

DR. APJ ABDUL KALAM TECHNICAL UNIVERSITY, LUCKNOW

STUDY AND EVALUATION SCHEME

B. Tech. Textile Technology

3rd Year V-SEMESTER

Effective from SESSION-2020-21

S. No.	Subject Code	Subject Name	Period L T P	Evaluation Scheme				End Semester		Total	Credit
				CT	TA	Total	PS	TE	PE		
1	KTT501	Textile Testing-I	3-1-0	30	20	50		100		150	4
2	KTT502	Yarn Manufacture-III	3-1-0	30	20	50		100		150	4
3	KTT503	Chemical Processing of Textiles	3-1-0	30	20	50		100		150	4
4	KTT051/ KTT052/ KTT053	Fabric Structure & Analysis/ Textile Design & Colour / Structure & Properties of Fibers	3-0-0	30	20	50		100		150	3
5	KTT054/ KTT055/ KTT056	Knitting Technology/Multi & Long fibre spinning/Textured yarn Technology	3-0-0	30	20	50		100		150	3
6	KTT551	Textile Testing-I Lab	0-0-2				25		25	50	1
7	KTT552	Yarn Manufacture-III Lab	0-0-2				25		25	50	1
8	KTT553	Chemical Processing of Textiles Lab	0-0-2				25		25	50	1
9	KTT554	Mini Project or Internship Assessment*	0-0-2				50			50	1
10	NC	Constitution of India / Essence of Indian Traditional Knowledge	2-0-0	15	10	25		50			
11		MOOCs (Essential for Hons. Degree)									
	TOTAL		17-3-8							950	22

*The Mini Project or internship (4 weeks) conducted during summer break after IV semester and will be assessed during V semester.

Department Elective – I

- Fabric Structure & Analysis
- Textile Design & Colour
- Structure & properties of fibers

Department Elective – II

- Knitting Technology
- Multi & Long fiber spinning
- Textured yarn Technology (NPTL/MOOCs)

DR. APJ ABDUL KALAM TECHNICAL UNIVERSITY, LUCKNOW

STUDY AND EVALUATION SCHEME

B. Tech. Textile Technology

3rd Year VI-SEMESTER

Effective from SESSION-2020-21

S. No.	Subject Code	Subject Name	Period L T P	Evaluation Scheme				End Semester		Total	Credit
				CT	TA	Total	PS	TE	PE		
1	KTT601	Textile Testing-II	3-1-0	30	20	50		100		150	4
2	KTT602	Advance Spg. Technology	3-1-0	30	20	50		100		150	4
3	KTT603	Advance Wvg. Technology	3-1-0	30	20	50		100		150	4
4	KTT061/ KTT062/ KTT063	Technical Textiles/ Non-woven Technology/ Functional Textiles	3-0-0	30	20	50		100		150	3
5	KAS601/ KAS602	Renewable Source of Energy/ Operation Research	3-0-0	30	20	50		100		150	3
6	KT6551	Textile Testing-II Lab	0-0-2				25		25	50	1
7	KTT652	Advance Spg. Technology Lab	0-0-2				25		25	50	1
8	KTT653	Advance Wvg. Technology Lab	0-0-2				25		25	50	1
9	NC	Constitution of India / Essence of Indian Traditional Knowledge	2-0-0	15	10	25		50			
		MOOCs (Essential for Hons. Degree)									
	TOTAL		17-3-6							900	21

Department Elective – III

- Technical Textiles
- Non-woven Technology
- Functional Textiles

Open Elective-I

- Renewable Source of Energy (NPTL/MOOCs)
- Operations Research

5th Semester B. Tech. Textile Technology

1. Textile Testing-I (L T P 3-1-0= 4)

Course Outcome: After completing the course student will be able to:

- CO1 Apply statistical techniques for collecting samples and analysis
- CO2 Understand and explain significance of environmental conditions on properties of textile materials and determine moisture regain of materials
- CO3 Determine various physical properties of cotton fibres such as length, diameter, maturity, fineness, colour, grade etc.
- CO4 Determine various mechanical properties of cotton and synthetic fibres such as tenacity, extension, modulus, toughness etc.
- CO5 Evaluate various yarn properties such as linear density, twist, strength, elongation, by using specific instruments.

Unit (1): Introduction of textile testing, sampling, random sampling, biased sampling, sampling techniques, square, cut square, zoning technique, selection of sample for testing, grading of cotton fibre with respect to staple length, laboratory measurement of fibre length, span length, Baer sorter, Shirley photo electric staple, servo fibro graph, salient features of HVI.

Total Lectures Required = 7

Unit (2): Atmospheric conditions for testing, absolute & relative humidity, moisture regain & moisture content, importance of moisture in textiles, measurement of moisture regain & content, effect of moisture on properties (physical & mechanical) of textile material, factors affecting the regain, correct numerical weight, oven dry weight, shrilly moisture meter.

Total Lectures Required = 6

Unit (3): Dry and wet bulb hygrometer, control of testing room atmosphere, AFIS, Napping potential, Nep count, rating of neps, maturity coefficient measurement by NaOH method, fibre fineness by airflow meter & Sheffield microneaire.

Total Lectures Required = 8

Unit (4): Fibre bundle strength by Pressley, stelometer, fibre quality index, linear density of manmade fibres and strength, spin finish, crimp analysis, Trash, Shirley trash analyzer, Yarn numbering system, wrapping test for lap, sliver, roving.

Total Lectures Required = 7

Unit (5): determination of yarn count, diameter, average & resultant count of folded yarn, relation between Ne, Denier, Tex, Nm. Instruments used for determination of count, quadrant balance, Knowles balance, beeslay balance and physical balance, Twist, classification of twist, twist measurement, direct counting method, , twist-untwist method, Twist tester, , level of twist.

Total Lectures Required = 8

Grand total of lectures required = 36

Reference Books: -

1. Quality control and testing management by Dr. V.K. Kothari
2. Principle of textile testing by J.E. Booth
3. Physical testing of textiles by B.P. Savile.

2. Yarn Manufacture-III (L T P 3-1-0 = 4)

Course Outcome: After completing the course student will be able to:

- CO1 Understand objectives of ring spinning, twisting mechanism
- CO2 Understand and explain building mechanism, role of balloon control ring, drafting system,
- CO3 Determine various types of wastes in ring spinning; determine ring frame efficiency, causes of loss in efficiency, various causes of yarn faults & their remedies
- CO4 Understand the mechanism of compact spinning, the advantages of compact spinning, fancy yarn manufacturing methods.
- CO5 Estimate the requirements of sewing threads, calculate the production, draft, efficiency of ring frame & doubling frame. Calculate the resultant doubled yarn & fancy yarn count.

Unit (1): Objects of Ring Frame, drafting, twisting & winding on ring frame, Traveller twisting, yarn twist by traveller, propagation of twist, spinning triangle.

Total Lecturers Required = 7

Unit (2): Builder motion, types of rings and travellers and their common uses, lappet movement, balloon control rings, apron drafting system mechanical and actual draft.

Total Lecturers Required = 8

Unit (3): ring frame wastes, limitation in ring spinning and factors responsible for loss in efficiency, yarn faults and their remedies, Traveller forces.

Total Lecturers Required = 7

Unit 4: Compact spinning, spinning machine manufacturers. Objects of doubling, ring doublers, fancy yarns manufacturing

Total Lecturers Required = 7

Unit 5 sewing thread and tyre Cord yarns. Reeling, yarn bundling, calculation of draft, TPI and production of ring frame & doubling frame, brief idea of classmate test report.

Total Lecturers Required = 7

Grand Total of lectures required =36

Reference Books: -

1. Elements of ring frame & doubling – Dr. A.R. Khare
2. The technology of short-shape staple spinning – W. Klein
3. Cotton spinning – Taggart
4. Spun yarn technology – Oxtoby
5. Fundamentals of Spun yarn technology by C. A. Lawrence

3. Chemical Processing of Textiles (L T P 3-1-0 = 4)

Course Outcome: After completing the course student will be able to:

- CO1 Understand the objectives of desizing, scouring, bleaching, heat setting and mercerization of textile materials
- CO2 Understanding of the processing machinery: Jigger, Winch, Jet dyeing m/c, Soft flow dyeing m/c, Pre treatment range (PTR), Mercerizing m/c etc
- CO3 Classification of dyes according to their mode of application
- CO4 Methods of printing and role & types of printing thickeners
- CO5 Classification of finishing and various types of finishing methods

Chemical Processing of Textiles

Unit (1): Importance of textile wet processing, Role of water & its quality for wet processing, Role of surfactants, Objectives of desizing, scouring, bleaching, heat setting and mercerization of textile materials, Different types of desizing and bleaching agents, methods of singeing, desizing, scouring and bleaching of textile material.

Total Lectures required =7

Unit (2): Brief introduction to processing machinery: Jigger, Winch, Jet dyeing m/c, Soft flow dyeing m/c, Pre treatment range (PTR), Mercerizing m/c, Stenter, Continuous dyeing range (CDR), Cold Pad Batch (CPB) dyeing m/c, Flat bed printing m/c, Roller printing m/c, Rotary printing m/c

Total Lectures required =7

Unit (3): Classification of dyes according to their mode of application, Dyeing of cellulosic material (fibre, yarn & fabric) with direct, reactive, vat and sulphur dyes. Dyeing of polyester with disperse dyes, exhaust and continuous dyeing, Dyeing of P/C blends, Common dyeing faults and their remedies.

Total Lectures required =8

Unit (4): Styles and methods of printing, Role and types of printing thickeners, Properties of thickeners, Printing auxiliaries, Printing faults and their remedies.

Total Lectures required =7

Unit (5): Finishing: Introduction to finishing, Classification of finishing - Mechanical and Chemical, Various types of finishing such as Calendaring, Milling, sanforizing or zero-zero, Optical brightening, softening, flame retardant, Oil & soil resistance, water repellent, Easy care.

Total Lectures required =7

Total Lectures required =36

Text Books and Reference material:

1. Pre-treatment of Textile Materials for Dyeing and Printing by Prof (Dr) M.S.Parmar, NITRA Publication
2. A glimpse on the chemical technology of textile fibres, by R.R. Chakraborty
3. Technology of dyeing, by V.A. Shenai

4. Technology of finishing, by V.A. Shenai
5. Technology of Printing, by V.A. Shenai
6. Dyeing and chemical technology of textile fibres by E.R. Trotman
7. An introduction to Textile finishing by J.T. Marsh.
8. Chemical Finishing (Garment processing Series), Published by NITRA
9. Mechanical Finishing (Garment processing Series), Published by NITRA

4. Departmental Elective 1

(a) Fabric Structure & Analysis (L T P 3-0-0=3)

Course Outcome: After completing the course student will be able to”

- | | |
|-----|---|
| CO1 | Classify various types of fabrics and compare derivatives of plain and twill weaves |
| CO2 | Explain various types of satin/sateen and twill weaves |
| CO3 | Illustrate regular and irregular satins, various derivatives of twill, diamond, mock leno, honeycomb, huch-a-back and crepe weaves. |
| CO4 | Design of various derivatives of hopsack, ripstop, Bedford cord weave |

Unit (1): Classification of various fabrics, construction of plain weave and its derivatives (rib and mat weave), ordinary twill, right hand twill, warp faced, weft faced & balanced twills.

Total Lectures required = 7

Unit (2): Satin regular, irregular and their extension. Combined twills, end to end and pick-to-pick combination, elongated twills, steep twills, broken twill, curved twill, Fancy twills-large diagonal shaded twills, Wave/ zig-zag, herringbone twill.

Total Lectures Required = 8

Unit (3): Regular and irregular satin, sateen base diagonals and brained twills, Diamond, mock leno, ordinary honeycomb, brighten honeycomb, Huck-a-back and crepe weave.

Total Lectures Required = 8

Unit (4): derivatives of hopsack, barley corn stitched hopsack and twilled hopsack, Ripstop weave, Simple and wadded bed ford cords, weft and piques,

Total Lectures Required = 7

Unit (5): Principle of figuring with extra material extra warp figuring, extra weft, limitation of extra thread, Double & Triple cloth.

Total Lectures Required = 6

Grand Total Lectures Required = 36

Reference Book: -

1. W. Watson Textile Design & colour Longmans Greens Co. London.
2. Z.J Grosicki Watson's Textile design and colour Newnes Buter Worth, London.
3. Z.J. Grosicki, Advance Textile Design Newnes Butter Worth, London.
4. "Nishant" A Grammar of textile.

(b) Textile Design & Colour (L T P 3-0-0 =3)

Course Outcome: After completing the course student will be able to”

CO1	Understanding of Light and colour phenomena and attributes of the primary & secondary colours,
CO2	Explain Colour measurement, Primary, Secondary, Tertiary & compound colours,
CO3	Understanding about different stages of colouring of textile materials, Colour and weave effect and its classification
CO4	Unit repeating design, Geometric ornamentation, Construction of symmetrical designs, Stripe and check effect designs, etc

Unit (1): Light and colour phenomena, physical basis of colour, Emission & absorption theory of light, Colour vision and light theory of colours, Complementary colours, Chromatic circle, Pigment theory of colours, Brewster circle, Attributes of the primary & secondary colours,

Total Lectures required = 7

Unit (2): Colour measurement, Primary, Secondary, Tertiary & compound colours, Biren’s triangle, Modification of colours, Coloured greys, Colours in combination, Colour contrast, contrast in hue, contrast of tone, colour harmony, Relative spaces occupied by colours, divisional colours, Application of colours, Mixed colour effect,.

Total Lectures required =8

Unit (3): Composition of designs, Condition to be observed during ornamentation of fabrics, Mode shade, Harmony of succession, gradation of hue, Different stages of colouring of textile materials, Colour and weave effect and its classification. Bases of Textile design, One third and one fourth drop design, Half drop and drop reverse design.

Total Lecture required = 8

Unit (4): Unit repeating design, Geometric ornamentation, Construction of symmetrical designs, Stripe and check effect designs, Sari border / vertical border design, Factor affecting the woven designs, reversing inclined figure, Diamond, Ogee, & diagonal waved line base, applications of colours.

Total Lecture required = 7

Unit (5): Art sheet based question covering all above units

Total Lecture required = 6

Grand total Lectures required = 36

Reference Books:

1. W. Watson- Textile design and colour
2. Traditional Textile designs B K Behera

(c) Structure & properties of Fibres (L T P 3 0 0)

Course Outcome: After completing the course student will be able to:

- CO1 Describe various models of physical structure of fibre and Analyze structure–property relationship
- CO2 Explain various properties of fibres.
- CO3 Characterize and measure various physical and chemical structure of fibres by using instrumental techniques.
- CO4 Derive various mathematical models of fibre structures and properties.
- CO5 Determine the effects of different factors influencing fibre properties.

Unit (1): Basic structural features of fibre, Structure of Cotton, wool, silk, and other textile fibres, relation between fibre structure and fibre, Methods of estimating molecular weight, orientation, crystallinity & crystalline orientation of fibre forming polymer, Overall orientation by “sonic modulus tester.

Total Lectures Required = 7

Unit (2): Concept of scanning electron microscope (SEM), Concept of transmission electron microscope (TEM) Fourier Transform Infrared Spectroscopy (FTIR), Atomic force microscopy, fibre fracture.

Total Lectures Required = 7

Unit (3): Thermal behaviour of textile fibres by Differential Scanning Calorimeter (DSC), TGA, thermal mechanical analysis (TGA), Thermo mechanical Analyser (TMA) Density gradient column, Preparation of density gradient column, Crystallinity by density gradient column.

Total Lectures Required = 7

Unit (4): Optical properties of fibres (2), Birefringence behaviour, dielectric properties, fibre friction, fibre friction measurement, fibre to fibre, yarn to yarn friction measurement.

Total Lectures Required = 7

Unit (5): Creep behaviour, concept of moisture absorption by fibres, Moisture absorption, heat of absorption, differential heat of absorption, integral heat of absorption, Quantitative theory of heat moisture absorption, Rate of moisture absorption.

Total Lectures Required = 8

Grand Total of lectures required = 36

Reference Book: -

1. Manufactured fibre technology by V.B. Gupta, V.K. Kothari
2. Physical properties of fibre by J.W.S. Hearle
3. Thermal behaviour of material by Turi
4. Modern yarn production by Ray
5. ASTM Standard books

5. Department Elective-II

(a) Knitting Technology (L T P 3-0-0=3)

Course Outcome: After completing the course student will be able to:

- CO1 Difference between knits and woven, knitting terms and definitions
- CO2 Comparison of warp and weft knitting, Classification of weft knitting machine, elements of knitting machine
- CO3 Classification of knit-structures, loop formation on: single jersey, Rib machines and inters look machines,
- CO4 Understanding of Plain knitted fabric, Rib fabric, Interlock and Purl fabric,
- CO5 Basic warp knitting machines, classification of warp knitting, Modern developments in weft knitting technique

Unit 1: Difference between knits and wovens, knitting terms and definitions (Course,, wale, stitch density) different type of knitting needles: bearded needle, latch needle, sinker, jack, cam arrangement, overlap, under lap, closed lap, open lap.

Total Lectures required =7

Unit 2: Comparison of warp and weft knitting, Classification of weft knitting machine, elements of knitting machine like type of needles, sinkers, etc Needle numbering system, technology of loop formation, geometry of loop structure, Elements of loop structure: needle loop, sinker loop, relation between yarn count, machine gauge and stitch density.

Total Lectures required =8

Unit 3: Classification of knit-structures, loop formation on: single jersey, Rib machines and inters look machines, socks knitting technology, Loop formation on flat bed machine.

Total Lectures required =7

Unit 4: Four primary base knitting structures: Plain knitted fabric, Rib fabric, Interlock and Purl fabric, Special knitting machines: Fabric machine, garment length machine, flat machine, circular machine fabrics and Spacer fabrics.

Total Lectures required =7

Unit 5: Basic warp knitting machines, classification of warp knitting, Modern developments in weft knitting technique, calculations regarding production, gsm, stitch density etc, Causes and remedies of faults of knitted fabrics.

Total Lectures required =7

Grand total of lectures required = 36

Reference and Text Book-

1. Knitting Technology – Chamberlin
2. Knitting Technology – W.J. Spencer
3. Knitting Calculation – Chamberlin
5. Wet Knitting Vol. 1&2 –Published by IIT New Delhi.
6. Knitting – NCUTE

(b) Multi & Long Fibre Spinning (L T P 3-0-0= 3)

Course Outcome: After completing the course student will be able to”

CO1	Characteristics of manmade fibres, Spinnability, blending, and its objectives,
CO2	Spinning of dyed fibres, estimation of blends intimacy, factors affecting the blend irregularity,
CO3	Production of bulked yarn, characteristic difference in the physical & mechanical properties,
CO4	Retting of flax, & jute, Jute & flax spinning,
CO5	Woollen, semi-worsted & worsted systems of spinning

Unit 1: Characteristics of manmade fibres, Spinnability, blending, and its objectives, Spinnability, blending & its objectives, processing of Man- made fibres & blends on short, medium and long staple spinning systems.

Total Lectures Required = 8

Unit 2: Spinning of dyed fibres, estimation of blends intimacy, factors affecting the blend irregularity, structural properties of blended yarns.

Total Lectures Required = 8

Unit 3: Production of bulked yarn, characteristic difference in the physical & mechanical properties of various long staple fibres & their influence in the choice of preparatory & spinning machinery.

Total Lectures Required = 8

Unit 4: Retting of flax, & jute, Jute & flax spinning, manufacturing of spun silk.

Total Lectures Required = 6

Unit 5: Woollen, semi-worsted & worsted systems of spinning.

Total Lectures Required = 6

Grand total lectures required =36

Reference book:-

1. Wool Spinning by Vickerman, Abhishek Publication
2. Principle of woollen spinning by Priestman
3. Woollen & Worsted yarn manufacture by J. W Redcliff
4. Jute Spinning Calculation by Andrew Smith
5. Worsted Drawing & Spinning by Miles

(c) Textured Yarn Technology (3-0-0=3) (NPTL/MOOCs)

Course Outcome: After completing the course student will be able to”

CO1	Importance of texturising, Methods of texturising
CO2	Structural geometry of textured yarn, characterization of textured yarn
CO3	Textured yarn properties and fabric characteristics, principles of draw texturing
CO4	Principles of air bulking and properties of air bulked yarn,
CO5	Morphological changes induced by mechano-thermal forms of texturing

Unit (1): Importance of texturising, Methods of texturising, Basic principles of heat setting and texturising, False twisting, Process variables, developments of false twist texturing machines.

Total Lectures Required = 7

Unit (2): Structural geometry of textured yarn, characterization of textured yarn, Stuffer box crimping, Edge crimping & other methods of texturing thermoplastic yarns.

Total Lectures Required = 7

Unit (3): Textured yarn properties and fabric characteristics, principles of draw texturing, Draw texturising machines, and properties of draw textured yarn, Effect of process variables, time, temperature, twist and tension on properties of textured yarn.

Total Lectures Required = 8

Unit (4): Principles of air bulking and properties of air bulked yarn, Texturing of non thermoplastic yarns cross linking and effect of process variables on properties of textured yarn, Texturing with the aid of solvent.

Total Lectures Required = 7

Unit (5): Yarn characteristics, Morphological changes induced by mechano-thermal forms of texturing and their effect on properties of textured yarns.

Total Lectures Required = 7

Grand total lectures required =36

Reference book:-

1. Textured yarn Technology by J.W.S.Hearle
2. Synthetic fibre by Vaidhya

5th Semester Lab Syllabus

6. Textile Testing-I (L T P 0 0 2)

Measurement of fibre length and its distribution, fineness, moisture content and strength etc using different methods and instruments, Fibre diameter and its variability, cleanliness of cotton, testing of neps in card web, sliver, roving and yarns, Analysis and interpretation of test results.

Measurement of hank of sliver, roving and count of yarn and their variability, Single yarn strength and elongation, Lea strength measurement, Use of statistical techniques for evaluation of experimental results

7. Yarn Manufacturing-III (L T P 0 0 2)

Names of parts & their functions of ring frame and doubling frame, study of constructional details, setting and gauging of machinery, various controls, change places etc. Calculations pertaining to gearing, speeds, constant, draft, TPI and production in ring frame, doubling frame, and reeling.

8. Chemical Processing of Textiles (L T P 0 0 2)

Dyeing of cotton with direct, reactive, vat and sulphur dyes, dyeing polyester and P/C blends, Printing of cotton fabric using various styles of printing, namely, direct, resist and discharge, Treatment of cotton fabric with water repellent finish, Treatment of cotton fabric with optical brightening finish, Evaluate colour fastness to washing, light, perspiration and rubbing properties.

6th Semester B. Tech. Textile Technology

1. Textile Testing-II (L T P 3-1-0= 4)

Course Outcome: After completing the course student will be able to:

- | | |
|-----|--|
| CO1 | Understand the mechanical properties of yarns & fabric, different methods of testing tensile properties of yarn & fabric |
| CO2 | Understand the yarn evenness measuring principle & its importance, |
| CO3 | Estimate the properties of fabric from yarn properties, measure bursting, tear & tensile properties & their importance |
| CO4 | Measure, air permeability, cover factor, & different fabric properties & their application areas |

Unit (1): Tensile properties of yarn and fabric, stress-strain curve, various methods for finding of yield point, methods for finding of various modulus, destination of tenacity, and stiffness of fabric.

Total Lectures Required = 7

Unit (2): Procedure of determination of strength and elongation in the spun yarns, knowledge about the equipment used, yarn tensile strength testing machines, single yarn strength tester, lea strength tester, fabric strength tester- impact tester, Grab test, fabric B.S. Test, Scott serigraph, Instron tensile tester.

Total Lectures Required = 8

Unit(3): Measurement of evenness testing of yarns, nature and causes of irregularities, principles and methods of evenness testing, evaluation and interpretation of evenness diagram & spectrogram and their associated equipment, Classimat faults.

Total Lectures required =7

Unit (4): Measurement of physical properties of fabric and the knowledge of the equipment used, tensile strength, bursting strength, tearing strength, pilling, air permeability, crimp, thickness, EPI, PPI, weight and cover factor.

Total Lectures required =7

Unit (5): Measurement of water repellence, shrinkage, measurement of fastness to light and rubbing, thermal transmission, Brief introduction to FAST and KAWABATA.

Total Lectures required =7

Grand total of lectures required = 36

Text Books & Reference Books: -

1. Physical testing of textiles by B.P. Saville.
2. Quality control and testing management by Dr. V.K. Kothari.
3. Principles of textile testing by J.E. Booth.
4. Quality control by V.K. Kothari

2. Advance Spinning Technology (L T P 3 1 0=4)

Course Outcome: After completing the course student will be able to

CO1	Understand the ring spinning limitations, principles of rotor spinning
CO2	Understand the mechanism of rotor spinning, air-jet spinning, friction spinning & other novel spinning methods
CO3	Understand the structure of different methods of spinning & correlate their properties with structure
CO4	Calculate the production, twist, draft at different spinning technology
CO5	Apply the knowledge in deciding the uses of yarn in different areas.

Unit-1: Limitation of ring spinning, Principles of unconventional method of yarn manufacturing open-end spinning process, Advantages and Limitations of open-end spinning process, Classification of new spinning yarn technology.

Total Lectures required =7

Unit-2: Rotor spinning- Objects of rotor spinning, Principle of operation, Raw material requirements, opening unit, yarn formation, Design of rotor, Navel and yarn withdrawal tube, Automation, yarn characteristics comparison of yarn properties with ring yarn and rotor yarn.

Total Lectures required =7

Unit-3: Friction spinning- Principle, DREF-2 and DREF-3, yarn formation , yarn quality, yarn structure, fibre specifications for optimum results, merits & limitations, Twist less spinning-TNO process and TWILLO process, Traveller-less NOVA Spinning.

Total Lectures required =7

Unit-4: Air jet Spinning-Principle, concept of false twist, Murata jet spinning, operation principle Raw material requirement, Effect of process variables on yarn twist & tenacity, yarn quality, limitation of air jet yarns, self twist process.

Total Lectures required =8

Unit-5: Bobtex ICS process, Wrap spinning, plyfil spinning, SIRO spinning, Electrostatic spinning, Core spinning.

Total Lectures required =7

Grand total of lectures required = 36

Reference Book-

1. New Spinning Technology Vol. 4 & 5 –W.Klien
2. Fundamentals of Spun yarn technology by C. A. Lawrence
3. Spun yarn technology – Oxtoby

3. Advance Weaving Technology (L T P 3 1 0=4)

Course Outcome: After completing the course student will be able to:

- CO1 Understand different principles of Shuttle-less weaving,
- CO2 Understand the mechanism of projectile weaving, different weft feeding mechanism,
- CO3 Understand different rapier weaving mechanism, importance of control,
- CO4 Understand of principle of Air-Jet weaving, mechanism of beat-up in air-jet weaving
- CO5 Understand water-jet weaving mechanism, uses of water-jet loom, machine parameters for water-jet loom.

Unit 1: Principle of operation of shuttle less loom, Classification of shuttle less looms, Comparative study of various systems of weft inserting, advantage of shuttle less looms over shuttle looms.

Total of lectures required=7

Unit-2: Basic operational principle of projectile weaving machinery, picking mechanism of Sulzer projectile loom, beating, Selvedge formation, multicolour weft feeding on projectile loom.

Total of lectures required=7

Unit-3: The Rapier system of weft insertion, Classification of Rapier looms and its description, flexible and rigid rapier, weft transfer & weft Control mechanism, loom timing , rapier design, tip transfer mechanism of rapier loom.

Total lectures required=7

Unit-4: Working principle of Air-jet weaving, essential requirements of air-jet loom, weft measuring, weft tensioning devices, beating-up, weft gripping, weft cutting, weft stop motion selvedge formation, Tendon nozzle and relay nozzles, quality of compressed air for air jet loom, multiphase weaving

Total lectures required=8

Unit-5: Weft insertions of water-jet loom , general description of the water-jet loom, weft supply system, tension measuring device, water stream for weft insertion, fundamental problems of hydraulic weft insertion, Electronic dobby and electronic jacquard.

Total lectures required=7

Grand total of lectures required=36

Reference books

1. Modern development in weaving machine by ra and Duxburg,
2. Weaving mechanism, machine and Management by Talukdar.
3. Weaving Mechanism by Robinson.
4. Modern weaving machinery Ormerd.

4. Departmental Elective III

(a) Technical Textiles (L T P 3 0 0=3)

Course Outcome: After completing the course student will be able to:

- CO1 Understand various technical textile used in industry, filter fabric and its finishing treatment, thermal and chemical properties of filter fabric
- CO2 Manufacturing process and properties of protective textiles,
- CO3 Medical textiles, fibres used, classification of medical textiles- non-implantable material wound dressings, bandages, plasters, etc,
- CO4 Smart textiles, brief introduction of smart textiles, classification of smart textiles,
- CO5 Manufacturing process of geo textile, classification of geo textiles.

Unit (1): Introduction to technical textile, types of technical textiles, textiles used in industry such as filtration, filter fabric construction- woven, needle felt & knitted filter fabric, finishing treatment of filter fabric, thermal and chemical properties of filter fabric, essential requirements of good filter fabric. Application of nano technology and nano materials for the improved filtration.

Total Lectures required =8

Unit (2): Manufacture and properties of protective textiles- water proof/coated and water repellent, antimicrobial, flame retardant, chemical resistance, Nuclear and biological resistance, mechanical resistance such as bullet proof, cut proof, stab proof.

Total Lectures required =7

Unit (3): Medical textiles, fibres used, classification of medical textiles- non-implantable material wound dressings, bandages, plasters, etc, Extra-corporal devices – Artificial kidney, liver lung, implantable material- suture, soft tissue implant, Orthopaedic implants, Cardiovascular implants, Healthcare/ hygiene products, medical cost, surgical gown, face mast etc.

Total Lectures required =8

Unit (4): Smart textiles, brief introduction of smart textiles, classification of smart textiles, passive smart textiles, active smart textiles, brief discussion of smart shirt, smart suit, musical jacket, space suit etc. automotive textiles: type cord, seat belt, air bag, seat upholstery, carpets, headliners, helmets etc, Agro textile: Shade net, green house film, finishing net etc.

Total Lectures required =7

Unit (5): Introduction of geo textile, classification of geo textiles, functions of geo textile-soil reinforcement, objective of geo textiles, manufacturing of geo textile, essential properties of geo textiles- Mechanical determinants, Hydraulic determinants, durability determinants

Total Lectures required =6

Grand total of lectures required = 36

Reference Books:

1. Hand book of technical textiles- A.R. Horrocks & S.C. Anand
2. Smart fibre, fabrics and clothing Tao X
3. Shears handbook of industrial Textiles.

(b) Non Woven Technology (L T P 3 0 0=3)

Course Outcome: After completing the course student will be able to:

- CO1 Concept about felts and non woven, Classification of non-woven fabrics,
- CO2 Various method of web formation, web characteristics and their influence on properties of non-woven fabrics,
- CO3 Non-woven fabric by hydro entanglement, Description of hydro entanglement machine,
- CO4 Non-woven fabric by Stitch bonding, Non-woven fabric by chemical bonding,
- CO5 Knowledge about latest development in non-woven industry.

Unit 1: National and international scenario on non-woven fabric production, Concept about felts and non woven, Classification of non-woven fabrics, fibres for non-woven fabrics, Felt manufacturing process.

Total Lectures Required =7

Unit 2: Various method of web formation, web characteristics and their influence on properties of non-woven fabrics, Non woven fabric by Needle punch, Description of needle punching machine, effect of process variables on properties of needle punch fabric.

Total Lectures Required =8

Unit 3: Non-woven fabric by hydro entanglement, Description of hydro entanglement machine, effect of process variables on properties of hydro entanglement non woven fabric, Non-woven fabric by adhesive bonding, mechanical bonding, Melt blown process of non-woven fabric manufacturing.

Total Lectures Required =7

Unit 4: Non-woven fabric by Stitch bonding, Non-woven fabric by chemical bonding, Non-woven fabric by bonding with thermoplastic adhesives, Non-woven fabric by Spun laced, Effect of process variables on properties of stitch bonding, chemical bonding spun laced non-woven fabrics.

Total Lectures Required =7

Unit 5: Flocked fabric, Laminates, latest development in non-woven industry: ultrasonic bonding, Infra-red bonding, bonding by bi-component fibres. Application of various non woven fabrics.

Total Lectures Required =7

Grand total of Lectures required= 36

Reference & Text Books

1. Non Woven – N.N. Banarjee
2. Non woven – NCUTE

(c) Functional Textiles (L T P 3 0 0=3)

Course Outcome: After completing the course student will be able to:

- CO1 Classification of functional clothing, Functional finishes, etc
- CO2 Nuclear biological Chemical protective clothing, extreme cold clothing; design, mechanism and applications,
- CO3 Medical functional clothing: therapeutic and rehabilitative clothing,
- CO4 Sportswear clothing and moisture management in sportswear,
- CO5 Smart Textiles, classification of smart textiles, Intelligent textiles, mechanism of various types of smart textiles.

Unit 1: Definition of functional clothing, Classification of functional clothing, Functional finishes, ways to apply functional finishes on textile surfaces, Functional clothing market review.

Total Lectures Required =6

Unit 2: Functional Protective clothing: Nuclear biological Chemical protective clothing, extreme cold clothing; design, mechanism and applications, Fire retardant clothing, approaches to achieve fire retardancy in clothing, mechanism of fire retardancy, Soft and hard body armour , super thickening fluids for body armour, water proof breathable fabrics, ways to achieve waterproof textiles and breathability in textiles.

Total Lectures Required =7

Unit 3: Medical functional clothing: therapeutic and rehabilitative clothing, bio sensing clothing, wound healing promoting dressings, antimicrobial sutures.

Total Lectures Required =7

Unit 4: Sportswear clothing: moisture management in sportswear, compression textiles, Aerodynamics, Spacesuit design and development, woven and knitted sportswear.

Total Lectures Required =7

Unit 5: Cosmetic-textiles: definition, classification, mechanism to develop various cosmetic effects in textiles, various cosmetoin gradients, worldwide scene of cosmeto-textiles, Smart Textiles, classification of smart textiles, Intelligent textiles, mechanism of various types of smart textiles, Wearable electronics.

Total Lectures Required =9

Grand total of lectures required = 36

Reference Books:

1. Functional Finishes for Textiles: Improving Comfort, Performance and Protection
2. Functional Textiles and Clothing, G. Thilagavathi., M. Parthiban, S. Viju
3. Electronics in Textiles and Clothing: Design, Products and Applications L. Ashok Kumar, C. Vigneswaran, CRC Press
4. Smart Clothes and Wearable Technology, J. McCann (Editor), David Bryson Woodhead Publishing Series in Textiles

5. Open Elective-I

Renewable Energy Resources (L T P 3 0 0)

Course Outcome: After completing the course student will be able to:

- CO1 Introduction: Various non-conventional energy resources
- CO2 Solar Thermal Energy: Solar radiation, flat plate collectors and their materials, applications and performance,,
- CO3 Resources of geothermal energy, thermodynamics of geothermal energy
- CO4 Thermo-electrical and thermionic Conversions: Principle of working, performance and limitations.
- CO5 Understanding of bio-mass and its conversion theory.

Unit-I: Introduction: Various non-conventional energy resources- Introduction, availability, classification, relative merits and demerits. Solar Cells: Theory of solar cells. Solar cell materials, solar cell array, solar cell power plant, limitations.

Total Lectures required =7

Unit-II: Solar Thermal Energy: Solar radiation, flat plate collectors and their materials, applications and performance, focussing of collectors and their materials, applications and performance; solar thermal power plants, thermal energy storage for solar heating and cooling, limitations.

Total Lectures required =7

Unit-III: Geothermal Energy: Resources of geothermal energy, thermodynamics of geothermal energy conversion-electrical conversion, non-electrical conversion, environmental considerations. Magneto-hydrodynamics (MHD): Principle of working of MHD Power plant, performance and limitations. Fuel Cells: Principle of working of various types of fuel cells and their working, performance and limitations.

Total Lectures required =7

Unit-IV: Thermo-electrical and thermionic Conversions: Principle of working, performance and limitations. Wind Energy: Wind power and its sources, site selection, criterion, momentum theory, classification of rotors, concentrations and augments, wind characteristics. performance and limitations of energy conversion systems.

Total Lectures required =8

Unit-V: Bio-mass: Availability of bio-mass and its conversion theory. Ocean Thermal Energy Conversion (OTEC): Availability, theory and working principle, performance and limitations. Wave and Tidal Wave: Principle of working, performance and limitations. Waste Recycling Plants.

Total Lectures required =7

Grand total of lectures required = 36

Text books:

1. Raja et al, "Introduction to Non-Conventional Energy Resources" Scitech Publications.
2. John Twideu and Tony Weir, "Renewal Energy Resources" BSP Publications, 2006.
3. M.V.R. Koteswara Rao, "Energy Resources: Conventional & Non-Conventional" BSP Publications, 2006.
4. D.S. Chauhan, "Non-conventional Energy Resources" New Age International.
5. C.S. Solanki, "Renewal Energy Technologies: A Practical Guide for Beginners" PHI Learning.
6. Peter Auer, "Advances in Energy System and Technology". Vol. 1 & II Edited by Academic Press.
7. Godfrey Boyle, "Renewable Energy Power For A Sustainable Future", Oxford University Press.

(b) Operations Research (L T P 3 0 0)

Course Outcome: After completing the course student will be able to:

- CO1 Definition and scope of operations research
- CO2 Linear Programming: Two variable Linear Programming model and Graphical method of solution, Simplex method,
- CO3 Types of transportation problems, mathematical models , transportation algorithms,
- CO4 Network Techniques: Shortest path model, minimum spanning
- CO5 Models of inventory, operation of inventory system.

Unit-I: Introduction: Definition and scope of operations research (OR), OR model, solving the OR model, art of modelling, phases of OR study. Linear Programming: Two variable Linear Programming model and Graphical method of solution, Simplex method, Dual Simplex method, special cases of Linear Programming, duality, sensitivity analysis.

Total Lectures required =8

Unit-II: Transportation Problems: Types of transportation problems, mathematical models , transportation algorithms, Assignment: Allocation and assignment problems and models, processing of job through machines.

Total Lectures required =7

Unit-III: Network Techniques: Shortest path model, minimum spanning Tree Problem, Max-Flow problem and Min-cost problem. Project Management: Phases of project management, guidelines for network construction, CPM and PERT.

Total Lectures required =7

Unit-IV: Theory of Games : Rectangular games, Minimax theorem, graphical solution of $2 \times n$ or $m \times 2$ games, game with mixed strategies, reduction to linear programming model. Quality Systems: Elements of Queuing model, generalized poisson queuing model, single server models.

Total Lectures required =7

Unit-V: Inventory Control: Models of inventory, operation of inventory system, quantity discount. Replacement: Replacement models: Equipments that deteriorate with time, equipments that fail with time.

Total Lectures required =7

Grand total of lectures required = 36

Text books:

1. Wayne L. Winston, "Operations Research" Thomson Learning, 2003.
2. Hamdy H. Taha, "Operations Research-An Introduction" Pearson Education, 2003.
3. R. Panneer Seevam, "Operations Research" PHI Learning, 2008.
4. V.K.Khanna, "Total Quality Management" New Age International, 2008.

6th Semester Lab Syllabus

6. Textile Testing-II (L T P 0 0 2)

Use of microscope for testing of yarns for appearance, twist and diameter, measurement of evenness, measurement of yarn strength, tenacity, elongation at break, modulus, crimp rigidity, fabric testing for dimension, weight, thickness, shrinkage and air permeability, Fabric testing for elongation, tensile, bursting, and tearing strength, abrasion resistance, flexural rigidity, crease recovery and draping qualities of fabric.

7. Advance Spinning Technology (L T P 0 0 2)

Names of parts & their functions of Rotor Spinning, Air-jet Spinning and Friction spinning machines, study of constructional details, setting and gauging of machinery, various controls, change places etc. Calculation of speeds, draft, twist and production of Rotor, Air-jet and Friction spinning machines.

8. Advance Weaving Technology (L T P 0 0 2)

Names of parts & their functions of Rapier projectile, Air-jet and Water-jet looms, study of constructional details, setting and gauging of machinery, various controls, change places etc. Calculation of speeds and production of Rapier projectile, Air-jet and Water-jet looms.