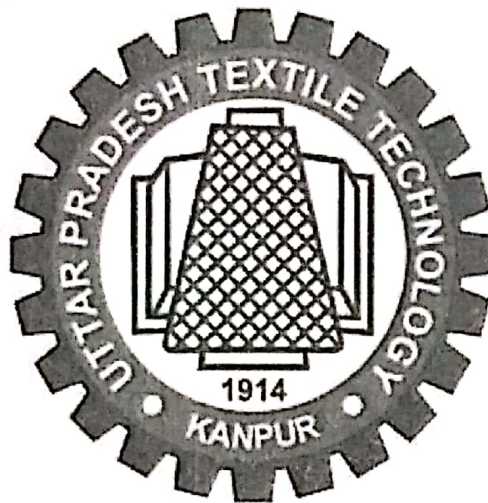


SYLLABUS

Uttar Pradesh Textile Technology Institute, Kanpur

**Affiliated to
DR. A.P.J ABDUL KALAM TECHNICAL UNIVERSITY, LUCKNOW**



**PROPOSED STUDY & EVALUATION SCHEME
FOR
3RD B. TECH. TEXTILE TECHNOLOGY**

On

AICTE B. Tech Model Curriculum Structure (MCS)

(Effective from the Session: 2020-21)

P. Dasgupta
19.2.21
Head
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Study & Evaluation Scheme (MCS)
3rd Year B. Tech TEXTILE TECHNOLOGY
Uttar Pradesh Textile Technology Institute Kanpur

Affiliated to

DR. APJ ABDUL KALAM TECHNICAL UNIVERSITY, LUCKNOW

Effective from Session-2020-21

3rd Year V-Semester

Sl. No.	Subject Codes	Subject	Periods			Evaluation Scheme				End Semester		Total	Credit
			L	T	P	CT	TA	Total	PS	TE	PE		
1	KTT501	Textile Testing	3	1	0	30	20	50		100		150	4
2	KTT502	Fabric Structure & Design	3	1	0	30	20	50		100		150	4
3	KTT503	Chemical Processing of Textile-I	3	1	0	30	20	50		100		150	4
4	KTT051/ KTT052	Structure & Properties of Fibres/ Multi & Long Fibre Spinning	3	0	0	30	20	50		100		150	3
5	KTT054/ KTT060	Non Woven Technology/ Textured yarn Technology	3	0	0	30	20	50		100		150	3
6	KTT551	Textile testing Lab	0	0	2				25		25	50	1
7	KTT552	Fabric Structure & Design Lab	0	0	2				25		25	50	1
8	KTT553	Chemical Processing of Textile-I Lab	0	0	2				25		25	50	1
9	KTT554	Mini Project or Internship Assessment*	0	0	2			50				50	1
10	KNC501/ KNC502	Essence of Indian Traditional Knowledge/Constitution of India	2	0	0	15	10	25		50			
11		MOOCs (Essential for Hons Degree)											
		Total	17	3	8							950	22

*The Mini Project or internship (3-4 weeks) conducted during summer break after II semester and will be assessed during III semester.

The non credit courses Essence of Indian Traditional knowledge/ constitution of India shall be conducted through NPTEL@MOOCS.

Constitution of India and environmental governance: https://swayam.gov.in/nd1_noc20_lw02/

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Study & Evaluation Scheme (MCS)
3rd Year B. Tech TEXTILE TECHNOLOGY
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3rd Year VI-Semester

Effective from Session-2020-21

Sl. No.	Subject Codes	Subject	Periods			Evaluation Scheme				End Semester		Total	Credit
			L	T	P	CT	TA	Total	PS	TE	PE		
1	KTT601	Yarn Manufacture-III	3	1	0	30	20	50		100		150	4
2	KTT602	Fabric manufacture-III	3	1	0	30	20	50		100		150	4
3	KTT603	Chemical Processing of Textile-II	3	1	0	30	20	50		100		150	4
4	KTT061/ KTT062	Theory of Textile Structure/ Clothing Science	3	0	0	30	20	50		100		150	3
5		Open Elective-I	3	0	0	30	20	50		100		150	3
6	KTT651	Yarn Manufacture-III Lab	0	0	2					25	25	50	1
7	KTT652	Fabric manufacture-III Lab	0	0	2					25	25	50	1
8	KTT653	Chemical Processing of Textile-II Lab	0	0	2					25	25	50	1
9	KNC601/ KNC602	Essence of Indian Traditional Knowledge/Constitution of India	2	0	0	15	10	25		50			
10		MOOCs (Essential for Hons. Degree)											
		Total	17	3	6	150	100	250	75	500	75	900	21

Essence of Indian Traditional Knowledge/Constitution of India shall be conducted through NPTEL (MOOCs)

Open Elective-I: As per AKTU Model Curriculum

1. KOE061: Real Time Systems
2. KOE062: Embedded System
3. KOE063: Introduction to MEMS
4. KOE064: Object Oriented Programming
5. KOE065: Computer based Numerical Technique
6. KOE066: GIS & Remote Sensing
7. KOE067: Basics of Data base Management System
8. KOE068: Software Project Management
9. KOE069: Understanding the Human Being Comprehensively- Human Aspirations and Its Usefulness

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3rd B. Tech (Textile Technology) 5th Semester

1. Textile Testing (L TP 3 1 0) Credit 4

Course Code	Course Title
KTT-501	Textile Testing
Course Outcomes	
CO1	Determine various tensile properties of yarns and fabrics
CO2	Explain various instruments for measurement tensile strength of fibre, yarn and fabrics.
CO3	Evaluate evenness of fibre, yarn and other textile strands and interpret the results of spectrogram, diagram, and classimat.
CO4	Test bursting strength, tearing strength, pilling, air permeability, crimp, thickness, EPI, PPI, weight and cover factor of fabrics.
CO5	Measure water repellency, shrinkage, measurement of fastness to light and rubbing, thermal transmission, of fabrics, and evaluate low stress mechanical properties by FAST and KAWABATA.

Course Articulation Matrix of Textile Testing -II:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
KTT-601.1	3	3	3	3	3				3	1		1
KTT-601.2	2	3	3	3	3				2	2		1
KTT-601.3	3	2	3	3	2				2	2		2
KTT-601.4	3	3	2	2	3				2	1		2
KTT-601.5	3	3	3	3	3				3	2		2
Avg.	3	3	3	3	3				2	2		2

Unit I (10 Hours)

Introduction to Textile testing: Importance of testing, Quality, Relative humidity and standard condition for testing. Moisture content moisture regains, Selection of sample for testing. Different technique for fibre, yarn and fabric sampling. **Fibre Testing:** Measurement of fibre length and its distribution, fineness, Trash% and strength etc using different methods and instruments. Brief idea about advanced & high volume fibre testing instruments

Unit II (08 Hours)

Procedure for measurement of yarn linear density, measurement of yarn twist, Doubling effect on count and uniformity. stress-strain curve, various methods for finding of yield point, methods for finding of various modulus, estimation of tenacity Single yarn strength and Lea count strength product (CSP) and Corrected Count (CCSP).. Tensile properties and - various type of measuring instruments based on CRT, CRL and CRE and their working principles.

Unit III (08Hours): Nature and causes of irregularities, principles of evenness testing: optical and capacitance methods, evaluations and interpretation of evenness results, concept of index of irregularity. Variance - length curves and spectrogram analysis, yarn imperfections, yarn faults classification, Uster Classimat and Classifault. **Yarn hairiness:** Importance and assessment techniques.

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Unit IV (10 Hours)

Testing of fabric Dimensional Properties: Thickness, Area density (GSM), Warp and Weft crimp, Cover factor calculations.

Testing of fabric mechanical Properties: Tensile, Tear, compression and shear, Fabric Abrasion, Pilling, Bursting, flexural rigidity; Drape-ability, Crease recovery.

Transmission behavior of fabrics: Measurement of Air, water, heat and static charge transmission.

Unit V 06 Hours)

Garment Testing: Sewability: Seam strength, Seam slippage, Seam pucker, Needle Cutting Index, Low stress Mechanical Properties of Fabric, Primary and total hand value.

Books Recommended:

1. J.E. Booth, Principle of Textile Testing
2. V K Kothari, Testing and quality management Vol-1
3. GAV Leaf, Practical Statistics For The Textile Industry: Part I, The Textile Institute, 1984.
4. Saville B P, Physical Testing of Textiles, Woodhead publishing -UK, 2004.
5. Jinlian H U, Fabric Testing, Woodhead Publishing, 2008.
6. Arindam Basu, Textile Testing (Fibre, Yarn and Fabric), SITRA, Coimbatore, 2001.
7. Somasundar S, Application of Statistical Methods in Textile Industry, SITRA, Coimbatore, 1998.

2. KTT 502-Fabric Structure & Design (L T P 3 1 0) =4

After successful completion of this course, the students should be able to;

- a. Develop new weave structures.
- b. Create new structures using color and weave effect.
- c. Draw simple and compound structures.
- d. Illustrate special weaves.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3	1	3	2	1							2
2	3	2	3	2								2
3	3	1	3	2	1							2
4	2	3	3	2	1							2
Avg.	3	2	3	2	1							2

Module I (10 Hrs)

Introduction: Basic concepts of yarn count, thread density, crimp and cover factor of fabric, classification of fabrics, concept of designing through fabric structure, importance of fabric structure analysis, representation of weave repeat, draft plan and peg plan, use of point paper.

Elementary Weaves: Construction of plain, twill, satin and sateen weaves and their derivatives.

Unit II (10 Hours) Absorbent Fabrics: Construction of diamond, diaper, honey comb, huck-a-back and mock-leno weaves. **Crepe weave:** Construction of crepe weaves.

Cord Structures: Bedford cord, whip cord and welt with wadded structures.

Color and Weave Effect: Weave and color combinations of line effect, hounds tooth, birds-eye

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effect, hair lines and step pattern.

Extra thread figuring: Figuring with extra threads with single and two colors.

Module III (08 hours)

Pile structures: Construction of velvet and velveteen fabrics, fustians.

Backed fabrics: Construction of backed fabric.

Double Cloth: Construction of self stitched, centre stitched and wadded double cloth.

Module IV (09hours)

Special Weave: Gauze and net leno fabrics, damasks, brocades, tapestry, tissue, lappet, swivel figured structures.

Calculations: Raw material calculations to produce different weaves and their technical specifications.

Unit V (8 Hrs): Composition of design, Conditions required during ornamentation of fabrics, Colour and Weave effect, unit repeating design, construction of symmetric design, stripe & check effect, factors affecting woven design, Diamond, Ogee & diagonal waved line. Half drop and drop reverse design.

Books Recommended:

1. Groszicki Z J, "Watsons Textile Design and Colour", Newnes Buttersworth (1988).
2. Groszicki Z J, "Watsons Advanced Textile Design", Newnes Buttersworth(1989).
3. Klibbe J W, " Structural Fabric Design", Revised Edition, 1965, North Carolina State University.
4. Nisbeth H, "Grammer of Textile Design", Tarapore Wala sons and Co.(1994).
5. Gokarneshan N, "Fabric Structure and Design", New Age International, New Delhi (2004).

3. KTT 503 Chemical Processing of Textile-I (L T P 3 1 0) Credit 4

Course Outcomes:

After successful completion of this course, the students should be able to;

CO1	Explain various mechanical and chemical pre-treatment processes, Discuss methods of singeing, desizing and scouring. Evaluate efficiency of desizing and scouring
CO2	Explain and compare various bleaching processes for various textile fibres, and evaluate efficiency of bleaching.
CO3	Describe mercerization of yarns and fabrics of cellulosic materials,, compare various methods, evaluate degree of mercerization.
CO4	Discuss and compare various mechanical finishing such as Sanforizing, callendering, raising, milling, stentering etc. with suitable machineries.
CO5	Explain utility and application methods of various physical and chemical finishes such as resin finishing, anti-crease, wash-n-wear, durable press, Heat setting, weight reduction, soil release, water repellent and flame retardant finishes.

Course Articulation Matrix of Chemical Processing of Textile-II:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
RTT-503.1	2	3	2	3	2							2
RTT-503.2	3	2	3	3	3							1
RTT-503.3	3	3	3	3	2							2
RTT-503.4	3	3	3	2	3							1
RTT-503.5	2	2	3	2	2							2
Avg.	3	3	3	3	2							2

Unit I (08 Hours)

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Introduction: Process line for pretreatment, coloration and finishing of textiles.
Singeing & Desizing: Objective, singeing techniques, their merits and demerits. Desizing: Objectives, mechanism involved in removal of size content by various methods. Evaluation of desizing efficiency

Unit 2(08 Hours) Scouring: Actions involved in removal of impurities, recipe and process parameters. Scouring of natural, manmade and blended textiles. Carbonisation of wool. Degumming of silk. Evaluation of scouring efficiency.

Unit III (10 Hours) Bleaching: Hypochlorite, peroxide & chlorite bleaching, methods of bleaching. Bleaching of cotton, silk, wool, man-made fibres and blended textiles by suitable bleaching agents. Estimation of bleaching

Mercerization: Objectives, concepts of mercerization. Mercerizing machine, Evaluation of mercerization, Causticization

Unit IV (06 Hours)

Concept of colour: Visible spectrum, wavelength and blindness of colour. Additive and subtractive theories of colour mixing. Shade, tint, Hue, chroma, color wheel. Tristimulus values of colour. Computer colour matching,

Unit V (10 Hours) Dyeing:

Dyeing of Cellulosic and Protein fibres: Classification of colouring matter, Application of Direct, Reactive, Vat, Solubilized vat and Sulphur dyes on cellulose fibres. Application of Acid, Basic and Metal complex dyes on wool and silk. Auxiliaries used in dyeing. Eco friendly chemicals and banned dyes.

Books Recommended:

1. Karmakar S.R., —Chemical Technology in the pretreatment processing of textiles, Textile Science & Technology, Elsevier Publication, 1999.
2. Trotman, E.R., —Dyeing and Chemical Technology of Textile Fibres, Charles Griffin and Co. Ltd., London, 1991.
3. Shenai, V.A. —Technology of Bleaching and Mercerizing - Vol. III, Sevak Publications Chennai, 1991.
4. Bhagwat R.S —Handbook of Textile Processing, Colour Publication, Mumbai, 1999.
5. Shenai, V.A., —Technology of Dyeing, Sevak Publisher, Bombay, 1991.


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4. Department Elective-I: (L T P 3 0 0) credit 3

4.1 KTT051 Structure and Properties of Fibres (L T P 3 0 0) Credit 3

- CO1 Describe various models of physical structure of fibre and Analyse 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.

Course Articulation Matrix of Structure and Properties of fibers:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
												2
KTT-011.1	3	3	3	2	2							2
KTT-011.2	3	2	3	3								2
KTT-011.3	3	3	2	3	3							2
KTT-011.4	2	3	3	2	2							2
KTT-011.5	3	3	1	1	2							1
Avg.	3	3	3	2	2							2

Unit I:

Physical and chemical structure of cotton, wool, silk, and manmade textile fibres, models of fine structure of fibre, Methods of investigation of physical structure by IR spectroscopy, FTIR, and X-ray diffraction techniques, . Measurement of density and crystallinity by density gradient column.

Total Lectures Required = 8

Unit II:

Moisture regain and content. Significance of moisture in textiles. Relation between regain and relative humidity, hysteresis of moisture absorption, effect of various factors on moisture regain. Difficulties involved in drying of textile specimen. Heat of sorption and heat of wetting, their relationship, swelling of fibres, Quantitative theory of moisture absorption. Concept of contact angle and surface energy on textile surface

Total Lectures Required = 8

Unit III:

Tensile properties of fibre, Factors affecting results of tensile experiment, experimental methods; effect of variability and weak-link theory, Elastic recovery, Effect various factors on recovery, Cyclic loading and fatigue, Fibre fracture. Time effect, Creep and stress relaxation. Dynamic testing. Concept of viscoelastic effects, Kelvin and Maxwell model. Bending and torsional rigidity of fibre.

Total Lectures Required = 8

Unit IV:

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Thermal behavior of textile fibres by Differential Scanning Calorimeter (DSC), Difference between Heat Flow and Heat Flux DSC, Various types of DSC and their applications, Thermo-gravimetric analysis (TGA), thermo-balance principle in TGA, Applications of TGA Analysis or Thermogravimetry, thermal mechanical analysis (TMA), and Dynamic Mechanical Analysis (DMA). Various types of DMA, Different types of loading in DMA, Application of DMA

Total Lectures Required = 8

Unit V:

Optical and electron microscopy, Brief Introduction to Scanning Electron Microscope, Optical properties of fibres, Define Refractive index and dichroic ratio. Birefringence and overall orientation of fiber. Dielectric properties of Fibres, Fibre friction, Particle Size analysis, various techniques to measure particle size,

Total Lectures Required = 8

Grand Total of lectures required = 40

Reference Book: -

1. Morton W E and Hearle J W S, Physical Properties of Textile Fibres, 1st reprint, The Textile Institute, Manchester, 1986.
2. Gupta V B and Kothari V K, "Manufactured Fibre Technology" 1st Ed., Chapman and Hall, London, 1997.
3. Hearle JWS, Polymers and their properties, Vol. I, John Wiley and Sons, NY; 1982.
4. Turi E A "Thermal characterization of polymeric materials", Vol I and II, Academic Press, 1997.
5. Gedde, U. L. F. (1995). Polymer physics. Springer Science & Business Media.
6. Billmeyer F W, "Text book of polymer science", John Wiley and Sons, 1984.
7. Meredith R, The Mechanical Properties of Textile Fibres, North Holland Publishing Co; Amsterdam 1959.

4.2 KTT 052 Multi & Long Fibre Spinning (L T P 3-0-0= 3)

Course Outcomes:

After this course students will be able to

CO1: Explain the critical parameter difference in processing of long fibres

CO2: Explain the process condition & need for dyed fibres processing

CO3: Explain the machine used for spinning wool fibres & blends using woolen & worsted system

CO4: Explain the process sequence for jute fibre processing.

CO5: Apply measures for process control during jute, wool & other long fibre spinning

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
KTT-012.1	3	3	3	2	2							2
KTT-012.2	3	2	3	3								2
KTT-012.3	3	3	2	3	3							2
KTT-012.4	2	3	3	2	2							2
KTT-012.5	3	3	1	1	2							2
Avg.	3	3	3	2	2							1
												2

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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 woolen spinning by Priestman
3. Woolen & Worsted yarn manufacture by J. W Redcliff
4. Jute Spinning Calculation by Andrew Smith
5. Worsted Drawing & Spinning by Miles

5. Department Elective II: Credit 3 (L T P 3 0 0)

a) KTT054 Non Woven Technology (3 0 0)

After successful completion of this course, the students should be able to;

CO1 Describe on woven market & classification of non-woven

CO2 Explain the different methods of non woven manufacturing processes and description of non woven machines.

CO3 Explain properties of fibres required for non-woven, structure of fibres in non-woven & non-woven fabric properties & their application

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3	3	3	2	2							2
2	3	2	3	2								2
3	3	3	2	2	2							2
Avg.	3	3	3	2	2							2

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 =9

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Unit 2: Various method of web formation, web characteristics and their influence on properties of non-woven fabrics, (3) Non woven fabric by Needle punch, Description of needle punching machine, effect of process variables on properties of needle punch fabric Total Lectures Required =9

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 =8

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 =8

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 =8 Grand total of Lectures required= 42

Reference & Text Books

1. Russel, S. J., Handbook of nonwovens, Woodhead Publishing Ltd., 2006 (Edited)
2. Chapman, R.A., "Applications of Nonwovens in Technical Textiles", The Textile Institute, 2010.
3. Horrocks A.R. and Anand S.C., "Handbook of Technical Textiles", The Textile Institute, 2000.
4. Adanur, S. "Handbook of Weaving", CRC Press, 2001
5. Russel S.J. "Handbook of Nonwoven", The Textile Institute, 2007
6. Krecma, R., Manual of Nonwovens, The Textile Trade Press, Manchester, UK, 1971.
7. Purdy, A. T., Developments in Nonwoven Fabrics, Textile Progress, Vol. 12, No. 4, The Textile Institute, Manchester, UK, 1983.

5.2 Department Elective II-B

KTT 060 Textured Yarn Technology (3-0-0=3)

CO1: Explain the need for texturing of thermoplastic filament yarn for apparel & other uses.

CO2: Explain the influence of raw material & process parameters on textured yarn quality

CO3: Explain the development of different texturing system and there merits

CO4: Decide selection of texturing methods based on raw material characteristics

CO5: Explain the bulking quality by different bulking methods.

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

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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

6 **KTT 551 Textile Testing Lab (0 0 2) Credit 1**

At least 10 of the following

Fibre & Yarn Testing

1. To determine the bundle strength of cotton fibre
2. To determine the fibre fineness by air-flow method
3. To determine the span length of fibre & analyze it.
4. To determine the Hank and Hank C.V% of the given sliver / Determination of the within bobbin and between bobbin hank C.V % of the given roving.
5. To determine the count of a yarn by using physical/electronic balance.
6. To measure the Single yarn and Ply yarn twist of the given yarn sample using Twist Tester.
7. To determine the Yarn count, Lea Strength and CSP of the given yarn sample.
8. To determine the single yarn strength.
9. To Study evenness and imperfection in the given yarn and compare the results with Uster statistics.
10. To Study the spectrogram and irregularity trace to determine type of irregularity.
11. To prepare yarns Appearance Boards and compare with ASTM standards.

Fabric & garment Testing

12. To characterize a woven fabric with respect to its dimensional properties: thread density, yarn number, crimp, weave, cover factor, weight, skewness, thickness
13. To determine the tensile strength of a woven fabric by strip test method. Draw load-elongation curve of a woven fabric.
14. To determine the tear strength of a fabric using Elmendorf tear tester or ballistic tester.
15. To determine the bursting strength of a fabric using hydraulic bursting tester.
16. To determine the abrasion resistance of a fabric.
17. To determine the bending length and flexural rigidity of a woven fabric using the Shirley tester.
18. To determine the crease recovery of fabric and observe the effect of loading time and recovery time on crease recovery.

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19. To determine the drape coefficient of woven and knitted fabric using the drape meter.
20. To measure the Air permeability and Fabric Impact Strength of the given fabric.
21. To measure the water permeability of the given fabric.

7. KTT 552 Fabric Structure & Design Practical (0 0 2) Credit 1

Analysis of the fabric in respect to yarn and fabric parameters and their weave representation with draft and peg plan:

1. Plain weave
2. Plain derivative- Rib weave
3. Twill weave
4. Satin/sateen weave
5. Diamonds weave
6. Honey comb weave
7. Huck-a-back weave
8. Mock leno weave
9. Crepe weave
10. Bedford cord weaves/ welt structure
11. Extra thread figured weave
12. Velvet/velveteen weave
13. Double cloth

8. KTT 553 TEXTILE CHEMICAL PROCESSING- I Lab L T P 002

At least 10 of the following

1. Desizing of grey cotton yarn/fabric using chemicals/enzyme and determine the desizing efficiency.
2. Scouring of desized cotton yarn/fabric and determine the scouring loss%, drop absorbency and degree of impurities.
3. Scouring of P/C blended fabrics.
4. Bleaching of scoured cotton yarn/fabric with hypochlorite agent and measurement of the whiteness index, and change in mechanical properties.
5. Bleaching of cotton fabric with hydrogen peroxide agent and measurement of the whiteness index, and change in mechanical properties.
6. Cold and Hot mercerization of cotton yarn and measurement of the BAN, and change in mechanical properties.
7. Scouring and Bleaching of Wool.
8. Degumming of Silk.
9. Dyeing of cotton yarn/fabric using direct dyes and studying the influence of temperature, Time and Electrolyte on dye adsorption and fastness properties.
10. Dyeing of cotton yarn/fabric using vat dyes and assessment of fastness properties of dyed material.
11. Dyeing of cotton yarn/fabric using hot and cold brand reactive dyes and assessment of dye exhaustion % on dye bath and fastness properties.
12. Dyeing of cotton yarn/fabric using azoic dyes and assessment of fastness properties of dyed material.
13. Dyeing of cotton yarn/fabric using sulphur dyes and assessment of fastness properties of dyed material.
14. Dyeing of Wool fibres with Acid and metal complex dyes and assessment of fastness properties of dyed material.

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15. Dyeing of Silk yarn / fabric with Acid dyes and direct dyes and assessment of fastness properties of dyed material.

9. **KTT 554 Mini Projector Internship Assessment (0 0 2) credit 1**

10. **Non Credit Course: Essence of India Traditional Knowledge/Constitution of India:**
As per AICTE Model Curriculum & shall be preferably conducted through SWAYAM

1.1 KNC501: Essence of Indian traditional Knowledge (2 0 0) Non Credit

Course objective

The course aims at imparting basic principles of thought process, reasoning and inferencing. Sustainability is at the core of Indian Traditional knowledge Systems connecting society and nature. Holistic life style of yogic science and wisdom capsules in Sanskrit literature are also important in modern society with rapid technological advancements and societal disruptions. Part-I focuses on introduction to Indian Knowledge Systems, Indian perspective of modern scientific world-view, and basic principles of Yoga and holistic health care system.

Course Contents

- Basic structure of Indian Knowledge System: अ ा दशिव4ा -४वेद, ४उपवेद (आयुव'द, धनुव'द, गन्व'वेद, ३थपःशआद) ६वेद ांग (शािा, क३/४, शान7^a, ा करण, ३/४ा शातप, छांद) ४उपड्ग (धम'िTM, मीम ांस, पुरण, तक' िTM)
- Modern Science and Indian Knowledge System
- Yoga and Holistic Health care
- Case studies

References

- Knowledge traditions and practices of India, CBSE Publication
- V. Sivaramakrishnan (Ed.), Cultural Heritage of India-course material, Bharatiya Vidya Bhavan, Mumbai. 5th Edition, 2014
- Swami Jitatanand, Modern Physics and Vedantharatiya Vidya Bhavan
- Swami Jitatanand, Holistic Science and Vedantharatiya Vidya Bhavan
- Fritzo Capra, Tao of Physics
- Fritzo Capra, The Wave of life
- VN Jha (Eng. Trans.), Tarkasangraha of Annam Bhatta, International Chinmay Foundation, Velliarnad, Arnakulam
- Yoga Sutra of Patanjali, Ramakrishna Mission, Kolkata
- GN Jha (Eng. Trans.), Ed. RN Jha, Yoga-darshanam with Vyasa Bhashya, Vidyanidhi Prakashan, Delhi 2016
- RN Jha, Science of Consciousness Psychotherapy and Yoga Practices, Vidyanidhi Prakashan, Delhi 2016
- P B Sharma (English translation), Shodashang Hridayan

Pedagogy: Problem based learning, group discussions, collaborative mini projects.

Outcome: Ability to understand, connect up and explain basics of Indian traditional knowledge in modern scientific perspective.

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1.2 KNV502: Constitution of India (2 0 0) Non Credit

The Constitution of India is the supreme law of India. Parliament of India cannot make any law which violates the Fundamental Rights enumerated under the Part III of the Constitution. The Parliament of India has been empowered to amend the Constitution under Article 368, however, it cannot use this power to change the “basic structure” of the constitution, which has been ruled and explained by the Supreme Court of India in its historical judgments. The Constitution of India reflects the idea of “Constitutionalism” – a modern and progressive concept historically developed by the thinkers of “liberalism” – an ideology which has been recognized as one of the most popular political ideology and result of historical struggles against arbitrary use of sovereign power by state. The historic revolutions in France, England, America and particularly European Renaissance and Reformation movement have resulted into progressive legal reforms in the form of “constitutionalism” in many countries. The Constitution of India was made by borrowing models and principles from many countries including United Kingdom and America. The Constitution of India is not only a legal document but it also reflects social, political and economic perspectives of the Indian Society. It reflects India’s legacy of “diversity”. It has been said that Indian constitution reflects ideals of its freedom movement; however, few critics have argued that it does not truly incorporate our own ancient legal heritage and cultural values. No law can be “static” and therefore the Constitution of India has also been amended more than one hundred times. These amendments reflect political, social and economic developments since the year 1950. The Indian judiciary and particularly the Supreme Court of India has played an historic role as the guardian of people. It has been protecting not only basic ideals of the Constitution but also strengthened the same through progressive interpretations of the text of the Constitution. The judicial activism of the Supreme Court of India and its historic contributions has been recognized throughout the world and it gradually made it “as one of the strongest court in the world”.

Course content

1. Meaning of the constitution law and constitutionalism
2. Historical perspective of the Constitution of India
3. Salient features and characteristics of the Constitution of India
4. Scheme of the fundamental rights
5. The scheme of the Fundamental Duties and its legal status
6. The Directive Principles of State Policy – Its importance and implementation
7. Federal structure and distribution of legislative and financial powers between the Union and the States
8. Parliamentary Form of Government in India – The constitution powers and status of the President of India
9. Amendment of the Constitutional Powers and Procedure
10. The historical perspectives of the constitutional amendments in India
11. Emergency Provisions : National Emergency, President Rule, Financial Emergency
12. Local Self Government – Constitutional Scheme in India
13. Scheme of the Fundamental Right to Equality
14. Scheme of the Fundamental Right to certain Freedom under Article 19
15. Scope of the Right to Life and Personal Liberty under Article 21.

11. NPTEL/ MOOCS for Hons Degree: As per AKTU list

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3rd B. Tech (Textile Technology) 6th Semester

1. KTT601 Yarn Manufacture-III LTP 310 = Credit 4

Course Outcomes:

CO1	Explain the principles & mechanism involved in drafting, twisting & winding in roving frame & mechanism of combing.
CO2	Discuss the need & uses of combing & machine setting parameters
CO3	Highlight technological design changes in combing preparatory, combing & speed frame.
CO4	Select the machine & process parameters on comber & speed frame machine.

Course Articulation Matrix of Yarn Manufacture-III:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
KTT-501.1	3	3	3	3	3				3	1		1
KTT-501.2	3	3	3	3	3				2	2		2
KTT-501.3	3	3	3	3	2				3	2		2
KTT-501.4	3	2	2	2	3				2	1		1
Avg.	3	3	3	3	3				3	2		2

Unit-I (10 Hours)

Ring Spinning Process: Objectives and principles of Ring Spinning Machines. Constructional features and identification of different parts, Principles of drafting systems and weighting system on ring frame. Twisting, winding and building operation, Role of drafting system, yarn guiding devices, forces acting between ring and traveler, yarn tension variation, balloon tension at maximum diameter, tasks of traveller, limiting speed, classification, form of traveler, traveler mass and material, different ring-traveller combinations, fiber lubrication, running on new-ring, winding process, cop structure, spinning geometry, causes of end breaks. Calculation pertains to speed, draft, twist, production and efficiency in ring frame. General idea about lubrication and maintenance of high speed ring frame. Recent developments.

Unit-II(6 Hours)

Doubling and Reeling Process: Objectives and principle of doubling. Study of different components of ring doubler- creel, yarn guiding roller, rings, travellers and spindle. Building motions. Concept of balanced twist in doubled yarn, direction of twist in doubled yarn and its relation to single yarn. TFO- Construction details and principle of operation.

Unit III (08 Hours)

Development in Ring Spinning: Compact spinning - working principles of different compact spinning systems-Elitwist-Comfor twin, structure and properties of compact yarns, applications of compact yarn - Techno economics of compact spinning. **SIRO Spinning-** Principle and mechanism of SIRO spinning system, structure, properties and end use of SIRO yarn, Solo spinning system.

Unit IV (10 Hours)

Non-conventional spinning processes: Causes leading to the advent of non-conventional systems of spinning.

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Rotor spinning : Tasks of the rotor spinning machine; Mechanism of yarn formation on rotor spinning; Raw material requirements and preparation - raw materials requirements (fibre lengths, fineness, strength, dirt & dust, foreign matter); Designing features of chief organs and their functions, sliver in-feed unit, feeding roller & guide plate, opening unit - opening roller - clothing of the opening roller, trash removal, fibre guide passage, fibre flow into the Rotor - rotor groove, rotor diameter, combination of rotor diameter and rotor groove, rotor bearing, rotor revolutions, formation of a coherent fibre strand, back doubling, formation of the yarn, the false twist effect, wrapping fibers, yarn withdrawal and winding unit, navel, types of the navel, withdrawal tube, direction of withdrawal, package formation unit- requirements for the package, the winding process; Effect of rotor machine variables and fibre properties on the properties of rotor spun yarns. techno-economic aspects of rotor spinning system; Limitation of rotor spinning.

Unit V (10 Hours)

Friction spinning: Operating principle; Designing aspects of feed device, opening roller and spinning drum, classification, raw material requirements, technological interrelationships, yarn structure and characteristics, techno-economic aspect.

Air-jet spinning: Mechanism of yarn formation on Air-jet spinning; Designing aspects of nozzles; Raw material requirements; Structure, properties and end uses of yarns spun on Air-jet spinning, techno-economics aspects. Comparison of properties of ring spun, rotor spun, friction spun and air-jet spun yarn.

Books Recommended:

1. Klein W, "A Practical Guide to Ring Spinning", The Textile Institute, Manchester, 1999.
2. Lawrence C A, "Fundamental of Spun Yarn Technology" CRC Press, USA, 2003.
3. Lord P R, "Handbook of Yarn Production", The Textile Institute, Woodhead Publication Limited, Cambridge, 2003.
4. Shaw J, "Short-staple Ring Spinning, Textile Progress", The Textile Institute, Manchester, 1982.
5. Murty HVS, TFO- Technology & Techniques.
6. Mahendra Gowda R V, "New Spinning Systems", NCUTE Publication, IIT Delhi, 2006.
7. Eric, Oxtoby, "Spun Yarn Technology", Butterworths, London, 1988.
8. Klein. W, "New Spinning Systems: Vol 5", The Textile Institute", UK, 1993.

2. KTT 602 Fabric Manufacture-III (L T P 3 1 0) credit

Course Outcomes:

CO1	Show various parts of a shuttle loom, demonstrate various motions of loom
CO2	Classify and explain shedding and picking mechanisms with their limitations and scopes.
CO3	Classify and explain let-off and take-up mechanisms with their limitations and scopes.
CO4	Demonstrate various auxiliary motions in shuttle loom.
CO5	Explain various automations in shuttle loom

Course Articulation Matrix of Fabric Manufacture III:

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CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
KTT-502.1	3	3	3	3	3	1			1	1		1
KTT-502.2	2	2	2	3	3				2	1		2
KTT-502.3	3	3	3	3	2				1	1		2
KTT-502.4	2	2	3	2	3	1			1	1		1
KTT-502.5	3	3	3	3	3				1	2		2
Avg.	3	3	3	3	3	1			1	1		2

Unit I (10 Hours)

Introduction: Automatic loom and its merit over plain shuttle loom.

Multiple box motion: Types of multiple box motion, working principle of multiple box motion, two colour and four colour drop box motion, brief description of pick-at-will, pick and pick Motion. Pattern card and use of this to make some design in drop box mechanism.

Terry weaving: Essential feature of terry weaving loom, various principle of terry pile formation and its Application.

Unit II (10 Hours)

Development of shuttle less looms: - Limitation of shuttle looms, Classification of shuttle less Looms. Yarn preparation & pre-requisites for shuttle less weaving. Techno economics of shuttleless weaving. Principles of positive shedding, Selvedge and salient features of shuttle less loom. Different types of accumulator and its important.

Projectile Loom: Working elements and weft insertion cycle in projectile loom-Torsion bar picking mechanism-Weft selection device-Salient features of projectile loom, Weft insertion rate and production calculation.

Unit III (10 Hours)

Rapier Loom: Classification of rapier loom: Flexible, Rigid rapiers-Principles of tip and loop transfer- Weft insertion cycle-Rapier drives-Salient features. Zero velocity and non zero velocity tip transfer. Weft insertion rate and production calculation.

Air-jet loom: Working principle – weft insertion mechanism - types of nozzles, profile reed. Air requirements. Weft insertion rate and production calculation.

Unit IV (10 Hours)

Water-jet Loom: Working principle - Weft insertion system – Nozzles - Water requirements – Weft insertion rate and production calculation.

Multiphase loom: Classification, principles of operation, shedding mechanisms of weft way and warp way, supply systems for weft, Fabric Defects

Narrow fabric production: Importance of narrow weaving. It's manufacturing process. Unconventional Fabric Production: Concepts of 3D fabric production and circular loom.

Books Recommended:

1. Talukdar M K, Sriramulu P K and Ajgaokar D B, "Weaving – Machine, Mechanism and Management", Mahajan Publisher Private Ltd., Ahmedabad, India, 1998.

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2. Aswani K T, "Fancy Weaving mechanism", Mahajan Publisher Private Ltd., Ahmedabad, India 1990.
3. Ormerod & W. S. Sondhelm "Weaving - Technology and Operations,
4. R. Sengupta "Weaving Calculation".
5. Woven Fabric Production I, II, NCUTE Publications 2002.
6. Handbook of weaving, By Sabit Adanur

3. KTT 603 Chemical Processing of Textile-II (LTP 3 1 0 Credit 4)

Course Outcomes:

After successful completion of this course, the students should be able to;

1. Perform dyeing of textiles made up synthetic fibres and their blends.
2. Control process parameters and use of dyeing machines for dyeing of textile materials.
3. Select the dyes and recipe for preparation of printing paste for printing of textile materials.
4. Explain finishing treatment process and treat the fabric with different finishing agent.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3	2	3	1								1
2	3	2	2	2								1
3	3	2	3	1								1
4	3	2	3	1								1
5	2	2	2	1								1
Avg.	3	2	3	1								1

Unit I (10 Hours)

Dyeing of synthetic fibres: Dyeing of polyester with disperse dye, dyeing of Nylon with acid dye, dyeing of acrylic with cationic dye.

Dyeing of blends: Classification of blends and shades, Methods for dyeing of blends. Suitability of each method for dyeing of specific blend- P/C, P/V, P/W, W/A.

Unit II (08 Hours)

Dyeing machineries: Loose fibre, yarn and package dyeing machines. Jigger, winch, jet and HTHP beam dyeing machine. Padding mangle, Continuous dyeing range.

Unit III (10 Hours)

Printing: Objective, Difference between dyeing and printing, Characteristics of printing paste ingredients, classification and mechanism of thickeners.

Printing methods: Hand block, Flat bed and rotary screen printing, screen preparation, drawbacks and advantages of each method. **Styles of printing:** Direct, Discharge and Resist. Printing of cotton with reactive, vat and pigment, Polyester with disperse dye and Acrylic with basic dyes. **Printing after treatments:** Steaming, curing, ageing in printing.

Digital Printing: Mechanism, process parameters and machinery.

Unit IV (10 Hours)

Finishing: Significance and classification of finishing.

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Mechanical finish: Calendering, Sanforizing and their evaluation. **Chemical and functional finish:** Mechanism, process parameters and troubleshooting of Softening, anti-crease finish, water proof and water repellent finish, flame-retardant and fire proof finish, Soil release finish; **Organdi finish:** Biopolishing, Stonewashing of denim , Anti-microbial finish, antistatic finish and their evaluation.

Unit V: 04 Hours

Waste minimization: Need for waste minimization. water conservation, energy conservation. Textile effluent management, techniques of effluent treatment.

Books Recommended:

1. Miles L W C, "Textile Printing", Dyers Company Publication Trust, Bradford, England, 1981.
2. Shenai V A, "Technology of Printing", Sevak Publications, Mumbai,1990.
3. Shenai V A and Saraf, N M, "Technology of Textile Finishing", Sevak Publications, Mumbai,1990.
4. Karmakar S. R., "Chemical Technology in the Pre-treatment Process of Textiles", Elsevier sciences,1999.
5. Cavaco-Paulo A. and Gubitz G. M., "Textile Processing with enzymes", Woodhead Publication Ltd.,2003

4. Department Elective-III (L T P 3 0 0) credit 3

1.1 KTT 061 Theory of Textile Structure (L T P 3 0 0)

Course Outcomes:

After successful completion of this course, the students should be able to;

1. Explain ideal helical model of yarn and different structural parameters.
2. Illustrate method of measuring structural parameters.
3. Determine effect of different parameters affecting the structure of yarn and on its properties.
4. Illustrate structural characteristics of knitted and nonwovens and design the fabric to get the desired property

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3	2	3	1								1
2	3	2	2	2								1
3	3	2	3	1								1
4	3	2	3	1								1
Avg.	3	2	3	1								1

Unit I (10 Hours)

Geometry of twisted yarn: Idealized helical yarn structure; yarn count and twist factors, twist contraction; Limits of twist.

Packing of fibres in yarn: Idealized packing; measurement of packing density and radial packing density of yarn; Packing in actual yarns; Specific volume of yarns; Equation of yarn diameter.

Fibre Migration: Ideal migration, tracer fiber technique, characterization of migration behavior, migration in spun yarns, mechanisms of migration, effect of various parameters on migration behavior.

Unit II (10 Hours)

Structural Mechanics: Translation of fiber properties into yarn properties; Extension of continuous filament yarn for small strains and large strains; Prediction of breakage, Nature of rupture for continuous filament yarn. Extension and breakage of spun yarn, Blended yarn structure, Structure property relationship of ring, rotor, air-jet, friction spun yarn, Extension of continuous filament yarn.

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Unit III (10 Hours)

Fabric Geometry: Engineering approach to the analysis of fabric, Pierce geometrical model, flexible thread model and rigid thread model, Square fabric, Jammed Structure, square and jammed fabric, Crimp interchange, Maximum possible cover factor. Yarn cross sections in the fabric, Pierce elastic thread model. Geometry of weft and warp knitted structures.

Unit IV (10 Hours)

Fabric deformation under tensile stress; prediction of modulus; tensile properties in bias direction. Other fabric deformation: compression, shear, bending and buckling; fabric handle; Structure of felts and stitch bonded fabric; Basic of braided fabric structure.

Books Recommended:

1. Hearle J. W. S., "Structural Mechanics of Fibers, Yarns and Fabrics", Wiley-Interscience, New York, 1969.
2. Goswami B. C., "Textile Yarns: Technology, Structure and Applications", Wiley- Interscience, New York, 1977.
3. Jinlian Hu., "Structure and Mechanics of Woven Fabrics", Woodhead Publishing Ltd., 2004.
4. Hearle J. W. S., John J., Thwaites. And Jafargholi Amirbayat., "Mechanics of Flexible Fibre Assemblies", Sijthoff and Noordhoff, 1980.
5. Hassan M. Berery., "Effect of Mechanical and Physical Properties on Fabrics Hand", Wood head publishing Ltd., 2005.
6. Behera BK, Hari PK, "Woven Textile Structure: Theory and Applications". Woodhead publishing.

1.2 KTT062 Clothing Science (L T P 3 0 0)

Course Outcomes:

After successful completion of this course, the students should be able to;

1. Describe thermal and non-thermal components of clothing comfort.
2. Explain the role of body components in maintaining body temperatures
3. Recognize the Principles of heat transfer to and away human body
4. Explain various aspects of thermal & skin sensational clothing comfort

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3	1	3	2	1							2
2	3	2	3	2								2
3	3	1	3	2	1							2
4	2	3	3	2	1							2
Avg.	3	2	3	2	1							2

Unit I (10 Hours)

Introduction: Concept of selection of fabrics for clothing purpose. Types of fabric required for apparel use for different age group, occasions, purpose. Fabric properties and performance for apparel use.

Serviceability of Fabrics: Abrasion resistance - flat abrasion, flex abrasion, edge abrasion, Pilling - mechanism of pilling formation, anti-pilling techniques, Snagging, Strength, Tearing strength - Tensile strength - Bursting strength, seam strength and seam slippage.

Tailorability of fabrics : tailorability of woven and knitted garments, Tailorability of leather garments and fur garments

Unit II (10 Hours)

Aesthetic properties: Drape, Crease and Wrinkle recovery - Lustre. Yarn unevenness: neps, thick place, thin place, periodic fault, Scroopiness, Colour- Colour fastness: to light, washing,

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perspiration, rubbing, dry cleaning.

Dimensional Stability of Fabrics: Hygral expansion, Relaxation shrinkage, Swelling shrinkage, Felting shrinkage. Mechanism of fabric shrinkage- Relationship between Hygral Expansion, Relaxation shrinkage and extensibility - Knitting Process Parameters and fabric stability. Methods of measuring dimensional stability to dry cleaning and dry heat.

Fabric Hand : smoothness, fullness and stiffness, subjective hand judgment, objective evaluation of fabric hand and its applications.

Unit III (10 Hours)

Clothing Comfort: Definition of comfort - Human clothing system - Physical, Physiological and psychological aspects of comfort. Tactile and pressure sensation aspects. Applications of clothing comfort research.

Thermal Comfort: Introduction. Thermal transfer processes. Dry heat transfer and Rapid heat transfer. Function of Textiles in enhancing thermal comfort. Comparison of thermal comfort properties for different textile structures.

Unit IV (10 Hours)

Functional Properties: Elasticity: elastic recovery, residual strain; Thermal insulation. Water repellence, water resistance and water proof; Wicking: vertical and horizontal transportation of liquid; Water absorbency; UV protection; Soil release

Safety: Toxicity - residual dye stuff and other finishing agent ; Flammability

Books Recommended:

1. Kothari, V K, "Testing and Quality Management", CBS Book Publishers, New Delhi, 2000.
2. Li. Y, "The Science of Clothing Comfort", Textile Progress, Volume: 31, No. 1/2, Textile Institute.
3. Saville B P, "Physical Testing of Textiles", The Textile Institute, Woodhead publication limited, Cambridge.
4. Billie J Collier and Helen H Epps, "Textile Testing and Analysis", Prentice- Hall Inc., New Jersey.
5. Lyman Fourt & Norman R.S. Hollies, "Clothing: Comfort & Functions", Marcel Dekker, Inc, Newyork.
6. G.Song, "Improving Comfort in Clothing", Woodhead Publication.
7. A.Das, R.Alagirusamy, "Science in Clothing Comfort", Woodhead Publication

5. **Open Elective-1:** As per AKTU Syllabus. The student have choice to go through course via MOOCS/NPTEL/SWAYAM

5.1 KOE 061: Real time Systems

5.2 KOE062: Embedded System

5.3 KOE 063: Introduction to MEMS

5.4 KOE064: Object oriented Programming

5.5 KOE065: Computer based Numerical Technique

5.6 KOE066: GIS and Remote Sensing

5.7 KOE067: Basics of Database Management System

5.8 KOE068: Software project management

5.9 KOE069: Understanding the Human Being Comprehensively- Human Aspirations and Its usefulness

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6. KTT 651 Yarn Manufacture-III Practical L T P 0 0 2 credit 1

1. To study the construction details and passage of materials in Ring frame.
2. To outline the main gearing diagram of ring frame and calculate Draft Constant and Twist Constant. & Production.
3. To study the building motion in ring frame.
4. To calculate required speed, draft and twist level and produce yarn from a given roving and determine the yarn count & production.
5. To study the construction details and passage of materials in Ring doubler.
6. To study the construction details and passage of materials of TFO.
7. Production & twist calculation in TFO with 3 positions and its effect on yarn strength.
8. Study of flow of materials in Rotor spinning machine.
9. Study of different elements of Rotor spinning machine.
10. Study of draft distribution in Rotor spinning machine.
11. Study of twist level in Rotor spun yarn.
12. Calculation of production of rotor spinning machine

7. KTT 652 Fabric Manufacture-III Practical (KTT552) L T P 0 0 2 credit 1

1. Study and working of pirn change motion.
2. Study and working of shuttle change motion
3. Study & working of multiple box loom
4. To study fabric formation in Terry towel loom.
5. To study the yarn passage in different shuttleless loom
6. To study path of warp yarn in rapier loom.
7. To study picking mechanism in rapier loom.
8. To produce a fabric by changing the design in rapier loom.
9. To study path of warp yarn in air-jet loom.
10. To study picking mechanism in air-jet loom.

8. KTT 653 Textile Chemical Processing II Lab Credit 0 0 2 Credit 1
At least 10 of the following

1. Dyeing of Polyester fibres/yarn/fabrics with Disperse Dye using carrier dyeing process.
2. Dyeing of Polyester fibres/yarn/fabrics with Disperse Dye using HT-HP dyeing process.
3. Dyeing of Nylon yarn/fabric with Acid Dye.
4. Dyeing of poly acrylonitrile fibre with cationic dyes.
5. Dyeing of blended fabric with suitable dyes.
6. Printing of cotton fabric with direct style printing and assessment of fastness properties of printed material.
7. Printing of cotton fabric with discharge style printing and assessment of fastness properties of printed material.
8. Printing of cotton fabric with resist style printing and assessment of fastness properties of printed material.
9. Finishing of cotton fabric using starch and evaluation of stiffness and add-on%.
10. Finishing of cotton fabric using softeners and evaluation of drape and add-on%.
11. Crease Proofing of cotton fabric and evaluation of crease recovery angle.
12. Assessment of shrinkage of woven and knitted fabrics.
13. Finishing of cotton fabric with anti-pilling finish and evaluation of pilling.

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15. Finishing of cotton fabric with flame retardant finish and evaluation of LOI.
16. Finishing of cotton fabric with soil release finish and measure the ability of fabric to release oily stains during home laundering.
17. Determination of the colour difference and colour strength value of dyed material using computer colour matching system

9. Non Credit course (Essence of Indian traditional Knowledge/ Constitution of India)

9.1 KNC601: Essence of Indian traditional Knowledge

Course objective

The course aims at imparting basic principles of thought process, reasoning and inferencing. Sustainability is at the core of Indian Traditional knowledge Systems connecting society and nature. Holistic life style of yogic science and wisdom capsules in Sanskrit literature are also important in modern society with rapid technological advancements and societal disruptions. Part-I focuses on introduction to Indian Knowledge Systems, Indian perspective of modern scientific world-view, and basic principles of Yoga and holistic health care system.

Course Contents

- Basic structure of Indian Knowledge System: अ ा दशिव4ा -४वेद,४उपवेद (आयुव'द, धनुव'द, गNव'वेद, 3थपÆशआद) ६वेद ांग (शािा, क¼, शान7ª, ा करण, ¼ा शातप, छांद) ४उपङ्ग (धम'ि™, मीम ांस, पुरण, तक' ि™)
- Modern Science and Indian Knowledge System
- Yoga and Holistic Health care
- Case studies

References

- Knowledge traditions and practices of India, CBSE Publication
- V. Sivaramakrishnan (Ed.), Cultural Heritage of India-course material, Bharatiya Vidya Bhavan, Mumbai. 5th Edition, 2014
- Swami Jitatman and, Modern Physics and Vedantharatiya Vidya Bhavan
- Swami Jitatman and, Holistic Science and Vedantharatiya Vidya Bhavan
- Fritzo Capra, Tao of Physics
- Fritzo Capra, The Wave of life
- VN Jha (Eng. Trans.), Tarkasangraha of Annam Bhatta, International Chinmay Foundation, Velliarnad, Arnakulam
- Yoga Sutra of Patanjali, Ramakrishna Mission, Kolkata
- GN Jha (Eng. Trans.), Ed. RN Jha, Yoga-darshanam with Vyasa Bhashya, Vidyanidhi Prakashan, Delhi 2016
- RN Jha, Science of Consciousness Psychotherapy and Yoga Practices, Vidyanidhi Prakashan, Delhi 2016
- P B Sharma (English translation), Shodashang Hridayan

Pedagogy: Problem based learning, group discussions, collaborative mini projects.

Outcome: Ability to understand, connect up and explain basics of Indian traditional knowledge in modern scientific perspective.

9.2 KNC 602 Constitution of India (2 0 0) Non Credit

9.2 KNC 502 Constitution of India (2 0 0) Non Credit

The Constitution of India is the supreme law of India. Parliament of India can not make any law which violates the Fundamental Rights enumerated under the Part III of the Constitution. The Parliament of India has been empowered to amend the Constitution under Article 368, however, it cannot use this power to change the "basic structure" of the constitution, which has been ruled and explained by the Supreme Court of India in its historical judgments. The Constitution of India reflects the idea of "Constitutionalism" – a modern and progressive concept historically developed by the thinkers of "liberalism" – an ideology which has been recognized as one of the most popular political ideology and result of historical struggles against arbitrary use of sovereign power by state. The historic revolutions in France, England, America and particularly European Renaissance and Reformation movement have resulted into progressive legal reforms in the form of "constitutionalism" in many countries. The Constitution of India was made by borrowing models and principles from many countries including United Kingdom and America. The Constitution of India is not only a legal document but it also reflects social, political and economic perspectives of the Indian Society. It reflects India's legacy of "diversity". It has been said that Indian constitution reflects ideals of its freedom movement, however, few critics have argued that it does not truly incorporate our own ancient legal heritage and cultural values. No law can be "static" and therefore the Constitution of India has also been amended more than one hundred times. These amendments reflect political, social and economic developments since the year 1950. The Indian judiciary and particularly the Supreme Court of India has played an historic role as the guardian of people. It has been protecting not only basic ideals of the Constitution but also strengthened the same through progressive interpretations of the text of the Constitution. The judicial activism of the Supreme Court of India and its historic contributions has been recognized throughout the world and it gradually made it "as one of the strongest court in the world".

Course content

1. Meaning of the constitution law and constitutionalism
2. Historical perspective of the Constitution of India
3. Salient features and characteristics of the Constitution of India
4. Scheme of the fundamental rights
5. The scheme of the Fundamental Duties and its legal status
6. The Directive Principles of State Policy – Its importance and implementation
7. Federal structure and distribution of legislative and financial powers between the Union and the States
8. Parliamentary Form of Government in India – The constitution powers and status of the President of India
9. Amendment of the Constitutional Powers and Procedure
10. The historical perspectives of the constitutional amendments in India
11. Emergency Provisions : National Emergency, President Rule, Financial Emergency
12. Local Self Government – Constitutional Scheme in India
13. Scheme of the Fundamental Right to Equality
14. Scheme of the Fundamental Right to certain Freedom under Article 19
15. Scope of the Right to Life and Personal Liberty under Article 21.

10. MOOCS (Essential for Honors degree): As per AKTU List

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