear density
- 2. Determination of twist in single yarn
- 3. Determination of twist in double yarn
- 4. Determination of single yarn strength
- 5. Determination of yarn lea strength
- 6. Evaluation of yarn unevenness by capacitance principle and visual examination
- 7. Determination of fabric strip strength
- 8. Determination of tearing strength of fabric
- 9. Assessment of abrasion resistance of fabric
- 10. Evaluation of stiffness of fabric
- 11. Estimation of crease recovery angle
- 12. Estimation of drapability of fabric

Reference Books

- 1. Principles of Textile Testing by J. E. Booth.
- 2. Physical properties of Textile Fibres by J. W. S. Morton & Hearle.
- 3. Textile Testing by Skinkle.
- 4. Handbook of Indian Standards.
- 5. Quality control and Testing by V. K. Kothari.
- 6. Fabric Testing by Jinlian Hu.
- 7. Textile Testing Fibre, Yarn and Fabric by Dr.ArindamBasu
- 8. Textile Fibres Yarns and Fabrics by E. R. Kaswell

Course Outcomes

- 1. Describe significance of yarn and fabric properties.
- 2. Explain factors affecting yarn and fabric properties.
- 3. Test yarn and interpret the results.
- 4. Test fabric and interpret the results.

THIRD YEAR B.TEXT. - SEM- I

5.5 ANALYSIS OF MECHANICAL ELEMENTS (TPE)

Lectures	:	3Hrs/week
Practical	:	2 Hrs/week
Theory Paper	:	100 marks
Termwork	:	50 marks
Subject Total	:	150 marks

Course Objectives

- 1. To study various types of stresses and strains in materials under different loading conditions.
- 2. Describe effect of stresses due to various types of loading in different sections and effect of stresses and strains in some textile components
- 3. Explain different stresses, strains, strain energy and strength of joints under different loading conditions.
- 4. Describe tensile, compressive, impact strength, hardness etc. of materials.

Course Contents

Unit 1.Simple Stresses and Strains-

a) Strength and elasticity of material, simple stresses, strains, behaviour of brittle and ductile material under tension. Relation between elastic constant, Poisson's ratio, volumetric strain, principle of complementary shear stress.

b) Strain energy and impact loading-

Concept of strain energy, strain energy in bending, stresses due to impact.

Unit 2.Shear Force and Bending Moment-

Shear force and bending moment for simply supported beams, overhanging beams, cantilevers with point loads and uniformly distributed loads. SFD and BMD.

Unit 3. Stresses in Beams -

a) Bending stress – Symmetric bending of beams, standard beam sections, built up sections, design problems. Study of bending in drafting roller.

b) Direct and bending stresses – Uniaxial bending, concept of biaxial bending, kern of section, chimneys subjected to wind pressure.

c) Distribution of shears stresses in beams of standard sections.

d) Torsion – Torsion of circular shafts, transmission of power through shafts. Power transmitted by shaft. Study of torsion in Textile m/c. shaft.

Unit 4.Welded Joints-

Analysis and design of welded joints for direct and eccentric loads.

Unit 5. Slope and Deflection of Beams-

Calculation of slope and deflection for simple beams with point loads and udl, Macaulay's method

Unit 6. Testing of Materials-

Material properties, tension, compression, shear, hardness, fatigue, endurance limit, Testing procedure.

Reference Books

- 1. Strength of Materials : Ramamrutham.
- 2. Elements of Strength of Materials : S.P.Timoshenko and D.H. Young
- 3. Mechanics of Structures : S.B. Junnarkar
- 4. Strength of Materials : Vazirani and Ratwani
- 5. Introduction to Machine Design: V. B. Bhandari
- 6. Strength of Materials : R. K. Bansal

List of Experiments

- 1. Tensile test on ductile material.
- 2. Compression test on ductile material.
- 3. Shear test.
- 4. Izod impact test.
- 5. Charpy impact test.
- 6. Rockwell hardness test.
- 7. Brinell hardness test.
- 8. Testing of Composite materials hardness.

Course Outcomes

- 1. Identify different stresses and strains under different loading conditions.
- 2. Calculate effect of stresses due to various ways of loading in different sections and effect of stresses and strains in some textile components.
- 3. Estimate stresses, strains, strain energy and strength of joints under different loading conditions.
- 4. Identify tensile, compressive, impact strength, hardness etc. of materials

THIRD YEAR B. TEXT. – SEMESTER – I

5.6 METALLURGY (TPE)

Lectures:3 Hours / WeekTheory Paper:100 MarksSubject Total :100 Marks

Course Objectives

- 1) To acquaint students with the basic concepts of Metal Structure
- 2) To impart fundamental knowledge of Ferrous and Non Ferrous Metal Processing
- 3) To study applications of different Metals and Alloys
- 4) To Know Fundamentals of Metallography and To develop futuristic insight into Metals

Course Contents

1. Metal and alloy System and Metallographic Testing

- 1) Metals, metallic bonds, Crystal structures (BCC,FCC, HCP),
- 2) Imperfections in crystals, point, line, planer and 3D defects,
- 3) Alloy formation by crystallization, nucleation and grain growth
- 4) solidification cooling curves, Allotropy, solid solution types,
- 5) Phase and phase rules, Structural constituents, lever arm principle.
- 6) Sampling, mounting, polishing, etching, microscopic examination.
- 7) Macro examination of Metals, spark test, sulphur printing

2. Powder Metallurgy and Material Selection

- 1) Powder metallurgy applications, advantages and limitations,
- 2) Powder preparation methods-mechanical, physical and chemical methods
- 3) Powder metallurgy stages-mixing/blending, compacting, sintering
- 4) Manufacturing techniques with flowcharts for electric contacts, oil impregnated Bearings, cemented carbide cutting tools, Friction materials, Sintered bushes.
- 5) Steel Specifications -IS, BS and ASTM standards, Selection of Materials based on applications in Textiles like Torsion bar, Seizer blade,
- Properties required and Material and process selection for knitting needles, spinning rings, Gears, machine frames, yarn guides, tools, magnets, bearings, cams etc.

3. Compositions and Properties of Non-Ferrous Alloys

- 1) Equilibrium diagrams of Cu-Zn, Al-Cu (Only Al rich portion)
- 2) Equilibrium diagrams of Cu-Be, Al-Si and its modification
- 3) Composition, Properties and Applications of Brasses, Bronzes
- 4) Composition, Properties and Applications of Bearing metals,
- 5) Composition, Properties and Applications of Aluminium alloys.
- Precipitation hardening Requirements, Principle of age hardening, solutionzing, Aging, over-aging
- G. P. Zone theory, dispersion hardening, Effect of variables Composition, , Aging Time and Temperature, Important applications: Al+4.5%Cu, Cu + 2%Be, 17 – 7pH Alloy.

4. Basicof Equilibrium Diagrams

- 1) construction of equilibrium diagrams from cooling curves,
- 2) Solid solution type and eutectic, Off eutectic diagrams,
- 3) Introductory information with diagrams and common alloys on it.
- 4) Eutectoid, Peritectic Diagram and common alloys.

5. Compositions and Properties of Ferrous Alloys

- 1) construction of Iron –carbon equilibrium diagram
- 2) Details of phases in Iron –carbon equilibrium diagram and reactions
- 3) Classification of Plain carbon steel and Alloy steels
- 4) Classification of Stainless steels, tool steel
- 5) Composition, Properties and Applications of steels
- 6) Classification and Compositions of Cast Irons
- 7) Properties and Applications of Cast Irons: Grey, white, Malleable, SG iron

6. Principles and processes of Heat Treatment

- 1) Introduction to phase transformation- pearlite to austenite,
- 2) phase transformation Austenite to Pearlite, bainite, martensite
- 3) TTT Diagrams construction and significance, CCT diagrams
- 4) Heat Treatment processes,
- 5) Annealing processes and Normalizing,
- 6) Hardening and Tampering-types, structural transformations,

- 7) Surface hardening-flame, induction,
- 8) Case hardening -carburizing, Nitriding, cyaniding
- 9) Heat treatment furnaces, defects and remedies

Text Books

- 1) Physical Metallurgy- Vijendra Singh, Standard publishers, Delhi.
- 2) Material Science and Metallurgy Dr.V.D. Kodgire.
- 3) Introduction to Physical Metallurgy Avner

Reference Books

- 1) Metallurgy for Engineers Clerk and Varney
- 2) Engineering Metallurgy Vol.1 and 2 Higgins
- 3) Powder metallurgy-Dr A.K.sinha.
- 4) Metallurgy for Engineering technicians Rollson
- 5) Heat treatment principles and practices-T.V.Rajan and C.P.Sharma.
- 6) Mechanical metallurgy G.E.Diater, Tata McGraw-hill, New Delhi.
- 7) Material science and Metallurgy, C. Daniel Yesudin&others, Scitech Publication
- 8) Material Science And Engineering by W.D.Callister , Wiley (India) Edition

Course Outcomes

- 1. Understand basic concept of metal structure
- 2. Apply fundamental knowledge of Ferrous and Non Ferrous Metal
- 3. Selection of Metals and Alloys for different application
- 4. Analyze various heat treatment processes

THIRD YEAR B. TEXT. – SEMESTER – I

5.2 TECHNOLOGY OF DYEING – I (TC)

Lectures	:	3 Hours / Week
Practical	:	3 Hours / Week
Theory Paper	:	100 Marks
Term Work	:	25 Marks
Practical Examination	:	50 Marks
Subject Total	:	175 Marks

Course Objectives

- 1. To discuss effect of pre-treatment's on dyeing natural fibres and working of various dyeing equipment's.
- 2. To explain application methods of direct and reactive dyes and various after treatments for dyed goods.
- 3. To examine define fundamental principles of vat and sulphur dyes and their methods of application.
- 4. To express methods of application of dyes used for natural animal fibres.

1. Preparation of natural fibres for dyeing

General theory of cellulosic and protein fibres structures; Effect of different pretreatments like Scouring, Mercerization, Bleaching, Degumming etc. on dyeing; Quality parameters required for fabric to be dyed, study of dyeing machinery such as Jiggers, Winches, Package dyeing machine, Continuous dyeing machine. Recent developments in dyeing machines

2. Dyeing with Direct and Reactive Dyes

General principles of application of Direct Dyes; Parameter affecting dye absorption and levelling; Application properties of direct dyes; Batch wise application of direct dyes; Semi and fully continuous dyeing process for direct dyes; After treatments, effect of finishing treatments on hue and fastness Problems and remedies in dyeing cotton, viscose, and their blends with direct dyes

Reactive Systems, Batch wise dyeing methods, Semi and fully continuous dyeing methods, washing off and after treatments; Stripping of goods dyed with reactive dyes, fastness problems

3. Dyeing with water insoluble Dyes

Fundamental Principles of Dyes and their classification Auxiliaries, Vatting, properties of Leuco vat dyes, Dyeing, Fundamental processes, Batch wise, semi continuous and continuous dyeing process. Dyeing of Loose stock, Yarn packages, Hank, Woven Fabric, Knit goods, Dyeing with Indigo, Correction of faulty dyeings. Classification and different commercial forms of sulphur dyes. Different Auxiliaries like reducing agents, anti oxidants, Sequestering agent, wetting agents and oxidizing agents. Different application methods for yarn and fabrics. Batch wise and continuous dyeing methods, problems and remedies in dyeing of cotton with sulphur dyes

4. Dyeing with ingrain dyes

Chemical constitution, Treatment with napthols, Intermediate treatments, Development, After treatments, Dyeing of yarn and fabric with batch, semi continuous and continuous processes, stripping of azoic dyeings.

Application of mineral Khaki and phthalogen blue on cellulose. Dyeing with pigment colours with batch and continuous methods

5. Dyeing of wool and silk

Classification of acid dyes with mechanism; Factors affecting the acid dyeing of protein fibres; Principles of application of acid dyes to protein fibres; Dyeing of wool and silk

Mechanism of dyeing; Dyeing assistants; Application of Basic dyes to silk in different characterized bath; Dyeing of wool with basic dyes; Application of Basic dyes to cellulose materials. Stripping of basic dyes; Problems and remedies in dyeing.

6. Dyeing with Natural Dyes

Classification of natural dyes, sources, and different methods of application of natural dyes

List of Experiments

- 1. Dyeing of the cotton fabric with direct dyes in OBBD machine
- 2. Different after treatments on direct dyed fabric
- 3. Dyeing of cotton yarn with HE brand reactive dyes in package dyeing machine
- 4. Dyeing of the cotton fabric with cold brand reactive dyes in jigger dyeing machine
- 5. Dyeing cotton knit goods with reactive dyes on a soft flow dyeing machine
- 6. Dyeing of cotton fabric with different padding methods like cold pad batch, pad bake and pad steam
- 7. Dyeing of cotton yarn with vat dyes in package dyeing machine
- 8. Dyeing of cotton with azoic colours
- 9. Dyeing of cotton knits in winch with sulphur dye
- 10. Dyeing of wool and silk with Basic Dye
- 11. Dyeing of wool and silk with Acid Dye
- 12. Dyeing of cotton with Mineral Khaki

Reference Books

- 1. Dyeing and chemical Technology of Textile Fibres by E. R. T. Trotman
- 2. The dyeing of cellulose fibres by Clifford Pireston
- 3. Textile processing and properties by T. L. Vigo
- 4. Chemical technology of fibres materials by F. Sadav
- 5. Silk Dyeing printing and finishing by Prof. M. L. Gulrajani
- 6. Technology of Dyeing by Dr. V. A. Shenai.

Course Outcomes

- 1. Ability to design suitable pre-treatments for level dyeing
- 2. Ability to dye cellulosic materials with direct, reactive dyes and azoic colours to improve the fastness properties of dyed material
- Ability to apply vat dyes on cellulosic materials with different class of vat dyes and sulphur dyes with various dyeing techniques and to correct faulty dyeing
- 4. Classify dyes used for cellulose and animal fibres with different application techniques.

THIRD YEAR B. TEXT - SEMESTER - I

5.3 TECHNOLOGY OF PRINTING – I (TC)

Lectures	:	3 Hours / Week
Practical	:	3 Hours / Week
Theory Paper	:	100 Marks
Term Work	:	25 Marks
Practical Examir	ation:	50 Marks
Subject Total	:	175 Marks

Course Objectives

- 1. To understand concept of printing, various methods and styles of printing; To describe working of table screen printing process.
- 2. To describe working of flat bed screen printing machine and rotary screen printing machine.
- 3. To understand recent developments in flat bed and rotary screen printing machines; To describe inkjet printing technology.
- To understand role of print paste ingredients; To formulate print paste recipes for printing cotton using direct and reactive dyes by various styles; To explain pigment printing process.

1. Introduction

Historical background of printing of textiles, Preparation of cotton fabric for printing; General: Styles of Printing, Methods of Printing, Fixation of printed textiles

2. Printing ingredients

Printing paste ingredients and their functions, different types of thickeners and their chemistry

3. Printing with direct, reactive dyes

Print paste ingredients for Direct and Discharge style of printing using Direct and Reactive dyes on cotton

Printing with Pigments:Pigments and their classification, Print paste ingredients and printing operation

4. Printing machinery

Tabe, Flat Bed and Rotary Screen Printing machines – Technical features and various parts of individual machine like fabric feeding, gluing, screens and their exposing techniques, squeeze and their types – fabric drying

5. Printing operation

Printing operation on each machine; Faults in printing using these machines, their reasons and remedies

6. Recent Advancements

Recent developments in flat bed and rotary screen printing machinelnkjet / Digital Printing: Basic principles, mechanism of printing, requirement of ink

List of Experiments:

- 1. Tie and dye style of printing
- 2. Batik Style of printing
- 3. Direct style of printing with direct dye
- 4. Discharge style of printing on direct dyed ground.
- 5. Direct style of printing with reactive dyes by using various fixation methods
- 6. Direct style of printing with reactive dyes by using various thickeners
- 7. Discharge and resist style of printing on reactive dyed ground
- 8. Direct style of printing with pigments
- 9. Direct style of printing with pigments by using various thickeners
- 10. Direct style of printing with azoics
- 11. Development of table printing screens
- 12. Visit to printing units.

Reference Books

- 1. Textile Printing by L.W.C. Miles.
- 2. An Introduction to Textile Printing by W. Clarke.
- 3. Technology of Printing by Dr.V.A. Shenai
- 4. Book of Papers, QIP Summer School on "Advances in Textile Chemical Processing: Edited by Dr. R.B. Chavan.
- 5. Textile Printing Book of papers by Prof. R.B. Chavan.

- 6. Processing of silk by Prof. M.L. Gulrajani.
- 7. Proceedings: Recent advances in Textile Processing lectures/seminer, Dec.1982, I.I.T., Delhi.
- 8. Colourage, ITB International bulletin on dyeing printing and finishing.

Course Outcomes

- 1. Describe concept of printing, various methods and styles of printing. Illustrate working of table screen printing process.
- 2. Describe working of flat bed screen printing machine and rotary screen printing machine.
- Explain recent developments in flat bed and rotary screen printing machines; Describe inkjet printing technology.
- Explain role of print paste ingredients and formulate print paste recipes for printing cotton using direct and reactive dyes by various styles; Explain pigment printing process.

	THIRD YEAR B.	TEXT.	- SEMESTER -	- 1
5.4	TECHNOLOGY	OF F	INISHING –I	(TC)
	Lectures	:	3 Hours / Wee	k
	Practical	:	2 Hours / Wee	k
	Theory Paper	:	100 Marks	
	Term Work	:	25 Marks	
	Subject Total	:	125 Marks	

Course Objectives

- 1. To discuss the objects of finishing & classify various finishes given to variety of fabrics.
- To discuss the principle, features of machinery used in finishing department & to understand the importance of various parameters affecting the performance of functional finish like resin, flame retardant finish, antimicrobial finish etc.
- 3. To discuss the chemistry & practical application technique of resin finish, antimicrobial finish, flame retardant finish, soft finish and alike.
- 4. To understand the role of functional finishes in finishing of fabrics & to describe finishing processes used for animal & bast fabrics.

1. Introduction to Finishing and Finishing Machinery

Object of finishing, Importance of textile finishing, classification of finishing, process sequence of finishing of cotton, Wool and silk fabrics, concept and working of machinery like Calendering, Decatising, Raising, Sueding, felting, Sanforising, Stenter, Aero finishing.

2. Resin Finishing

Mechanism of creasing and resin finishing, Types of resin finishing, concept of Anticrease, wash-n-wear and Durable Press, Role of catalysts in resin finishing, Classification of resins and catalysts, Concept of deferred cure and post cure. Limitations of resin finishing, Causes of strength loss of resin finished fabric. Various approaches towards reducing the strength loss of resin finished goods. Mechanism of chlorine retention, Mechanism of formaldehyde release, various methods to reduce formaldehyde release. Eco-friendly cross linking agents, Low and ultra low

formaldehyde resins. Resin finishing formulations for 100% Cotton garments, 100% cotton shirting, 100% cotton suiting, Evaluation of Resin Finishing.

3. Flame Retardant Finishes

Concept of flameproof and flame retardancy. Limiting oxygen Index and its importance, Thermal behaviour of textile fibres. Concept of solid phase and Gas phase flame retardant. Classification of flame-retardants. Mechanism of the mode of action of flame retardant. Factors affecting flame retardancy. Essential requirements of a good flame retardant. Various flame retardant finishes for cotton, wool, silk, polyester and nylon, Evaluation of flame retardant finish.

4. Antimicrobial Finishes

Object, requirements, types of antimicrobial finishing. Mechanism of antimicrobial finishing. Desirable properties of a good antimicrobial finishes, various antimicrobial finishes for cotton, wool, silk. Mildew-proof and rot proof finishing, Evaluation of antimicrobial finishes.

5. Softeners and Hand Builders

Desirable properties and various classes of softeners, Properties, mode of action and application of cationic, anionic, Non-ionic, reactive and emulsion type softeners. Softeners for cotton, wool, silk, jute, polyester and acrylic. Comparison of various softeners, Classification of stiffeners, examples and their application.

6. Finishing of Animal Fibre and Bast Fibres

Weighting of silk, various mechanical and chemical finishes for silk and wool, Mechanism of setting of wool, concept of wet setting of wool, woollenisation of Jute, Various finishes for Jute and Linen. Waterproof and water repellent finishing, Bio polishing, Finishing recipes for various sorts of cotton & blended textiles, Problems and remedies in finishing.

List of Experiments

- 1. Application of OBA on cellulosic by continuous and exhaust method.
- 2. Preparation and application of Blue Tone and Red Tone on cellulosic.
- 3. Finishing of cotton for imparting soft, medium and stiff handle.

- 4. Resin finishing of cotton.
- 5. Application and evaluation of flame retardant finishing on cotton
- 6. Application and evaluation of antimicrobial finish on cotton.
- 7. Application and evaluation of various types of softeners on cotton.
- 8. Finishing of wool to impart mothproofing.
- 9. Finishing of Silk to impart crease recovery property, soil release and softness.
- 10. Finishing of Jute.
- 11. Application and evaluation of waterproof / Water repellent Finishing on cotton.
- 12. Bio polishing of cotton.

Reference Books

- 1. Chemical Finishing of Textiles by W. D. Schindler and P. J. Hauser
- 2. Textile Finishing by A.J. Hall.
- 3. Introduction to textile finishing by J.T. Marsh.
- 4. Technology of finishing Vol. X by Dr. V.A. Shenai.
- 5. Silk dyeing, printing and finishing by Prof. M.L. Gulrajani.
- 6. Handbook of textile finishing machinery by R. S. Bhagwat.
- 7. Finishing, reference book of textile technologies by ACIMIT
- 8. Textile finishing by Heywood, SDC Publications

Course Outcomes

- 1. Understand the objects of finishing & select the finishing process sequence according to the type of fabric and end use.
- 2. Understand working of finishing machines
- 3. Processing of various fibre fabrics with different types of finishes and choose the ingredients for the same.
- 4. Analyze problems with their remedies in finishing of textiles and evaluate the performance of finishes applied on various substrates.

THIRD YEAR B. TEXT. – SEMESTER – I

5.5 CHEMICAL ENGINEERING OPERATIONS (TC)

Lectures : 3 Hours / Week Theory Paper: 100 Marks Subject Total : 100 Marks

Course Objectives

- 1. To describe the objectives of chemical engineering operations and various unit operations.
- 2. To explain the concept of various type of drying and calculate various attributes on drying size reduction and respective equipment.
- 3. To compare various methods of mechanical separation and mixing and. pros and cons of various types of membrane based separation techniques and their field of application.
- 4. To illustrate various types of filtration techniques.

1. Unit operations

Introduction to the chemical engineering. Definition and classification of mass transfer operations. Definition and classification of diffusion. Fick's law of diffusion. The concepts of diffusion rate, diffusion co-efficient and diffusivities. Relevance of mass transfer studies to textiles.

Introduction. Difference between unit operations and unit processes. Study of different unit operations of chemical engineering like distillation, extraction, absorption, adsorption, evaporation, crystallization with respect to their concept, principle of separation, types, performance analysis and applications from textile industry view point.

2. Drying

Introduction, concept of drying. Definition, principle and purposes of drying. Concept of simultaneous heat and mass transfer operations. Equilibrium relationship, rate of drying. Heat and mass balance of drying operation. Heat capacities of textile materials. Theory of drying. Relevance of drying to textile industry. Principle and operation of various textile dryers like drum dryer, tumble dryer, stenters, study of new drying techniques like IR, RF drying. Numericals based on above.

3. Size Reduction

Brief introduction to mechanical operations. Definition of size reduction operations, classification of size reduction equipments. Concept of crushing efficiency and work index. Laws of crushing and grinding. Applications of the size reduction operations .Principle and operation of a ball mill.

4. Mechanical separation and mixing

Importance of the screening of size reduced materials. Concept of particle size, particulate matter. Introduction to sieve analysis. Screen efficiency, screen effectiveness. Simple numerical based on above. Brief study of mixing operation. Need of liquid mixing in textiles. Brief study of mixing performance analysis. Classification of mixing equipments.

5. Filtration

Introduction to filtration operation. Concept of filter media, filter aids, various types of filters used in textiles, advantages and uses of filtration operation. Applications of filtration operation to textiles. Working principle of filtration equipments. Simple numericals based on rate of filtration. Definition and need of settling processes. Types and applications of settling process in reference to textile processing industry.

6. Membrane separation techniques

Introduction, types of membranes, Merits and demerits of these operations over the conventional mass-transfer operations. Principle of operation, separation size range, rate expressions and applications of the membrane technologies like reverse osmosis, dialysis, electro-dialysis, ultra-filtration, micro filtration.

List of References

- 1. 'Mass Transfer Operations' by Treybal, McGraw-Hill publication. (1955)
- 'Introduction to Chemical Engineering', by Badger and Banchero, McGraw Hill publication (1955)
- Transport Phenomena by Beek and Muttzall, Byron Bird R., Wiley publication. (1975).

- 4. 'Theory of Coloration of Textiles' by Bird and Boston, Dyers Company Publications Trust, (1975).
- 5. The Physical Chemistry of Dyeing, Volume-III, by R.H. Peters, Elsevier publication (1975).
- 6. 'Chemical Engineers' Handbook, by Perry, McGraw-Hill publication.
- 7. 'Unit Operations in Environmental Engineering' by R. Elangovan, M. K. Saseetharan, New Age International (P) Ltd., Publishers.
- 'Coulson and Richardson's Chemical Engineering' Volumes 1-6, Asian Books Pvt Ltd.

Course Outcomes

- 1. Illustrate basic objectives of chemical engineering operations and various unit operations in chemical engineering.
- 2. Interpret the concept of various type of drying and their attributes and Discriminate various types and methods of size reduction
- Distinguish various methods of mechanical separation and mixing Compute various types of membrane based separation techniques and their field of application.
- 4. Summarize various types of filtration techniques and their applications.

THIRD YEAR B. TEXT. – SEMESTER – I

5.6 PHYSICAL PROPERTIES OF TEXTILE FIBRES (TC)

Lectures	:	3 Hours / Week
Practical	:	2 Hours / Week
Theory Paper	:	100 Marks
Term Work	:	25 Marks
Subject Total	:	125Marks

Course Objectives

- 1. To describe fibre structure.
- 2. To explain significance of mechanical properties of fibres.
- 3. To explain significance and measurement of moisture in textiles.
- 4. To deliberate importance and measurement of thermal and electrical properties.

1. Fibre structure:

Requirements of fibre formation, molecular weight and molecular weight distribution, degree of polymerization- useful limits of polymerization, crystalline and amorphous regions, morphological models - one phase, two phase, three phase models, morphology of cotton, viscose, jute, acetate, wool, silk, nylon 6, nylon 66, polyester, acrylic, polypropylene fibre.

2. Longitudinal and Transverse dimensions:

A) Fibre Length: Concept, technical significance of fibre length, staple length of cotton, length- frequency diagrams, length measurement - oil plate method, comb sorter method, scanning method - digital fibrograph.

B) Fibre Fineness and Maturity: Concept, measures and technical significance of fineness, measurement of fineness - microscopic method, gravimetric method, airflow method - Sheffield micronaire, vibroscope method. Concept, measures and technical significance of maturity, measurement of maturity - caustic soda method, polarized light method, differential dyeing method.
3. Mechanical properties of fibres:

A) Tensile properties: Terms and definitions, stress-strain curve, importance of tensile properties, factors influencing tensile properties of fibres, types of loading, measurement– strain gauge transducer principle, pendulum lever principle.

B) Elastic recovery: Terms and definitions, effects of test conditions on elastic recovery of fibres, recovery properties of different fibres, mechanical conditioning of fibre, swelling recovery.

4. Thermal properties:

Thermal properties: Specific heat capacity, thermal conductivity, structural changes in fibres on heating, transitions in fibre- first and second order transition, degradation and decomposition, thermal expansion of fibre, heat setting of fibre, principle and working of DSC, DTA, DMA.

5. Electrical properties:

Electrical properties: Static electricity- causes and consequences in textiles, measurement of static electricity, electric resistance, specific resistance, measurement of resistance, factors influencing the electrical resistance of fibres.

6. Moisture relations in textiles:

Terms and definitions, effect of moisture on textiles, regain–humidity relationships, factors affecting moisture regain, measurement of atmospheric conditions, dry and wet bulb hygrometer, hair hygrometer, electrolytic hygrometer, measurement of regain– oven dry method, methods based on resistance and capacitance principle.

List of Experiments

- 1. Study of norms for fibre testing.
- 2. Fibre length by using grease plate method.
- 3. Comb sorter method for estimation of fibre length parameters.
- 4. Fibre fineness by cut-weight method.
- 5. Measurement of fibre fineness and maturity by airflow instrument.
- 6. Fibre maturity measurement by caustic soda method.
- 7. Study of fibre parameters on AFIS.
- 8. Measurement of moisture by oven dry method and Shirley moisture meter.

- 9. Determination of convolutions and ribbon width of cotton fibres.
- 10. Study of shrinkage behaviour of filament yarn.
- 11. Measurement of tensile strength of filament.
- 12. Measurement of torsional rigidity of fibre.

Reference Books

- 1. Physical properties of fibres, Morton and Hearle.
- 2. Physical testing of textiles by B. P. Saville
- 3. Fibre science by S. P. Mishra
- 4. Fibre Science Steven B. Warner
- 5. Physical testing of textiles by J.E. Booth.
- 6. Textile testing fibre, yarn & fabric by Dr.ArindamBasu

Course Outcomes

- 1. Describe fibre structure
- 2. Evaluate the mechanical properties of fibres
- 3. Apply moisture relations in textiles
- 4. Measure thermal and electrical properties of fibres

THIRD YEAR B. TEXT. - SEMESTER - I

5.1 INTELLECTUAL PROPERTY RIGHTS

(FT)

Lectures	:	3 Hours / Week
Theory Paper	:	100 Marks
Subject Total	:	100 Marks

Course Objectives:

- 1. To explain concept of IPR and its implementation.
- 2. To explain terms in IPR through case studies and their usage.
- 3. To explain IPR provisions in GATT and WTO.
- 4. To explain IPR implementation in cyber world.

1. Introduction

Invention and Creativity - Intellectual Property (IP) – need and Importance -Protection of IPR - Basic types of property (i. Movable Property ii. Immovable Property and iii. Intellectual Property).

2. IP Tools

Patents, Copyrights and related rights, Trade Marks and rights arising from Trademark registration, Trade secret, Industrial Designs and Integrated circuits -Protection of Geographical Indications at national and International levels -Application Procedures. Basics of Traditional Knowledge.

3. IP Transactions

Licensing, Franchising and Merchandising. Three routes for protection- PCT, Madrid, Hague.

4. International Convention Relating to Intellectual Property

Establishment of WIPO - Mission and Activities - History - General Agreement on Trade and Tariff (GATT). Indian Position Vs WTO and Strategies - Indian IPR legislations - commitments to WTO-Patent Ordinance and the Bill - Draft of a national Intellectual Property Policy - Present against unfair competition.

5. Cyber Intellectual Property

Introduction and overview of Cyber Intellectual Property; Intellectual property and cyberspace; Emergence of cybercrime ; Grant in software patent and Copyright in software; Software piracy; Trademarks issues related to Internet (Domain name); Data protection in cyberspace; E-commerce and E-contract; Salient features of Information Technology Act; IPR provisions in IT Act; Internet policy of Government of India. unfair competition.

6. Case Studies

Case Studies on - Patents - Copyright and related rights - Trade Marks - Industrial design and Integrated circuits - Geographic indications - Protection against unfair competition.

Reference Books:-

- Intellectual Property Rights by S.R.A. Rosedar, LexisNexis Publication , ISBN 978-9351432463.
- 2. Intellectual Property Rights by Neeraj Pandey & Khushdeep Dharni, Prentice-Hall of India Pvt.Ltd publication, ISBN 978-8120349896.
- Intellectual Property: The Law of Trademarks, Copyrights, Patents, and Trade secrete by Deborah E. Bouchoux ,4th edition, maxwel publication ISBN 978-8131528976.
- 4. Intellectual property rights: unleashing the knowledge economy by Prabuddha Ganguli, McGraw Hill Education publication, ISBN 978-0070077171.
- 5. Intellectual Property Rights in India: General Issues and Implications by Prankrishna Pal, Deep Publications, ISBN- 978-8189915872.
- 6. Intellectual Property: Patents, Copyrights, Trademarks & Allied Rights by William Cornish, 8th edition, Maxwel publication, ISBN-978-0414025592.

Course Outcomes:

- 1. To understand concept of IPR and its implementation.
- 2. To explain terms in IPR through case studies and their usage.
- 3. To describeIPR provisions in GATT and WTO.
- 4. To appraise IPR implementation in cyber world.

THIRD YEAR B. TEXT. - SEMESTER - I

5.2 KNITTING TECHNOLOGY (FT)

Lectures	:	3 Hrs / Week
Practical	:	2 Hrs / Week
Theory Paper	:	100 Marks
Term Work	:	25 Marks
Subject Total	:	125 Marks

Course Objective

- 1. To define basic terms and definitions used in knitting.
- 2. To explain loop forming cycle, process fabric structure production and fabric calculation in circular weft knitting.
- 3. To explain loop forming cycle, process fabric structure production and fabric calculation in warp knitting.
- 4. To explain loop forming cycle, process fabric structure in flat knitting.

I) Introduction:-

Reasons for the growth of knitting, Comparison of knitted and woven fabric with respect to production and properties, Hand knitting. Knitting processes (weft and warp) and their structures. Basic terms and definitions used in knitting (wales, courses, stitch length, stitch density, face and back loops)

II) Weft Knitting:-

Machine: Passage of yarn through circular weft knitting machine. Study of elements of knitting machines such as : Creel, Yarn feeding – Need, types, stop motions, indicators, tensioners etc., Loop forming mechanism – Knitting cycle, types of needles and their comparison, Study of essential elements of loop forming such as cylinder, sinker, cam, dial, yarn guide etc, Loop forming cycle for single jersey, rib and Interlock fabrics. Take down motion – Spreader, Nip roller, cloth roller

III) Fabric structures: -

Principle stitches such as Knit, Tuck, Miss and their representation, their effects on fabric properties. Types and properties of knitted fabrics such as single jersey, double jersey and their derivatives like interlock, Rib and purl. Pattern analysis method, Design, Needle order and Cam order. Pattern structures with one, two, three and four needle types (1. Single Jersey: cross miss, Lapique, Longitudinal tuck stripes, Plain pique. 2. Rib : Milano, Half Milano, Cardigan, Half Cardigan, Double Cardigan, Swiss and French double pique. 3. Interlock: Pique, Texi Pique, Pin tuck, Interlock Super Roma, Bourrelet). Concept of colour and structure Jacquards. Fleecy fabrics, plush fabrics, stripers, Loop transfer. Study of weft knitted fabric defects and their remedies, yarn quality requirements. Circular weft knitting machine production calculations, fabric weight and Tightness factor. Knitted fabric relaxation concept.

IV) Flat Knitting :-

- 1. Basic elements and their functions of flat knitting machine. Hand and machine operated flat knitting machines and their knitting actions.
- 2. Machine operation for various stitches such as Miss, Tuck, Transfer, drop stitch.
- 3. Design with and without needle selection, bed racking, new formed and transfer loop for hand and power operated machines.
- 4. Concept of seamless knitting.

V) Warp Knitting :-

Passage of yarn through warp knitting machine. Essential elements of warp knitting machine. Knitting cycle of Tricot and Raschel warp knitting machine.

VI) Warp Knitting Structure:-

Study and representation of single and two guide bars structures like Piller stitch, Tricot, Blind Iap, In Iay, Atlas, Full Tricot, Locknit, Reverse Locknit, Satin, Loop raised, Shark Skin, nettings and Crochet Fabric weight calculations, Production calculations

List of Experiments:-

1. Study of single jersey circular weft knitting machine – yarn supply arrangements, loop forming mechanism, takedown motion, Production calculation.

- Study of double jersey circular weft knitting machine yarn supply arrangements, loop forming mechanism, takedown motion, Production calculation.
- Study of warp knitting machine yarn supply arrangements, loop forming mechanism, takedown motion, Production calculation.
- 4. Study of flat knitting machine yarn supply arrangements, loop forming mechanism, takedown motion, Production calculation.
- 5. Machine operation of manual and motorized Flat knitting machine.
- Design setting on single jersey circular weft knitting machine- Machine operation, cam and needle arrangements, yarn feeding and take down setting.
- Design setting on Double jersey circular weft knitting machine- Machine operation, cam and needle arrangements, yarn feeding and take down setting.
- 8. Design setting on warp knitting machine Machine operation, cam chain preparation.
- 9. Knitted fabric analysis Single jersey
- 10. Knitted fabric analysis Single jersey
- 11. Knitted fabric analysis. Double Jersey
- 12. Knitted fabric analysis. Double Jersey
- 13. Knitted fabric analysis : Derivative of single jersey fabric
- 14. Knitted fabric analysis : Derivative of Interlock fabric
- 15. Knitted fabric analysis : Derivative of Rib fabric
- 16. Visit to Circular knitting unit.

Reference Books:-

- 1. Knitting Technology by Prof. D. B. Ajgaonkar.
- 2. Circular Knitting by Dr. Chandrashekhar lyer.
- 3. Knitting Technology by Mr. D. Spenser.
- 4. Warp Knitting by Dr. S. Raz.
- 5. Flat Knitting by Dr. S. Raz.

Course Outcome

- 1. Understand basic terms and definitions used in knitting.
- 2. Understand loop forming cycle, process fabric structure production and fabric calculation in circular weft knitting.
- 3. Understand loop forming cycle, process fabric structure production and fabric calculation in warp knitting.
- 4. Understand loop forming cycle, process fabric structure in flat knitting.

THIRD YEAR B. TEXT. – SEMESTER – I				
5.3	GARMENT	PRO	CESSING	(FT)
Lectur	es	:	4 Hours / V	Veek
Practic	al	:	2 Hours / V	Veek
	-			

Theory Paper	:	100 Marks
Term work	:	25 Marks
Subiect Total	:	125 Marks

Course Objectives

- 1. To discuss various styles, methods & importance of printing with the role of each ingredient in print paste formulation.
- 2. To understand the process of cotton and polyester printing with the role of special print effects in garment industry.
- 3. To discuss the various specialty Finishes used in garment industry and to understand the role of various parameters affecting the performance of functional finishes like resin, flame retardant finish, antimicrobial finish etc.
- 4. To discuss the process of wash down effects on denim garments & to understand the principle & features of machinery used for garment processing.

Course Contents

Unit 1.Introduction

Historical background of printing of textiles Preparation of cotton fabric for printing. Concept of printing. Various ingredients used in preparation of printing paste

Unit 2.Styles of Printing

Various styles of printing such as Direct, Resist and Discharge by using direct, reactive and disperse dyes. Printing with pigments. Khadi, Metallic, Floc, Plastizol, Reflective, Pearl prints

Unit 3.Methods of Printing

Introduction to various methods of printing such as table, flat bed and rotary screen printing. Basic principles, Mechanism of printing Advantages and disadvantages of inkjet printing.

Unit 4.Introduction of Finishing

Objects of finishing, Importance of finishing, classification of finishes, Difference between finishing of woven fabric, Knit goods, and Readymade garments. Mechanism of resin finishing, concept of anti-crease, wash-n-wear and durable press finish. Heat setting and weight reduction of polyester

Unit 5. Functional Finishes for Garments

Concept of garment finishing, Soil release finish, water repellent and flame retardant finish, anti-microbial finish, Anti-static finish. Difference between pre-garment stage and readymade garment stage finishing, Finishing of woven / knitted garments, various softening treatments, water resistant breathable finish, Bio polishing, Deodorizing Finish etc.

Unit 6. Finishing Machines

Drum washing machine, hydro extractor, Tumble drier, Pedal dyeing machine

Reference Books

- 1. Technology Of Printing by V.A. Shenai.
- 2. An Introduction To Textile Printing by W. Clark
- 3. Textile Printing by L.W.C. Miles.
- 4. Fabric Care by Noemia D'SOUZA, New Age International Publishers, Daryagang, New Delhi.
- 5. Textile finishing by A.J. Hall.
- 6. Introduction to textile finishing by J.T. Marsh.
- 7. Technology of finishing Vol. X by Dr. V.A. Shenai.
- Garment Finishing and Care Labelling byS.S.Satsangi, Usha Publishers,53-B/AC-IV, Shalimar Bagh, New Delhi.

List of Experiments

- 1. Weight reduction to produce silk like finish
- 2. To identify various types of stains and their removal
- 3. To test cotton and blended fabrics for dimensional stability (Shrinkage)
- 4. Resin finishing of garment.
- 5. Permanent press finishing of garment

- 6. Softening treatments on garment.
- 7. Stiffening treatment on garment
- 8. Bio-polishing treatment on garment.
- 9. Stone wash on garment.
- 10. Acid wash on garment.
- 11. Special printing on garments like Plastizol, khadi, Pearl and Metallic Printing
- 12. Direct, Discharge and Resist style of printing with reactive dye

Course Outcomes

- 1. Ability to explain the process of printing of fabrics & garments also to analyze the print style and method to be used with role of each ingredient in paste formulation.
- 2. To describe the process of printing cotton & polyester fabrics also to summarize the process of special print effects on garments.
- Summarize the various specialty finishes used in garment industry & to compare the effects given by various wash down processes to analyze problems & suggest possible remedies in denim processing.
- 4. Ability to describe working principle & procedure of machines used in garment industry.

THIRD YEAR B. TEXT. – SEMESTER – I

5.4 EMBROIDERY AND SURFACE ORNAMENTATION (FT)

Lectures	:	3 Hours / Week
Practical	:	2 Hours / Week
Theory Paper	:	100 Marks
Practical Exam	:	50 Marks
Term work	:	25 Marks
Subject Total	:	175 Marks

Course Objectives

- 1. To describe the history, tools and types of hand embroidery stitches.
- 2. To explain the different Indian traditional embroideries and ornamentation techniques.
- 3. To study the embroidery machine and latest development in it.
- 4. To develop the motifs with the software used for the embroidery.

1. Introduction: Definition, History of Embroidery, general rules for hand embroidery, Design transfer techniques, Tools for hand embroidery, Selection of needle, threads and fabrics for embroidery.

2. Indian Traditional Embroidery: Phulkari, Kasuti, Kashmiri embroidery, kutch work, chikkankari, kantha, tribal embroideries- stitches, designs, colors and materials used., running, couching, button hole, satin, long and short, wheat, chain, stem, herringbone, cross stitch, knotted stitches, fish bone etc.

3. Ornamentation Techniques:Eyelet work, cutwork, Richelieu work, lace work, drawn thread and fabric work, patch work, mirror work, appliqué, shaded embroidery, shadow work, badala work, bead and sequins work, bobbin thread embroidery etc.

4. Introduction to Machine Embroidery: History of embroidery machine, Advantages of embroidery machines, Various types of needles, frames, bobbins, Selection of frames to design, Selection of needle thread and bobbin thread and suitable stitches for embroidery using computer.

5. Construction and Working of Embroidery Machines: Passage of thread, operation screen, tension switch, needle bar, bar switch, thread breakage indicator, colour change motor, driver box, x-axis and y-axis pulse motor, Care and maintenance of embroidery machine, Timing and setting of embroidery machine. Special types of embroidery machines, Costing, Quality and Care of embroidery goods, latest developments and technical features of embroidery machines.

6. Software used for Embroideries:Introduction to various types of embroidery software, process of digitizing, punching tools, different input methods for embroidery software, various types of stitches, improving embroidery quality, Editing and Modifying designs, troubleshooting and corrective actions.

List of Experiments

- 1. Study of historical background motifs, colours, and materials used in embroideries of Phulkari embroidery.
- Study of historical background motifs, colours, and materials used in embroideries of Kasuti embroidery.
- 3. Study of historical background motifs, colours, and materials used in embroideries of Gujrat and Kutch embroidery.
- 4. Study of historical background motifs, colors, and materials used in embroideries of kantha embroidery.
- 5. Study of historical background motifs, colors, and materials used in embroideries of tribal embroidery.
- 6. Study of historical background motifs, colors, and materials used in embroideries of Chikankari embroidery.
- 7. Study of computerized embroidery machine.
- 8. Study of materials and tools used for machine embroidery.
- 9. Study of embroidery software.
- 10. Design development for computerized embroidery.
- 11. Embroidering of the developed design on machine.
- 12. Visit to Embroidery unit

Reference Books

- 1. Shailaja D. Naik, "Traditional Embroideries of India", A.P.H Publishing Corporation, New Delhi, 1996.
- 2. Sheila Paine, "Embroidered textiles", Thames and Hudson Ltd., 1990.
- 3. Gail Lawther, "Inspirational Ideas for Embroidery on clothes and Accessories", Search Press Ltd., 1993.
- 4. Handbook of machine embroidery by unity overseas ltd.
- Embroidery Machine Essentials: How to Stabilize, Hoop and Stitch Decorative Designs by LindeeGoodall, Paperback Publications, ISBN-: 0873419995

Course Outcomes

- 1. Illustrate the history, tools and stitches used for the hand embroidery.
- 2. Discuss the different Indian traditional embroideries and understand ornamentation techniques.
- 3. Study the embroidery machine and describe the latest developments
- 4. Design the motifs for embroidery by using the embroidery software

THIRD YEAR B. TEXT. - SEMESTER - I

5.5 APPAREL MACHINERY AND EQUIPMENTS (FT)

Lectures :	4 Hours/week
Practical :	2 Hours/week
Theory paper:	100 Marks
Term work :	25 Marks
Practical exam:	50 Marks
Subject Total :	175 Marks

Course Objectives

- 1. To explain the classification of sewing machinery
- To describe the various parts and adjustment of a single needle lockstitch &overlock machine.
- 3. To describe the stitch, sewing needle and sewing thread.
- 4. To interpret the work aids and latest developments in apparel production machinery
- History and development of sewing machines: History of sewing machines and development. Sewing machinery - classification according to bed types, stitch types (hook or looper), material wise (extra light to heavy weight). Introduction to spreading machines and cutting machines - types and functions.
- 2. Parts of sewing machines: Bed classification and application, Major parts of sewing machinery and functions. Major parts of Single needle lock stitch machine UBT and non-UBT: stand height, pedal, presser foot, height of needle bar, needle to hook relationship, height of feed dog, normal and reverse feed stitch length, feed timing, presser foot pressure, needle and bobbin thread tension, bobbin winding assembly, belt tension and their adjustment. Sewing machine safety regulations. Sewing machine maintenance
- **3.** Adjustments of major parts: Sewing needle and sewing thread, thread consumption, thread routing. Adjustment on SNLS UBT: Needle stop position, wiper, thread timing sequence, timing of thread trimmer cam, positioning the

moving knife, installation, sharpening, replacing moving knives, adjusting the floating amount of the auxiliary tension disk. Parts, functions and adjustments of Overlock machines: Needle height, feed dog height, differential feed ratio, tilt of the feed dog, position of the upper and lower knives, sharpening of knife and loopers, trouble shooting in over lock.

- 4. **Work Aids:** Work-aids and attachments as deskilling devices, functions of pullers, guides and folders compensating presser foots- left, right, double; feller, hemmer etc. Collar turning machines, folding machinery. Computer controlled cutting, sewing, folding machinery
- 5. **Spreading and Fusing:** Manual and automatic spreading, features and specifications, fusing and pressing machinery. Application according to use.
- 6. **Latest developments:** Latest developments in production machinery, automatic spreading, cutting, fusing, pressing and sewing machines.

List of Experiments

- 1. Study of various types of cutting machine for the working and construction.
- 2. Study of various types of cutting machine for the working and construction.
- 3. Study the various types of beds of the sewing machines.
- 4. Study the major parts of sewing machines.
- 5. Study of Needles for the sewing machine.
- 6. Study of sewing threads.
- 7. Study of single needle sewing machine for working and construction.
- 8. Study of overlock sewing machine for working and construction
- 9. Study of special sewing machines for working and construction.
- 10. Study of feed off the arm machine for working and construction
- 11. Work aids and attachment for sewing machine.
- 12. Visit to garment unit.

Reference Books

- 1. Mr. R. Rathinamoorthy et al, "Apparel machinery Equipments", woodhead publication 2015.
- 2. Juki machine manual for single needle lockstitch machine by Juki machine
- 3. Jacob Solinger., "Apparel Manufacturing Handbook ", Van Nostrand Reinhold Company (1980).
- 4. Peyton B .Hudson., " Guide to Apparel Manufacturing ", MEDIApparel Inc (1989) ISBN: 0 -945116-08-X.
- 5. Carr.H, Latham. B., "The Technology of Clothing Manufacture ", Blackwell Scientific Publications (1988).

Course Outcomes

- 1. Classify the sewing machinery according to bed types, stitch types and material wise.
- 2. Describe the various parts, features and adjustment of single needle lock stitch and overlock machine.
- 3. Categorize the stitch, sewing needles and sewing threads requirements and its application.
- 4. Describe the work aids and latest developments in apparel production machinery.

THIRD YEAR B. TEXT. – SEMESTER – I

5.6 FASHION ART AND DESIGN (FT)

Lectures	:	3 Hours / Week
Practical	:	2 Hours / Week
Theory Paper	:	100 Marks
Term Work	:	50 Marks
Subject Total	:	150 Marks

Course Objectives:

- 1. Explain fashion design process.
- 2. Explain Indian and world fashion.
- 3. Describe various design details and their application for different body shapes and sizes.
- 4. Explain dress as non-verbal communication.

1. Fashion Design Process

Flowchart, Analyzing, Innovational opportunities, Research Inspirations, Research direction, Designing process, Prototyping and Collections, Promotion, Portfolio, Fashion careers.

2. Study of Fashion Details

Necklines: Round, square, vee, boat, off shoulder, plunging, scoop, keyhole, one shoulder, halter, sweetheart, surplice, cowl, jewel, spaghetti, queen anne, bateau, etc. **Sleeves**: set in, cap, roll up, raglan, kimono, puff, bell, petal, dolman, batwing, cape, leg-o-mutton, peasant, bishop, melon, lantern, flutter, etc. **Collars**: Chelsea, shawl, pointed flat, peter pan, puritan, convertible, notched, wing, tuxedo, shirt, turtleneck, ruffle, mandarin, jabot, tie neck, etc. **Cuffs**: Angled, round, two buttonhole, two buttons, straight, turn back, barrell, french, convertible, etc. **Pockets**: Patch, patch with top stitching, flap, jetted, bound patch, shirt, welt, jetted with zip, shirred patch, double pocket, post box in patch, angled flap, etc. **Skirts**: A-line, Godet, gypsy, straight, pencil, bubble, wrap, circular, draped, tulip, layered, etc.

3. Smart Dressing

Ensembles for ladies: pear body, diamond body, round body, hourglass body, inverted triangle body, straight body, plus size body, petite figure, problem areas, maternity wear. Ensembles for gents: short & heavy body, short and thin body, tall and heavy body, tall and thin body, athletic body, and problem areas. Ensembles for children. Smart dressing according to occasion.

4. Dress & Image

Dress as Non-verbal communication, Dress and Image, Gender and Sexuality, Dress in human interaction, Dress in workplace, Race, Ethnicity and Social Class.

5. History of Fashion

Brief overview of historical Greek costumes, Egyptian costumes, Roman Costumes, Costumes of Byzantine Era and English Costumes. Study of historical Indian costumes, Detailed Study of 20th Century Fashion- Effect of World War I and World War II on fashion, and Fashion in late 20th century.

6. Study of Latest Fashion

Study of Latest Fashion Designers - French, Italian, American, Indian and English. Study of Latest Fashions – Based On Age, Sex, Nationality, Occupation, Socio Economic Status. Study of contemporary textiles and costumes of different states like Kashmiri shawls, Kancheepuram and Baluchari saris, Paithani saris, Bandhani, Patola, Ikkat, and Kalamkari..

List of Experiments: -

- 1. Study of various types body shapes and sizes.
- 2. Study of different types of necklines.
- 3. Study of different types of sleeves.
- 4. Study of various types of cuffs.
- 5. Study of different types of pockets.
- 6. Study of different types of collars.
- 7. Study of historical Greek costumes.
- 8. Study of historical Egyptian costumes.

- 9. Study of historical Roman costumes.
- 10. Study of various types of saris of different states.
- 11. Study of latest Indian fashion.
- 12. Study of current world fashion.

Reference Books:-

- 1. Fashion Design: Process, Innovation and Practice by Kathryn McKelvey and Janine Munslow (2003), Blackwell Publications. ISBN: 8126522984.
- Fashion Technology: Today and Tomorrow by NirupamaPundir (2007), Mittal Publications. ISBN: 8183242030.
- Past and Present Trends in Fashion Technology by Peter McClaud (2006), Abhishek Publications. ISBN 9788182473522.
- 4. How to be a Fashion Designer by Gladys Shultz (2010), Kessinger Publishing. ISBN: 1164476912.
- Abu Jani and SandipKhosla: A Celebration of Style by SharadaDwivedi (2000), AJSK Publications. ISBN: 819012370X.
- 6. The Complete Costume History by AugusteRacinet (2006), Taschen Publication. ISBN: 3822850950.
- Understanding Fashion by Elizabeth Rouse (1989), Blackwell Scientific Publication. ISBN: 0632018917.
- 8. The Meanings of Dress by Mary Lynn Damhorst, Kimberly A. Miller, and Susan Michelman (2005), Fairchild Books. ISBN: 1563673665.

Course Outcomes:

Student will be able to,

- 1. Explain fashion design process.
- Apply knowledge of Indian and world's historical costumes to design contemporary products.
- 3. Recommend design details for various body shapes and sizes.
- 4. Appraise dress as nonverbal communication.

THIRD YEAR B. TEXT. – SEMESTER – II

6.1 COMPUTER PROGRAMMING & APPLICATION (TT/MMTT/TPE/TC/FT)

:	3 Hours / Week
:	2 Hours / Week
:	100 Marks
:	50 Marks
:	50 Marks
:	200 Marks
	: : : :

Course Objectives

- 1. To describe network topologies, types and network hardware components
- 2. To explain database system and SQL commands and to design database and write SQL commands
- 3. To explain VB.Net IDE project, various types of statements, data types, variables, constants, arrays, controls and their properties in VB.Net IDE
- 4. To explain the development of simple applications in VB.Net, describe opportunities in ERP and its implementation

Course Contents

Unit 1. Introduction to Computer Network

Introduction to network, use of computer networks, Network Topologies, Network types - LAN, MAN, WAN, Network hardware Components - cables, connectors, NIC, Hub, Switch etc. Network Operating system, Client / Server Architecture, Internet and its applications. Switching and routing in network, The X.25 network & supporting protocols, TCP/IP

Unit 2. Database Management System

Introduction to database, Records, Relational database management systems, structural query languages (SQL), SQL table creation integrity constraints, insertion of records, select statement, alter command, drop table partitioned table, SQL operator, transaction processing, where clause, like operator, between operator, order by clause, group by clause, having clause, SQL function, commands - Select, Insert, update, delete, joins - inner join, outer join

Unit 3. Introduction to .Net Framework

Introduction to .NET, .NET Framework features & architecture. Introduction to Visual Studio, Event driven Programming, Project Basics. VB.NET Development Environment, Solution Explorer, Toolbox, Properties Window, Form Designer, Output Window, Object Browser. The VB.NET Language - data types, variables, forcing variables declarations, Scope & lifetime of a variable, type conversion, constants, operators and expressions.

Unit 4. Conditional Branching and Looping

Conditional statements, loop statements. Arrays, types of array, control array, Error Handling, Collections, Subroutines, Functions, Passing arguments, Optional Argument, Returning value from function. Msgbox & Input box.

Unit 5. Designing User Interface & Database Connectivity

Working with Forms: Loading, showing and hiding forms, controlling one form within another. GUI Programming with Windows Form: Method, properties, events and working of basic controls-Textbox, Label, Button, Listbox, Combobox, Checkbox, PictureBox, RadioButton, Panel, scroll bar, Timer, ListView, TreeView, toolbar, StatusBar. OpenFileDilog, SaveFileDialog, FontDialog, ColorDialog, PrintDialog. Link Label. Designing menus: ContextMenu, access & shortcut keys.

Introduction to database connectivity, Overview of ado.net, Connection Object, Command Object, Data Adapter, Dataset, Data Reader, Connection to database with Server Explorer, Data binding, Data Grid View, Data form wizard, Data Validation.

Unit 6 Introduction to ERP

Evolution of ERP, growth of ERP, Need for system interaction and interface, early ERP packages, various models of ERP, advantages of ERP, Overview of enterprise, integrated management, business modelling ERP for small business, business process for ERP module design, opportunities and problems in ERP selection and implementation, hardware Environment.

List of Experiments

- 1. Study of basics of computer Networking.
- Design & analysis of DBMS using Ms-Access Data retrieval, updation, deletion.
- Design & analysis of DBMS using Ms-Access Data retrieval using Advanced Queries
- 4. Design & Implementation of user IDE using VB.Net Framework.
- 5. Design & Implementation of VB.Net program for decision making statement.
- 6. Design & Implementation of VB.Net program for different loops (Nested Loops)
- Design a form to select image from list and display it in the picture box. And demonstrate of Windows explorer
- 8. Design and implementation of VB.Net program for Timer, List box & combo box control
- 9. Design a form for implement application of Common Dialog Control in VB.Net.
- 10. Database connectivity using ADO.Net Application-1
- 11. Database Connectivity using ADO.NET Application-2
- 12. Internet & web application in VB.Net, Deployment of project

Reference Books

- 1. Peter Aitken's Visual Basic.NET Programming by Peter Aitken- Dreamtech Publications.
- 2. VB.NET Programming Black Book by Steven Holzner –Dreamtech Publications.
- 3. Mastering VB.NET by Evangelos Petroutsos- BPB Publications
- 4. Computer Network by Andrew Tanenbuam Pearsons India
- 5. Database Management System by Korth, McGraw Hill Publication

Course Outcomes

- 1. Understand various concepts of computer networking
- 2. Design database system & implement of SQL commands
- Understand various statements, controls its properties & methods in VB.Net.
 And develop simple application programs in VB.Net with ADO.Net
- 4. Illustration and implementation basic ERP for simple application

THIRD YEAR B. TEXT. – SEMESTER – II

6.2 MANMADE FIBRES AND YARNS (TT)

Lectures	:	3 Hours / Week
Theory Paper	:	100 Marks
Subject Total	:	100 Marks

Course Objectives:

- 1. To explain the manufacturing process of viscose,polyester,polyamide,polypropylene and acrylic fibres
- 2. To explain the structure, properties and applications of viscose,polyester,polyamide,polypropylene and acrylic fibres
- 3. To explain the classification, characteristics and need for textured yarns
- 4. To describe the methods of manufacturing textured yarns

Course Content:

Unit 1:Viscose Rayon: - Process of manufacturing viscose fibre / filament yarns, physical and chemical properties of viscose rayon, applications of viscose fibres. Tencel Fibre: - Manufacturing process, properties and applications

Unit 2:Polyester Fibres: - Raw materials, manufacturing details of PET fibre / yarns, Properties and applications of PET fibres.

Polyamide Fibres:- Raw materials and manufacturing process of Nylon 6 and Nylon 6,6, fibres and filament yarns, physical, chemical properties and applications of nylon fibres.

Unit 3:Polypropylene Fibres: - Manufacturing process of polypropylene fibres and filament yarns. Dope dyed PP fibres, properties and applications of polypropylene fibres

Acrylic Fibres: - Comparison of acrylic and modacrylic fibres, manufacturing process, properties and applications of acrylic fibres.

Unit 4:Definition and concept of texturising, classification and characteristics of textured yarns, False Twist Texturising:- Methods of production of stretched(single heater) and modified stretched (double heater) yarns by conventional methods.

Unit 5:Draw Texturising concepts, sequential and simultaneous draw texturising, Study of simultaneous draw texturising process. Draw Texturising Machine Details: -Machine profiles, Twisting devices, Heaters, Cooling devices, Coning oil application, Process variables, Defects in draw textured yarns. Quality of draw textured yarns, technological developments in draw– texturising technology. Double density machine and multiple input shaft machines,

Unit 6:Air Jet Texturising:- Principle of loops formation, Air-jet texturising machine, air- jets, wetting systems, stabilizing devices, process variables in air texturising, Quality of air textured yarns, blending of filaments in air texturising. Other methods of texturising:- Edge crimping, Stuffer box crimping, Knit-de-knit, Gear Crimping, Chemical Texturising

List of References:-

- 1. Manufactured Fibre Technology, Edited by V. B. Gupta and V. K. Kothari (1997) Chapman and Hall, London.
- A.A.Vaidya, Production of Synthetic Fibres, Prentice Hall of India Pvt. Ltd., New Delhi 1988.
- V.B.Gupta and K.K.Kothari (Ed), Man-made Fibres Production, Processing Structure, Properties and Applications, Vol. I and II, Dept. of Textile Technology, IIT, New Delhi 1988
- Production and Applications of Polypropylene Textiles O. P. Rajgrat and F. Sevicik.
- 5. Yarn Texturing Technology by J.W.S. Hearle, L. Hollick, D.K. Wilson Woodhead Publishing Ltd, England.
- 6. Hes L. Ursiny P., "Yarn Texturing Technology", Eurotex, U.K., 1994.
- Yarn Texturising Technology J. W. S. Hearle, Wilson, Woodhead Publishing Ltd., England.
- Wilson D.K. and Kollu T., "Production of Textured Yarns by Methods Other than False Twist Technique", Text. Prog., Vol. 16, No.3. Textile Institute, 1981.

Course Outcomes:

Students will be able to:

- 1. Describe the manufacturing process of viscose,polyester,polyamide,polypropylene and acrylic fibres
- 2. Understand the structure, properties and applications of viscose,polyester,polyamide,polypropylene and acrylic fibres
- 3. Describe the classification, characteristics and need for textured yarns
- 4. Describe the methods of manufacturing textured yarns

THIRD YEAR B.TEXT. - SEMESTERII

6.3 INDUSTRIAL ENGINEERING (TT/MMTT/TPE/TC/FT)

Lectures	:	3Hrs/week
Theory Paper	:	100 marks
Subject Total	:	100 marks

Course Objectives

- 1. Understand the importance of Industrial Engineering
- 2. Discuss the factors affecting Production Planning and Control and inventory management.
- 3. Understand method study and motion economy.
- 4. Use CPM, PERT and linear programming techniques.

Course Contents

Unit 1.Introduction to Industrial Engineering

Concept of Industrial Engineering, definition, history & development, various techniques of Industrial Engineering, Scope in Textiles

Unit 2.Production Planning & Control

a) Production – Definition, Types of production, characteristics of each type production. Plant layout

Objectives of good plant layout, types of layout

b) Productivity – Definition, ways to increase productivity, measurement of productivity – Total productivity Index & factor productivity indices, Numericals.

c) Definition of PPC, Functions of PPC

d) Sales forecasting, various techniques of sales forecasting, Numericals.

e) Gantt chart, types, its use.

Unit 3.Work Study and Operational Research

I. Work Study, Definition, techniques, objectives, use of work study to increase productivity

a) Method Study – Definition, steps in method study, details of every step, charts used for recording, outline chart, flow process chart & its types, two handed process chart, multiple activity chart, principles of motion economy.

b) Micromtion Study – Contribution of Gilbreth, Therbligs, Prodedure, SIMO Chart.

c) Work Measurement – Definition, Techniques, concept of total time, standard time, allowances, Numericals.

II. Operation Research

Definition, various techniques of OR.

a) Basics of linear programming – Formulation of LP, Graphical solution, simplex method, problems

b) Network Analysis - PERT, CPM, and comparison. Numericals

Unit 4.Value Analysis and Value Engineering

Value, concept of value analysis, concept of value engineering, Reasons of unnecessary cost, value analysis procedure.

Unit 5. Job Evaluation and Merit Rating

a) Job Evaluation-

Definition, objectives, procedure of job evaluation, methods of job evaluation

b) Merit Rating-

Introduction, objectives, methods of merit rating

Unit 6. Inventory Management

Concept, Types, ABC Analysis, EOQ, EBQ, Safety stock, Total cost with and without discount offered, Numericals.

Reference Books

- 1. Work Study ILO
- 2. Work Study in Textiles ILO
- 3. Elements of Production Planning & Control SamualEilon.
- 4. Industrial Engineering & Management Banga Sharma.
- 5. Industrial Engineering & Management O. P. Khanna.
- 6. Industrial Engineering Manual of Textile Industry NobertLioyd Enrick.
- 7. Industrial & Production Engineering Sanjay S. Patil, &NandkumarHukeri

Course Outcomes

- 1. Understand the importance of Industrial Engineering
- 2. Discuss the factors affecting Production Planning and Control and inventory management.
- 3. Understand method study and motion economy.
- 4. Use CPM, PERT and linear programming techniques

THIRD YEAR B. TEXT. – SEMESTER – II

6.4 STRUCTURAL MECHANICS OF YARNS (TT)

Lectures	:	3 Hours / Week
Practical	:	2 Hours / Week
Theory Pape	er:	100 Marks
Term Work	:	50 Marks
Practical Exa	am:	50 Marks
Subject Tota	l:	200Marks

Course Objectives

- 1. To describe yarn structure.
- 2. To explain the fibre migration.
- 3. To explain mechanical properties of yarns.
- 4. To deliberate the role of yarn structure on tactile and aesthetic comfort.

1. Classification, structure and specifications of yarn:

- A) Classification of yarns
- B) Yarn structures: Fundamental structural features of yarns, structurally related performance of yarn.
- C) Yarn specifications: Linear density, yarn structural features, fibre content, mechanical and chemical treatment, quality specifications for spun yarn.

2. Ideal Yarn geometry and packing:

Idealized helical geometry, twist contraction, limit of twist, packing of fibres in yarnsidealized open and close packing, concentrating and disturbing features of actual yarn, specific volume and packing fraction, Schwarz constant- significance and derivation.

3. Form and fibre arrangement in twisted yarns:

Fibre migration- ideal migration, geometrical approach, tracer fibre technique for study of migration, characterization of migration behaviour, migration in spun and filament yarn, tension variation as mechanism of migration, frequency and order of migration.

4. Theory of the extension of continuous filament yarns:

Simplest analysis of tensile behaviour, analysis with transverse forces and lateral contraction, analysis for large extension, prediction of breakage, prediction of load-extension curve by energy method, actual breakage of continuous filament yarn-mechanism of break in low twist and high twist yarns. Effect of test length, twist factor and rate of extension on breakage behaviour of yarn. extension behaviour of actual yarn, effect of buckling permanent deformation and migration on extension of yarn, effect of processing parameters on tensile behaviour of yarn.

Breakage in spun yarn- traditional approach, modified approach.

5. Yarn structure in relation to the aesthetic and tactile qualities of apparel fabrics:

Role of structure in visual aesthetics, tactile aesthetics, comfort in apparel fabrics under conditions of actual use, role of yarn structure in fabric compression.

6. Blending in staple yarn systems:

Objects of blending, fibre distribution in blended yarn, Hamburger approach for prediction of blend yarn tenacity, requirements of blending.

List of Experiments

- 1. Study of effect of rate of loading on tensile properties of yarn.
- 2. Comparison of dry and wet tenacity of yarn.
- 3. Study of yarn friction.
- 4. Study of yarn hairiness.
- 5. Study of yarn abrasion.
- 6. Study of fibre migration in twisted yarn.
- 7. Study of yarn diameter.
- 8. Effect of change in speed on yarn strength.
- 9. Study of tensile properties of blend yarn.
- 10. Twist measurement by optical and twist up to break method.
- 11. Study of classimat faults.
- 12. Analysis of variance length curve and spectrogram.

Reference Books

- 1. Structural mechanics of fibres, yarns and fabrics by Hearle, Grosberg and Backer
- 2. Textile yarns by Marindale and Goswami.
- 3. Textile fibres yarns and fabrics by E. R. Kaswell
- 4. Physical testing and quality control, by K. Slater
- 5. Principle of textile testing by J. E. Booth.

Course Outcomes

- 1. Describe yarn structure.
- 2. Analyse the structure in context of fibre migration.
- 3. Evaluate and interpret the mechanical properties of yarns.
- 4. Predict tactile and aesthetic comfort from yarn structure.

THIRD YEAR B. TEXT. - SEMESTER - II

6.5 UNCONVENTIONAL SPINNING TECHNOLOGY (TT)

Lectures	:	4 Hours / Week
Practicals	:	3 Hours / Week
Theory Paper	:	100 Marks
Termwork	:	50 Marks
Subject Total	:	150 Marks

Course Objectives

- 1. To explain the principle of unconventional spinning systems.
- 2. To describe operations and various mechanisms used.
- 3. To understand the recent developments of all unconventional spinning techniques.
- 4. To analyse the effect of process parameters on quality of yarns produced on unconventional spinning systems.

Course Contents

Unit 1.AIR JET SPINNING:

- Basic concept, evolution of air jet spinning.
- Principles of MJS, MTS and MVS.
- Stages involved, operating principle of air jet
- Mechanism of yarn formation, Mechanism of twisting.
- Raw material and preparatory process requirements.
- Technical Specifications and working of different air jet spinning systems.
- Structure and properties of yarns.
- Effect of process parameters like: total draft, nozzle pressure; take up ratio, delivery speed, and raw material parameters on quality of air-jet yarn.
- Developments in air jet spinning
- Techno economics of air-jet yarn.
- End uses of yarns.

Unit 2.FRICTION SPINNING:

- Introduction to the principle of friction spinning.
- Details of different machine zones like: drafting, opening, fibre collection, twisting and winding.

- Raw material preparatory process requirements.
- Specifications and working of different friction spinning systems.
- Structure and Properties.
- Effect of process parameters like: total draft, opening roller speed, delivery speed, Parameters of twisting drum and raw material parameters on quality of friction spun yarn.
- Critical Analysis and developments in Friction Spinning.Applications of friction spun yarns.

Unit 3.SIRO SPINNING:

A) SIRO Spinning:

- Principle and importance of SIRO spinning.
- Working of SIRO spinning.
- Structure, Properties and Applications of SIRO yarn.
- Advantages and limitations of SIRO spinning.

B) Compact SIRO spinning.

- Advantages over SIRO Spinning.
- Case studies.

Unit 4.SELF-TWIST SPINNING:

- Principle of self-twisting.
- Self-twist yarn formation mechanism.
- Concept and importance of phase shifting.
- Structure and Properties of Self-Twist yarn.
- Advantages and limitations of self-twist spinning.
- Applications of self-twist yarn.

Unit 5.WRAP SPINNING:

- Concept of wrap yarn manufacturing.
- Working of wrap spinning.
- Structure and Properties.
- Applications of wrap yarn.

Unit 6. TWIST-LESS SPINNING:

- Drawbacks of twisted yarns.
- Concept of twist-less spinning.
- Different techniques of twist-less yarn manufacturing such as: BOBTEX, TWILLO and TEK-JA process.
- Effect of machine and process parameters on yarn quality.
- Raw material requirements.
- Structure and Properties of each twist less yarn.
- Advantages and limitations of twist less spinning.
- End uses.

Reference Books

- The Economics of Science and Technology of yarn production Vol.-I and II Spinning in 70s by P.R. Lord.
- Textile progress vol. 10 No.2 The Production and properties of staple fibre, Yarns made by Recently developed Techniques by L. Hunter.
- 3. Air jet spinning Textile Progress, Textile Institute Publication.
- 4. Spun Yarn Technology by Carl A. Lawrence
- 5. New Spinning Systems H. Staldar
- 6. Spun Yarn Technology by Eric Oxtoby.
- 7. Textile Yarns by Martindale and Goswami.
- 8. Series Vol.V New Spinning System by W. Klein.

List of Experiments

- 1. Production of yarn on air-jet machine and comparing it with ring yarn.
- 2. Effect of total draft on air-jet yarn properties.
- 3. Effect of Nozzle pressure on air-jet yarn properties.
- 4. Effect of take up ratio on air-jet yarn properties.
- 5. Effect of condenser on air-jet yarn properties.
- 6. Production of SIRO yarn and compare it with TFO yarn.
- 7. Production of compact SIRO yarn and compare it with TFO double yarn.
- 8. Production of compact SIRO yarn and compare it with single compact yarn.
- 9. Visit to Spinning Mills.
- 10. Visit to Spinning Mills.

Course Outcomes

- 1. Illustrate the basics of unconventional spinning systems. (Knowledge)
- 2. Understand the operations and various mechanisms used. (Understand)
- Understand the recent developments in unconventional spinning machines (knowledge)
- 4. To evaluate the effect of process parameters on quality of yarns produced on unconventional spinning systems. (Analyse)

THIRD YEAR B. TEXT. - SEMESTER- II

6.6 KNITTING TECHNOLOGY (TT)

Lectures	:	4 Hrs / Week
Practical	:	3 Hrs / Week
Theory Paper	:	100 Marks
Term Work	:	50 Marks
Subject Total	:	150 Marks

Course Objective

- 7. To define basic terms and definitions used in knitting
- 8. To explain loop forming cycle, process fabric structure production and fabric calculation in circular weft knitting
- 9. To explain loop forming cycle, process fabric structure production and fabric calculation in warp knitting
- 10. To explain loop forming cycle, process fabric structure in flat knitting

1. Introduction

Types of knitted fabrics, their applications, properties and basic structure of warp and weft knitting. Terms and definitions used in knitting. Comparison of knitting with woven fabric with respect to production and properties. Concept of hand knitting. Evolution of knitting from hand to machine knitting. Concept of flat and circular knitting.

2. Circular Weft Knitting

- a. Knitting cycle and basic elements of knitting. Essential elements of knitting machine – yarn supply arrangement, loop forming arrangement and fabric take down mechanism.
- b. Passage of yarn through circular weft knitting machine. Study of elements of knitting machines such as :
- 1. Creel Construction, types, capacity and their suitability.
- Yarn feeding Need, construction, drive, types of positive and negative feeders, stop motions, indicators, tensioners etc.
- Loop forming mechanism Knitting cycle, types of needles and their comparison. Study of essential elements of loop forming such as cylinder, sinker, cam, dial, yarn guide.
- 4. Take down motion Spreader, Nip roller, cloth roller, Drive mechanism and its types, cloth roller capacity. Machine and material monitoring systems.

Weft Knit Structures:

- a. Principle stitches such as Knit, Tuck, Miss and their representation and their effect on fabric properties.
- b. Types and properties of knitted fabrics such as single jersey, double jersey (Interlock, Rib and Purl). Manufacturing process of these fabrics. Conditions for the use of delayed and synchronized timings.
- c. Fabric analysis method, representation of design, Needle order, Cam order. Basic designs and the derivatives (1. Single Jersey – cross - miss, lapique, longitudinal tuck stripes, plain pique. 2. Rib – Milano, half Milano, cardigan, half cardigan, double cardigan, Swiss and French double pique. 3. Interlock-Interlock Pique, Texi pique, Pin tuck, Interlock super Roma, Bourrelet}
- d. Concept of colour Jacquards.

Weft Knitted Fabric Quality and Calculations:

- a. Weft knitted fabric defects and their remedies. Yarn quality requirements
- b. Circular weft knitting machine production calculations, fabric weight and Tightness factor. Knitted fabric relaxation concept.
 Relation between machine gauge and yarn count.

3. Flat Knitting

Basic elements and their functions of flat knitting machine. Hand and machine operated flat knitting machines and their knitting actions.

Machine operation for various stitches such as Miss,Tuck, Transfer, and Drop Stitch.

Design with and without needle selection, bed racking, new formed and transfer loop for hand and power operated machines. Concept of seamless knitting

4. Socks and Gloves Knitting

Basic machines for above items, working principles and types

5. Warp Knitting

Introduction:

Structure, properties and applications of warp knitting. Knitting cycle and basic elements of warp knitting, Essential elements of warp knitting machine like: yarn supply, loop forming and fabric take down mechanism. warp preparation for warp knitting.

Warp Knitting Machine:

- a. Passage of yarn through warp knitting machine.
- b. Essential elements of warp knitting machine such as yarn supply arrangement, loop forming mechanism and fabric take down mechanism.
- c. Knitting cycle of Tricot and Raschel warp knitting machine.

Warp Knitted Fabric Structure:

- a. Study and representation of single, two guide-bar and multi guide-bar (Tricot, Raschel) structures.
- b. Weft insertion techniques, Terry technique, Sinker pile fabrics, fall plate, cut press techniques.
- c. Net fabric manufacturing

Warp Knitted Fabric Quality and Calculations:

- a. Warp knitted fabric defects and their remedies. Yarn quality requirements
- b. Production calculation on weight and length basis
- c. Fabric weight calculation
- d. Concept of rack, run-in

Relation between machine gauge and yarn count.

6. Advanced Knitting Processes in circular knitting:

- a. Relative Technology (Relanit) on circular knitting machines.
- b. Concept of mechanical and electronic jacquard.
- c. Structure and knitting of fleecy and plush fabrics Concept and mechanism of striper and loop transfer

List of Experiments:-

- Study of single jersey circular weft knitting machine yarn supply arrangements, loop forming mechanism, takedown motion and Production calculation.
- Study of double jersey circular weft knitting machine yarn supply arrangements, loop forming mechanism, takedown motion and Production calculation.
- Study of warp knitting machine yarn supply arrangements, loop forming mechanism, takedown motion and Production calculation.
- Study of manually operated flat knitting machine yarn supply arrangements, loop forming mechanism, takedown motion.
- 5. Study of motor operated flat knitting machine yarn supply arrangements, loop forming mechanism, takedown motionand Production calculation.
- Design setting on single jersey circular weft knitting machine- Machine operation, cam and needle arrangements, yarn feeding and take down setting.
- Design setting on Double jersey circular weft knitting machine- Machine operation, cam and needle arrangements, yarn feeding and take down setting.
- 8. Design setting on Warp knitting machine- Machine operation, cam chain preparation.
- 9. Knitted fabric analysis Single jersey
- 10. Knitted fabric analysis Interlock fabric
- 11. Knitted fabric analysis Rib fabric.
- 12. Knitted fabric analysis Derivative of single jersey
- 13. Knitted fabric analysis. Derivative of single jersey
- 14. Knitted fabric analysis : Rib fabric
- 15. Knitted fabric analysis : Interlock fabric
- 16. Visit to circular knitting unit.

Reference Books:-

- 1. Knitting Technology by Prof.D.B. Ajgaonkar.
- 2. Circular Knitting by Dr. Chandrashekharlyer.
- 3. Knitting Technology by Mr. D. Spenser.

- 4. Warp Knitting by Dr. S. Raz.
- 5. Flat Knitting by Dr. S. Raz.

Course Outcome

- 1. Understand basic terms and definitions used in knitting.
- 2. Understand loop forming cycle, process fabric structure production and fabric calculation in circular weft knitting.
- 3. Understand loop forming cycle, process fabric structure production and fabric calculation in warp knitting.
- 4. Understand loop forming cycle, process fabric structure in flat knitting.

THIRD YEAR B. TEXT. – SEMESTER – II

6.2 MAN MADE FIBRE SCIENCE (MMTT)

Lectures :	4 Hours / Week
Theory Paper:	100 Marks
Term Work :	50 Marks
Subject Total:	150Marks

Course Objectives

- 1. To describe fibre structure.
- 2. To describe analytical techniques for study of fibre structure.
- 3. To explain significance of mechanical properties of fibres.
- 4. To deliberate importance and measurement of thermal and electrical properties.

1. Fibre structure:

Requirements of fibre formation, molecular weight and molecular weight distribution, degree of polymerization- useful limits of polymerization, crystalline and amorphous regions, morphological models - one phase, two phase, three phase models, morphology of cotton, viscose, jute, acetate, wool, silk, nylon 6, nylon 66, polyester, acrylic, polypropylene fibre.

2. Techniques for investigation of fibre structure:

- A) Optical properties of textile fibres: refractive index, double refraction, birefringence. Optical heterogeneity in fibres, factors influencing birefringence of a fibre, measurement of birefringence – Becke line method, compensator method, refractometer method, significance of birefringence, optical dichroism and its importance.
- B) X-ray diffraction: Production and origin of X-rays, Bragg's law of X-ray diffraction, crystal structure, miller indices, study of fibre structure- X-ray diffractometer method, fibre diagram method.
- C) Electron microscopy: Principle of electron microscope, Transmission and scanning electron microscope Principle, working and applications.

 D) Infrared Spectroscopy: Spectroscopy, Beer-Lambert law, Principles of IR-Spectroscopy, Principle and working of IR spectrophotometer, Applications, IR-Dichroism and its importance.

3. Mechanical properties of fibres:

- A) Tensile properties: Terms and definitions, stress-strain curve, importance of tensile properties, factors influencing tensile properties of fibres
- B) Elastic recovery:Terms and definitions, effects of test conditions on elastic recovery of fibres, recovery properties of different fibres, mechanical conditioning of fibre, swelling recovery.
- C) Fibre Friction: Laws of friction in textiles, consequence of friction in textiles, measurement of friction, empirical results, nature of friction.

4. Variability and Directional Effects:

- A) Effects of variability: Weak link effect, derivation of Pierce formula, Spencer-Smith theory, composite specimen effect, variability in practice
- B) Directional effects: Bending and twisting of fibres, derivations of flexural and torsional rigidity, significance of flexural and torsional rigidity, shear modulus, shear strength, general elastic deformation, compression.

5. Theories of mechanical properties and viscoelasticity:

Approaches, structural effects in fibres, theories of time dependencethermodynamic effects, Boltzmann super position principle, WLF equation, creep stress relaxation, stress-strain curve, dynamic mechanical properties, their measurement and importance. Model theory of viscoelasticity- linear viscoelasticity, viscoelastic models, features of Eyring model.

6. Thermal and electrical properties:

- C) Thermal properties: Specific heat capacity, thermal conductivity, structural changes in fibres on heating, transitions in fibre- first and second order transition, degradation and decomposition, thermal expansion of fibre, heat setting of fibres, principle and working of DSC, DTA, DMA.
- D) Electrical properties: Static electricity- causes and consequences in textiles, measurement of static electricity, electric resistance, specific resistance,

measurement of resistance, factors influencing the electrical resistance of fibres.

Reference Books

- 1. Fibre science- edited by J.M. Preston, published by the textile institute, Manchester.
- 2. Physical methods of investigation of textiles, edited by Meredith R. And Hearle J.W.S.-published by textile book published inc. New York.
- 3. Physics of fibres- an introductory survey-Woods H. J. Published by the institute of physics-London, 1955.
- 4. Applied fibre science- vol I, edited by F. Happey published by academic press, London.
- 5. Physical properties of textile fibres-Morton W. E. and Hearle J.W.S. Published by the textile institute Manchester.
- 6. Fibre microscopy-Stores J. L. Published by London national trade press.
- 7. Structure/property relationship in textile fibres-textile progress vol. 20, no. 4 the textile institute Manchester.
- Instrumental analysis of cotton cellulose and modified cotton cellulose by Robert T.O'Conner.
- 9. Fibre science by S. P. Mishra
- 10. Fibre Science Steven B. Warner

NOTE: Termwork marks will be given on the basis of performance of student through assignments, viva/presentation.

Course Outcomes

At the end of the course students will be able to

- 1. Describe fibre structure.
- 2. Interpret fibre structure through analytical techniques.
- 3. Evaluate the mechanical properties of fibres.
- 4. Measure thermal and electrical properties of fibres.

THIRD YEAR B. TEXT. - SEMESTER - II

6.4 YARN AND FABRIC TESTING (MMTT)

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Course Objectives

- 1. To explicate significance of yarn and fabric properties.
- 2. To highlight factors affecting yarn and fabric properties.
- 3. To describe principle and testing methodology of yarn.
- 4. To explain principle and testing methodology of fabric.

1. Yarn number and twist:

C) Yarn number: Concept, direct and indirect systems, measurement of yarn number-Knowles balance, Stubbs balance, Beesley balance, quadrant balance.

D) Twist: Terms and definitions, function of twist in yarn structure, effect of twist on yarn and fabric properties, measurement of twist–straightened fibre method, twist contraction method, twist to break method, optical method, twist take up method.

2. Evenness of yarn:

Concept, classification of irregularity, causes of irregularity, measures of irregularity, basic irregularity, index of irregularity. Addition of irregularity, measurement of yarn irregularity - visual examination, cutting & weighing method, electronic capacitance principle, analysis of irregularity– variance-length curves, spectrogram, importance of yarn uniformity.Imperfections – concept, causes and importance.

Seldom occurring faults: Classification of faults and its causes. Principle& working of Classimat tester.

Hairiness in spun yarn: Concept, causes, remedies. measurement of hairinessphotoelectric method.

3. Strength testing:

Terms and Definitions, Effect of fibre properties on the yarn strength, factors affecting the tensile properties of textiles, single yarn strength - The pendulum lever principle, Strain gauge transducer principle, machines working on these principles, interpretation of test results.

Lea Strength - The lea CSP or Break factor & its significance – description of lea strength tester, comparison of lea & single yarn test results, Ballistic test & its importance.

Fabric Strength – Importance of fabric strength test, sampling of fabric, Tensile strength testing – cut strip method, ravelled strip method, grab test, comparison of strip test & grab test, tear strength, bursting strength.

4. Thickness, Cover and Serviceability of fabric:

A) Thickness – definition, significance, fabric thickness by Shirley method.

B) Cover factor – definition, derivation of cover factor, significance.

C) Serviceabilityand wear: Concept, factors affecting abrasion resistance, assessment of abrasion damage, BFT abrasion testing machine, Martindale abrasion tester. Pilling of fabrics: Concept, mechanism of pilling, factors affecting fabric pilling, ICI pill box tester.

5. Aesthetic& Tactile Comfort of Fabric:

A) Fabric stiffness &drape: Concept, importance of stiffness and drape, measurement of stiffness: Shirley stiffness tester (cantilever principle), heart loop test, measurement of drape by drape meter, factors affecting stiffness and drape.
B) Crease resistance & crease recovery: Concept, measurement of crease recovery, factors affecting crease recovery.

6. Transport Properties:

A) Air permeability - Concept, importance, Shirley air permeability tester, factors affecting air permeability.

B) Water fabric relations -Concept, importance, mechanics of wetting, wetting time test, spray test, drop penetration test, Bundesmann test, water head test.

List of Experiments

- 1. Determination of yarn linear density
- 2. Determination of twist in single yarn
- 3. Determination of twist in double yarn
- 4. Determination of single yarn strength
- 5. Determination of yarn lea strength
- 6. Evaluation of yarn unevenness by capacitance principle and visual examination
- 7. Determination of fabric strip strength
- 8. Determination of tearing strength of fabric
- 9. Assessment of abrasion resistance of fabric
- 10. Evaluation of stiffness of fabric
- 11. Estimation of crease recovery angle
- 12. Estimation of drapability of fabric

Reference Books

- 1. Principles of Textile Testing by J. E. Booth.
- 2. Physical properties of Textile Fibres by J. W. S. Morton & Hearle.
- 3. Textile Testing by Skinkle.
- 4. Handbook of Indian Standards.
- 5. Quality control and Testing by V. K. Kothari.
- 6. Fabric Testing by Jinlian Hu.
- 7. Textile Testing Fibre, Yarn and Fabric by Dr.ArindamBasu
- 8. Textile Fibres Yarns and Fabrics by E. R. Kaswell

Course Outcomes

At the end of the course students will be able to

- 1. Describe significance of yarn and fabric properties.
- 2. Explain factors affecting yarn and fabric properties.
- 3. Test yarn and interpret the results.
- 4. Test fabric and interpret the results.

THIRD YEAR B. TEXT. - SEMESTER - II

6.5 HIGH PERFORMANCE FIBRES AND COMPOSITES (MMTT)

Lectures	:	4 Hours / Week
Theory Paper	:	100 Marks
Subject Total	:	100 Marks

Course Objectives:

- 1. Describe the concept and requirements of high performance fibres
- 2. Explain the manufacturing process of commonly used high performance fibres
- 3. Explain the structure, properties and applications of commonly used high performance fibres
- 4. Explain the concept of fibre reinforced composites

Course Content:

Unit 1:

Introduction to high performance fibres: Concept and requirements of high performance fibres.

Carbon Fibres: Introduction, PAN and pitch based carbon fibres – manufacturing, properties and applications. Vapour grown carbon fibre,

Unit 2:

Aramid Fibres: Introduction, polymer preparation, spinning of fibres, structure and properties of fibres, applications.

Unit 3:

Gel spun high performance polyethylene fibres: - Introduction, manufacture, fibre characteristics and applications, solid state extrusion of high molecular weight polyethylene fibres.

Fully aromatic polyester fibre: fibre manufacture, properties and applications.

Unit 4:

Glass Fibres: Introduction, fibre manufacture, properties and applications. Ceramic Fibres: Introduction, silicon carbide based fibres, Alumina based fibres. Single crystal oxide fibres.

Unit 5: Chemical resistant fibres:

Manufacture, fibre characteristics and applications of following fibres:

Chlorinated fibres: PVDC

Fluorinated Fibres: PTFE, PVF, PVDF and FEP

Poly (entheretherketones): PEEK

Poly (phenylenesulphide): PPS

Poly (ether imide): PEI

Thermal resistant fibres:

Manufacture, fibre characteristics and applications of PBI, PBO, fibres.

Unit 6:

Fibre Reinforced Composites: Overview of composites, Composition of composites, Fibre reinforced composites manufacturing methods, Characteristics of composites

List of References:-

- 1. High Performance Fibres, Edited by J. W. S. Hearle, Published by wood head publishing Ltd., England in association with Textile Institute Manchester.
- 2. Carbon fibers by J. P. Donnet and R. C. Bansal, Marcel Dekker, New York
- 3. Hand book of Fibres Science and Technology, High Technology Fibres, Edited by ManachemLewin and Jack Preston.
- 4. New fibers. T. Hongu and G. 0. Phillips Ellis Horwood Ltd, Chichester,
- 5. Kevlar aramid fiber. by H.H. Yang. John Wiley and Sons, Chichester, New York,
- Mukhopadhyay S. K., "Advances in Fibre Science" The Textile Institute. 1992, ISBN: 1870812379
- Fiber reinforced Composites Materials, Manufacturing, And Design, P.K. Mallick, 3rd ed. Taylor & Francis

Course Outcomes:

Students will be able to:

- 1. Explain the concept and requirements of high performance fibres
- 2. Describe the manufacturing process of commonly used high performance fibres
- 3. Analyze the structure, properties and applications of commonly used high performance fibres
- 4. Explain the concept of fibre reinforced composites

THIRD YEAR B. TEXT. – SEMESTER – II 6.6MANMADE STAPLE YARN MANUFACTURE-V(MMTT)

Lectures		4 Hours / Week
Practicals	:	3 Hours / Week
Theory Paper	:	100 Marks
Termwork	:	50 Marks
Subject Total	:	150 Marks

Course Objectives

- 1. To understand the manufacturing process and characteristics of Blended Yarns.
- 2. To explain the principle of unconventional spinning.
- 3. To describe various operations and mechanisms used.
- 4. To analyse the effect of process parameters on quality of yarns produced on unconventional spinning systems.

Course Contents

Unit 1.BLEND SPINNING:-

- Object of blending, Fibre characteristics and Spinnability.
- Measures of blending, Blend Migration, blend segregation in processing, selection of blend constituents, mechanics of blending and blending Techniques.
- Modification of cotton spinning machineries for processing of manmade fibres.
- Common faults in blended and 100% man made spun yarn.
- Blending of manmade fibres with wool.
- Processing of manmade fibres and its blends on Rotor Spinning Machines.
- Blend spinning of dyed fibres.

Unit 2.AIR JET SPINNING:

- Basic concept, Principles of MJS, MTS and MVS.
- Stages involved, operating principle of air jet
- Mechanism of yarn formation, Mechanism of twisting.
- Raw material and preparatory process requirements.
- Structure, properties and end uses of yarns.

 Effect of process parameters like: total draft, nozzle pressure; take up ratio, delivery speed, and raw material parameters on quality of air-jet yarn.

Unit 3.FRICTION SPINNING:

- Introduction to the principle of friction spinning.
- Details of different machine zones like: drafting, opening, fibre collection, twisting and winding.
- Raw material preparatory process requirements.
- Structure and Properties.
- Effect of process parameters like: total draft, opening roller speed, delivery speed, Parameters of twisting drum and raw material parameters on quality of friction spun yarn.

Unit 4.FRICTION SPINNING & SELF-TWIST SPINNING:

- Principle of self-twisting and Self-twist yarn formation mechanism.
- Concept and importance of phase shifting.
- Structure and Properties of Self-Twist yarn.
- Advantages and limitations of self-twist spinning and Applications of self-twist yarn.

Unit 5. SIRO SPINNING & WRAP SPINNING:

- A) SIRO Spinning:
 - Principle and importance of SIRO spinning.
 - Working of SIRO spinning.
 - Structure, Properties and Applications of SIRO yarn.
 - Advantages and limitations of SIRO spinning.
- B) Wrap Spinning:
 - Concept of wrap yarn manufacturing.
 - Working of wrap spinning.
 - Structure, Properties and Applications of wrap yarn.

Unit 6. TWIST-LESS SPINNING:

- Drawbacks of twisted yarns and Concept of twist-less spinning.
- Different techniques of twist-less yarn manufacturing such as: BOBTEX, TWILLO and TEK-JA process.
- Raw material requirements.
- Advantages and limitations of twist less spinning.
- End uses.

List of Experiments

- 1. Demonstration of tinting and channelization of material in spinning
- 2. Study of yarn faults in blended yarns
- 3. Production of yarn on air-jet machine and comparing it with ring yarn.
- 4. Effect of total draft on air-jet yarn properties.
- 5. Effect of Nozzle pressure on air-jet yarn properties.
- 6. Effect of take up ratio on air-jet yarn properties.
- 7. Effect of condenser on air-jet yarn properties.
- 8. Production of SIRO yarn and compare it with TFO yarn.
- 9. Production of compact SIRO yarn and compare it with TFO double yarn.
- 10. Production of compact SIRO yarn and compare it with single compact yarn.
- 11. Visit to Spinning Mills.
- 12. Visit to the Blend Spinning plant.

Reference Books

- 1. K R Salhotra, "Spinning of man-made fibres and blends on cotton systems", The textile Association, India 2004.
- V. B. Gupta and K. K. Kothari (Ed), Man-made Fibres Production, Processing Structure, Properties and Applications, Vol. I and II, Dept. of Textile Technology, IIT, New Delhi 1988
- Textile progress vol. 10 No.2 The Production and properties of staple fibre, Yarns made by Recently developed Techniques by L. Hunter.
- 4. Air jet spinning Textile Progress, Textile Institute Publication.
- 5. Spun Yarn Technology by Carl A. Lawrence
- 6. New Spinning Systems H. Staldar

7. Spun Yarn Technology by Eric Oxtoby.

Course Outcomes

At the end of the course students will be able to

- 1. Demonstrate the manufacturing process and characteristics of Blended Yarns. (Knowledge)
- 2. Understands the basics of unconventional spinning techniques. (Knowledge)
- 3. Understand the operations and various mechanisms used. (Understand)
- 4. To evaluate the effect of process parameters on quality of yarns produced on unconventional spinning systems. (Analyse)

THIRD YEAR B.TEXT. - SEMESTER - II

6.2 THEORY OF TEXTILE MACHINES-I (TPE)

Lectures	:	4 Hrs/week.
Practical	:	2 Hrs/week
Theory Pape	er :	100 marks
Term work	:	50 marks
Sub Total	:	150 marks

Course Objectives

- To understand theory of different mechanisms, use of Velocity and Acceleration diagram for mechanisms in textile machines. To get familiar with Coriolis component of acceleration and application of velocity and acceleration diagrams to sley motion.
- 2. To understand the concept of cams and followers and its types, profile of cam for given follower motion. To know the Application of cams and cam mechanisms and Transmission of Motion and Power with the help of different drives in Textile Machines.
- To get familiar with coil Friction in textile machines, its application in yarn tensioning devices, let off motion, yarn friction meters. To study Roller weighting system and drafting systems.
- 4. To get acquainted with high speed rings, spindles and travelers, yarn tension in spinning.

Course Contents

1) Mechanisms – Introduction – Link, Kinematic pair, kinematic chain, mechanism, inversion. Study of four bar mechanism, single slider crank mechanisms and their inversions.

Straight Line Mechanisms – Pantograph, Scott Russell mechanism, Peaucellier mechanism, Harts' mechanism, Intermittent motion mechanisms – ratchet and pawl mechanism and Geneva mechanism.

Examples from textile machines – Straight-line motion mechanisms in rapier loom, crank and rack operated straight line motion, planetary straight-line motion and radial cam operated motion, screw traversing motion for rapier movement.

- 2) Velocity and Acceleration in Mechanisms -
 - Relative velocity method, velocity diagram for different mechanism,
 acceleration diagrams for various mechanisms. Coriolis component of
 acceleration, application of velocity and acceleration diagrams to sley motion.
 Numerical examples based on velocity and acceleration diagrams.
- 3) Cams Types of cams and followers, profile of cam for given characteristicsof follower, specified contour cams, tangent and circular arc type cams. Spring force on follower, torque on cam shaft. Conjugate cam. Application of cams and cam mechanisms in Textile Machines.
- 4) Transmission of Motion and Power -

Belt drives – flat, vee and rope belts. Length of belt, velocity ratio, slip, creep, initial tension in belt, limiting tension ratio, centrifugal tension, power transmission, condition for maximum power transmission. Chain drives used in machines.

5) Friction -

Introduction – types – laws of friction.

Friction in pivot bearings, Power lost in friction, coil friction – application in yarn tensioning devices, let off motion, yarn friction meters.

 Study of Roller weighting system and drafting systems –
 Roller weighting in spinning, mechanism of drafting systems, Study of high speed rings, spindles and travelers, Study of yarn tension in spinning.

Experiment List:

- 1. Study of basic mechanisms. (Demonstration of models, Actual mechanisms, etc.)
- 2. Determine the Velocity by relative velocity method. (Minimum 2 problems)
- 3. DetermineAcceleration byrelative acceleration method. (Minimum 2 problems)
- 4. Design of Problems on cam profile. (Minimum 2 problems)
- 5. Study of belt drives and calculation
- 6. Study of Bearings
- Study of drafting systems and comparison of drafting system with and without apron
- 8. Study of Rings and traveler on a ring frame.

Reference Books:

- 1. "Theory of Machines", Ratan S.S, Tata McGraw Hill New Delhi, 2nd Edition.
- 2. "Theory of Machines", P.L.Ballany, Khanna Publication, New Delhi, 2nd Edition.
- 3. "Theory of Machines", V.P. Singh, DhanpatRai and Sons.
- 4. "Theory of Machines", H.G.Phakatkar, Nirali Publication. Pune
- 5. "Theory of Machines", Dr. R.K.Bansal, Laxmi Publication.
- 6. "Theory of Machines", Thomas Bevan, CBS Publishers, New Delhi.
- 7. "Theory of Machines and Mechanism", G.S. Rao and R.V. Dukipatti, "New Age Int.Publications Ltd., New Delhi.
- 8. "Theory of Machines", Shah and Jadhawani, DhanpatRaiand Sons

Course Outcome

Student will be able to,

- 1 Describe theory of different mechanisms, use Velocity and Acceleration diagram in textile machines. Explain need of application of velocity and acceleration diagrams to sley motion.
- 2 Explain the principle, working, applications of cam and followers with the help of diagrams. Describe various methods of Transmission of Motion and Power with the help of different drives in Textile Machines.
- 3 Describe working of friction, Roller weighting system and drafting systems& its applications with the help of diagrams.
- 4 Explain various high speed rings, spindles and travelers, yarn tension in spinning with the help of diagrams.

THIRD YEAR B.TEXT.SEMESTER - II

6.4 ENGINEERING DESIGN OF TEXTILE MACHINES-I (TPE)

Lectures	:	3 hrs/week.
Practicals	:	3 hrs/week.
Theory Paper	:	100 marks.
Term Work	:	50 marks
Oral Exam.	:	50 marks.
Subject Total	:	200 marks.

Course Objectives:

- To know the concept of Machine Design, understand general design procedure & manufacturing considerations in design. To know the concept of Principal planes & Principal stresses and the procedure for evaluating the same. To get familiar with theories of failure & their concerned expressions.
- To know the design procedure of shafts for various loading conditions. To get familiar with design procedure of various types of keys, couplings & springs.
- To know the design procedure of bolted & riveted joints for direct & eccentric loading condition. To get familiar with design procedure of pulleys & flywheels.
- 4) To get conversant with computer aided drafting system. To study the functions of seals- its types, materials, construction, working & applications.
- Unit 1. Introduction to machine design and selection of engineering materials -Concept of machine design, General design procedure, criteria for selection of material in design, design considerations of casting & forging.
- **Unit 2. Principal stresses and strains –** Normal stress, shear stress, Principal stresses and planes, Principal strains, Mohr's circle diagram, Theories of failure- Max. Normal stress theory, Max. Shear stress theory, Distortion energy theory (statement only).
- Unit 3. A) Design of shaft Shafts subjected to axial stresses, bending stresses, torsional stresses and their combination, ASME code for shaft design, material selection for shaft, design of shaft for torsional rigidity, design consideration of drafting rollers.

B) Design of keys – Design of Square, Flat & Kennedy key, design of splines.

C) Design of couplings - Design of Muff coupling, rigid flanged coupling and flexible coupling.

Unit 4. A)Design of springs - Introduction, types of springs, design of helical compression, tension, torsion & leaf springs, nipping of leaf springs, spring materials.

B) Design of threaded joints – design of direct & eccentric loaded threaded joints.

- Unit 5. Design of pulleys and flywheels Function of flywheel, Torque analysis, design of solid disk & rimmed flywheel. Design of flat belt and V- belt pulleys, selection of pulleys.
- **Unit 6. A) Seals –** Functions, types of seals, failure of seals, seal materials, application of seals.

B) Introduction to computer aided drafting – Features of Auto CAD system, basic Auto CAD commands.

List of Experiments:

Minimum five assignments based on above syllabus viz.

- 1) Introduction to Machine design & Selection of materials.
- 2) Principal stresses & strains.
- 3) Design of shafts, keys & couplings.
- 4) Design of springs & joints.
- 5) Design of pulleys & flywheels.
- 6) Study of seals & Auto CAD commands.

Reference Books:

- 1. Introduction to Machine Design by V. B. Bhandari.
- 2. Design of Machine elements by V. B. Bhandari.
- 3. A Textbook of Machine Design by R.S. Khurmi & J. K. Gupta.
- 4. Design of Machine elements by Spotts.

- 5. Machine Design by Pandya & Shah.
- 6. Design of Machine elements by T. Krishna Rao Vol. I & II
- 7. Machine Design by P. Kannaiah.
- 8. Mechanics of Spinning Machines by R. Rengaswamy.

Course Outcomes:

At the end of the course students will be able -

- To explain the concept of Machine Design, describe general design procedure & manufacturing considerations in design. To derive necessary expressions for Principal planes & Principal stresses and calculate the same. State & explain theories of failure, derive their concerned expressions & solve numerical based on it.
- To design shafts for different loading conditions. To design various types of keys, couplings & springs.
- To design bolted & riveted joints for direct & eccentric loading condition. To design pulleys & flywheels.
- 4) To describe features of computer aided drafting system & Auto CAD commands. To explain with sketch different types of seals & their applications.

THIRD YEAR B.TEXT. - SEMESTER - I

6.5	TRIBOLOGY		(TPE)
Lect	ures	:	3 Hrs/week
Tuto	orial	:	1 Hrs/week
The	ory Paper	:	100 marks
Sub	oject Total	:	100 marks

Course Objectives

- 1. To explain working principles and process parameters of friction, wear lubrication and types of lubricants.
- 2. To describe properties, selection criterion, mechanism of action and applications of types of oils, greases, solid lubricants and gas lubrication.
- 3. Explanation of constructional details and selection of lubrication systems. Informing about lubrication practices.
- 4. To teach Lubricant conservation, testing, monitoring, lubrication, management, environmental issues, handling and storage.

Unit 1.

A) Basic concept of lubrication –

Definition of Tribology, meaning of lubrication, friction, liquid lubrication, hydrodynamic lubrication, boundry lubrication, hydrostatic lubrication, Dry or solid lubrication etc.

B) Choice of Lubricant Type -

Problem related to lubricant selection, basic types, selection criterion, choice for particular component.

Unit 2.

A) Selection of Lubricating Oils :-

Important properties, classification, viscosity, boundary lubrication, oil stability, contamination, Compatibility etc. Synthetic oils, natural oils, emulsions. Lubricating oils used in textile machines.

B) Oil Feed Systems :-

Advantages of oil feed, various systems like total loss system, oil mist system, wick and pad etc. Problems of oil changing, selection of right system.Lubrication systems used in textile machines.

Unit 3.Study of Greases

Nature and composition of grease, grease manufacturing, mechanism of action of grease, properties of grease, advantages and disadvantages, selection and application, methods of application. Anti-seizes and anti-scuffing compounds. Lubricating greases used in textile machines.

Unit 4.Solid Lubrication

Mechanism of solid lubrication, advantages and disadvantages MoS₂, PTFE, Nylons, Acetals, metals, composites etc. selection of solid lubricants. Solid Lubricants used in textile machines.

Unit 5. Gas Lubrication

Principles of gas bearings, properties of gas, advantages and disadvantages, examples of gas bearing use.

Unit 6. Lubricant Testing and Specifications:-

Object, functional, chemical, physical tests. Standards and specification, precision of tests.

Lubricant Monitoring:-

Objects of lubricant monitoring, SOAP, Particle Test and Ferrography, oil monitoring by lab. Testing, Spot tests. Testing of grease. Failure investigation.

Oil Conservation, Lubricant Handling and Storage -

Handling of used oil, Disposal of emulsions and contaminated oils, Laundering, refining and reuse. Care in lubricant handling, storage and applications.Revision and Discussion about SEE

Reference Books

1. Lubrication – by A.R. Lansdown.

- Recent Advances in Tribology Proceeding of X National Conference on Industrial Tribology, 1983.
- 3. Maintenance Management Vol.4, IMME Publication.
- 4. Basic Lubrication Theory by Alastair Cameron

Course Outcomes

At the end of the course students will be able to

- 1. Describe working principles and process parameters of friction, wear lubrication and types of lubricants.
- 2. To describe properties, selection criterion, mechanism of action and applications of types of oils, greases, solid lubricants and gas lubrication.
- 3. Identify constructional details and selection of lubrication systems. To know and write lubrication practices.
- 4. To know importance of Lubricant conservation, testing, monitoring, lubrication, management, environmental issues, handling and storage.

THIRD YEAR B. TEXT. - SEMESTER - I

6.6 CHEMICAL PROCESSING MACHINERY (TPE)

Lectures	:	3 Hours / Week
Practical	:	3 Hours / Week
Theory Pap	ber:	100 Marks
Term Work	: :	50 Marks
Subject Tot	tal :	150 Marks

Course Objectives

- 1. To define maintenance and discuss function with construction of preparatory machines.
- 2. To study the working of dyeing machines for different forms of substrate.
- 3. To explain working of various printing machines.
- 4. To discuss working and construction of finishing machines.

1. Maintenance Management

What is maintenance, importance of maintenance, types of maintenance and responsibilities of maintenance department

2. Mechanical Pre-treatment Machines

Study of construction, working and maintenance of shearing & cropping machine, surface shearing machine for carpets & terry towels, Gas singling machine, different positions of singling, indirect singling machine

3. Chemical Pre-treatment Machines

Construction & working of kier, study of continuous & batch type open width scouring machines. Slack rope and tight rope washing machine. Batch & continuous washing machine for open width & rope form.

Machinery for semi-continuous & continuous bleaching method, J-box unit, vapor lock bleaching range, Bleaching machine for knit goods

Hank mercerizing machine, fabric mercerization machine like pad-chain, padchainless & padless- chainless mercerization ranges, Mercerizing machine for knit goods, Liquor ammonia mercerization, Caustic recovery plant, Developments in mercerizing machines.

4. Dyeing Machines

Machinery for cotton fibre dyeing, hank, cheese, and cop dyeing machine, Machinery for fabric dyeing like padding mangles, semi-automatic & fully automatic jiggers & jumbo jiggers, winch dyeing machines. H.T. H.P. beam dyeing machines, jet dyeing machine, soft flow dyeing machine. Continuous dyeing ranges

5. Printing Machines

Flat bed printing, rotary screen printing machines. Techniques of screen preparations for flat bed and rotary screen, Study of working & construction of agers & steamers

6. Finishing Machines

Study of working & construction of finishing machinery like vertical drying range, friction calendar, Schriener calendar, felt calendar, stenter machine, float drier, sanforising machine, decatising machine, polymeriser

List of Experiments

- 1. Constructional study and working of air flow dyeing machine.
- 2. Study the working and construction of over flow dyeing machine.
- 3. Study the working and construction of padding mangle and stenter.
- 4. Industrial visit for study of mercerisation machine.
- 5. Industrial visit for study of singeing machine.
- 6. Study the working and construction of sanforising machine.
- 7. Study the working of solonied valve at different machines of processing.
- 8. Study the thermal controllers on various machines of wet processing.
- 9. Study the working and construction of package dyeing machine.
- 10. Study the construction and working of vertical drying range.
- 11. Study the gearing arrangement and working of jigger machine.
- 12. Study the working and construction of rope washing machine.

Reference Books

- 1. Handbook Of Textile Processing Machinery R.S. Bhagwat
- 2. Technical Specification Of Wet Processing Machinery-National Textile Corporation

- 3. Maintenance In Chemical Processing- Gokhale & Dhingra
- 4. Engineering In Textile Coloration- C. Duckworth
- 5. Tech. Of Dyeing Dr. V. A. Shenai
- 6. Tech. Of Printing Dr. V. A. Shenai
- 7. Tech. Of Finishing Dr. V. A. Shenai
- 8. Tech. Of Bleaching. & Mercerising-. V. A. Shenai

Course Outcomes

At the end of the course students will be able to

- 1. Ability to understand maintenance management and understand various preparatory machines.
- 2. Ability to understand working of dyeing machines for various substrates.
- 3. Ability to understand working of printing machine.
- 4. Ability to understand working and construction of various finishing machines.

THIRD YEAR B. TEXT. – SEMESTER – II

6.2 TECHNOLOGY OF DYEING – II (TC)

Lectures : 3 Hours / Week Practical : 3 Hours / Week Theory Paper: 100 Marks Term Work : 25 Marks Practical Examination:50 Marks Subject Total : 175 Marks

Course Objectives

- 1. To discuss various methods of mass colouration and tow dyeing
- 2. To explain properties of disperse dyes and factors influencing dyeing operations
- 3. To describe and demonstrate different methods of Nylon and Acrylic dyeing
- 4. To evaluate the evenness of dyeing and fastness properties

1. Mass Colouration and Tow Dyeing

Mass colouration of polyester and Nylon with different methods colour addition in polymerization, chips coating, Master batch addition, chips dyeings and Injection during Melt Spinning, Mass colouration of acrylic fibre, Tow dyeing of polyester and acrylic. Advantages and limitations of mass colouration

2. Theory of Dyeing with Disperse Dye

Disperse dyes, dispersions, Dye solubility, size of particles, theory of cellulose acetate dyeing mechanism, Affinity, Temperature influence, Influence of Heat Treatment influences, Polyester dyeing mechanism, Dyeing in vapour phase, Dyeing kinetics with disperse dyes. Dyeing with carriers

3. Polyester Dyeing

Preparation of fabric for dyeing, Carrier dyeing of Polyester, Industrial practices of carrier dyeing, Advantages and limitations of carrier dyeing, High temperature dyeing process, HT dyeing equipments, Effects of different auxiliaries, Control and rectification of various problems in High temperature dyeing, Oligomers Problem. Thermo fixation Process – Preparation of fabric for dyeing, Preparation of pad liquor,

Padding and dyeing, Thermotixatron equipments required for dyeing. Dyeing of micro denier polyester, CDPET and texturised polyester

4. Nylon and Acrylic Dyeing

Dyeing theory of Nylon, Dyeing with acid and metal complex dyes, leveling agents, swelling agents, High and low temp. dyeing, dyeing with disperse and reactive dyes. Faults and remedies in Nylon Dyeing.

Preparation of acrylic for dyeing. Dyeing of acrylic fibre, yarn and fabric, Effect of different parameters on dyeing. Effect of different auxiliaries in dyeing. Defitherm process. Dyeing of acrylic with disperse dyes. Stripping of cationic dyes

5. Dyeing of Other Synthetic Fibres and Various Blends

Dyeing of cellu-acetate and tri acetate, dyeing of modified and unmodified polypropylene, Dyeing of PVA, PVC and polyurethane Fabrics.

Batch and continuous dyeing process of poly / cellulose blends, Dyeing of poly / wool, polyester / Acrylic, Polyamide / Wool, Acrylic / Wool, Acrylic / Silk, Dyeing with one colour and two colour synthetic fibre blends Polyamide / acrylic, Dyeing of polyester / modified polyester blend, polyester / Lycra, Acrylic / cellulosic

6. Dyeing of special Fabric

Dyeing of Knitted goods, Garment dyeing, Terry Towel dyeing, Processing of top dyed goods

List of Experiments

- 1. Carrier dyeing in OBBD machine
- 2. High temperature dyeing in of polyester fabric in H. T. Beaker dyeing machine
- 3. Polyester dyeing by thermosol method
- Dyeing of P/C blended shirting using disperse / reactive system by exhaust method
- 5. Dyeing of P/C blended shirting using disperse / vat system by exhaust method.
- Dyeing of P/C blended shirting with disperse / reactive method by continuous method
- Dyeing of P/C blended shirting with disperse / vat method by continuous method

- 8. Dyeing of P/V blend shirting using disperse / reactive by two bath method.
- 9. Dyeing of P/V blend shirting using disperse / reactive by one bath method
- 10. To study the effect of dispersing agent, levelling agent, defoming agent and rate of heating / cooling, fabric speed in dyeing of polyester
- 11. Dyeing of polyester / acrylic, polyester / wool blend
- 12. Dyeing of Nylon and its blends

Reference Books

- 1. Textile processing and properties by Tyrone L. Vigo
- 2. Processing of poly/cotton blends by G. G. Kulkarni and S. S. Trivedi
- 3. Dyeing of polyester and its blends by Prof. M. L. Gulrajani
- 4. Chemical processing of synthetic fibres by Dr. K. V. Datya and A.A. Vaidya
- 5. Technology of dyeing by Dr. V. A. Shenai
- Chemical technology in the pre treatment process of textile by Dr. S. R. Karmakar

Course Outcomes

At the end of the course students will be able to

- 1. Ability to use techniques of mass colouration
- 2. Analyses of properties of disperse dyes.
- 3. Ability to apply suitable methods of nylon and acrylic dyeing and solve the practical problems
- 4. Ability to formulate suitable dyeing techniques for good quality dyeing

THIRD YEAR B. TEXT.-SEMESTER - II

6.4 TECHNOLOGY OF PRINTING – II (TC)

Lectures : 3 Hours / Week Practical : 3 Hours / Week Theory Paper: 100 Marks Term Work : 25 Marks Practical Examination: 50 Marks Subject Total : 175 Marks

Course Objectives

- 1. To explain polyester printing process, print formulation for various styles; To discuss printing process of polyester and its blends
- 2. To explain Nylon printing process, print formulations; To discuss silk and wool printing using various dyes and style
- 3. To explain concept of transfer printing process
- 4. To describe brasso and carbonized printing process on P/C blend. To discuss carpet printing process

1. Printing of Polyester

Preparations of 100% polyester fabric for printing, Paste formulation, selection criteria of dyes, chemistry of print formulation; Direct, discharge and resist styles of printing on 100% polyester, Mechanism of various discharging and resisting agents used in printing.Shop floor practices, problems and remedies in printing

2. Printing of Polyester and their Blends

Single dye applications on PC blended fabrics; Pigment printing of polyester and P/C blended fabrics; Selection criteria for binders and synthetic binders; Printing with Fluorescent pigments

3. Printing of Polyamides

Preparation of Nylon fabric for printing, Paste formulations, for printing of nylon with acid, metal complex and disperse dyes;Shop floor practices, problems and remedies in nylon printing

4. Printing of Silk and Wool

Preparation of silk and wool fabric for printing, Paste formulations for printing of silk and wool with acid, metal complex and reactive dyes, printing with natural dyes

5. Transfer Printing

Concept of transfer printing, Selection of paper, ink and dyes for transfer printing, Introduction of machinery used for printing paper, Machinery used for transfer printing.

6. Brasso and Carpet Printing

Concept of Brasso style of printing, paste formulations, commercial practices, Problems and remedies in Brasso printing, Carbonized prints, Concept of carpet printing, Study of machinery used for carpet printing

List of Experiments:

- 1. Direct style of printing on 100% polyester by using disperse dyes: Steaming
- 2. Direct style of printing on 100% polyester by using disperse dyes: various fixation methods.
- 3. White discharge style of printing by using stannous chloride and Rongalite C
- Coloured discharge style of printing on polyester using stannous chloride and Rongalite C
- 5. Resist style of printing using Cupric Acetate on polyester
- 6. Brasso style of printing on P/C blends
- 7. Transfer printing on polyester
- 8. Printing of silk with acid and basic dyes
- 9. Printing of wool with metal complex dyes
- 10. Printing of P/C blended fabrics by using disperse / reactive dye
- 11. Printings of P/C blended fabrics by using disperse / vat dye
- 12. Carbonizing printing

Reference Books

- 1. Textile Printing by L.W.C. Miles.
- 2. An Introduction to Textile Printing by W. Clarke.
- 3. Technology of Printing by Dr. V. A. Shenai

- 4. Book of Papers, QIP Summer School on "Advances in Textile Chemical Processing: Edited by Dr. R.B. Chavan.
- 5. Textile Printing Book of papers by Prof. R.B. Chavan.
- 6. Processing of silk by Prof. M.L. Gulrajani.
- 7. Proceedings: Recent advances in Textile Processing lectures/seminer, Dec.1982, I.I.T., Delhi.
- 8. Colourage, ITB International bulletin on dyeing printing and finishing.

Course Outcomes

At the end of the course students will be able to

- 1. Explain polyester printing process, print formulation for various styles; To discuss printing process of polyester and its blends
- 2. Explain Nylon printing process, print formulations; To discuss silk and wool printing using various dyes and style
- 3. Describe concept of transfer printing process
- 4. Describe brasso and carbonized printing process on P/C blend and explain carpet printing process

THIRD YEAR B. TEXT. – SEMESTER – II 6.5. TECHNOLOGY OF FINISHING –II (TC)

Lectures	:	3 Hours / Week
Practical	:	2 Hours / Week
Theory Paper:		100 Marks
Term Work	:	25 Marks
Subject Tot	al:	125 Marks

Course Objectives

- 1. To describe the process of Heat setting, OBA, antipilling & soil release finishing with mechanism. Understand physical & chemical methods to reduce pilling.
- 2. To describe objects of spin finish & understand the role of spin finish ingredients.
- To explain various minimum application techniques used in finishing of fabrics & describe the process of foam finishing.
- 4. To describe finishing of Polyester, blended fabrics & special sorts & to describe the process of Silk like Polyester.

1. Heat Setting

Objects, types of setting, Mechanism of temporary set and permanent set, Structural changes brought about by heat setting. Concept of grey intermediate and post heat setting. Heat Setting conditions of various yarns and fabrics. Industrial practices of heat setting of polyester and its blends. Various methods to determine the degree of heat setting.

2. Antipilling and Soil Release Finishing

Causes of pill formation, Factors affecting pilling tendency, various physical and chemical methods to reduce pilling, Evaluation of efficiency of antipilling finishing. Type of soils, mechanism of soil impingement and soil retention. Mechanism of soil release. Soil release finishing of synthetics & its blends, Evaluation of soil release finishing.

3. Spin Finishing

Object of spin finish. Concept of Tribo-electric series and its importance. Spin finishing ingredients and their functions. Various methods of application of spin finishes. Spin finishing of textured polyester. Problems and remedies in spin finishing.

4. Optical Brightening Agent

Mechanism of whitening action. Concept of saturation and subjective brightness, whitening with a blueing agent, Essential requirements of a good OBA. Chemical classes of OBA. Methods of application of OBA on natural, synthetic fibres and their blends. Stripping of OBA.

5. Minimum Application Techniques, Energy Conservation and Finishing Formulations

Various Minimum application techniques.

Foam Finishing: - Concept of foam and blow ratio. Properties of foam, Factors affecting the stability of foam. Methods to determine the stability of foam. Disperse and condensation methods of preparation of foam. Various techniques of foam application. Drawbacks of foam finishing.

Various approaches for Energy Conservation and cost reduction in finishing.

Finishing recipe for PET, polyester/cellulosic blends, P/W blend, etc. Finishing sequence for Acrylic & its blends, nylon & its blends, cotton/lycra blends. Modern evaluation methods like KAWABATA and FAST system.

6. Special Finishes and Recent Advances

Silk like polyester, Antistatic finishes. Finishing of micro denier polyester goods. Recent developments in finishing like nano-finishes, micro-encapsulation. Introduction to finishing of technical textiles.

List of Experiments

- 1. Application & evaluation of OBA on Polyester and Nylon.
- Preparation and application of Blue Tone and Red Tone on synthetic and its blends.
- 3. Finishing of polyester material for imparting soft, medium & stiff handle.
- 4. Finishing of 100% polyester suiting.
- 5. Finishing of carbonized goods.
- 6. Finishing of polyester / cellulosic blend.
- 7. Finishing of polyester / wool blend.
- 8. Application & evaluation of softeners on polyester.
- 9. Application & evaluation of soil release finish on polyester.
- 10. Application & evaluation of antimicrobial finish on polyester.
- 11. Determination of degree of heat setting of various materials.
- 12. Weight reduction to produce silk like polyester.

Reference Books

- 1. Chemical processing of synthetic and its blends by Dr. K.V. Datye and A.A. Vaidya.
- 2. Low liquor dyeing and finishing The Textile Institute, Manchester.
- 3. Chemical after treatments of textiles by Marks, Atlas and wooding.
- Chemical processing of polyester/cellulosic blends by R.M. Mittal and S.S. Trivedi.
- 5. Technology of Finishing Vol. X, by Dr. V.A. Shenai.
- 6. Finishing, reference book of textile technologies by ACIMIT
- Chemical Finishing of Textiles, by W.D. Schindler and P.J. Hauser, Woodhead Publishing Ltd.
- 8. Textile finishing by A.J. Hall.

Course Outcomes

- 1. Differentiate among heat setting conditions to be adopted for various fabrics & summarize parameters affecting pilling tendency in fabrics.
- 2. Formulate the spin finish bath composition for different fibres & recipe for soil release finishing and evaluate the efficiency of soil release finishing.
- Demonstrate the parameters during application of OBA on various fibres & evaluating the whiteness of fabrics. Enlist the advantages & factors affecting foam processing.
- 4. Design process sequence, recipe for finishing of 100 % Polyester, P/C & P/V fabrics. Summarize the parameters in chiffon finish.

THIRD YEAR B. TEXT. – SEMESTER – II

6.6 PHYSICAL PROPERTIES OF YARNS AND FABRICS (TC)

Lectures	:	3 Hours / Week
Practical	:	2 Hours / Week
Theory Paper	:	100 Marks
Term Work	:	25 Marks
Subject Total	:	125 Marks

Course Objectives

- 1. To explicate significance of yarn and fabric properties.
- 2. To highlight factors affecting yarn and fabric properties.
- 3. To describe principle and testing methodology of yarn.
- 4. To explain principle and testing methodology of fabric.

1. Yarn number and twist:

A) Yarn number: Concept, direct and indirect systems, measurement of yarn number-Knowles balance, Stubbs balance, Beesley balance, quadrant balance.
B) Twist: Terms and definitions, function of twist in yarn structure, effect of twist on yarn and fabric properties, measurement of twist in single and double yarns–straightened fibre method, twist contraction method, twist to break method, optical method, twist take up method.

2. Evenness of yarn:

Concept, classification of irregularity, causes of irregularity, measures of irregularity, basic irregularity, index of irregularity. Addition of irregularity, measurement of yarn irregularity - visual examination, cutting & weighing method, electronic capacitance principle, analysis of irregularity– variance-length curves, spectrogram, importance of yarn uniformity.Imperfections – concept, causes and importance.

Seldom occurring faults: classification of faults and its causes. Principle& working of Classimat tester. Hairiness in spun yarn - concept, causes, remedies&measurement of hairiness- photoelectric method.

3. Strength testing:

Terms and Definitions, Effect of fibre properties on the yarn strength, factors affecting the tensile properties of textiles, single yarn strength - The pendulum lever principle, Strain gauge transducer principle, machines working on these principles, interpretation of test results.

Lea Strength - The lea CSP or Break factor & its significance – description of lea strength tester, comparison of lea & single yarn test results, Ballistic test & its importance.

Fabric Strength – Importance of fabric strength test, sampling of fabric, Tensile strength testing – cut strip method, ravelled strip method, grab test, comparison of strip test & grab test, tear strength, bursting strength.

4. Thickness, Cover and Serviceability of fabric:

A) Thickness – definition, significance, fabric thickness by Shirley method.

B) Cover factor – definition, derivation of cover factor, significance.

C) Serviceabilityand wear: Concept, factors affecting abrasion resistance, assessment of abrasion damage, BFT abrasion testing machine, Martindale abrasion tester. Pilling of fabrics: Concept, mechanism of pilling, factors affecting fabric pilling, ICI pill box tester.

5. Aesthetic& Tactile Comfort of Fabric:

A) Fabric stiffness &drape: Concept, importance of stiffness and drape, measurement of stiffness: Shirley stiffness tester (cantilever principle), heart loop test, measurement of drape by drape meter, factors affecting stiffness and drape.
B) Crease resistance & crease recovery: Concept, measurement of crease recovery, factors affecting crease recovery.

6. Transport Properties:

A) Air permeability - Concept, importance, Shirley air permeability tester, factors affecting air permeability.

B) Water fabric relations -Concept, importance, mechanics of wetting, wetting time test, spray test, drop penetration test, Bundesmann test, water head test.

List of Experiments

- 1. Determination of yarn linear density
- 2. Determination of twist in single yarn
- 3. Determination of twist in double yarn
- 4. Determination of single yarn strength
- 5. Determination of yarn lea strength
- 6. Evaluation of yarn unevenness by capacitance principle and visual examination
- 7. Determination of fabric strip strength
- 8. Determination of tearing strength of fabric
- 9. Assessment of abrasion resistance of fabric
- 10. Evaluation of stiffness of fabric
- 11. Estimation of crease recovery angle
- 12. Estimation of drapability of fabric

Reference Books

- 1. Principles of Textile Testing by J. E. Booth.
- 2. Physical properties of Textile Fibres by J. W. S. Morton & Hearle.
- 3. Textile Testing by Skinkle.
- 4. Handbook of Indian Standards.
- 5. Quality control and Testing by V. K. Kothari.
- 6. Fabric Testing by Jinlian Hu.
- 7. Textile Testing Fibre, Yarn and Fabric by Dr.ArindamBasu
- 8. Textile Fibres Yarns and Fabrics by E. R. Kaswell

Course Outcomes

- 1. Describe significance of yarn and fabric properties.
- 2. Explain factors affecting yarn and fabric properties.
- 3. Test yarn and interpret the results.
- 4. Test fabric and interpret the results.

THIRD YEAR B. TEXT. – SEMESTER – II

6.2 ADVANCED STYLING AND FORECASTING (FT)

Lectures	:	3 Hours / Week
Theory Paper	:	100 Marks
Term Work	:	25 Marks
Subject Total	:	125 Marks

Course Objectives:

- 1. Explain various fabric materials available in market and discuss how to select appropriate fabric for various applications.
- 2. Explain how to create articles using various fabric ornamentation techniques
- 3. Discuss various forecasting methods used by reputed forecasting companies to develop current trend for the local market.
- 4. Describe forecasted colors, fabrics and trends according to seasons and market.

1. Fabric Styling

Concept and scope of styling. Difference between fashion designing and fashion styling. Types of styling. Elements of Style- Accessing styles and trends, elements of style, Achieve Visual balance, making trends and trend setting.

2. Fashion Forecasting

Meaning of fashion forecasting, role and responsibilities of forecaster, steps in developing a forecast, fashion timetable and seasons, short term and long term forecasting, avoiding forecasting traps. Innovation characteristics, consumer adoption process and theories, fashion change agents, innovators and fashion leaders, consumer segmentation.

3. Colour Forecasting

Importance, colours in marketing, consumers and psychology of colour, language of colour, seasonal colour analysis, fashion colour names, colour cycles, Color Relationships across Product Categories, sources of colour ideas, NCD technique of colour trend analysis and synthesis

4. Textile Forecasting

Fashion in fibres and fabrics, sources of innovation in textile development, timing of innovation, innovation in fibres, yarns fabrics, dyes, finishes and trims, fabric fairs and trade shows, fabric libraries. Silhouette trends. Style forecasting: trend multiplication, different designers with same concept. Fashion map: geography & off the runway, street fashion. Trend Identification, analysis and synthesis. New uses of products.

5. Sales Forecasting

Importance, time series technique, correlation regression techniques, qualitative techniques, blending quantitative and qualitative techniques. Sales forecasting in context of product life cycle.

6. Presenting Forecasts

Objectives, presenting design as a creative process, trend reporting: trend map, trend boards, presentation techniques, publication and forecasting services.

List of assignments:

- 1. Colour forecasting for upcoming seasons.
- 2. Fabric swatch book for upcoming seasons.
- 3. Fashion styling for upcoming seasons.
- 4. Textile forecasting for upcoming seasons.
- 5. Forecasting sheet based on decade study.

Reference Books: -

- 1. Fashion Forecasting by Kathryn McKelvey and Janine Munslow (2008), Wiley-Blackwell. ISBN: 9781405140041.
- Fashion Forecasting by Evelyn L. Brannon (2010), Fairchild Publications. ISBN: 1563678209.
- Color Forecasting For Fashion by Kate Scully and Debra Johnston Cobb (2012), Laurence King Publishing. ISBN: 9781856698207.
- Fashion Forward: A Guide To Fashion Forecasting by Chelsea Rousso (2012), Fairchild Books. ISBN: 9781563679247.

- 5. Fashion Trends: Analysis And Forecasting by Eundeok Kim, Ann Marie Fiore and Hyejeong Kim (2011), Berg Publishers. ISBN: 9781847882936.
- 6. The Trend Forecaster's Handbook by Martin Raymond (2010), Laurence King. ISBN: 9781856697026.
- 7. Sustainable Fashion And Textiles Design Journeys by Kate Fletcher (2008), Routledge Publishers. ISBN: 1844074811.

Course Outcomes:

- 1. Recognize various fabric materials available in market and choose appropriate fabric as per application.
- 2. Produce articles using various fabric ornamentation techniques.
- 3. Apply various forecasting methods used by reputed forecasting companies to develop current trend for the local market.
- 4. Evaluate the forecasted colors, fabrics and trends according to seasons and market type as a member of team and present the same.

THIRD YEAR B.TEXT. – SEMESTER II

6.4 CAD-CAM FOR APPAREL MANUFACTURING (FT)

Lectures :	3 Hours/week
Practical :	3 Hours/week
Theory paper:	100 Marks
Term work :	25 Marks
Subject Total :	125 Marks

Course Objectives

- 1. To define the concepts of CAD-CAM and its usage in garment manufacturing.
- 2. To describe the computerized pattern making process.
- 3. To explain the computerized production planning and 3D technology in garment manufacturing.
- 4. To explain the latest developments of CAD-CAM in apparel industry.
- Introduction to computer: Introduction to computer concepts of CAD / CAM. Usage of CAD/CAM in Garment Manufacturing. Principles of computer graphics, abbreviations and symbols used in CAD systems.
- 2. Computerized production pattern making: Comparison of manual and CAD systems. Computerized production pattern making Hardware and software selection for CAD systems. How to produce a sample production pattern. Computer aided manipulation of pattern pieces to create individual styles. Operation of garment CAD software. Input and output reports for CAD
- Computer aided production planning in Garment Manufacturing: Reports generated by production planning software – production output reports by customer/location/delivery date. Use of microcomputers for production control in garment industry.
- 4. 3-D Modelling: Intelligent systems 3D scanning technology. 3D body scanners, Imaging techniques for various designs. Automatic Pattern Generation Systems.
 2D to 3D conversion technology. Draping 2D patterns on 3D body forms.

Digitizing a pattern and grading of patterns. Drape evaluation of 3D garment simulation.

5. Management Information System in garments Industry:

MRP and MRP – II. EDI and RFID in garment technology. Concept of Enterprise Resource Planning (ERP). History and evolution of ERP. Benefits and different modules of ERP. Future of ERP.OCR report and its use. Inventory Management. Study of ERP Software like Fast react and Stage and their modules. Lead time reduction with software.

6. CAM - Computer controlled machinery for garment manufacturing - automated layout planning by various techniques - Algorithm for computer production garment parts, Development of robotics for CAM. Creating marker plan and plotting markers. And developments in the 3D pattern making systems, WIP control using CAD software, 3D virtual clothing and simulation software.

List of Experiments

- 1. To understand the usage of the basic tools available for pattern making in any of the CAD software.
- 2. Draft the basic block using the tools available in the CAD software
- 3. Grade the basic block using grading tools available in CAD software
- 4. Measure and Check the correctness of seams in the patterns
- 5. To add darts/pleats/notches/folds in the patterns
- 6. Create marker plan for a set of patterns drafted in CAD
- 7. To understand the usage of the tools available in fashion designing software
- 8. To drape a one-piece garment on the models available with the tools available in fashion designing software
- 9. To drape any party-wear garment on the models available with the tools available in fashion designing software
- 10. Digitize a manually drafted pattern with the help of digitizer and grade the digitized pattern for all sizes
- 11. Create a mixed marker plan for all the sizes drafted/graded and plot the pattern with the plotter

12. To make a textile print (sari border / bedsheet / curtain print) with the tools available in Wonder weaves Tex Print

Reference Books

- 1. Winfred Aidrich, "CAD in Clothing and Textiles", Blackwell Science Ltd., 1994.
- 2. Jinlian Hu, "Computer technology for textiles and apparels" Woodhead publication.
- 3. Patric Taylor, "Computer in the Fashion Technology", Om Book Service, 1997.
- 4. Stephen Gray "CAD / CAM in clothing and Textiles ", Gower Publishing Limited, 1998, ISBN 0-566-07673X.
- Compilation of papers presented at the Annual world conference Sep 26 29, 1984 Hongkong, "Computers in the world of textiles ", The textile Institute ISBN: 0-0900739-69X
- Winifred. Aldrich, " CAD in clothing and Textiles ", Blackwell Science 2nd edition, 1992, ISBN: 0-63 -3893 – 4
- 7. Jacob Solinger, "Apparel Manufacturing Handbooks ", Van no strand and Reinhold Company, 1980,ISBN:0-442-21904-0

Course Outcomes

- 1. Illustrate the concepts of CAD-CAM and its usage in garment manufacturing.
- 2. Describe the computerized pattern making process.
- 3. Describe the computerized production planning and 3D Technology in garment manufacturing.
- 4. Interpret the latest developments of CAD-CAM in apparel industry.

THIRD YEAR B. TEXT. - SEMESTER - II

6.5 APPAREL MERCHANDISING (FT)

Lectures	:	4 Hours / Week
Theory Paper	:	100 Marks
Subject Total	:	100 Marks

Course Objectives

- 1. To explain the organization of the Apparel business
- 2. To describe the Fashion marketing and merchandising process.
- To describe retailing and Global Sourcing Strategies, Supply Chain and demand chain analysis
- 4. To distinguish between principle and auxiliary documents.

1. Organization of the Apparel Business:

Introduction to apparel industry - organization structure of the apparel industry Business, Apparel supply chain.

The Garment manufacturing process:

Apparel production process flow, order booking, pre-production meeting, production planning and control, cutting, sewing, finishing, quality control, printing process, embroidery process, sub-contracting work.

Various departments of garment unit:

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

2. Marketing:

Fashion marketing, size and structure of fashion market, Marketing evolution, selling vs marketing, marketing environment, marketing research, marketing objectives and Strategies, marketing mix, fashion marketing planning, fashion market sourcing-domestic, export manufacturing, retailers/wholesalers/co-operative, Buying agencies/Offices, Direct exporting

3. Product development :

Different types of samples, sample approval procedure, sample review, pilot run, merchandiser's role in product development, pre-production activities and its importance purchase order, Bill of material, pricing terminologies(FOB, CIF, CMT)

4. Merchandising:

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

5. Sourcing:

Need for sourcing, Resource Planning – Global Sourcing Strategies, Supply Chain and demand chain analysis ,Supply chain management and its importance. JIT technology. Buying house –Its function and role in garment industry.

6. Export Documentation:

Various types of export documents, Pre-shipment Post -shipment documentation, Terms of sale, payment, shipment etc. Export incentives: Duty drawback, DEPB, I / E license - exchange control regulation – (FEMA) foreign exchange management acts - export management risk - export finance.

Reference Books :-

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

 Fashion Marketing by Mike Easey .john Wiley & Sons publication. ISBN: 978-0632034598

Course Outcomes

- 1. Explain the organization of the Apparel business
- 2. Describe the Fashion marketing and merchandising process.
- 3. Describe retailing and Global Sourcing Strategies, Supply Chain and demand chain analysis
- 4. Distinguish between principle and auxiliary documents.

THIRD YEAR B. TEXT. – SEMESTER – II

6.6 MEN, WOMEN AND CHILDREN'S WEAR (FT)

Lectures	:	3 Hours / Week
Practical	:	3 Hours / Week
Theory Paper	:	100 Marks
Practical Exam	:	50 Marks
Subject Total	:	150 Marks

Course Objectives

- 1. To describe preparatory stages of garment and layout methods followed for various width of fabric.
- 2. To explain the drafting of various blocks
- 3. To explain the cutting process of various garments.
- 4. To explain and apply stitching and fit checking –process for various garments.

1. Pattern layout.

Various types of layouts used in apparel industry for different products. Pattern laid rules. Common method of layout for asymmetric design, stripes, checks and one way design for different products. Techniques for stripes, checks and plaids matching.

2. Tech pack and SOP:

Tech pack, Importance of tech pack, content of tech pack. Study and development of Tech Pack for various products. Concept of SOP. Benefits of SOP, SOP for different department's fabric, cutting, sewing, finishing. SOP in measurements for different products.

Fabric consumption:

Study of Marker efficiency, factors affecting marker efficiency, fabric consumption for different products and its importance. Calculation of fabric consumption Software available for minimizing fabric consumption.

Thread consumption:

Procedure to calculate thread consumption, Thread consumption on different machines.

3. Productivity and work study in garment construction:-

Productivity and its importance, Different techniques to improve productivity, work study approach, Work Measurement, Time study, SAM, SMV ,Takt time, Pitch time, PMTS, GSD, Ergonomics, operation break down.

4. Study of Children's Wear

Sizing in kids wear, Selection of fabrics and trimmings for Children's wear. Factors affecting selection, Drafting and economical layout for Baba Suit, Romper, A line Frock. Fit for children's garments

5. Study of Men's Wear:

Patterning, Cutting, Construction and Economical Layout for: Shirt, Trouser, Shorts, Jeans and their variation.Principles involved in fitting for Men's wear

6. Study of Women's Wear:

Patterning, Cutting, Construction and Economical Layout for: Shirt, Salwar and Kameez, Blouse and intimate apparels and their variations. Principles involved in fitting for women's wear

List of Experiments

- 1. Study of SOP for shirt measurement.
- 2. Tech pack preparation for Men's formal shirt
- 3. Prepare pattern for Men's Formal shirt.
- 4. Stitching of Men's Formal shirt.
- 5. Study of SOP for Trouser measurement.
- 6. Tech pack preparation for Men's formal trouser.
- 7. Prepare pattern for Men's Formal trouser.
- 8. Stitching of Men's Formal trouser.
- 9. Patterning, construction and economical layout for Salwarkameez
- 10. Patterning, construction and economical layout for blouse.
- 11. Patterning, construction and economical layout for romper.

12. Patterning, construction and economical layout for A- line frock.

Reference Books:-

- 1. Pattern making for fashion design by Helen Joseph Armstrong fifth edition, Pearson Education, Inc. ISBN-10: 0-13-606934-7
- Pattern grading for women's clothes by Gerry Cooklin, Blackwell Publishing. ISBN 0-632-05692-4
- 3. Metric pattern cutting for women's wear by Winifred Aldrich, Blackwell Publishing. 5th edition, ISBN: 978-1-118-37205-0
- 4. Metric pattern cutting for men's wear by Winifred Aldrich, Blackwell Publishing. 5th edition, ISBN 978-81-265-3241-4
- The art of fashion draping by connieamaden-crawford, third edition, Fairchild Publications, Inc. ISBN 81-8710-7359
- Draping for fashion design by Hilde Jaffe and NurieRelis, fourth edition, Pearson Education, Inc. ISBN 978-81-317-2696-9
- Juran's Quality Handbook by Joseph M. Juran, Blanton Godfrey, Robert E. Hoogstoel, Edward G. Schilling, fifth edition, McGraw-Hill Companies, Inc. ISBN 0-07-034003-X

Course Outcomes

- 1. Describe preparatory stages of garment and layout methods followed for various width of fabric.
- 2. Explain the drafting of various blocks
- 3. Explain the cutting process of various garments.
- 4. Explain and apply stitching and fit checking –process for various garments.

THIRD YEAR B. TEXT. - SEMESTER - II

6.7 DESIGN COLLECTION AND PRESENTATION (FT)

Practical	:	3 Hours / Week
Term work	:	50 Marks
Oral Exam	:	50 Marks
Subject Total	:	100 Marks

Course Objectives

- 1. To develop previous decade study for colors silhouettes, fabrics and styles and prepare forecasting sheet for selected season
- 2. To create mood/ inspiration/ story board.
- 3. To illustrate for the fashion models for selected collection.
- 4. To develop for the garment detailing sheet, pattern development sheet for the and construction details for selected design

List of Experiments

- 1. Previous decade study for colors, silhouettes, fabrics, styles and influences of socio-political and lifestyle causes on fashion: World scenario and Indian scenario.
- 2. To prepare research work sheet based on the selected theme.
- 3. To prepare forecasting sheet for colors, pattern and fabric for the ensuing seasons based on international forecast.
- 4. Preparation of Inspiration/Story boards/Mood boards.
- 5. Collections of fabric swatches, laces, braids, linings, wadding, Surface Ornamentations based on forecast done/ existing market trends
- 6. To prepare fabric swatch board foe the selected theme.
- 7. Illustrating Fashion Models for collection development.
- 8. To prepare client's brief sheet, cost sheet and design development sheet.
- 9. Design development process: Selection of Seams, Necklines, Collars, Sleeves, cuffs, pockets, Accessories etc
- 10. Development of garment specification sheet for a selected garment.
- 11. Pattern Development for a garment out of developed collection.
- 12. Window Display.

Reference Books

- 1. Fashion Forecasting by Brannon, Evelyn L., Bloomsbury Publishing PLC, ISBN: 9781563678202
- 2. Fashion Forward: A Guide to Fashion Forecasting by Rousso Chelsea, Paperback Publications, ISBN: 9781563679247
- Fashion Illustration for Designers by Kathryn Hagen, Paperback Publications, ISBN: 9780130983831
- 4. Illustrating Fashion: Concept to Creation by Steven Stipelman, Fairchild Books, ISBN: 9781563678301
- 5. Apparel Costing by M. Krishnakumar, Abhishek Publication, ISBN:9788182473928
- Pattern making for fashion design by Helen Joseph Armstrong fifth edition, Pearson Education, Inc. ISBN-10: 0-13-606934-7

Course Outcomes:

- 1. Develop previous decade study based on selected season for color, silhouettes, fabrics and styles and forecasting sheet.
- 2. Design mood/ inspiration/ story board for selected theme.
- 3. Illustrate fashion models for selected season.
- 4. Construct garment detailing sheet, pattern sheet, construction detailing sheet for selected design and arrange window display