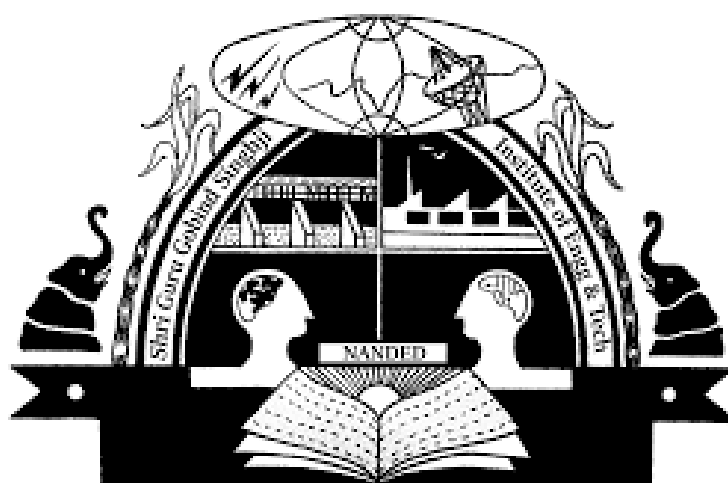


# Shri Guru Gobind Singhji Institute of Engineering & Technology, Nanded

(An Autonomous Institute of Government of Maharashtra)



## Department of Textile Technology

### Curriculum

Second Year B. Tech. (Textile Technology)

Academic year 2019-20



**Shri Guru Gobind Singhji Institute of Engineering & Technology, Nanded.**  
(An Autonomous Institute of Government of Maharashtra)

**DEPARTMENT OF TEXTILE TECHNOLOGY**

**Curriculum Structure: S.Y. B. Tech. (Textile Technology) with effective from 2019-20**

Semester I						
Course Code	Name of the course	L	T	P	Credits	
					Th	Pr
PCC-TT201	Fabric Forming Technology – I	3	--	2	3	1
PCC-TT202	Textile Testing – I	3	--	2	3	1
PCC-TT203	Textile Wet Processing – I	3	--	2	3	1
PCC-TT204	Natural Fibres and Fibre Forming Polymers	3	--	2	3	1
ESC285	Digital Fundamentals and Transducers	3	--	2	3	1
HMC278	Human Values and Professional Ethics	2	--	--	2	--
BSC261	Mathematical Foundation for Engineering*	2	--	--	Audit	
	<b>Total</b>	<b>19</b>	<b>--</b>	<b>10</b>	<b>22</b>	
Semester II						
Course Code	Name of the course	L	T	P	Credits	
					Th	Pr
BSC271	Mathematics-III: Transform Calculus and Differential Equations	3	--	--	3	--
PCC-TT205	Spun Yarn Technology – I	3	--	2	3	1
PCC-TT206	Fabric Forming Technology – II	3	--	2	3	1
PCC-TT207	Textile Testing – II	3	--	2	3	1
PCC-TT208	Textile Wet Processing - II	3	--	2	3	1
SII-TT209\$	Winter/Summer Internship	--	--	2	--	1
MAC277#	Indian Constitution	2	--	--	Audit	
	<b>Total</b>	<b>17</b>	<b>--</b>	<b>10</b>	<b>20</b>	

L – No. of Lecture Hours/week, T – No. of Tutorial Hours/week, P – No. of Practical Hours/week

\* This Audit course is only for Direct Second Year students and a MANDATORY course.

\$ Second year students may undergo internship program in the break between first year and second year or between two semesters of second year, but evaluation will be done during second semester of second year

# This Audit course is compulsory for all SY students.

**VISION**

Committed to excel in high quality education, research and extension services in the field of textiles.

**MISSIONS**

- 1 Imparting quality textile education and creating conducive teaching and learning environment
- 2 Strengthening research, innovation activities and extension services
- 3 Networking with premier industries, institutions, research organizations and alumni
- 4 Improving professional, ethical and leadership attitude of learners

**PROGRAM EDUCATIONAL OBJECTIVES (PEOs)**

- 1 Core Competency Graduates of the program will have core knowledge of textiles covering technology and production of fibres, yarns and fabrics
- 2 Analytical Proficiency Graduates of the program will be competent enough to pursue higher studies and research, work in interdisciplinary environment
- 3 Managerial Skills Graduates of the program will have the capability to demonstrate leadership, managerial and professional skills in their career
- 4 Social Skills The program also provides extension services and skill development programs for the industry and society

**B. Tech Textile Technology- Programme Articulation matrix**

PO/ PSO → PEO ↓	Engine ering knowle dge	Prob lem anal ysis	Design/ develop ment of solution s	Conduc t investig ations of complex problem s	Mod ern tool usag e	The engi neer and socie ty	Environ ment and sustaina bility	Eth ics	Indivi dual and team work	Communi cation	Project manage ment and finance	Life- long learn ing
	(PO1)	(PO2)	(PO3)	(PO4)	(PO5)	(PO6)	(PO7)	(PO8)	(PO9)	(PO10)	(PO11)	(PO12)
<b>I.</b> Core Compe tency	√	√	√	√	√	√			√	√		√
<b>II.</b> Analyti cal Profici ency	√	√	√	√	√				√	√		√
<b>III.</b> Manag erial Skills						√	√	√	√	√	√	√
<b>IV.</b> Social Skills						√	√	√	√	√	√	√

**Semester I****PCC-TT201: Fabric Forming Technology-I****(L3-T0-P2): 4 Credit****Course Objectives:**

On successful completion of the course, student will understand the concept of:

1. Different kinds of fabrics
2. Complete woven fabric weaving processes
3. Principles and motions of conventional weaving machines
4. Theoretical concepts of loom motions
5. Fundamentals of woven designs
6. Properties and manufacturing of some commercial fabrics

**Course Outcomes:**

- CO1- Students will learn fundamental science of fabric formation.
- CO2- Students will learn about various primary, secondary and auxiliary motions of a shuttle loom, dobby and jacquard loom etc.
- CO3- This course will make the students competent to handle shuttle loom and weaving process.
- CO4- This course will enable students to create primary fabric designs.

**Course Articulation Matrix:**

Program Outcome (PO)→ Course Outcome (CO)↓	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3		2	1					2			1
CO2	2											1
CO3	3	3	2	2					2			1
CO4	3	2	2	2					2			1

**Course Content:**

**Basics of weaving:** flow chart & brief description of different fabric formation methods such as Weaving, knitting, non-woven, braiding, Classification of weaving machines, their weft insertion rate. Basic motions such as primary, secondary and auxiliary motions and their objectives. Timing cycle of loom.

**Shedding mechanism** - Function of shedding, types of shed and their use. Negative & Positive tappet shedding, Heald reversing motions, Shed timing, early and late shedding.

**Picking Mechanism-** Function of picking, over picking & Under picking. Disadvantages of shuttle picking. Mechanism used for shuttle checking. Early & late picking and their uses.

**Beat-up Motion** – Functions, mechanism, Eccentricity of loom, Sley dwell. Types of reed, reed count and their calculations.

**Secondary Motions:** Negative let off motion its requirement, details of negative let- off and its limitations. Seven-wheel motions and related calculations.

**Auxiliary Motions:** Side weft fork, Loose reed & fast reed motion, Temples etc. Calculation related to loom production.

**Drawing-in & Denting-in:** Its type like manual, semiautomatic and automatic.

**Dobby shedding:** classification, use of doobby, working, drive & settings of a double lift double jack doobby.

**Jacquard shedding:** classification, use, elements of Jacquard, construction, working, drive & settings of a double lift single cylinder & double cylinder Jacquard, systems of harness mounting tie-ups.

**Multiple Box Motions:** importance, Types, Cow burn and Peck box motion,

**Fabric Designing:** Graphical representation of a fabric. Types of draft. Basic weaves like plain, twill & satin and their derivatives,

**Practical Work:**

1. Study of shedding mechanism & its timing and setting.
2. Study of over pick mechanism and its timing and setting.
3. Study of beat – up mechanism (Dismantling & fitting)
4. Study of seven-wheel take-up mechanism & its calculations.
5. Study of let-off and weft-stop motion.
6. Study of warp protection motion.
7. Study the loom drive and compute RPM, WIR and loom Production.
8. Study of working & drive of Jacquard loom.
9. Study of working & drive of Dobby loom.
10. Fabric analysis: EPI, PPI, Warp & weft count, crimp%, repeat of design for plain, twill & satin.
11. Prepare at least 3 different samples on pilot loom for plain, twill & satin weave

**Reference Books:**

1. Fundamentals of yarn Winding - M. V. Koranne.
2. Weaving Machines Mechanisms and Managements - M.K.Talukdar, P.K. Sriramulu & D.B Ajgaonkar.
3. Principles of Weaving – Marks & Robinson.
4. Mechanism of Weaving Machines - J.L.Chakravorty.
5. Weaving Mechanism – N.N. Banarjee.
6. Weaving Calculation – Sen Gupta.
7. Elementary Textile Designing - William Watson.

---

**PCC-TT202: Textile Testing-I**  
**(L3-T0-P2): 4 Credit**

---

**Course Objectives:**

1. Students will learn the methods and principles of testing of various parameters of fibres, yarns and fabrics.
2. Students will understand and experiment on various parameters of fibres, yarns and fabrics and their performances
3. This course will enable the students to analyze and evaluate different quality parameters of textiles.
4. The knowledge of the course may be used in process and quality control in yarn and fabric manufacture

**Course Outcomes:**

- CO1/ CO2- Students will learn and understand the principle and method of measurement of various physical and mechanical properties of fibres, yarns and fabrics in the field of textiles.
- CO3- They will be able to apply the knowledge of these measurement techniques for future applications.
- CO4- This course will make the students competent to analyze physical and mechanical properties of fibres, yarns and fabrics in the field of textiles.
- CO5- This course will enable students to conduct experiment related to various measurements and performance evaluation of textile materials.
- CO6- This course at the highest level may lead to design of new evaluation methods and techniques for evaluation of textile materials.

**Course Articulation Matrix:**

Program Outcome (PO)→ Course Outcome (CO)↓	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2									1
CO2	3	3	2									1
CO3	3	3	2	1								1
CO4	3	3	1	1								1
CO5	2	2	1									1
CO6	1	1	2	2								1

**Course Content:**

**Yarn and Fibre Fineness/ Count/ Linear Density:** English count, Tex and Denier and their conversion, Measurement of yarn count, Yarn count measurement for fabric, Relation between yarn count/ tex and yarn diameter, Fibre fineness measurement by air flow method, Micronaire and maturity, Relation between micronaire and denier.

**Yarn Twist and Crimp:** Yarn twist and its role in spun yarns, Twist direction, Twist multiplier, Twist contraction, Twist and yarn strength, Relation between yarn count and twist, Twist measurement by Untwist-twist method, Twist to break method and Microscopic method, Crimp measurement in yarns from woven fabrics.

**Fibre Length Measurement:** Fibre length and its significance, Baer sorter diagram and its analysis- Mean and Effective length, Digital Fibro graph – Span length and Uniformity ratio.

**Trash and Nep measurement in Fibres:** Trash analyzer and cleaning efficiency measurement of raw cotton, Nep and its measurement.

**Moisture Testing:** Moisture Regain and Content, Hysteresis behaviour in moisture test of textiles, Methods of moisture regain measurement for fiber, yarn and fabric.

**Tensile Testing of Textiles:** Load-Elongation and Stress-Strain curves of fibre, yarn and fabric, Tenacity of fibres and yarns, Factors affecting tensile strength of textiles, Weak-link effect and gauge length, Breaking time of specimen and tensile testing, Pendulum lever and CRT machines, Principles of CRL- Stelometer and CRL machines, Principles of CRE- Instron tensile tester, Ballistic strength tester.

**Yarn Irregularity and mass Variation:** Mass variations in yarns/ textile strands, Between length and Within length variations, B(l) and V(l) curves, Use of these curves in irregularity

measurement by Uster machine, Uster Count CV% and Uster CV%, Principle and method of Irregularity measurement of Uster machine, Uster settings for yarn irregularity measurement, Limit irregularity and Index of irregularity and calculations.

**Practical Work:**

1. Determine the English count of a given yarn, roving and sliver sample. Calculate the tex and denier of the samples. Also find the count CV% of the yarn sample.
2. Determine the twist of a given single yarn sample by Untwist-twist method. Compare the twist multiplier values by finding the twist value and count of another yarn.
3. Determine the twist of a given single yarn sample by twist to break method. Compare the twist multiplier values by finding the twist value and count of another yarn.
4. Determine the twist of a given single yarn sample by measuring the twist angle with the help of microscope.
5. Determine the single yarn strength/tenacity and breaking extension of two given yarn samples extension. Plot the stress-strain/ load-elongation graph of the yarn sample.
6. Determine the lea strength of two cotton yarn samples. Calculate CSP values.
7. Determine the warp-way and weft-way breaking strength and extension of one given fabric sample by raveled strip method.
8. Determine the warp-way and weft-way breaking strength and extension of one given fabric sample by cut strip method.
9. Determine the bundle strength and extension of given cotton samples by Stelometer.
10. Determine the warp way and weft way crimp in yarns taken out from a given fabric sample.
11. Determine the fineness of cotton fibres (micronaire value) by air flow method.
12. Determine the CV% of yarn irregularity (mass variation), thick places, thin places and neps by Uster or similar type machine.

**Reference Books:**

1. Principles of Textile Testing, J. E. Booth, Newnes-Butterworths, London
2. Physical Properties of Textile Fibres (4th Edition), J. W. S. Hearle W E Morton, Woodhead Publishing
3. Progress in Textiles: Science & Technology, Vol-I, Testing and Quality Management, Dr. V. K. Kothari, IAFL Publications, New Delhi
4. Textile Testing Fiber, Yarn & Fabric, Arindam Basu, SITRA, Coimbtore
5. ASTM Handbook Vol-07.01
6. ASTM Handbook Vol-07.02
7. Science in Clothing Comfort, Apurba Das & R. Alagirusamy, Woodhead Publishing India Pvt Ltd., New Delhi
8. [www.nptel.ac.in/courses/116102029](http://www.nptel.ac.in/courses/116102029).

## PCC-TT203: Textile Wet Processing-I

(L3-T0-P2): 4 Credit

**Course Objectives:**

1. To introduce basic concept of fabric preparation for dyeing.
2. To understand process and their purposes of different mechanical & chemical treatments for natural fibre made yarn & fabrics.
3. To introduce concept of mercerization.
4. To introduce concept of colors & their quantification.
5. To explain classifications of dyes.
6. To explain different dyes & dyeing techniques of cotton, silk & wool fibres.
7. To introduce different basic dyeing machine

**Course Outcomes:**

- CO1- In textile dye house students will understand dyeing preparatory processes & functioning of different machines.
- CO2- Students will understand & appreciate different dyeing conditions & machine operations in dye house.
- CO3- Students will understand quality evaluation aspects of dyeing process & products.
- CO4- Students will understand color measurement procedures & standards.

**Course Articulation Matrix:**

Program Outcome (PO)→ Course Outcome (CO)↓	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	1	1	2	1	1		2	1		1
CO2	2	1	1	2	1	1			2	1		1
CO3	1	1	1	1	1				1	1	1	1
CO4	2	2	1	2	1				2	1	1	1

**Course Content:**

**Mechanical Fabric Preparation & Desizing:** Grey inspection, Shearing, Cropping, Singeing & different singeing machines; Chemistry and technology of different desizing viz. Enzymatic, acid and oxidative.

**Scouring and bleaching:** Hard & soft water; Chemistry of fats, waxes & soaps; Chemistry and technology of scouring cotton cloth in both in KIER and continuous process; Chemistry and technology of hypochlorite, peroxide and chlorite bleaching. Scouring & Bleaching performances evaluation and norms for bleached cloth.

**Wool Scouring & Silk Degumming:** Composition of raw wool; Technology & chemistry of wool scouring; Technology of silk degumming & Wool & silk bleaching.

**Mercerisation:** Mercerisation, its chemistry and technology; Physical and chemical effect of mercerization, Chain & Chainless merceriser; Evaluations of mercerisation performances.

**Color:** Concept of light and color; Primary, secondary and tertiary color; Hue, value, chroma & color mixing concept; Chemical constitution responsible for color; Auxochrome, chromophore, dyes & pigments; Munsell, CIE & CIE Lab color measurement systems; Principles of spectrophotometer for color measurement.

**Dyeing Machine:** Principle of working of different batch dyeing machine like Jigger,



Winch & different yarn dyeing machines.

**Dyeing:** Introduction to theory of dyeing, Classification of dyes based on method of application, Concept of dissolution, absorption and fixation of different dyes; Application of different dyes like Direct, Vat, Solubilized vat, Reactive, Azoic, Sulphur, Acid and basic dyes on cellulosic and protein fibres through batch dyeing machines; Effect of process and material parameters on dye performances; Various dyeing faults, their causes and remedies; Concept of washing fastness, rubbing fastness, light fastness & their measurements.

**Practical Work:**

1. Determination of amount of size in Textile Fabric/Yarn through enzymatic, acid & chlorite desizing.
2. Cotton scouring & scouring loss determination.
3. Estimation of available Chlorine in hypochlorite bleaching liquor.
4. Bleaching of cotton yarn/cloth with hypochlorite & peroxides.
5. Dyeing of Cotton with direct dyes with different shades & after treatments.
6. Dyeing of Cotton with Hot& Cold brand reactive dyes with different shades.
7. Dyeing of Cotton with Vat dyes with different shades.
8. Dyeing of Cotton with solubilized Vat dyes with different shades.
9. Dyeing of Cotton with Sulphur dyes with different shades.
10. Dyeing of silk/wool with acid dyes with different shades.

**Reference Books:**

1. Dyeing & Chemical Technology of Textile Fibres, E. R. Trotman, Charles Griffin & Company Ltd.
2. Textile scouring & bleaching, E. R. Trotman, Charles Griffin & Company Ltd.
3. Fundamentals & Practices in Colouration of Textiles, Chakraborty J. N., Woodhead Publishing India in Textiles.
4. Textile Preparation & Dyeing, Roy, Choudhury A.K.; Published, Oxford & IBH Publishing Co. Pvt. Ltd.
5. Technology of Textile Processing - Vol.3, Technology of Bleaching, Dr. V. A. Shenai, Sevak Publications, Mumbai.
6. Technology of Textile Processing - Vol.6, Technology of Dyeing, Dr. V. A. Shenai, Sevak Publications, Mumbai.
7. Technology of Textile Processing - Vol.2, Chemistry of dyes & Principle of dyeing, Dr. V. A. Shenai, Sevak Publications, Mumbai.
8. Bleaching Mercerization & dyeing of cotton materials, R. S. Prayag.

**PCC-TT204: Natural Fibres and Fibre forming Polymers****(L3-T0-P2): 4 Credit****Course Objectives:**

On successful completion of the course, student will understand the concept of:

1. To introduce basic concept of polymers.
2. To understand different classification basis.
3. To understand synthesis mechanism.
4. To understand molecular weight measurement techniques.
5. To introduce basic important polymers
6. To understand basis of different fibre classifications.
7. To know details of three major natural fibres i.e. cotton, silk & wool.
8. To introduce other natural fibres.

**Course Outcomes:**

- CO1- Students understanding of engineering knowledge in synthesis, characterization, classification of different polymeric substances & fibre developed.
- CO2- Student understanding of problem analysis skills in identifying different polymeric materials & fibre in raw and in mixture form developed.
- CO3- Students understanding of conduct investigation of complex problems like measuring types of different fibre in a fibre mixture increased
- CO4- Students understanding of modern tools of different fibre testing & polymer characterization happened
- CO5- Student developed individual & team work spirit by conducting different individual & group assignment & practical job works.
- CO6- Students developed Effective communication through repeated written & oral test & assignment of the subject.

**Course Articulation Matrix:**

Program Outcome (PO)→ Course Outcome (CO)↓	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	1	1	2	1	1		2	1		1
CO2	2	1	1	2	1	1			2	1		1
CO3	1	1	1	1	1				1	1	1	1
CO4	2	2	1	2	1				2	1	1	1

**Course Content:**

**Polymer Introduction & their types:** Polymer introduction, Thermoplastics and thermosetts, Linear and cross-linked polymers, Fibers, rubber and plastics, Stereo regularity in polymers, Co-polymers.

**Polymer Synthesis:** Step growth and chain growth polymerization, Mechanism of linear step growth polymerization, Reactivity of functional groups, Carother's theory, Free radical polymerization: - initiation, propagation and termination.

**Polymer Molecular weights:** Concept of molecular weight and its distribution, Molecular weight of different fibers, Methods of measurements of number average and weighted average molecular weights, End group analysis, Introduction to GPC, Viscosity average molecular

weight.

**Introduction to few common polymers:** Polyester, Nylon, Polyacrylics, Polyethylene, Polypropylene, PVC, Polystyrene, Polycarbonate, Polyurethanes, PVA, Polyisoprene, Teflon, Phenol Formaldehyde, Urea Formaldehyde & Epoxy polymers.

**Fibre & it's classification:** Definition of textile fibres; Essential and desirable properties of textile fibres; Textile fibre classifications.

**Natural Cellulosic Fibres:** Cotton fibre: Morphology; Fine structure, Chemical structure; Cotton fibre Physical & chemical properties; Oxy-cellulose and hydrocellulose; Brief idea of Jute fibre production; Chemical composition, Morphology; Physical and chemical properties and end uses, Introduction to other natural fibres like Flax, Banana & Coir.

**Natural Protein Fibres:** Silk fibre; Cultivation of mulberry silk & fibre production; Morphology and brief idea of fine structure; Chemical structure, Silk Fibre Physical and chemical properties. Introduction to wild silk; Wool Fibres; Morphology and brief idea of fine structure; Chemical composition and structure, Physical and chemical properties.

**Practical Work:**

1. Physical appearance & Burning behavior of different textile fibres.
2. Fibre identification by chemical dissolution test of different natural fibres.
3. Fibre identification by chemical dissolution test of different synthetic fibres.
4. Longitudinal view of different textile fibres under microscope.
5. Cross sectional view of different textile fibre under microscope.

**References Books:**

1. Polymer Science, Gowariker V. R., Viswanathan N. V. & Sreedhar, J. Wiley Eastern Ltd.
2. Introduction to Polymers, R. J. Young & P. A. Lovell., Chapman & Hall.
3. Text Book of Polymer Science, F. W. Billmeyer Jr., John Wiley & Sons.
4. Textile Science, Gohl E. P. G. & and Vilensky L. D., Longman Cheshire.
5. Dyeing & Chemical Technology of Textile Fibres, E. R. Trotman, Charles Griffin & Company Ltd.
6. Introduction to Textile Fibres; H. V. Sreenivas Moorthy
7. Textile Fibres, Dr. V.A.Shenai, Sevak Publications, Mumbai.

## ESC285: Digital Fundamentals and Transducers (L3-T0-P2): 4 Credit

**Course Objectives:**

1. To introduce the students for the purpose of measurement.
2. To provide the knowledge of fundamentals and types of all the sensors and transducers and their signal conditioning used in the Textile industry.
3. To understand the sensors and transducers concept and its applications in the process measurement.
4. To give the analysis of various sensors characteristics and their selections in applications in controlling various parameters.

**Course Outcomes:**

- CO1- Know the general concepts of measurement systems, static and dynamic characteristics, errors, standards and calibration.
- CO2- Understand the basic principle and construction of various active and passive transducers. Introduction to semiconductor sensors and their applications in textile industries.
- CO3- Demonstrate the benefit of automatic control systems over manual control for various kinds of textile industries.
- CO4- Get analysis of various physical measurements like conductivity, density, viscosity, pH, Humidity, Moisture etc. by using sensors and their use in textile industries.
- CO5- Evaluate the results of measurements taken from signal conditioning circuits constructed by the student.
- CO6- Develop skills to compare theoretical concern with practical aspects.

**Course Articulation Matrix:**

Program Outcome (PO)→ Course Outcome (CO)↓	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2								2	2
CO2	3	2	3		2		2				2	2
CO3	3	3	2	2	1	2					1	2
CO4	3	3	3	1	2	2	2				2	2
CO5	3	3	3	3	3						2	2
CO6	3	3	3	3	3						2	2

**Course Content:****Unit 1 Digital Fundamentals:**

**Fundamentals of digital systems:** Digital Signals, digital circuits, NAND and NOR operations, EX-OR operation, Boolean algebra, examples of IC Gates, number systems-binary, signed binary, Octal, hexadecimal numbers, binary and BCD arithmetic, one's and two's complement arithmetic, codes.

**Combinational digital Circuits:** Standard representation for logical functions, K-map representation. Simplification of logical functions using four, five and six variable K-maps, multiplexer, de-Multiplexer/decoders, adders, subtractors.

**Sequential circuits and systems:** Clocked SR flip flop, J-K, T and D types of flip flop, shift

register and counter types.

**Unit 2 Introduction:**

General configuration & functional description of measuring instruments, Classification and characteristic of transducers.

**Unit 3 Transducers:**

Temperature Transducers: Std. & calibration, Gas & fluid filled system, Thermocouple, RTD, Thermistors bimetal strip and their working principle and application in textile industries. Resistance Transducers: Potentiometer, strain gauge, types of strain gauge, derivation of gauge factor, bridge configurations, compensation, applications of strain gauges.

Capacitive Transducers: Capacitance principles, capacitive displacement transducers, capacitive level transducers, capacitive hygrometer and capacitive proximity transducers.

Inductive Transducers: Linear variable differential transformer, rotary variable differential transformer.

**Unit 4 Pressure & Flow Transducers:**

Diaphragms Bellows, Bourdon tube & calibration with dead weight tension and manometers, orifices, Nozzles, Ventury meter, magnetic flow meter and turbine flow meter & their working principle and application in textile field.

**Unit 5 Physical Measurements:**

Measurement of conductivity, density, viscosity, mass, Humidity & moisture content fluid level, pH, measurement of force & tension of textile materials during their working in machines and instruments.

**Unit 6 Introduction to Controllers:**

Types of automatic control systems, Types of controllers and their principles, Introduction to P, PI, PID Electronic controllers.

Alarm: Level alarm, temperature alarm, pH alarm, Pressure alarm their use in textile industry.

**Unit 7 Measurement accessories and General test equipment:**

Brief concept of instrumentation amplifiers, signal generation and processing, data acquisition and conversion, input-output devices and displays.

Brief review of general-purpose electronic test equipment - CRO, digital multimeters, counters, signal generators, regulated power supplies.

**Text/ Reference Books:**

1. Arun Ghosh, Introduction to Measurements and Instrumentation, PHI Learning Pvt. Ltd., 2012.
2. Bentley J. P., Principles of measurement systems, Third Edition, Pearson education Asia pvt.ltd, 2000. Patranabis D, Sensors and Transducers, Wheeler Publishing Co., Ltd. New Delhi, 1997.
3. Patranabis D, Sensors and Transducers, Wheeler Publishing Co., Ltd. New Delhi, 1997.
4. Jain R.P., Modern Digital electronics, Tata McGraw Hill Edition, 6th Edition 2006.
5. Anand Kumar, Fundamentals of Digital Circuits Prentice-Hall India, 2003.
6. A. K. Sawhney, A Course in Electrical and Electronic Measurements and Instrumentation, Dhanpat Rai and Co. (P) Ltd. 1998.
7. Murthy, D.V.S., Transducers and Instrumentation, Prentice Hall of India Pvt. Ltd., New Delhi, 1995.
8. Process Measurement and Analysis- B. G. Liptak- Butterworth Heinemann- Third Edition.
9. Instrumentation Measurement and Analysis - B C Nakra & K K Chaudhary 2nd Edition Tata

McGraw Hill.

10. Principles of Process Control- by C.D. Jonshon.
11. Sizing Materials, Methods, Machines- Ajgaonkar, Talukdar and Wadekar.
12. R. S. Gaonkar “Microprocessor Architecture, Programming and application with 8085/8085A”, Fourth Edition, Willey Eastern Ltd.
13. B. Ram “Fundamentals of microprocessor and Microcomputer”, Dhanpat Rai and Sons, New Delhi.

**Term Work:**

Eight experiments related to above syllabus.

**Practical Examination:**

1. Practical examination shall consist of performance of the experiment carried out at the time of examination and viva- voce based on the term work submitted by the student for the subject.

**HMC278: Human Values and Professional Ethics**

**(L2-T0-P0): 2 Credit**

**Course Objectives:**

1. To create an awareness on Professional Ethics and Human Values.
2. To help students understand the Harmony for life.
3. To understand co-existence.
4. To study the moral issues and decisions confronting individuals and organizations In profession.

**Course Outcomes:**

After completion of the course the student is able to:

1. Understand the core human values that shape the ethical behavior of a person.
2. Understand how values act as an anchor of actions for life.
3. Learn the need of Human values and Professional ethics in life.
4. Understand Harmony at Four levels of life.
5. Learn the moral issues and problems in profession and find the solution to those problems.
6. Understand the core human values that shape the ethical behavior of a person.

**Course Articulation Matrix:**

Program Outcome (PO)→ Course Outcome (CO)↓	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1			1			2		3				
CO2								3				
CO3								3				3
CO4						2		3				
CO5			1			2		3	2			3
CO6												

**Course Content:****Unit 1: Course introduction**

Need, basic guidelines, content and process for value education, Moral values, Social, Environmental, Economic values, Purusharth, Duty, Justice, Equality.

A look at basic aspirations: self-exploration, happiness and prosperity, Fulfillment of human aspirations.

**Unit 2: Understanding the harmony**

Thoughtful human being harmony, sentient, attitude and its importance in relationship, significance of restraint and health (*Yama and Niyama*), Egoism, Altruism, Universalism (idea of Sarvodaya and Vasudevikutumbakam), The problem of hierarchy of values and their choice (View of Pt Madan Mohan Malviya and Mahatma Gandhi), human goal settings and life management techniques.

**Unit 3: Understanding professional ethics**

Harmony at various levels and understanding professional ethics, creating environmentally aware engineers, humanistic universal education, humanistic universal education, natural acceptance of human values, ethical human conduct.

**Unit 4: Competence of professional ethics**

Management models for present technologies, strategies for integrating humans in family and at all levels of existence, relevance of the above strategies in becoming responsible engineers, technologists and managers.

**Unit 5: Motivation**

Contribution of ancestors in science and technology development to raise self-esteem in Indian context.

**Text Books/ Reference Books:**

1. R. R. Gaur, R. Sangal, G. P. Bagaria, A Foundation Course in Value Education, 2009.
2. A. Nagraj, Jeevan Vidya ek Parichay, Divya Path Sansthan, Amarkantak, 1998.
3. Sussan George, How the Other Half Dies, Penguin Press. Reprinted 1986, 1991
4. P. L. Dhar, R. R. Gaur, Science and Humanism, Commonwealth Purblishers, 1990.
5. A. N. Tripathy, Human Values, New Age International Publishers, 2003.
6. Subhas Palekar, How to practice Natural Farming, Pracheen (Vaidik) Krishi Tantra Shodh, Amravati, 2000.
7. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, Limits to Growth – Club of Rome’s report, Universe Books, 1972.
8. E. G. Seebauer & Robert L. Berry, Fundamentals of Ethics for Scientists & Engineers, Oxford University Press, 2000.
9. M. Govindrajran, S. Natrajan & V. S. Senthil Kumar, Engineering Ethics (including Human Values), Eastern Economy Edition, Prentice Hall of India Ltd.
10. Subroto Bagchi, The Professional.
11. B. P. Banerjee, Foundations of Ethics and Management, Excel Books, 2005.
12. B L Bajpai, Indian Ethos and Modern Management, New Royal Book Co., Lucknow, 2004, Reprinted 2008.
13. Dr. Nityanand Mishra Niti Shastra, Motilal Banarasidas 2005
14. Dr. Avdesh Pradhan Mahatma ke Vichar , BHU Varanasi 2007

## BSC261: Mathematical Foundation for Engineering (L2-T0-P0): Audit

**Course Objective:**

1. To develop the sound conceptual understanding of Algebra, coordinate geometry, complex numbers, vectors, matrices, Calculus and Differential Equations.
2. To develop the foundation for engineering mathematics and other engineering courses.

**Course Outcomes:** At the end of the course student will be able to

1. Analyze the structure of complex numbers, quadratic equations, vectors and matrices and their uses.
2. Find the standard and general equations of lines, circles, conic sections, and their properties.
3. Sketch the graphs of functions and can evaluate limit, continuity, derivatives, integrations.
4. Formulate and solve first order differential equations.

**Course Articulation Matrix:**

Program Outcome (PO)→ Course Outcome (CO)↓	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	1	2								2
CO2	3	3	1	2								1
CO3	3	3										1
CO4	3	3	2									2

**Course Content:****Unit-1 Complex Numbers (05 hours)**

Complex numbers as ordered pairs. Argand's diagram. Triangle inequality. Powers and roots of complex numbers, De Moivre's Theorem.

**Unit-2 Algebra (05 hours)**

Quadratic equations and expressions. Permutations and Combinations. Binomial theorem for a positive integral index.

**Unit-3 Coordinate Geometry (07 hours)**

Coordinate Geometry: Locus. Straight lines. Equations of circle, parabola, ellipse and hyperbola in standard forms. Parametric representation.

**Unit-4 Vectors and Matrices (08 hours)**

Addition of vectors. Multiplication by a scalar. Scalar product, cross product and scalar triple product with geometrical applications. Matrices and Determinants: Algebra of matrices. Determinants and their properties. Inverse of a matrix. Cramer's rule.

**Unit-5 Differential Calculus (10 hours)**

Function. Inverse function. Elementary functions and their graphs. Limit. Continuity. Derivative and its geometrical significance. Differentiability. Rules of derivatives, Applications of Derivatives: Tangents and Normals, Increasing and decreasing functions. Maxima and Minima

**Unit-6 Integral calculus (10 hours)**

Integration as the inverse process of differentiation. Integration by parts and by substitution. Definite integral and its application to the determination of areas (simple cases). Solving first order differential equations: Exact differential equations and first order linear differential equations.



**References:**

1. Bernard and Child, Higher Algebra, Macmillan and Co. Pvt. Ltd, New York.
2. J.V. Uspensky, Theory of equations, macGraw Hill Publications.
3. S. L. Loney, The Elements of Coordinate Geometry, Macmillians and Co., New York
4. G.B.Thomas, M.D.Weir, J. Hass, Thomas' calculus, 12<sup>th</sup> edition, Pearson Publications
5. H.Anton, C. Rorrers, Elementary Linear Algebra Applications version, 9<sup>th</sup> edition, Wiley publications.

**Semester II****BSC271: Mathematics-III: Transform Calculus and Differential Equations****(L3-T0-P0): 3 Credit****Course Title:** Transform Calculus, Vector Calculus and Partial Differential Equations**Course Objectives:**

1. To understand the concepts of Laplace transforms, Fourier Series, Fourier transforms
2. To apply Laplace transforms for solving ordinary differential equations
3. Define and compute the line integral, surface integral, volume integral using Green's Theorem, Stokes's Theorem and the Divergence Theorem.
4. To understand the methods of solving partial differential equations such as wave equation, heat equation and Laplace equation.

**Course Outcomes:**

On successful completion of this course students will be able to

1. Develop the skills of Laplace Transforms, Fourier series and Fourier Transforms and their inverses.
2. Develop the skills of solving Partial differential equations
3. Solve ODE's and PDE's using the properties of Laplace transform, Fourier series and Fourier Transforms.
4. Determine solutions of PDE for vibrating string and heat conduction.
5. Evaluate line integrals, surface integrals, and volume integrals and convert line integrals into area integrals and surface integrals into volume integrals using integral theorems

**Course Articulation Matrix:**

Program Outcome (PO)→ Course Outcome (CO)↓	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3		1								2
CO2	3	3			2					1		2
CO3	3	3			1							2
CO4	3	3	2	1	2					1		2
CO5	3	3										2

**Course Content:****Unit 1: Laplace Transforms (10 hours)**

Laplace transforms, inverse Laplace transforms, Properties of Laplace transforms, Laplace transforms of unit step function, impulse function, Convolution theorem; Applications of Laplace transforms - solving certain initial value problems.

**Unit 2: Fourier Series (07 hours)**

Expansion of a function in Fourier series for a given range - Half range sine and cosine expansions.

**Unit 3: Fourier Transforms (10 hours)**

Fourier Integrals, Fourier transforms-sine, cosine transforms and inverse transforms - simple illustrations

**Unit 4: Vector Calculus (10 hours)**

Line integrals, surface integrals, Integral Theorems: Greens theorem, the divergence theorem of Gauss and Stokes theorem

**Unit 5: Partial Differential Equations (08 hours)**

Method of Separation of variables for solving partial differential equations, first and second order one dimensional wave equation, heat equation and two dimensional Laplace equation.

**References:**

1. Erwin Kreyszig, *Advanced Engineering Mathematics*, Eighth Edition, John Wiley and Sons, 2015.
2. R. K. Jain and S. R. K. Iyengar, *Advanced Engineering Mathematics*, Fifth Edition, Narosa Publishing House, 2016.
3. I. N. Sneddon, *Elements of Partial Differential Equations*, Dover Publications, Inc. Mineola New York.

**PCC-TT205: Spun Yarn Technology-I****(L3-T0-P2): 4 Credit****Course Objectives:**

1. To impart basic knowledge of cotton fibres, yarns, fibre mixing and blending
2. To provide the knowledge about the working mechanism and operation of various blow room machines and carding process
3. This course will enable the students to understand the effect of different process and machine parameters on intermediate product quality
4. Students will understand and experiment on various aspects of processes and their performances
5. Students will know about various technology and manufacturing of blow room laps/ fibrous sheets and carded slivers

**Course Outcomes:**

- CO1/ CO2 Students will learn and understand fibre mixing and blending and basics about cotton/ man-made fibre processing and working mechanism as well as operations of blow room machines and carding machine.
- CO3 Students will also learn about various process and machine parameters and their influence on output materials.

- CO4 This course will make the students competent to analyze the process and conduct experiment related to the process and its performances.
- CO5 This course will enable students to design and manufacture intermediate products required for yarn production.

**Course Articulation Matrix:**

Program Outcome (PO)→ Course Outcome (CO)↓	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1			1							1
CO2	3	1			1							1
CO3	2	3	3	2					1			
CO4	2	2	3	1					1			
CO5	2	2	3	1	1				1			1

**Course Content:**

**Ginning of Cotton:** Ginning of cotton, Mechanism and working of different types of gins and their limitations, Ginning performance.

**Mixing & Blending:** Objects and importance, Fundamentals of mixing and blending. Methods and techniques of blending, Measures of blending

**Opening and Cleaning:** Principle of opening and cleaning, modern concepts, Components of blow room machines- feeding and opening devices, grids and others, Construction and working of blow room machinery. Conventional and Automatic bale openers. Step cleaner, Airflow cleaner, Monocylinder, Multimixers and Auto mixers, RN cleaner, ERM cleaner etc.

**Blow room sequence and Auxiliary Devices and Performance:** Blow room lines for various types of cotton, Transportation of material, Dust removal, Metal extractors and waste disposal in blow room, Cleaning efficiency, Nep generation, Assessment of neps in carding.

**Advances in Blowroom:** Cleanomat and Tuftomat openers & cleaners. Modern blow room lines, Concept of cleanability of cotton, C-factor and T/C2, Modern developments.

**Carding:** Design and working of carding machine, Drive of carding machine- speeds, drafts and production calculations, Principle of carding- stripping and carding action, Design of feed plate, Carding segments and its importance, Flat movements, Flat strip and its control, Types of coiling, Mechanism of coiling and related calculations.

**Card clothing:** Geometry and specification of licker-in, cylinder, doffer and flat wires, Close and open loop auto levelers in cards.

**Practical Work:**

1. Determine the cleaning efficiency of any opener/ cleaner by Shirley analyzer. Also indicate the influence of trash composition on cleaning efficiency of the same opener.
2. Determine the degree of opening of fiber tufts. Compare opening of fibre tufts before and after processing through an opener.
3. Determine nep count/ number of neps per 5 grams from a given fibre from lap/sheet of fibres/ carded sliver.
4. Study of the general features of the carding machine. Draw a diagram of the carding machine showing all parts and components with their dimensions.
5. Determine the licker-in, cylinder and doffer speed and their surface speeds. Calculate the drafts between two successive rollers. Also calculate the production and production constant of the machine.

6. Determine the feed roller rpm and surface speed. Also calculate the overall draft and draft constant of the machine.
7. Study of web doffing device. Calculate the speeds and surface speeds of transfer roller, groove roller, crush roller, apron driving roller and table calendar roller. Also calculate the production of the card.
8. Study of the coiling mechanism. Calculate the speed of vertical shaft, coiling wheel, coiler calendar roller and base plate. Also calculate the (i) time to produce one coil (ii) length of a single coil (iii) circumferential shifts of coils along the periphery of the can.
9. Study of the flat driving mechanism in the card. Calculate the flat speed.

**Reference Books:**

1. The Technology of Short Staple Spinning, Short Staple Spinning Series, Vol.-I, W. Klein.
2. A Practical Guide to Opening and Carding, Short Staple Spinning Series, Vol.-II, W. Klein.
3. Textile Progress, Vol. 24, No-2, The Textile Institute, Manchester.
4. Spinning of Manmades and Blends on Cotton System, K. R. Salhotra.
5. Textile Mathematics, Vol. II, J. E. Booth.
6. Fundamentals of Spun Yarn Technology by Carl A. Lawrence, CRC Press

**PCC-TT206: Fabric Forming Technology-II**  
**(L3-T0-P2): 4 Credit**
**Course Objectives:**

1. Learning a technology of winding
2. To learn parameters of quality and production of warp winding
3. Learning a technology of warping and sizing
4. To learn parameters of quality and production of warping & sizing
5. To learn high speed shedding mechanisms.
6. To understand the fabric designs and weave structures

**Course Outcomes:**

- CO1 Understanding of theoretical and practical aspects of yarn winding.
- CO2 Apply knowledge of winding machine in quality and production of products of these machines
- CO3 To familiar with technology of warping & sizing process
- CO4 Apply knowledge of warping and sizing machine in quality and production of products of these machines
- CO5 To work practically with high speed shedding mechanisms.
- CO6 Analyze and create the fabric designs and weave structures

**Course Articulation Matrix:**

Program Outcome (PO)→ Course Outcome (CO)↓	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3				1							
CO2	2	1	2	1								

CO3	3				1					2		
CO4	2	1	1	1	1	1				2		
CO5	3				3					1		
CO6	3	3	2									

**Course Content:**

**Winding:** Objectives, types & uses of winding, package requirements for warping, knitting & dyeing, yarn path of conventional & modern winding, principles & calculations related to surface driven & spindle driven winding, ribboning & its effects, anti patterning methods, types of yarn clearer & tensioners & their importance & settings, factors related to yarn tensioning, different types of knots, Yarn ballooning & their control. Different types of splicers, structure, advantages of splicing, Assessment of splice quality, tension manager, waxing device, Causes and remedies for different package faults, Uniform build of yarn package, theory and practices, Brief introduction of weft winding and its requirements.

**Warping:** Objectives of warping, classification, types of creel, head stock, modern direct warping; passage, drive & production calculations, Sectional warping; use, yarn path, drive, types of drum, taper angle, calculations related to production, Ball warping: yarn path & its use.

**Sizing:** Objectives & types of sizing, sizing ingredients and their functions, size paste preparation methods & equipment's, different size recipes for different sorts, yarn path of modern sizing machines, creel, different size boxes, different drying methods, mechanics of drying, leasing & winding, controller used in sizing: temperature, stretch, size level, moisture, Calculations regarding add on %, pick up %, steam requirement, production and sizing cost calculation.

**High Speed Shedding:** Modern dobbies such as mechanical & electronic Rotary doobby, construction and working of Staubli electronic rotary doobby. Modern mechanical & electronically controlled jacquard, working principle of Staubli, Gross and Bonas Jacquard, calculations related to warp & weft requirement of a fabrics, GSM.

**Designing:** Dobby design preparation, Jacquard design preparation, weft patterning, Fabric designs like Diamond, honeycomb.

**Practical Work:**

1. Study of yarn passage, drive, anti-patterning & calculations of conventional winding machine
2. Settings of yarn clearer, tensioner & cone holder of RJK winding machine.
3. Study of yarn path, drive & working of pirn winding.
4. Settings of pirn diameter, bunch length, tension, traverse, total winding length of pirn winding.
5. Study of warp passage, drive & calculations of sectional warping machine
6. Different settings such as vertical shaft, knife & hooks, pattern cylinder on Dobby loom.
7. Different settings of Jacquard loom.
8. Select a weave and prepare a design lattice for Dobby loom.
9. Development of a design of jacquard.
10. Study of sizing machine: size paste preparation, passage, creel, sow box, drying & different controllers in the industry
11. Study of modern direct & sectional warping: passage, creel, drive & calculations in the industry
12. Study of a modern winding machine for yarn passage, tensioner, balloon controller, splicer,

material flow, package faults, production records, shift incharge duties & responsibilities in the industry.

13. Collect at least 10 samples from daily use which can be produced on Dobby, Jacquard & Drop box and analyze it.

### Reference Books:

1. Fundamentals of yarn Winding, M. V. Koranne.
2. Winding, M. K. Talukdar.
3. Winding, Silver jubilee monograph series, BTRA.
4. Yarn Winding NCUTE Programme at IIT Delhi, March, 1999, Edited, P. K. Banerjee.
5. Textile Math. (Vol. I to III) - J. E. Booth.
6. Sizing Materials, Methods, Machines, D. B. Ajgaonkar, M. K. Talukdar and Wadekar.
7. Grammar of Textile Designing, H. Nisbeth.
8. Elementry Textile Designing, William Watson.
9. Weaving machines, mechanisms management, M. K. Talukdar, P. K. Sriramulu, D.B. Ajgaonkar, Mahajan publishers
10. Woven fabric production-II, NCUTE
11. Handbook on Fabric Manufacturing, B. Purushotama, WPI India Pvt Ltd.

## PCC-TT207: Textile Testing-II (L3-T0-P2): 4 Credit

### Course Objectives:

1. Students will learn the methods and principles of testing of various parameters of fibres, yarns and fabrics.
2. Students will understand and experiment on various parameters of fibres, yarns and fabrics and their performances
3. This course will enable the students to analyze and evaluate different quality parameters of textiles.
4. The knowledge of the course may be used in process and quality control in yarn and fabric manufacture

### Course Outcomes:

- CO1/CO2- Students will learn and understand the principle and method of measurement of various physical and mechanical properties of fibres, yarns and fabrics in the field
- CO3- They will be able to apply the knowledge of these measurement techniques for future applications.
- CO4- This course will make the students competent to analyze physical and mechanical properties of fibres, yarns and fabrics in the field of textiles.
- CO5- This course will enable students to conduct experiment related to various measurements and performance evaluation of textile materials.
- CO6- This course at the highest level may lead to design of new evaluation methods and techniques for evaluation of textile materials.

### Course Articulation Matrix:

Program Outcome (PO)→	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12

Course Outcome (CO)↓												
CO1	3	3	2		2							1
CO2	3	3	2		2							1
CO3	3	3	2	1	1							1
CO4	3	3	1	1	1							1
CO5	2	2	1		1							1
CO6	1	1	2	2	1							1

**Course Content:**

**Fabric Testing:** Tearing strength and its measurement, Bursting strength measurement, Pilling and Abrasion testing of fabrics, Measurement of bending and stiffness characteristics of fabrics, Fabric handle -drape, compression and thickness measurement, Crease recovery and its measurement, Air and water permeability, water repellency of fabrics, Flammability.

**High Volume Instruments (HVI):** Cotton fibre length, length uniformity, strength, micronaire and colour grade measurement by HVI

**Advanced Fibre Information System (AFIS):** Introduction, Working of the machine, Analysis of data and application.

**Kawabata Evaluation System (KES):** KES-BF1-Tensile and Shear, KES-BF2-Bending, KES-BF3-Compression, KES-BF4-Surface friction and variations units -workings and methods of various parameters measurement.

**Fabric Assurance by Simple Testing (FAST):** FAST 1 – Compression meter, FAST 2 – Bending meter, FAST 3 – Extension meter, FAST 4 - Dimension stability test -workings and methods of various parameters measurement.

**Practical Work:**

1. Determine the ends/inch, picks/inch, gm/sq. metre (gsm) and cloth cover of a given fabric sample.
2. Determine the warp-way and weft-way bending length and flexural rigidity of a given fabric sample.
3. Determine the warp-way and weft-way crease recovery of a given fabric sample.
4. Determine the tear strength of a given fabric sample.
5. Determine the bursting strength of a given fabric sample.
6. Determine the abrasion resistance of a given fabric sample.
7. Determine the air permeability of a given fabric sample.
8. Determine the water permeability/ water repellency of a given fabric sample.
9. Determine the flammability of a given fabric sample.
10. Determine the ballistic/ impact strength of a given fabric sample.

**Reference Books:**

1. Principles of Textile Testing, J. E. Booth, Newnes-Butterworths, London
2. Physical Properties of Textile Fibres (4th Edition), J. W. S. Hearle W E Morton, Woodhead Publishing
3. Progress in Textiles: Science & Technology, Vol-I, Testing and Quality Management, Dr. V. K. Kothari, IAFL Publications, New Delhi
4. Textile Testing Fiber, Yarn & Fabric, Arindam Basu, SITRA, Coimbtore

5. ASTM Handbook Vol-07.01
6. ASTM Handbook Vol-07.02
7. Science in Clothing Comfort, Apurba Das & R. Alagirusamy, Woodhead Publishing India Pvt Ltd., New Delhi
8. [www.nptel.ac.in/courses/116102029](http://www.nptel.ac.in/courses/116102029).

## PCC-TT208: Textile Wet Processing-II

(L3-T0-P2): 4 Credit

### Course Objectives:

On successful completion of the course, student will understand the concept of:

1. To explain principles of dyeing machines for synthetics.
2. To explain different dyeing methods for polyester.
3. To clarify methods & precautions for blended fabric & other synthetic fabric dyeing.
4. To introduce problems, features & methods of dyeing with natural dyes.
5. To introduce basics of printing fabrics.
6. To introduce different printing machines.
7. To introduce different printing methods.
8. To introduce simple finishes to fabrics.

### Course Outcomes:

- CO1 Students developed understanding in engineering knowledge of different synthetic fibres dyeing, machines involved, printing technology as well as basics of natural dyes, finishing & coating of textiles.
- CO2 Students developed understanding of problem analysis skills in identifying different defects during synthetic fabric dyeing & their quality evaluation.
- CO3 Students developed to conduct investigations of complex problems like measuring of blends of different fibres mix, identify different fibres & recipe preparation.
- CO4 Students developed understanding of Modern Tools required for processing & measurements of different parameters in chemical wet processing of synthetic textiles & printing process
- CO5 Students developed understanding to work as Individual & team work through conducting different individual & group assignments & practical job work.
- CO6 Students developed understanding in Effective communication through repeated written & oral test & assignments of the subject.

### Course Articulation Matrix:

Program Outcome (PO)→ Course Outcome (CO)↓	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	1	1	2	1	1		2	1		1
CO2	2	1	1	2	1	1			2	1		1
CO3	1	1	1	1	1				1	1	1	1
CO4	2	2	1	2	1				2	1	1	1

### Course Content:



**Dyeing Machines:** Principle and technology of different batch dyeing machines like – HTHP Beam dyeing machine, Jet dyeing machine, continuous dyeing line and their latest developments.

**Dyeing of Man-made Fabrics/Fibres:** Different Mass Coloration/Dope dyeing techniques; Preparations for polyester & its blend dyeing; Dyeing of synthetics like viscose rayon, polyester, polyamide, poly acrylic fabrics with suitable dyes.

**Dyeing of Blends:** Dyeing of polyester/viscose, polyester /cotton blended fabric with disperse reactive and disperse vat dyes. Dyeing of polyester/wool blends. Dyeing textured polyester & micro denier filament fabric.

**Natural dyes:** Introduction to Natural dyes; Its sources and classifications; Problems and prospects of natural dyes.

**Printing Basics:** Introduction to printing; Different methods & styles of Printing; Printing paste ingredients & types of thickeners; Concepts of Ageing, Steaming & Curing and related machines.

**Printing Machines:** Working of flat bed and rotary screen printing; Printing screen preparation; Transfer printing & Digital printing; Features of different latest printing machinery.

**Printing Process:** Printing of cellulosic fabrics with reactive, vat dyes & pigments; Printing of polyester with disperse, Silk/Wool with acid dyes; Printing of P/C blended fabrics with disperse/reactive & disperse /vat dyes; Problems in printing.

#### **Practical Work:**

1. Determination of P/C & Poly/Wool blends by chemical methods
2. Dyeing of Rayon with Reactive dyes.
3. Dyeing of nylon with acid dyes.
4. Dyeing of Nylon with Disperse dyes.
5. Dyeing polyester with Disperse dyes & Carriers.
6. Dyeing of polyester in HTHP machine.
7. Dyeing of P/C blends with Disperse/ reactive dyes.
8. Dyeing of P/C blends with Disperse/Vat dyes.
9. Printing Cotton fabrics with Direct dyes.
10. Printing cotton fabric reactive dyes.
11. Printing Polyester with Disperse dyes.
12. Tie Dyeing of Cotton fabric.
13. Batic Printing of cotton fabric.

#### **References Books:**

1. Dyeing & Chemical Technology of Textile Fibres, E. R. Trotman, Charles Griffin & Company Ltd.
2. Fundamentals & Practices in Colouration of Textiles, Chakraborty J. N., Woodhead Publishing India in Textiles.
3. Technology of Textile Printing; R. S. Prayag, Mrs. L.R.Prayag, Dharwad, Karnataka State.
4. Technology of Textile Processing – Vol-IV, Technology of Printing, Dr. V. A. Shenai, Sevak Publications, Mumbai
5. Textile Preparation & Dyeing, Roy, Choudhury A. K., Oxford & IBH Publishing Co. Pvt. Ltd.
6. Technology of Textile Processing - Vol.6, Technology of Dyeing, Dr. V. A. Shenai Sevak

Publications, Mumbai.

7. Technology of Textile Processing - Vol.2, Chemistry of dyes & Principle of dyeing, Dr. V. A. Shenai., Sevak Publications, Mumbai.
8. Book of Papers: Convention on Natural Dyes-Dec-1999, IITD.

### SII-TT209: Winter/Summer Internship

(L0-T0-P2): 1 Credit

(2 weeks duration)

#### Course Objectives:

1. Students will understand the working and mechanism of different machines and processes
2. Students will learn about latest industrial practices in the field of textiles
3. They will the theories already learnt with the practical works
4. They will learn the management and financial aspects of a factory.

#### Course Outcomes:

- CO1/CO2- The practical knowledge acquired in the internship program is vast and crucial for understanding and validating the theoretical knowledge.
- CO3- The knowledge and understanding of the industrial practices may be applied subsequently to improve and modify processes and working.
- CO4- This will enable the students to conduct experiments on processes and machines.
- CO5- This will help to design, evaluate and manufacture various textile products in the long run.

#### Course Articulation Matrix:

Program Outcome (PO)→ Course Outcome (CO)↓	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	1	1	1	2	2	1	2	1	1	1
CO2	2	2	1	1	1	2	2	1	2	1	1	1
CO3	2	2	3	3	1	2	1		2	1	1	1
CO4	2	2	3	3	1				1			
CO5	2	2	3	3	1				1			

#### Course Content:

The students will undergo internship program/training in spinning/ weaving/ manmade fibre spinning/ dyeing, printing, finishing/ technical textiles depending upon the industry in one or more than one areas.

Every students need to undergo minimum two weeks of industrial training in the second year in summer/ winter vacation. Everybody needs to present the work done during the internship program in front of departmental examiners. A bound volume of the report (containing the work done in internship) is to be submitted in the department.

**Course Objectives:**

1. To understand the basic foundation and the basic law for the governance of our nation, the history and the different types of Constitutions.
2. To understanding the importance and the different aspects of the Constitution. To know and understand the different rights enshrined in the Constitution and understand the rights and duties of the government.
3. To understand the basis and procedure of amendments.
4. To know the different aspects of the Union and the State Executive.
5. To know how our country was founded, who founded it, what are our rights are, what life was like, how life has changed, how the rights still apply today.

**Course Outcomes:**

1. Student will be able to understand how India has come up with a Constitution which is the combination of the positive aspects of other Constitutions.
2. Student will be able to understand the interpretation of the Preamble.
3. Student will be able to understand the basics of governance of our nation.
4. It helps in understanding the different aspects covered under the different important Articles.
5. Student will be able to understand the basic law and its interpretation. Understand the important amendments which took place and their effects.
6. Student will be able to understand our Union and State Executive better.
7. Student will be able to that along with enjoying the rights one needs to fulfill one's duties.

**Course Content:**

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

**Text Books:**

1. Introduction to the Constitution of India by Durga Das Basu (Students Edn.) Prentice-Hall EEE, 19th /20th Edition, 2001.
2. An Introduction to Constitution of India by M. V. Pylee, Vikas Publishing, 2002.