VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI

Scheme of Teaching and Examinations and Syllabus

M.Tech. Textile Technology (JTT)

(Effective from Academic year 2020 - 21)

VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI
Scheme of Teaching and Examinations – 2020 - 21
M.Tech. Textile Technology (JTT)
Choice Based Credit System (CBCS) and Outcome Based Education(OBE)

I SEMESTER

Sl. No.	Course	Course Code	Course Title	Teaching Hours / Week			Examination				Credits
				Theory	Practical / Field Work	Skill Development Activities	Duration in hours	CIE Marks	SEE Marks	Total Marks	
				L	P	SDA					
1	PCC	**20JTT11**	**Advanced Textile Mathematics**	03	--	02	03	40	60	100	4
2	PCC	**20JTT12**	**Advanced Fiber Physics**	03	--	02	03	40	60	100	4
3	PCC	**20JTT13**	**Advanced Wet Processing**	03	--	02	03	40	60	100	4
4	PCC	**20JTT14**	**Yarn Engineering**	03	--	02	03	40	60	100	4
5	PCC	**20JTT15**	**Advanced Knitting and Non-wovens**	03	--	02	03	40	60	100	4
6	PCC	**20JTTL16**	**Textile Laboratory - I**	--	04	--	03	40	60	100	2
7	PCC	**20RMI17**	**Research Methodology and IPR**	02	--	02	03	40	60	100	2
			TOTAL	**17**	**04**	**12**	**21**	**280**	**420**	**700**	**24**

Note: PCC: Professional Core.

Skill development activities:
Students and course instructor/s to involve either individually or in groups to interact together to enhance the learning and application skills.
The students should interact with industry (small, medium and large), understand their problems or foresee what can be undertaken for study in the form of research/ testing / projects, and for creative and innovative methods to solve the identified problem.
The students shall
(1) Gain confidence in modelling of systems and algorithms.
(2) Work on different software/s (tools) to Simulate, analyse and authenticate the output to interpret and conclude. Operate the simulated system under changed parameter conditions to study the system with respect to thermal study, transient and steady state operations, etc.
(3) Handle advanced instruments to enhance technical talent.
(4) Involve in case studies and field visits/ field work.
(5) Accustom with the use of standards/codes etc., to narrow the gap between academia and industry.
All activities should enhance student's abilities to employment and/or self-employment opportunities, management skills, Statistical analysis, fiscal expertise, etc. ■

Internship: All the students have to undergo mandatory internship of 6 weeks during the vacation of I and II semesters and /or II and III semesters. A University examination shall be conducted during III semester and the prescribed internship credit shall be counted for the same semester. Internship shall be considered as a head of passing and shall be considered for the award of degree. Those, who do not take-up/complete the internship shall be declared as fail in internship course and have to complete the same during the subsequent University examination after satisfying the internship requirements. ■

Note: (i) Four credit courses are designed for 50 hours Teaching – Learning process.
(ii) Three credit courses are designed for 40 hours Teaching – Learning process.
(iii) Two credit courses are designed for 25 hours Teaching – Learning process. ■

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II SEMESTER

Sl. No.	Course	Course Code	Course Title	Teaching Hours / Week			Examination				Credits
				Theory	Practical / Field Work / Seminar	Skill Development Activities	Duration in hours	CIE Marks	SEE Marks	Total Marks	
				L	P	SDA					
1	PCC	**20JTT21**	**Advanced Textile & Apparel Testing**	03	--	02	03	40	60	100	4
2	PCC	**20JTT22**	**Advanced Silk Technology**	03	--	02	03	40	60	100	4
3	PCC	**20JTT23**	**Advanced Manufactured Fiber Technology**	03	--	02	03	40	60	100	4
4	PEC	**20JTT24X**	**Professional Elective 1**	04	--	--	03	40	60	100	4
5	PEC	**20JTT25X**	**Professional Elective 2**	04	--	--	03	40	60	100	4
6	PCC	**20JTTL26**	**Textile Laboratory - II**	--	04	--	03	40	60	100	2
7	PCC	**20JTT27**	**Technical Seminar**	--	02	--	--	100	--	100	2
			TOTAL	**17**	**06**	**06**	**18**	**340**	**360**	**700**	**24**

Note: PCC: Professional Core, PEC: Professional Elective.

Professional Elective 1		**Professional Elective 2**	
Course Code under 20JTT24X	**Course Title**	**Course Code under 20JTT25X**	**Course Title**
20JTT241	**Environmental Management for Textile Industry**	**20JTT251**	**Developments in Fabric Formation**
20JTT242	**Fabric Engineering**	**20JTT252**	**Variability and its Control**
20JTT243	**Friction in Textiles**	**20JTT253**	**Marketing Management**
20JTT244	**Nano Fibre Technology**	**20JTT254**	**Biotechnology Applications in Textile Industry**

Note:

1. Technical Seminar: CIE marks shall be awarded by a committee comprising of HoD as Chairman, Guide/co-guide, if any, and a senior faculty of the department. Participation in the seminar by all postgraduate students of the programme shall be mandatory.

The CIE marks awarded for Technical Seminar, shall be based on the evaluation of Seminar Report, Presentation skill and performance in Question and Answer session in the ratio 50:25:25. ■

2. Internship: All the students shall have to undergo mandatory internship of 6 weeks during the vacation of I and II semesters and /or II and III semesters. A University examination shall be conducted during III semester and the prescribed internship credit shall be counted in the same semester. Internship shall be considered as a head of passing and shall be considered for the award of degree. Those, who do not take-up/complete the internship shall be declared as fail in internship course and have to complete the same during the subsequent University examination after satisfying the internship requirements. ■

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III SEMESTER

Sl. No.	Course	Course Code	Course Title	Teaching Hours / Week			Examination				Credits
				Theory	Practical/ Mini–Project/ Internship	Skill Development Activities	Duration in hours	CIE Marks	SEE Marks	Total Marks	
				L	P	SDA					
1	PCC	**20JTT31**	**Advanced Apparel Production Technology**	03	--	02	03	40	60	100	4
2	PEC	**20JTT32X**	**Professional Elective 3**	03	--	--	03	40	60	100	3
3	PEC	**20JTT33X**	**Professional Elective 4**	03	--	--	03	40	60	100	3
4	Project	**20JTT34**	**Project Work Phase -1**	--	02	--	--	100	--	100	2
5	PCC	**20JTT35**	**Mini-Project**	--	02	--	--	100	--	100	2
6	Internship	**20JTTI36**	**Internship**	(Completed during the intervening vacation of I and II semesters and /or II and III semesters.)			03	40	60	100	6
			TOTAL	**09**	**04**	**02**	**12**	**360**	**240**	**600**	**20**

Note: PCC: Professional Core, PEC: Professional Elective.

Professional Elective 3		**Professional Elective 4**	
Course Code under 20JTT32X	**Course Title**	**Course Code under 20JTT33X**	**Course Title**
20JTT321	**Industrial Engineering**	**20JTT331**	**Strategic and Technology Management**
20JTT322	**Financial Management**	**20JTT332**	**Theory of Yarn Spinning**
20JTT323	**Human Resource Management**	**20JTT333**	**Medical Textiles**
20JTT324	**Geo-Textiles in Geo-Technical Engineering**	**20JTT334**	**Product Development**

Note:

1. Project Work Phase-1: Students in consultation with the guide/co-guide if any, shall pursue literature survey and complete the preliminary requirements of selected Project work. Each student shall prepare relevant introductory project document, and present a seminar.

CIE marks shall be awarded by a committee comprising of HOD as Chairman, Guide/co-guide if any, and a senior faculty of the department. The CIE marks awarded for project work phase -1, shall be based on the evaluation of Project Report, Project Presentation skill and performance in Question and Answer session in the ratio 50:25:25.

SEE (University examination) shall be as per the University norms. ■

2. Internship: Those, who have not pursued /completed the internship, shall be declared as fail in internship course and have to complete the same during subsequent University examinations after satisfying the internship requirements. Internship SEE (University examination) shall be as per the University norms. ■

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IV SEMESTER

Sl. No.	Course	Course Code	Course Title	Teaching Hours / Week		Examination				Credits
				Theory	Practical / Field Work	Duration in hours	CIE Marks	SEE Marks Viva voce	Total Marks	
				L	P					
1	**Project**	**20JTT41**	**Project Work Phase - 2**	--	04	03	40	60	100	20
			TOTAL	--	**04**	**03**	**40**	**60**	**100**	**20**

Note:

1. Project Work Phase-2:

CIE marks shall be awarded by a committee comprising of HOD as Chairman, Guide/co-guide, if any, and a Senior faculty of the department. The CIE marks awarded for project work phase -2, shall be based on the evaluation of Project Report subjected to plagiarism check, Project Presentation skill and performance in Question and Answer session in the ratio 50:25:25.

SEE shall be at the end of IV semester. Project work evaluation and Viva-Voce examination (SEE), after satisfying the plagiarism check, shall be as per the University norms. ■

M.TECH. TEXTILE TECHNOLOGY (JTT)

SEMESTER – I

ADVANCED TEXTILE MATHEMATICS			
Course Code	20JTT11	CIE Marks	40
Teaching Hours / Week (L:P:SDA)	3:0:2	SEE Marks	60
Credits	04	Exam Hours	03

Module-1

Confidence limits- Estimation of confidence intervals, confidence limits for large and small samples, confidence limits for standard deviation and difference in mean and SD. Significance tests-interpretation of significance tests, single tail and double tail tests, chi-square distributions Analysis of variance- the design of experiments, randomised variation in experiments, randomisation, completely randomised design (CRD) and randomised block design (one way & two-way ANOVA). ■

Module-2

Linear regression and time series-relation between variables, variation about regression line, regression equation, correlation coefficient, interpretation of "R", equation for regression partial and multiple correlation. Components of time series, measurement of trend using method of least squares. ■

Module-3

Spinning calculations- forces acting on ring and traveller, calculations related to various drives viz, belt, rope, chain, gear etc. Details of average count and resultant count of yarn. Calculation related spin plan-preparation of spin plan for known count and known quantity of yarn produced with given spinning machinery details. ■

Module-4

Calculation s related OE spinning, Air jet spinning, and friction spinning. Calculation of no. of fibres in the yarn, calculation related to evenness of sliver, riving, single & double yarns. Weaving and knitting calculation - estimation of production of different types of preparatory machines, sizing machines and looms. Calculation of fabric weight, cloth cover, stitch density of knitted fabric, air porosity, fabric thickness. Preparation of plan for weaving industry from known machine and material parameters. ■

Module-5

Calculations in garment manufacturing - standard time, importance of GSD & its benefits in garment industry. SAM calculations using synthetic data and time study techniques. Garments CM cost estimation using SAM. Calculation of product capacity of a factory, seam efficiency, seam strength, thread consumption factor etc. ■

Course outcomes:

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

Students can analyze the fibres, yarns, fabrics and garments with the knowledge of Advanced Mathematics. ■

Question paper pattern:

The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.

- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.■

Textbooks

(1) Textile Testing – J E Booth., CBS Publishers, New Delhi, 1996.

(2) Handbook of textile testing and quality control - Hamby and Grover, Wiley Eastern Pvt. Ltd., Delhi 1969

(3) Practical statistics for textile Industry – Part-1 & 2, Gave Leaf, Textile Institute 1984.

(4) Textile Mathematics-Vol. 1, 2, 3, J E Booth. Butterworth's Pub London,198

(5) Textile Mechanics-Vol. 1&2, K Slater, Textile Institute Pub ,1979

Reference Books

(1) Weaving calculation- Sen Gupta, D. B Tarpurwala & sons., 1956

(2) Mechanics of Textile Machinery-W A Hanton, Langmans, Green and Co., London 1950

(3) An introduction to quality control for the apparel industry, Pradeep V. Mehta

(4) Progress in textile science and technology Vol-1 Ed., V K Kothari, AIFI., India 2000

ADVANCED FIBER PHYSICS			
Course Code	20JTT12	CIE Marks	40
Teaching Hours/Week (L:P:SDA)	3:0:2	SEE Marks	60
Credits	04	Exam Hours	03

Module-1

Introduction to macromolecular physics: Modern concepts of fiber structure. Physical methods of structural characterization of fibers, viz., DGC, TEM, SEM, WAXS, SAXS, IRS, NMR, DSC and DTA. ■

Module-2

Deformation of elastic solid: Generalized Hook's Law, Component of Stress and strain. Linear visco-elastic behavior of fibers. ■

Module-3

Models: Boltzmann superposition principle. Study of dynamic mechanical properties and their investigation in study of fibers. Introduction to mechanical properties of fiber composites. Temperature dependence of visco-elastic behavior. Time-Temperature Equivalence and Superposition. WLF equation. Study of fiber stiffness and torsion. ■

Module-4

Moisture in textiles- Effect of moisture o mechanical, electrical and other properties of fibres. Studies on heats of sorption, theories of moisture sorption, molecular theory of moisture Hysteresis and rate of absorption of moisture in textiles ■

Module-5

Fibre Properties: Study of optical properties, thermal, frictional, electrical, Di-electric and static properties of fibers. ■

Course outcomes:

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

- This course work prepares the students to face real problems related to fiber behavior in various fields of textiles viz-spinning, weaving chemical processing and garmenting.
- As this subject deals with the most fundamental aspects of textiles (fibers), in-depth knowledge in this subject helps in carrying out any kind of research in textiles and allied fields. ■

Question paper pattern:

The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.

- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module. ■

Textbooks

(1) Polymer characterization" - Hunt and James - Chapman and Hall, London, 1993

(2) Mechanical properties of polymers - I M Ward

(3) Mechanical properties of polymers - Nielson - Vol I, II, III.

(4) Physical properties of fibers - W.R. Morton and J.W.S Hearle

Reference Books

(1) Characterization of polymers - Campbell and White

(2) Introduction to polymer visco-elasticity - Aklonis

ADVANCED WET PROCESSING			
Course Code	20JTT13	CIE Marks	40
Teaching Hours/Week (L:P:SDA)	3:0:2	SEE Marks	60
Credits	04	Exam Hours	03

Module-1

Dye-Fiber Interaction: Kinetics of Dyeing. The diffusion of dye inside the fiber. Fick's laws of diffusion. Theoretical basis for dye absorption. Theories of dyeing of protein and other fibers using suitable dyes. ■

Module-2

Regulations: Red listed textile chemicals, their sources and remedies. Pollution aspects of textile dyeing. Modern approaches to Eco-friendly wet processing of woven and knitted textiles. Ecofriendly dyes and their method of dyeing. Methods of analysis of formaldehyde, Pentachloro Phenol (PCP), chlorine compounds and heavy metals in processed and finished fabrics. Eco-labeling and various Eco-standards. ■

Module-3

Garment Dyeing: Modern developments in garment dyeing. Methods and machines. Low temperature dyeing of garments. Finishing of garments using different chemicals and auxiliaries. ■

Module-4

Finishing: Modern developments in finishing of natural and synthetic textiles. Finishing of textiles with various specialty chemicals. ■

Module-5

Developments: Modern developments in textile and garment printing, color measurement and computer colour matching concepts. Latest developments in natural dyes and their application on various fibers. ■

Course outcomes:

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

This Course prepares the students thoroughly with respect to advances in wet processing aspects in industry. Students can make their careers in garment and textile wet processing industries by following various principles studied in the course. ■

Question paper pattern:

The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.

- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module. ■

Textbooks

(1) Textile Colouration - C.L. BIRD.

(2) Textile Printing – LWC Miles.

(3) Chemical Technology of Textile fibers – ER Troatman.

(4) Dyeing and printing with natural dyes - M.L.Gulrajani.

(5) Eco-friendly Textile wet processing-coordinator,N CUTE Publication - Dr.R.Ashokan

Reference Books

(1) Environment Problems in chemical processing of Tex tiles, NCUTE Publication – Dr.A.Asokan, Ms.Yogita

(2) Finishing of Khadi Garments - Dr.R.B.Chavan, R.Chattopadhyay, R.P.Tewari, IIT Delhi

(3) Instrumental Colour measurement and computer aided colour matching for textiles, H.S. Shah & Gandhi.

YARN ENGINEERING			
Course Code	20JTT14	CIE Marks	40
Teaching Hours/Week (L:P:SDA)	3:0:2	SEE Marks	60
Credits	04	Exam Hours	03

Module-1

Importance of Yarns: Designing yarns for specific end-uses. Selection of fiber /filament, structure of fiber/filament, spun yarns, multifilament yarns, textured yarns and micro denier multifilament. Yarn diameter derivation of Pierce, Grosberg and Dickson formulae. Functional properties of end products. ■

Module-2

Yarn Structure and yarn Regularity: Geometrical properties of single and folded yarns. Derivations of related equations. Open & hexagonal packing and their merits and demerits. Twist contraction and retraction - practical applications. Twist migration and segment length in spun and filament yarns -Theoretical analysis of yarn irregularity - blend irregularity. ■

Module-3

Transfer of Force: Transmission of force from fiber to fiber in spun yarns - mechanism of yarn breakage. ■

Module-4

Relationship: Effect of fiber properties and their geometrical configuration on tensile properties of yarns. Concept of elongation. ■

Module-5

Blends: Effect of properties of constituent fibers and their composition on the behavior of blended Yarns. ■

Course outcomes:

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

This course helps students to work in apparel and technical industry with a wide knowledge on different yarns and their structural aspects. This knowledge on yarns will help correlate with fabric properties for various applications. ■

Question paper pattern:

The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.

- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.■

Text/Reference Books

(1) Textile yarns - B.C. Goswamy, J.G. Martindale, Wiley Interscience.

(2) Structural mechanics of fibres, yarns and fabrics, J.W.S. Hearle, P Grosberg, S. Backer,Wiley Interscience.

(3) Spun yarn technology – Oxtoby, Butter Worth.

(4) Technology of short staple spinning – Vol I, II, III, W. Klein, Textile Institute.

ADVANCED KNITTING AND NON-WOVENS			
Course Code	20JTT15	CIE Marks	40
Teaching Hours/Week (L:P:SDA)	3:0:2	SEE Marks	60
Credits	04	Exam Hours	03

Module-1

KNITTING:
Warp knit fabrics; warp knit v/s woven construction, Single needle bar structure and working mechanism, pattern mechanism. Five basic overlap / under lap variations, closed lap and open lap, direction of lapping at successive courses. Classes of warp knitting machinery, knitting cycle, Tricot, Raschel machines. Knitting elements in Raschel machine, knitting cycle in Raschel Knitting action of the single needle bar Raschel and compound needle. ■

Module-2

Knitting elements of Tricot machines, knitting cycle in Tricot machine. Plain Tricot structures, knitted with two full set guide bars, two bar Tricot, Shark skin, Queenscord, Velour and Velvet structures, Satin, overfed pile structures, reverse lock knit. Differences between Tricot and Raschel machines and fabrics. Laying-in in warp knitting, rules governing, laying-in, fall-plate patterning, full width weft insertion, cut presser and miss press structures. ■

Module-3

Modified warp knit machines and fabrics: Fall plate and chopper bar Raschel, co-we-nit, weft insertion in knitting. Pattern controlling mechanism, pattern wheels, electronic jacquards. Yarns for warp knitting: - Materials for warp knitting, filament and spun yarns, unconventional yarns, important yarn properties for warp knitting, winding and warping for warp knitting. Faults in warp knits. warp knitting calculations. ■

Module-4

NONWOVENS:
Classification of non-wovens, preparatory machines for non-wovens fabric Production. Effects of fiber arrangements in the web. Methods and technique used in non-woven production, needle punched, stitch bonded, and adhesive bonded wet laid spun bonded, spun laced laminated and moulded fabrics. Classification of binders and their properties, effect of fiber properties on nonwovens. Modern developments in non-woven productions. ■

Module-5

Structure of non-wovens: web geometry, fiber orientation curl factor, web density. Identification, properties and application of different non-wovens. Methods of tests: porosity, tear strength, air permeability, tensile strength, 3-point bending test, fatigue test, CBR Loading, cone puncture test, absorbency test, peeling test, pilling test, study of DIN standards. ■

Course outcomes:
At the end of the course the student will be able to:
Student will have an in depth knowledge about warp knitting and non-woven fabric production. It will update the knowledge about modern aspects of warp knitting and non-woven production and application. ■

Question paper pattern:
The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.

- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module. ■

Textbooks

(1) Knitting Technology - David J Spencer.

(2) Warp Knitting - Ajgaonkar.

(3) Non-woven fabrics – NN Banerjee.

(4) Non-woven Bonded Fabrics - Joachim Lünenschloss, Wilhelm Albrecht

Reference Books

(1) Non-woven Fabrics – production and applications" - M.L. Gulrajani.

(2) Non-woven Technology – BTRA Conference papers.

TEXTILE LABORATORY - I			
Course Code	20JTTL16	CIE Marks	40
Teaching Hours/Week (L:P:SDA)	0:4:0	SEE Marks	60
Credits	02	Exam Hours	03

Sl. No.	Experiments
1	Collection of special knit structure and analysis of the same.
2	Understanding relationship between knitted structure and geometry.
3	Design and product development of Knitted fabrics
4	Collection of nonwoven samples and their characterization.
5	Structural analysis of non- wovens
6	Design and product development of non - wovens
7	Collection of functional wet processed samples and analysis of the same.
8	Application and use of Reflectance spectrophotometer for analysis of colour parameters.
9	Energy consumption and environmental impact of wet processing industry. ■

Course outcomes:

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

- The students will be able to tackle problems both in industry and business. ■

RESEARCH METHODOLOGY AND IPR			
Course Code	20RMI17	CIE Marks	40
Teaching Hours/Week (L:P:SDA)	1:0:2	SEE Marks	60
Credits	02	Exam Hours	03

Module-1

Research Methodology: Introduction, Meaning of Research, Objectives of Research, Motivation in Research, Types of Research, Research Approaches, Significance of Research, Research Methods versus Methodology, Research and Scientific Method, Importance of Knowing How Research is Done, Research Process, Criteria of Good Research, and Problems Encountered by Researchers in India.

Defining the Research Problem: Research Problem, Selecting the Problem, Necessity of Defining the Problem, Technique Involved in Defining a Problem, An Illustration. ■

Module-2

Reviewing the literature: Place of the literature review in research, bringing clarity and focus to your research problem, improving research methodology, broadening knowledge base in research area, enabling contextual findings, How to review the literature, searching the existing literature, reviewing the selected literature, Developing a theoretical framework, Developing a conceptual framework, Writing about the literature reviewed.

Research Design: Meaning of Research Design, Need for Research Design, Features of a Good Design, Important Concepts Relating to Research Design, Different Research Designs, Basic Principles of Experimental Designs, Important Experimental Designs. ■

Module-3

Design of Sampling: Introduction, Sample Design, Sampling and Non-Sampling Errors, Sample Survey versus Census Survey, Types of Sampling Designs.

Measurement and Scaling: Qualitative and Quantitative Data, Classifications of Measurement Scales, Goodness of Measurement Scales, Sources of Error in Measurement Tools, Scaling, Scale Classification Bases, Scaling Technics, Multidimensional Scaling, Deciding the Scale.

Data Collection: Experimental and Surveys, Collection of Primary Data, Collection of Secondary Data, Selection of Appropriate Method for Data Collection, Case Study Method. ■

Module-4

Testing of Hypotheses: Hypothesis, Basic Concepts Concerning Testing of Hypotheses, Testing of Hypothesis, Test Statistics and Critical Region, Critical Value and Decision Rule, Procedure for Hypothesis Testing, Hypothesis Testing for Mean, Proportion, Variance for Difference of Two Mean, for Difference of Two Proportions, for Difference of Two Variances, P-Value approach, Power of Test, Limitations of the Tests of Hypothesis.

Chi-square Test: Test of Difference of more than Two Proportions, Test of Independence of Attributes, Test of Goodness of Fit, Cautions in Using Chi Square Tests. ■

Module-5

Interpretation and Report Writing: Meaning of Interpretation, Technique of Interpretation, Precaution in Interpretation, Significance of Report Writing, Different Steps in Writing Report, Layout of the Research Report, Types of Reports, Oral Presentation, Mechanics of Writing a Research Report, Precautions for Writing Research Reports.

Intellectual Property: The Concept, Intellectual Property System in India, Development of TRIPS Complied Regime in India, Patents Act, 1970, Trade Mark Act, 1999,The Designs Act, 2000, The Geographical Indications of Goods (Registration and Protection) Act1999, Copyright Act,1957,The Protection of Plant Varieties and Farmers' Rights Act, 2001,The Semi-Conductor Integrated Circuits Layout Design Act, 2000, Trade Secrets, Utility Models, IPR and Biodiversity, The Convention on Biological Diversity (CBD) 1992, Competing Rationales for Protection of IPRs, Leading International Instruments Concerning IPR, World Intellectual Property Organisation (WIPO),WIPO and WTO, Paris Convention for the Protection of Industrial Property, National Treatment, Right of Priority, Common Rules, Patents, Marks, Industrial Designs, Trade Names, Indications of Source, Unfair Competition, Patent Cooperation Treaty (PCT), Advantages of PCT Filing, Berne Convention for the Protection of Literary and Artistic Works, Basic Principles, Duration of Protection, Trade Related Aspects of Intellectual Property Rights(TRIPS) Agreement, Covered under TRIPS Agreement, Features of the Agreement, Protection of Intellectual Property under TRIPS, Copyright and Related Rights, Trademarks, Geographical indications, Industrial Designs, Patents, Patentable Subject Matter, Rights Conferred, Exceptions, Term of protection, Conditions on Patent Applicants, Process Patents, Other Use without Authorization of the Right Holder, Layout-Designs of Integrated Circuits, Protection of Undisclosed Information, Enforcement of Intellectual Property Rights, UNSECO. ■

Course outcomes:

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

- Discuss research methodology and the technique of defining a research problem
- Explain the functions of the literature review in research, carrying out a literature search, developing theoretical and conceptual frameworks and writing a review.
- Explain various research designs, sampling designs, measurement and scaling techniques and also different methods of data collections.
- Explain several parametric tests of hypotheses, Chi-square test, art of interpretation and writing research reports
- Discuss various forms of the intellectual property, its relevance and business impact in the changing global business environment and leading International Instruments concerning IPR.■

Question paper pattern:

- The question paper will have ten questions.
- Each full question is for 20 marks.
- There will be 2full questions (with a maximum of four sub questions in one full question) from each module.
- Each full question with sub questions will cover the contents under a module.
- Students will have to answer 5 full questions, selecting one full question from each module. ■

Textbooks

(1) Research Methodology: Methods and Techniques, C.R. Kothari, Gaurav Garg, New Age International,4th Edition, 2018.

(2) Research Methodology a step-by-step guide for beginners. (For the topic Reviewing the literature under Module 2), Ranjit Kumar, SAGE Publications,3rd Edition, 2011.

(3) Study Material (For the topic Intellectual Property under module 5), Professional Programme Intellectual Property Rights, Law and Practice, The Institute of Company Secretaries of India, Statutory Body Under an Act of Parliament, September 2013.

Reference Books

(1) Research Methods: the concise knowledge base, Trochim, Atomic Dog Publishing, 2005.

(2) Conducting Research Literature Reviews: From the Internet to Paper, Fink A, Sage Publications, 2009.

***** END OF I SEMESTER *****

SEMESTER – II

ADVANCED TEXTILE AND APPAREL TESTING			
Course Code	20JTT21	CIE Marks	40
Teaching Hours/Week (L:P:SDA)	3:0:2	SEE Marks	60
Credits	04	Exam Hours	03

Module-1

Advance Fibre and Yarn Testing Instruments: Study of High Volume Instrument (HVI). Advanced Fiber Information System (AFIS). Comparison of AFIS with HVI System, Yarn Hairiness and its measurement. Uster spectrograph and its analysis. Properties desired in export yarns. ■

Module-2

Advance Fabric Testing Instruments: Objective evaluation of fabric handle by KAWABATA Evaluation system, Fabric Assurance by Simple Testing and fabric extractions force technique. The influence of chemical and mechanical finishes on fabric handle. ■

Module-3

Inspection: Introduction, raw material inspection, In-process Inspection - spreading, cutting, sewing, pressing and final inspection. ■

Module-4

Apparel Testing: Soil/Stain release testing, snagging, bonded and laminated apparel fabric, testing of fusible interlinings, buttons, zippers and sewing threads. Care labelling of apparel and textiles: American, International, British, Canadian and Japanese systems. ■

Module-5

Quality Control Program: Planning for the quality control program, inspection and analysis of data. Tools of quality control. ISO 9000 series standards. Total Quality Management concepts. ■

Course outcomes:

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

Students who have studied this subject can confidently work in QC dept. and research institutions. ■

Question paper pattern:

The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.

- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.■

Textbooks

(1) Principles of Textiles Testing" - J.E. Booth.

(2) Hand book of textile testing and quality control" -B. Glover, D.S. Hamby, Wiley Eastern Ltd.,

(3) The measurement of Appearance" - Richard S. Hunter and Richard W. Harold, Wiley Interscience.

(4) An introduction to quality control for the apparel industry" - Pradeep V Mehta.

Reference Books

(1) International Apparel Quality Manuals – KESF and FAST Manuals

(2) Progress in Textile Science and Technology – Vol.1 Ed.by V.K. Kothari, IAFL, India, 2000

ADVANCED SILK TECHNOLOGY			
Course Code	20JTT22	CIE Marks	40
Teaching Hours/Week (L:P:SDA)	3:0:2	SEE Marks	60
Credits	04	Exam Hours	03

Module-1

Structure and Properties: Silk Composition of silk, amino acid composition, moisture regain, micro structure of silk, chained structure of silk, crystalline structure of silk, optical proportion of silk. Mechanical and thermal properties of silk: Tensile properties, stress-strain characteristics of silk. Visco-elastic behavior of silk, creep and stress relaxation inverse stress relaxation. Dynamic mechanical behavior and thermal behavior. ■

Module-2

Indian Silk Industry and Process: Production of silk, quality of silk, problems and prospects. Present Scenario of Indian Silk Industry Production of silk produced by the other countries across the world and quality of silk produced by their Modern approach to silk cocoon production and cocoon characteristics evaluation. Recent developments in cocoon, stifling, sorting, grading, cooking and reeling. Technological developments in reeling machines and methods to increase the production of raw silk. ■

Module-3

Production of Spun Silk: Conversion and modern approach, prospects and application, Production of Indian cottage silk and its suitability for producing traditional silk fabric with intricate designs. Production of soft silk, crepe, georgette, chiffon etc. Production of damasks and brocades and silk furnishing cloth. ■

Module-4

Dyeing and Finishing: Types of dye used, factors affecting dyeing behavior of silk, preparation of silk for dyeing. Recent developments in degumming, bleaching, dyeing. Dyeing of silk with reactive, direct and natural dyes. Finishing of silk fabrics: Types and methods, modern technologies involved to impart wrinkle resistant finish, stain repellent, antimicrobial finish and other specialty finishes applicable to silk and its blends. Developments in machineries, chemicals and auxiliaries used for silk dyeing and finishing. ■

Module-5

Developments: Processing of silk fibroin, filaments, hydrogels production of 3D sponges, membranes of silk, non-wovens, fluorescent silks. Biomedical applications of silk such as in sutures, would heeling, tissue engineering, drug delivery systems. Silk fibre reinforced composites. Spider silk and their applications: Types of spider silk, chemical compositions, general properties, tensile properties and application of spider silk. ■

Course outcomes:

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

The subject will enhance the knowledge of student of new methods, new techniques of production of silk and their diversified applications. It will enable the student to learn the structure details and relationship between structure and properties of silk. Also the subject will help the student to acquire knowledge about new techniques and methods of dyeing and finishing of silk, eco-friendly and economical aspects of dyeing and finishing of silk. ■

Question paper pattern:

The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.

- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.■

Textbooks

(1) Silk Processing, Properties and Applications - K. Murugesh Babu, Woodhead Pub. Limited, UK, 2013.

(2) FAO Manual on silk.

(3) Silk man companion – Central Silk Board, Bangalore

(4) Silk wet processing - Dr. M. L. Gulrajani, IIT Delhi Publication.

(5) Silk Dyeing - Dr. V. A. Shenai, Sewak Publications.

(6) Silk Dyeing, Printing and Finishing – G H Hurst, Summer Press Publications

Reference Books

(1) The Technology of Clothing Manufacture - Harold Carr and Barbara Latham, Wiley, 1994

(2) Watsons Advanced Textile Design – Z Grosicki

(3) Grammar of Textile Design – H Nisbet

ADVANCED MANUFACTURED FIRE TECHNOLOGY			
Course Code	20JTT23	CIE Marks	40
Teaching Hours/Week (L:P:SDA)	3:0:2	SEE Marks	60
Credits	04	Exam Hours	03

Module-1

Structural principles of fibre forming polymers. Rheology and hydrodynamics in MMF spinning. Development of fibre structure during man-made fibre spinning. Study of various variables in melt spinning and effect of various parameters on linear density of fibres. ■

Module-2

High speed melt spinning: One step (SP) and two step spinning (TSP) process. Study of fluid flow in spin line. Modifications to be done in spinning, mechanism for high speed melt spinning. Recent developments in dry and wet technology. Study of various types of spinnerets, orifices used for MMF spinning. Mechanism of crystallization during MMF Spinning. ■

Module-3

Melt spinning of Hollow, Multicomponent, Ultra-fine and Nano fibres. Spin finish application: Composition of spin finish, various methods of spin finish application, spin finish for staple fibre production. ■

Module-4

Detailed study of mechanism of heat setting of synthetic fibres. Study of property changes in synthetic fibres during heat setting. Study of various physical and chemical methods of modifications of PET, NYLON & Acrylic fibers. ■

Module-5

New fibres: Introduction to various high performance fibres, Kevlar-LCP behaviour, dry jet spinning of Kevlar fibres, Carbon fibres, raw materials, chemistry of production, surface treatments. Recent trends in production of high performance fibres like Boron, Silicon, Glass, PBT, PBZO, PBZT and aromatic polyesters. High tech fibres, biomimetric chemistry and fibres, biotechnology and fibres, electronics and fibres, fibres in sports, fibres in ocean. ■

Course outcomes:

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

This course work prepares the students to work in most modern man-made fiber manufacturing plants in India and abroad, Subject also prepares and motivates to students to take up the research work in the field of advanced manufactured fibers, technical and smart textiles. ■

Question paper pattern:

The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.

- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module. ■

Textbooks

(1) High Speed Fibre Spinning" - Andrzej Ziabicki, Hiromichi Kawai, Krieger Publishing Company, 1991

(2) Fundaments of fibre formation" - Andrzej Ziabicki, Wiley, 1976

(3) Manmade fibres: Science and Technology", Vol. I, II and III – HF Mark, SM Atlas and E Cernia Interscience Publishers, NY

(4) Manufactured Fibre Technology" – Ed.by V. B. Gupta and V K Kothari, Chapman and Hall, London, 1997.

(5) New Fibres - T. Hongu and G O Phillips, Ellis Horwood, New York 1990.

Reference Books

(1) Carbon Fibres Third Edition -Donnet J. B, and others, Marcel Dekker, New York 1990.

(2) Spinning of Man Made fibres and blends on cotton systems - K R Salhotra, The Textile Association, India 2004.

ENVIRONMENTAL MANAGEMENT FOR TEXTILE INDUSTRY			
Course Code	20JTT241	CIE Marks	40
Teaching Hours/Week (L:P:SDA)	4:0:0	SEE Marks	60
Credits	04	Exam Hours	03

Module-1

Water: Source of water and their characteristics- surface water, ground water, rain water etc. Constituents of water and their effects on textile wet processing. Colour, turbidity, suspended solids, dissolved solids, PH value, acidity, alkalinity, hardness, iron and manganese, copper, chlorine organic growth. ■

Module-2

Quality requirements: Quality requirements of water for silk reeling and textile processing. Conservation and reuse of water. Processing chemistry - fibres, chemicals, type of chemical processing. ■

Module-3

Textiles effluent: Introduction to textiles effluent, characteristics of textiles processing, dye manufacture and synthetic fibres formation industries, reduction and pollution control at mill state. Methods and techniques used for effluent treatments. ■

Module-4

Standard regulations for effluents: Effluent testing parameters- colour and physical appearance, odour, temperature, PH value total suspended solids, total dissolved solids, BOD, COD. ■

Module-5

Environmental management: Objectives, environmental impact assessment (EIA), elements of EIA process. Important environmental laws. Environmental pollution control norms. Biotechnology and its application in environmental industries. Plasma treatments. ■

Course outcomes:

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

Students can help analyse the environmental related issues of garment and textile industries, governmental policies and make decisions on eco aspects of industries. ■

Question paper pattern:

The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.

- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.■

Textbooks

(1) Textile Effluents – Padma Vankar, NCUTE Publications, IIT, Delhi.

(2) Eco friendly processing - NCUTE Publications.

(3) Environmental problems in chemical processing of textiles - NCUTE Publications.

Reference Books

(1) Waste water-An introduction to environmental pollution, Dr. B.K. Sharma, Krishna Prakashan, Media (P) Ltd., Meerut.

(2) Water pollution - V.P. Kudesia, Pragathi Prakashan, Meerut.

FABRIC ENGINEERING			
Course Code	20JTT242	CIE Marks	40
Teaching Hours/Week (L:P:SDA)	4:0:0	SEE Marks	60
Credits	04	Exam Hours	03

Module-1

Engineering concepts: Textile properties and textile structure – engineering concepts and approach to textile Structure – classification of multi directional textile structure – laminar and orthogonal. Classification and standardization of fabrics. ■

Module-2

Geometry of fabric structure: Pierce's basis and modified models – Painter –Adom's and Love's technique descriptive and mechanistic models. Kemp and Hamalton: Twin arc, Olofson – Snow dens and other models. ■

Module-3

Tensile deformations: Tensile deformation – heaps solution – pierces solution – geometrical solutions during extension of cloth – load extensional modules – tear – various Models. ■

Module-4

Other deformations: Bending and tensional deformations – buckling, shear and drape of fabrics –theory various Models – behavior**.** ■

Module-5

Knit structures: Geometry of knitted fabrics – weft and warp knits – various models –applications. Mechanics of knitted fabrics – theory-behaviour**.** ■

Course outcomes:

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

The result is that students will be able to design and develop new fabrics for various applications. ■

Question paper pattern:

The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.

- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module. ■

Textbooks

(1) Structural mechanics of fibres, yarns and fabrics**,** Vol.I - J. W. S. Hearle, P. Grosberg, Stanley Backer, Wiley Intersci. New York.

(2) Textile fibres, yarns and fabrics - a comparative survey of their behaviour with special reference to wool – E R Kaswell, Pub. Reinhold, 1953

(3) Textile Mathematics - Vol I, II, III – J. E. Booth, Textile Institute

Reference Books

(1) Woven Cloth Construction - A.T.C. Robinson & R. Marks, Textile Institute

FRICTION IN TEXTILES			
Course Code	20JTT243	CIE Marks	40
Teaching Hours/Week (L:P:SDA)	4:0:0	SEE Marks	60
Credits	04	Exam Hours	03

Module-1

General mechanism of friction Laws of friction, theories of friction, friction in various textile processes like spinning, weaving and chemical processing etc. Detailed study of various methods of measurement of fibre friction in textiles. ■

Module-2

Theory of spin finish application, various methods of spin finish application, Spin finish application to synthetic fibres, spin finish composition for synthetic filaments, staple fibres and textured yarns. ■

Module-3

Role of friction in the mechanical behaviour of fabrics. Study of surface geometry of synthetic fibres. Resistivity and static behaviour of textile surfaces. ■

Module-4

Effect of photochemical and environmental degradation on the surface properties of textile fibres. Soil release from the textile surface, stain and water repellency of textile surfaces. ■

Module-5

Generation of static charges in textile process and their remedies. Role of fiber friction in garment making, Effect of friction on comfort property of textiles. ■

Course outcomes:

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

The students will be able to use the application of friction to analyse the fabrics based on their frictional behaviour. ■

Question paper pattern:

The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.

- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module. ■

Textbooks

(1) Surface Characteristics of Fibres and Textiles - Ed.by M.J.Schick, New York: M. Dekker, c1975-1977

(2) Friction in Textiles – H G Howell, Literary Licensing, LLC, 2013

Reference Books

(1) Friction in Textiles – H G Howell, Literary Licensing, LLC, 2013

NANO FIBRE TECHNOLOGY			
Course Code	20JTT244	CIE Marks	40
Teaching Hours/Week (L:P:SDA)	4:0:0	SEE Marks	60
Credits	04	Exam Hours	03

Module-1

Nano fiber production: Introduction, principles of electrostatic atomization, Electrospraying and electrospinning by the capillary method, Electrospraying and electrospinning by the charge injection method, Solution electrospinning, Melt electrospinning.

Types and processing of structured functional nanofibers: Core-shell, aligned, porous and gradient nanofibers, Core-shell nanofibers, Aligned nanofibers, Porous nanofibers Gradient nanofibers, Applications of structured functional nanofibers. ■

Module-2

Continuous yarns from electrospun nano fibers: Using electrospun nanofibers: background and terminology, controlling fiber orientation, producing noncontiguous or short yarns, producing continuous yarns.
Producing polyamide nanofibers by electrospinning: Introduction, the electrospinning process, Properties of electrospun nanofibers, measuring the effects of different spinning conditions and the use of high molecular weight polymers on the properties of electrospun nanofibers, Improving the properties of electrospun nanofibers. ■

Module-3

Controlling the morphologies of electrospun nanofibres: Introduction, the electrospinning process and fibre morphology, Polymer concentration and fibre diameter, Fibre bead formation and fibre surface morphology, Controlling fibre alignment and web morphologies, Bicomponent cross-sectional nanofibres, Future trends.
Processing of composite functional nanofi bers: Formation of polymer and polymer composite nanofibers, Formation of polymer and nano particle composite nanofibers, Formation of polymer and inorganic salt composite nanofibers, Examples and applications of composite functional nanofibers. ■

Module-4

Carbon nanotube and nanofibre reinforced polymer fibres: Introduction, Synthesis and properties of carbon nanotubes, developing nanotube/nanofibre–polymer composites, Adding nanotubes and nanofibres to polymer fibres, Analysing the rheological properties of nanotube/nanofibre–polymer composites, Analysing the microstructure of nanotube/nanofibre polymer composites, Mechanical, electrical and other properties of nanocomposite fibres, Future trends. ■

Module-5

Nanofilled polypropylene fibres: Introduction, Polymer layered silicate nanocomposites, the structure and properties of layered silicate, polypropylene nanocomposites, Nanosilica filled polypropylene nanocomposites, Calcium carbonate and other additives.
Applications: Filtration applications, drug delivery applications, tissue engineering, in lithium-ion batteries, sensor applications, clothing for protection against chemical and biological hazards, food processing, sound absorption, electromagnetic wave attenuation and bioreactor, water purification, microelectronics.
Developments in nanofibers: Background, Nanotechnology, materials and nanofiber, Creation of new industries, Researches and global developments of nanofiber. ■

Course outcomes:
At the end of the course the student will be able to:
This course work prepares the students to work in most modern Nano fiber manufacturing plants in India and abroad, Subject also prepares and motivates to students to take up the research work in the field of Nano fibers, Technical and Smart textiles. ■

Question paper pattern:
The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.

- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module. ■

Text/ Reference Books

(1) Nanofibers and nanotechnology in textiles, Edited by P. J. Brown and K. Stevens, Wood head Publishing Limited Cambridge, England, 2007.

(2) Functional nanofibers and their applications, Edited by Qufu Wei, Wood head Publishing Limited, 2012.

(3) Handbook of Nanofibers, Edited by Ahmed Barhoum, Mikhael Bechelany, Abdel Salam Hamdy Makhlouf Springer, 2019.

(4) Nanofibers: Production, Properties and Functional Applications, Edited by Hua Fen Han, Scitus Academics LLC, 2017.

(5) Advances in Nanofibres, Edited by Russel Maguire, Intech Open, 2013.

(6) Electrospun nanofibes, Edited by Mehdi Afshari, Woodhead Publishing, 2017.

DEVELOPMENTS IN FABRIC FORMATION			
Course Code	20JTT251	CIE Marks	40
Teaching Hours/Week (L:P:SDA)	4:0:0	SEE Marks	60
Credits	04	Exam Hours	03

Module-1

Pre requisites: Pre requisites for successful installation of shuttle less looms, yarn quality norms for unconventional weaving, preparatory process to unconventional weaving. ■

Module-2

Weft insertion methods: Weft insertion by projectile, rapier, air jet, water jet, weft insertion stages of different weaving machines. Weft insertion by other methods by multi-phase weaving. Study of unconventional selvedges, accumulators, shed geometry, weft consumption, weft unwinding tension. ■

Module-3

Controls: Productivity- its measurement and control. Material handling equipment and importance. ■

Module-4

Management: Management of loom shed, maintenance. ■

Module-5

Developments: Modern development in weaving machines projectile, rapier, air jet, water jet, QSC wider width machine. Techno economics of unconventional weaving machines. ■

Course outcomes:

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

Students with this knowledge can work in the modern weaving industries, garment manufacturing units with a thorough knowledge of fabric properties, manufacturing methods, machinery knowledge. ■

Question paper pattern:

The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.

- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module. ■

Text/Reference Books

(1) Principles of Weaving – R Marks and A T C Robinson &, Textiles Institute, Manchester,1976

(2) Modern Preparation and Weaving Machinery – A Ormerod - Butterworth, (Publishers) Limited, 1983

(3) Shuttle-less Weaving Machines – Oldrich Talavasek & Vladimir Svaty - Elsevier Science, Oxford, 1981.

(4) Handbook of Weaving – Sabit Adanur

VARIABILITY AND ITS CONTROL			
Course Code	20JTT252	CIE Marks	40
Teaching Hours/Week (L:P:SDA)	4:0:0	SEE Marks	60
Credits	04	Exam Hours	03

Module-1

Lap formation and control of lap uniformity. Irregularities of carded, drawn and combed Silver and their control. Irregularities in roving, yarns and their control. ■

Module-2

Influence of different materials and their blends on irregularity. Index of blend irregularity and its influence on the quality of end product. ■

Module-3

Influence of ambient conditions on the irregularity of material at various stages of processing restricted to spinning of cotton and its blends**.** ■

Module-4
Irregularities of yarns produced on ring, rotor, friction and air jet spun systems. ■
Module-5
Instruments used for measurement of irregularity – analysis and interpretation of data and graphs remedial measures. ■
Course outcomes: At the end of the course the student will be able to: Students can satisfactorily work in quality control department. ■
Question paper pattern: The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60. • The question paper will have ten full questions carrying equal marks. • Each full question is for 20 marks. • There will be two full questions (with a maximum of four sub questions) from each module. • Each full question will have sub question covering all the topics under a module. • The students will have to answer five full questions, selecting one full question from each module. ■
Text/Reference Books
(1) Textile yarns, B.C. Goswamy, J.C. Martindale-Willey Interscience.
(2) Manual of cotton spinning, Vol IV. Part -1-Foster Textile Inst.
(3) An Introduction to the Study of Spinning - W E Morton, Lightning Source Incorporated, 2008
(4) Roller Drafting - Nogeera

MARKETING MANAGEMENT			
Course Code	20JTT253	CIE Marks	40
Teaching Hours/Week (L:P:SDA)	4:0:0	SEE Marks	60
Credits	04	Exam Hours	03
Module-1			
Core concepts of marketing. Need, Want & Demand, Product, Value and satisfaction. Production concept, product concept, selling concept and Marketing concept. A model for consumer buying behaviour, factors influencing consumer behavior, buying decision process- Buying roles & stages in buying. New product development-Idea generation, Idea screening, Concept development and using, Product development. Marketing strategies in the various stages 'Product Life Cycle'. Pricing - Objectives, Influencing factors, methods, strategies for new products and existing products. ■			
Module-2			
Channel Decisions Nature and characteristics of Marketing Channel Functions, channel dynamics, Channel Design and Management decisions. Communication process - Steps in the development of effective communication, Designing message, selection communication channels, deciding promotion mix, measuring results. Promotional Mix tools**.** Advertising, Sales promotion, personal selling, public relations, and direct marketing. Marketing organization & implementation: Evolution, ways of organizing the marketing departments, marketing relations with other departments**.** ■			
Module-3			
E-Business frameworks -media convergence -Anatomy of E-Biz applications - Internal and External applications and integration - organizational business – ED- Implementation –Managing technology – IT bills of various governments. Introduction to web applications - technologies for Web services –Internet tools relevant for E-Business Internet applications for E-business. Types of electronic payments -Digital token based payments-Smart cards credit cards based –other emerging payments technologies -E-governance and implications - Technical specification of digital currencies**.** ■			

Module-4
Brand, Brand identity, Brand Image, Brand Personality, Brand Loyalty and the connected issues. Brand Positioning, Repositioning, Brand Equity: Conceptualization and measurement Trends in Brand Management: Brand cult, Brand alliances, Co-branding, Destination, Branding. Introduction to industrial marketing, Difference between consumer marketing and industrial marketing, classification of industrial products, Nature of demand, Industrial marketing system. Industrial buying behaviour. ■
Module-5
The concept and the need for international marketing - the nature, scope and variety of international markets. International market Vs Local Markets, differences & Similarities. Trade groups, international regulations, trade bodies & Organization like IMF, World Bank & Conference e.g. GATT, UNCTAD, their impact on world trade Euro-dollar & Petro Dollar Market. Exchange rate fluctuations on Imports and Exports. ■
Course outcomes: At the end of the course the student will be able to: The students will be able to analyse marketing strategies, export and import procedures. ■
Question paper pattern: The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60. • The question paper will have ten full questions carrying equal marks. • Each full question is for 20 marks. • There will be two full questions (with a maximum of four sub questions) from each module. • Each full question will have sub question covering all the topics under a module. • The students will have to answer five full questions, selecting one full question from each module. ■
Textbooks
(1) Retail Management-A Strategic Approach - Barry Bermans and Joel Evans, 8th edition, PHI private limited, New Delhi, 2002.
(2) The Art of Retailing - A.J. Lamba, 1st edition, Tata McGraw Hill, New Delhi, 2003.
(3) Marketing Management - Kotler Philip, 1st Ed., Pearson Education (Singapore) Pvt. Ltd., New Delhi, 2004
(4) Marketing Management - S. Jayachandra, 1st edition, Excel Publications, New Delhi, 2004
(5) The Economics of Electronic Commerce - Soon-Young choi, Whiston, A.B., Macmillan Publishing Company, USA.
(6) Electronic commerce-A manager's guide - Kalakota R &Whinston, A. B., Addition Wesley, USA.
Reference Books
(1) Advertising and Promotion - Belch E. George & Belch A. Michael, 5th edition, Tata Megraw Hill, New Delhi, 2001.
(2) Brand building advertising: concepts and cases - Parameswaran, Tata Mcgraw Hill, New Delhi, 2002 .
(3) Strategic Brand Management - Jean Noel Kapferer, Global business press, Abhinav Publishing industry, 1st
(4) Industrial Marketing, AITBS - Hill, M Richard, Alexander S. Ralph, Cross James S, 4Ed. New Delhi 1991.
(5) Direct Marketing: An Integrated Approach - William J. McDonald, McGraw Hill, Singapore, 1st edition, 1998.

BIOTECHNOLOGY APPLICATIONS IN TEXTILE INDUSTRY			
Course Code	20JTT254	CIE Marks	40
Teaching Hours/Week (L:P:SDA)	4:0:0	SEE Marks	60
Credits	04	Exam Hours	03
Module-1			
Enzymes: Catalytic mechanism of few enzymes: Lysozyme, Chymotrypsin and serine protease, different classes of enzymes and their industrial application, application of enzymes in solution and in immobilized state, use of enzyme inhibitors as therapeutic agents. **Biotechnology**: Biotechnology-an interdisciplinary pursuit, conventional & modern biotechnology, various natural raw materials for biotechnology, genetics & biotechnology, current trends and underlying principles of microbial, plant, animal & environmental biotechnology; safety, social, moral & ethical aspects of biotechnology. ■			

Module-2

Production of cellulose-free polygalacturonase preparation by sclerotium rolfsii for bioscouring of cotton. Enzymatic modification of hemp fibres for sustainable production of high quality materials. Enzyme- retted flax using different formulations and processed through the USDA flax fibre pilot plant. Influence of enzymatic pre-treatment on the colours of bleached and dyed flax fibres. Combined bioscouring and bleaching of cotton fibres. ■

Module-3

The effects of ultrasound on the performance of industrial enzymes used in cotton bio-preparation/bio-finishing applications. Survey and recent report on enzymatic processing of bast fibres. Optimization of enzymatic scouring. ■

Module-4

Enzymatic scouring for better textile properties of woven and knitted cotton and blended fabrics. Recent developments in enzymatic scouring. Applications of enzymes in cotton cultivation and other types of fibre developments/productions. ■

Module-5

Integrated enzymatic pre-treatment of cotton fabrics. Enzymatic finishing of wool fabrics: Effects of different treatments with a protease on physical and chemical parameters of the fabric. Application of enzymes in textile effluent treatments. ■

Course outcomes:

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

Students can help analyse the environmental related issues of Apparel and Textile industries and make decisions on eco aspects of industries. Subject also prepares and motivates to students to take up the research work in the field of eco-friendly textiles. ■

Question paper pattern:

The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.

- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module. ■

Textbooks/ Reference Books

(1) Biotechnology in Textile Processing, George M Guebitz, Artur Cavaco-paulo, Ryszard Kozlowski. Published by food products press, 10 Alice street, Binghamton, NY, USA.

(2) Textile Processing with Enzymes, Editors: A Cavaco-Paulo G Gubitz, Woodhead Publishing, 2003.

(3) Bioprocessing of Textiles, C. Vigneswaran, M. Ananthasubramanian, P. Kandhavadivu, Woodhead Publishing, India, 2014.

(4) Advances in Textile Biotechnology, 2nd Edition, Editors: Artur Cavaco-Paulo Vincent Nierstrasz Qiang Wang, Woodhead Publishing, 2019.

(5) Enzymes-Biochemistry, Biotechnology & Clinical Chemistry, 2nd Edition, By Trevor Palmer and Philip L Bonner, Woodhead Publishing, 2007.

TEXTILE LABORATORY - II			
Course Code	20JTTL26	CIE Marks	40
Teaching Hours/Week (L:P:SDA)	0:4:0	SEE Marks	60
Credits	02	Exam Hours	03

Sl.No.	Experiments
1	Collection and analysis of HVI and AFIS result sheets.
2	Collection and analysis of KESF and FAST result sheets.
3	Collection and analysis of Uster spectrograph result sheets.
4	Comparison of specification and test methods of different standard institutions.
5	Collection of inspection reports from industry and its analysis.
6	Kinematic analysis of various loom motions.
7	Energy conservation study of different kinds of looms.
8	Design of Product and its production planning.
9	Collection of online monitoring systems of weave room. ■

Course outcomes:

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

- The students will be able to tackle problem both in industry and business. ■

TECHNICAL SEMINAR			
Course Code	20JTT27	CIE Marks	100
Number of contact Hours/week (L:P:SDA)	0:0:2	SEE Marks	--
Credits	02	Exam Hours	--

Course objectives:

The objective of the seminar is to inculcate self-learning, face audience confidently, enhance communication skill, involve in group discussion and present and exchange ideas.

Each student, under the guidance of a Faculty, is required to

- Choose, preferably through peer reviewed journals, a recent topic of his/her interest relevant to the Course of Specialization.
- Carryout literature survey, organize the Course topics in a systematic order.
- Prepare the report with own sentences.
- Type the matter to acquaint with the use of Micro-soft equation and drawing tools or any such facilities.
- Present the seminar topic orally and/or through power point slides.
- Answer the queries and involve in debate/discussion.
- Submit two copies of the typed report with a list of references.

The participants shall take part in discussion to foster friendly and stimulating environment in which the students are motivated to reach high standards and become self-confident.

The CIE marks for the seminar shall be awarded (based on the relevance of the topic, presentation skill, participation in the question and answer session and quality of report) by the committee constituted for the purpose by the Head of the Department. The committee shall consist of three faculties from the department with the senior most acting as the Chairperson. ■

Marks distribution for CIE of the course 20JTT27 Technical Seminar:

Seminar Report: 30 marks

Presentation skill:50 marks

Question and Answer:20 marks ■

***** END OF II SEMESTER*****

SEMESTER – III

ADVANCED APPAREL PRODUCTION TECHNOLOGY			
Course Code	20JTT31	CIE Marks	40
Teaching Hours/Week (L:P:SDA)	3:0:2	SEE Marks	60
Credits	04	Exam Hours	03

Module-1

The nature and scope of apparel manufacturing: Types of apparel manufacture-fundaments of apparel production. Basic types of apparel production process - major function of apparel manufacturing – engineering functions, management functions- apparel trade association**.** Computerized pattern making in garment production. Principle of pattern making, garment balance, Size charts, pattern grading, computerized made to measure system, Technological advances in pattern making, Gerber technology, Lectra systems, material utilizations, application/developments in computer aided apparel systems, Future trends. Computerized cutting, marker quality and geometric principle for calculating optimum marking design, principles of stitch, seam and their analysis, seam quality, computerized sewing, pressing and moulding. ■

Module-2

Advances in apparel product development: Industrial change process model for clothing product development, models of new product development, product development tools and application area product life time management (PLM) Demand Led new product development future trends.

Technological advances in sewing garment: History of sewing development of the industrial saving, machine advances in sewing needle design, advances in sewing thread technology, Advances in sewing machine automation, semi-automatic sewing equipment, machine using computer numerical control. Future trends in cloth technology. ■

Module-3

Development in pressing technology for garment finishing: The pressing process, pressing with pressure pressing without pressure, crease resistant finishes and permanent creasing future trends. Packaging and ware housing: Type of packing and packing materials, quality specification, merchandise packing and shipping packing. Intra transport, ware housing, computerized storage systems. ■

Module-4

Production control: Production analysis, distribution of documents and records, types of control forms, producing many styles in one line and determining supervisory sections in production lines. Production control charts, reports, production grid principle for assigning partial production, line operators, and evaluation**.** ■

Module-5

Indian apparel industry: Overview of technology in apparel manufacturing technology, usage, regional features and structures of the industry, Indian apparel export and important product category, domestic market and domestic brands, technology status and outlook**.** Apparel productivity- Apparel productivity in India and Western world, global comparison characteristics of low, medium and high productivity manufacturers and factors associated with productivity actions towards higher productivity**.** ■

Course outcomes:

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

Student will have an opportunity to learn the modern aspects of apparel production and its adaptation by Indian apparel industry. It will give overall prospects of garment manufacturing industry as an upcoming textile related industry. ■

Question paper pattern:

The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.

- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module. ■

Textbooks

(1) Apparel Manufacturing Hand book: Analysis, Principles and Practice – Jacob Solinger, Van Nostrand Reinhold Company 1981

(2) Managing Productivity in the Apparel Industry – Rajesh Bheda, CBP Publisher and Distributors

(3) The Technology of Clothing Manufacture, Harold Carr and Barbara Latham, John Wiley & Sons

Reference Books
(1) Seams Productions and Analysis -Radh D Clock
(2) Advances in Apparel Production -Ed. by Catherine Fairhurst, Textile Institute, Woodhead Publications Limited, Cambridge

INDUSTRIAL ENGINEERING			
Course Code	20JTT321	CIE Marks	40
Teaching Hours/Week (L:P:SDA)	3:0:0	SEE Marks	60
Credits	03	Exam Hours	03

Module-1

Productivity

Scope of Industrial Engineering – industrial engineering concepts – Productivity indices –production per spindle – HOK – OHS – calculations – workloads – work assignments – Work content – added work content – reduction of work content – ineffective time – improving productivity – causes for low productivity in Spinning, Weaving, Wet Processing and garment industries. Remedial measures for low productivity. ■

Module-2

Work Study

Definition – Purpose – Techniques of work study – Procedure for work study

Method Study

Definition – Procedure – Process chart and symbols – process sequence chart – outline process chart, flow process charts (man type – material type – equipment type), charts using time scale – multiple activity charts. Diagrams: string diagram – cycle graph, chrono cycle graph – travel chart. Textile and garment industry examples. Flow diagram for Textile and Garment Industry. ■

Module-3

Motion Study

Operation analysis – motion analysis – motion economy – two handed process chart – micro motion study – Therbligs – SIIMO chart – Textile and garment industry examples.

Time Study

Procedure – Equipment's – Techniques of time study – Stop watch method – Predetermined Motion Time Standards (PMTS) – Rating. Allowances – Standard Time – Standard data – Textile and garment industry examples. Calculation of Standard Minutes Value (SMV) ■

Module-4

Layout

Layout planning – Types of layout – process, product, combination and fixed.

Line Balancing

Objectives – Procedure – Techniques – Applications in Textile and garment units. Layout for Textile and garment units ■

Module-5

Material Handling

Objectives – principles of material handling – relationship of material handling to plant lay-out – material handling equipment's – Descriptions and characteristics – Specialized material handling Equipment's for Textile and garment units.

Work Environment and Services

Lighting – Ventilation – Temperature Control and Humidity Control – Noise Control – Safety – Ergonomics. Hygiene – Feeding and Convenience related services ■

Course outcomes:

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

- The graduates will become familiar with fundamentals of various science and technology subjects and thus acquire the capability to applying them.
- The graduates will be able to apply the basic concepts to design and translate the design into prototype / product and also to analyse and interpret data related to textile design, manufacturing and quality analysis.
- The graduates will demonstrate their ability to solve technical problems via technical approaches, self-study, team work and life-long learning approaches.
- Graduates will become equipped with the knowledge and skills necessary for entry-level placement in both TT as well as IT companies.
- The graduates will develop capacity to understand professional and ethical responsibility and will display skills required for continuous and life-long learning and up gradation.
- The graduates will have sound foundation for entering into higher education programmes. ■

Question paper pattern:

The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.

- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module. ■

Textbooks

(1) O. P. Khanna, Industrial Engineering and Management, Dhanpat Rai Publications (P) Ltd., New Delhi, 2004.

(2) Johnson Maurice, Introduction to Work Study, International Labour Organization, Geneva, 1995.

(3) Jacob Solinger, Apparel Manufacturing Hand Book-Analysis, Principles and Practice, Boblin Media Corp, Columbia, 1991.

(4) Rajesh Bheda, Managing Productivity of Apparel industry, CBS Publishers and Distributors, New Delhi 2002.

(5) W. G. Ireson and E. L. Grant, Handbook of Industrial Engineering and Management, Prentice Hall of India, New Delhi, 1988.

(6) Kiell B. Zandin and Maynard's Industrial Engineering Hand Book, Mc Graw Hill, Inc., New York, 2001.

Reference Books

(1) James M. Apple, Plant Layout and Materials Handling, John Wiley & Sons, 1997.

(2) Ralph M. Barnes, Motion and Time Study Design and Measurement of Work, John Wiley & Sons, New York, 1992.

(3) Elwood S. Buffa, Modern Production and Operations Management, Wiley Eastern, 1991.

(4) A. J. Chuter, Introduction to Clothing Production Management, Blackwell Publishing, Oxford, 2004.

(5) Introduction to Work Study, ILO, Geneva, Universal Publishing Corporation, Mumbai, 2006.

FINANCIAL MANAGEMENT			
Course Code	20JTT322	CIE Marks	40
Teaching Hours/Week (L:P:SDA)	3:0:0	SEE Marks	60
Credits	03	Exam Hours	03

Module-1

Financial Management: An overview, function and goals of financial management, financial planning and major financial decision areas**.** ■

Module-2

Capital structure: Theories of capital structure, NI and NOI approaches, capital structure decision, EBIT – EPS analysis. RO – ROE analysis, cash flow analysis**.** ■

Module-3
Capital Budgeting: Methods of capital budgeting, investment criteria, NPV, IRR, Pay Back Period, Risk analysis in capital budgeting. ■
Module-4
Working Capital Management: Current assets, Cash and Inventory management, EOQ, ABC analysis. ■
Module-5
Financial Analysis and Planning: Financial ratios, Break – even analysis and Leverages, application of financial analysis. ■
Course outcomes: At the end of the course the student will be able to: The students will be able to analyse financial statements, balance sheets and audited reports. ■
Question paper pattern: The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60. • The question paper will have ten full questions carrying equal marks. • Each full question is for 20 marks. • There will be two full questions (with a maximum of four sub questions) from each module. • Each full question will have sub question covering all the topics under a module. • The students will have to answer five full questions, selecting one full question from each module. ■
Textbook/ Textbooks
(1) Financial Management – Theory and Practice, 8th Edition" – Prasanna Chandra, Tata McGraw Hill, New Delhi
(2) Fundamentals of Financial Management – James C. Van Horne, John Martin Wachowicz, Financial Times/Prentice Hall, 2008
Reference Books
(1) Financial Management – Keown Scott
(2) Financial Management –M.Y. Khan and Jain

HUMAN RESOURSE MANAGEMENT			
Course Code	20JTT323	CIE Marks	40
Teaching Hours/Week (L:P:SDA)	3:0:0	SEE Marks	60
Credits	03	Exam Hours	03
Module-1			
Introduction to human resource management with reference to objectives and policies. Functions of HRM, Scope, importance and impact on Textile Industry. ■			
Module-2			
Importance of job analysis and job specifications. Different types of job evaluation programmes. Basis of promotion, demotion, transfers, Methods of training personnel for higher performance and productivity. Grievance Handling – procedure for grievance handling. ■			
Module-3			
Modern methods of recruitment and selection. Industrial disputes, procedure for settlement of disputes. ■			
Module-4			
Welfare measures, bonus facilities, Wage and salary administration and incentive schemes. ■			
Module-5			
Motivation and Morale. Labour Management relations. Objectives and functions of trade unions. Factories act and their importance. ■			

Course outcomes:
At the end of the course the student will be able to:
The students will be able to analyse recruitment procedures, incentive schemes and wage/salary administration procedures. ■

Question paper pattern:
The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.

- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module. ■

Textbooks

(1) Human Resource Management – P Subba Rao, Himalaya Publishing, New Delhi

(2) Human Resource Management – Gary Dessler and BijuVarkkey, Prentice Hall

(3) Personnel Management" - Edwin B. Flippo, McGraw-Hill, 1986

(4) Personnel Management" - Subratha Ghosh

Reference Books

(1) Management of Personnel in Indian Enterprises - N.N. Chatterjee, Allied Book Agency, 1978

(2) Personnel Management - Derek Torrington, Laura Hall, Prentice-Hall, 19 87

GEO-TEXTILES IN GEO-TECHNICAL ENGINEERING			
Course Code	20JTT324	CIE Marks	40
Teaching Hours/Week (L:P:SDA)	3:0:0	SEE Marks	60
Credits	03	Exam Hours	03

Module-1

An Overview of Geotextiles in Geotechnical Engineering, Historical development, Mechanism of geotextiles in soil as reinforcement, "How-Beam Analogy", Types of geosynthetics: geotextiles, geogrids, geonets, geomembranes, geocomposites. Applications of geosynthetics in civil engineering, Recent use in India and abroad. ■

Module-2

Manufacturing: Materials and Process. Raw materials: polyamide, polyester, polyethylene, polypropylene, poly vinyl chloride. Different type of geosynthetics based on manufacturing, woven, monofilament, multifilament, slit filament, non-woven. Different bonding process: Mechanically bonded, chemically bonded, and thermally bonded. ■

Module-3

Properties of Geotextiles: Physical Properties: Mass per unit area, Thickness, Specific gravity. Hydraulic properties: Apparent open size, Permittivity, Transmissivity. Mechanical Properties: Uniaxial Tensile Strength, Biaxial tensile strength test Trapezoidal shear strength test, Bursting and Puncture Strength, Soil Geosynthetic friction tests. Durability: Abrasion resistance, Ultraviolet resistance. ■

Module-4

Functions of Geotextiles: Reinforcement, Separation, Filtration, Drainage, Barrier Functions, Confinement. Concept about Randomly distributed fibers in soil. Effect of Bio – degradability of fibers or geosynthetics on the strength behavior of soil reinforcement. Applications of fin-drain the embankments. ■

Module-5

Applications of Geotextiles: Use of geotextiles in roads, Use of reinforced soil in Retaining walls, Improvement of bearing capacity, Geotextiles in environmental control and land fills, Ground Improvement by guardians, Use of Geotextiles in lining of canals. Optimization of fibers/geogrids/geonets/geosynthetics in the stabilization of soil using UCS test and model footing test. Effect of geosynthetics on the stabilization of sloped ground in hilly areas. Design of Reinforced retaining wall . ■

Course outcomes:
At the end of the course the student will be able to:
Student will have an opportunity to learn the interdisciplinary course of textiles in civil engineering applications. It will give overall prospects of textiles and civil engineering as an upcoming industry. ■

Question paper pattern:

The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.

- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module. ■

Textbooks

(1) Geo Textile by NWM John.

(2) Geo synthetics world by J. N. Mandal

(3) Designing with Geo synthetics by R. M. Koerner.

(4) Periodicals on Non-Woven & Geo Textiles.

(5) Geotextiles by Dr P.K.Banerjee

(6) Geotextiles by BTRA (Private circulation)

(7) Geosynthetics in civil engineering, Edited by R. W. Sarsby, Published by Woodhead Publishing Limited in association with The Textile Institute, 2007

(8) Engineering with Geosynthetics by G.Venkatappa Rao and G.V.S Suryanarayana Raju – Tata McGraw Hill, New Delhi, 1990.

(9) Construction and Geotechnical Methods in Foundation Engineering by Robert M. Koerner – McGraw Hill, New York, 1985.

(10) Designing with Geosynthetics by Robert M. Koerner, Prentice Hall, New Jersey, UAS,1989.

(11) Geosynthetics and Geotextile – Swamy sharan,

Reference Books

(1) Fundamentals of Geosynthetic Engineering by Sanjay Kumar Shukla, Jian-Hua Yin, CRC Press.

(2) Handbook on Geosynthetics and their applications, Sanjay Kumar Shukla, Thomas Telford, 2002.

(3) Reinforced soil structure – G.L.Shiva kumar Babu

STRATEGIC AND TECHNOLOGY MANAGEMENT			
Course Code	20JTT331	CIE Marks	40
Teaching Hours/Week (L:P:SDA)	3:0:0	SEE Marks	60
Credits	03	Exam Hours	03

Module-1

Management information system: Introduction and background frame work-information needed economics System view - role of MIS on various levels - structure of MIS – Information network - system life cycle - data flow - decision trees. ■

Module-2

Corporate strategy and planning: Concept of frame work, corporate management, role, Function skill. ■

Module-3

Strategic analysis: cost dynamics - portfolio analysis – financial analysis, Strategic choices. Alternating - diversification-mergers and acquisition implementation and evaluation of strategy. ■

Module-4

Strategic management and leadership: Role of leadership - process of leadership – line structure, styles. ■

Module-5

Technology management: Technology life cycle – transformation – alternatives – appropriate technology - technology change – technology transfer – models. Technology Absorption Assessment –evaluation, diffusion. ■

Course outcomes:
At the end of the course the student will be able to:
The new management concepts can prepare the students to take up the new challenges in the present global scenario. ■

Question paper pattern:
The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.

- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module. ■

Text/Reference Books

(1) Management Information Systems: conceptual foundation, structure and development" – David G.B, McGraw hill New York

(2) Effective Leadership, The Skills of Leadership - John Adair, Wildwood House

(3) Strategic Management – An Integrated Approach - Charles WL Hill and Gareth R Jones.

THEORY OF YARN SPINNING			
Course Code	20JTT332	CIE Marks	40
Teaching Hours/Week (L:P:SDA)	3:0:0	SEE Marks	60
Credits	03	Exam Hours	03

Module-1

Fibre dispersion: Ginning of cotton; the necessity of fibre-individualization; fibre opening in blow- room machinery; the mechanism of fibre-dispersion during carding operation; the minimum requirements during carding and the new approaches to improve fibre-dispersion in carding operation. Neps formation and theory of hook formation. ■

Module-2

Fibre processing: Methods adopted to clean the fibre from trash, short fibres and neps; role of blow-room, card and comber in fibre cleaning. Definition of fibre-extent; influence of fibre-extent on yarn quality; improvement of fibre-extent by straightening actions in carding, drafting and combing**.** ■

Module-3

Attenuation: Principle of rollers drafting and its application in yarn production; drafting irregularities-their causes and remedies; the function of aprons in roller drafting; limitation of apron-drafting and the scope for improvement; mechanism of wire-point drafting and its application in yarn production; merits and demerits of wire-point drafting. Comparison of wire-point drafting with roller drafting. ■

Module-4

Twisting: Effect of twisting of staple-fibre strand on its strength ;meaning of twist multiplier and the basis of selection of required twist; fundamental requirement to create real twist in a strand; mechanism of different twisting principle-ring-twisting, open-end twisting, air-jet twisting, up-twisting, two-for- one twisting, hollow-spindle twisting. ■

Module-5

Levelling and fibre blending: Influence of intermediate product uniformity on yarn uniformity; methods of levelling adopted during spinning processes. Important of fibre-mix homogeneity on yarn quality; types of mixing during spinning preparatory process; assessment of blend efficiency. ■

Course outcomes:
At the end of the course the student will be able to:
Students who have studied this can develop new yarn production methods, fancy yarn production systems. The course will help them set machine parameters thoroughly for all types of spinning. ■

Question paper pattern:
The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.
- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module. ■

Textbooks

(1) Spun Yarn Technology" -Oxtoby E, Butterworth's, London, 1987.

(2) The Technology of Short-staple Spinning" - Klein W, The Textile Institute, Manchester, 1998.

(3) A practical Guide to Opening and Carding" - Klein W, The Textile Institute, Manchester, 1999.

Reference Books

(1) A Practical Guide to Combing, Drawing and the Roving Frame" - Klein W, The Textile Institute, Manchester, 1999.

(2) A practical Guide to Ring Spinning" - Klein W, The Textile Institute, Manchester, 1999.

MEDICAL TEXTILES			
Course Code	20JTT333	CIE Marks	40
Teaching Hours/Week (L:P:SDA)	3:0:0	SEE Marks	60
Credits	03	Exam Hours	03

Module-1

Biomaterials–introduction, types; natural, polymeric and biological biomaterials ■

Module-2

Textile based healthcare and hygiene products; application of Nano technology in medical hygiene textiles; advanced textile materials in healthcare; infection control and barrier materials; plasma treated barrier materials. ■

Module-3

Bandages and pressure garments - elastic and non-elastic compression bandages, support and retention bandages; bandaging textiles; evaluation of bandages; bandages for various end uses. ■

Module-4

Wound – types, healing process; requirements of wound dressing; wound care materials – types, advantages and limitations; Testing of wound dressings; advanced wound dressings ■

Module-5

Implantable products; sutures – requirements, classifications, specifications, materials and their applications; vascular grafts, artificial ligaments, artificial tendons; scaffolds for tissue engineering; intelligent textiles for medical applications ■

Course outcomes:
At the end of the course the student will be able to:
Upon completion of this course, the student shall know the
- Types of materials available for biomedical applications
- Functional requirements of textile structures for specific end uses and
- Selection and characterization of textile materials used for biomedical applications. ■

Question paper pattern:
The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.
- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module. ■

Textbooks
(1) Allison Mathews and Martin Hardingham ., "Medical and Hygiene Textile Production – A hand book", Intermediate Technology Publications,1994.
(2) Anand S.C., Kennedy J.F. Miraftab M. and Rajendran S., "Medical Textiles and Biomaterials for Health care", Wood head Publishing Ltd. 2006.
(3) Joon B. Park. and Joseph D. Bronzino., "Biomaterials – Principles and Applications",CRC Press Boca Raton London, NewYork, Washington , D.C. 2002
(4) Anand S., " Medical Textiles", Textile Institute, 1996, ISBN: 185573317X
(5) Horrocks A.R. and Anand S.C, "Technical Textiles", Textile Institute, 1999, ISBN: 185573317X.
Reference Books
(1) Adanur S., " Wellington Sears Handbook of Industrial Textiles"' Technomic Publishing Co., Inc., Lancaster Pennylvania 1995, ISBN 1-56676-340-1.
(2) Michael Szycher and Steven James Lee, "Modern Wound Dressing: A Systematic Approach to Wound Healing", Journal of Biomaterials Applications, 1992
(3) Rajendran S., "Advanced Textiles for Wound Care", Woodhead Publishing Ltd., 2009, ISBN 1845692713.

PRODUCT DEVELOPMENT			
Course Code	20JTT334	CIE Marks	40
Teaching Hours/Week (L:P:SDA)	3:0:0	SEE Marks	60
Credits	03	Exam Hours	03
Module-1			
Overview of product developments. Scope of product development in textiles and clothing. Designing for functions aesthetics. Designing for apparel, clothing and industrial applications. ■			
Module-2			
Product improvement and product innovations in textiles. Demand estimation and product development objectives. Interaction between properties of fibre, yarn, fabric and garments properties. ■			
Module-3			
The product development process - requirements, key characteristics, recourses, conceptual design, technology selection, material selection, sampling, design and evaluation. ■			
Module-4			
Design logic, specifications, costing, manufacturing strategies and evaluation of new products. ■			
Module-5			
Standards, testing and specifications for new products. Case studies from the point of view of developing textile products for selected end use applications. ■			
Course outcomes: At the end of the course the student will be able to: Student will have an opportunity to learn the apparel and textiles product development and its adaptation by apparel and textile industry. It will give overall prospects of apparel and textiles manufacturing industry as an upcoming textile related industry. ■			
Question paper pattern: The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60. • The question paper will have ten full questions carrying equal marks. • Each full question is for 20 marks. • There will be two full questions (with a maximum of four sub questions) from each module. • Each full question will have sub question covering all the topics under a module. • The students will have to answer five full questions, selecting one full question from each module. ■			

Textbooks
(1) Fashion Design and Product Development, Harold Carr, John Pomeroy, Wiley-Blackwell, 1993.
(2) Apparel Product Development, Maurice J. Johnson and Evelyn C. Moore, Pearson Education, 2001..
(3) Apparel Product Development, 2nd Edition, Maurice J. Johnson and Evelyn C. Moore, Fashiondex
(4) New Product Development: from Initial Idea to Product Management, Marc A. Annacchino,
(5) Handbook of Developments in Consumer Behaviour (Elgar Original Reference), Victoria Wells, Gordon Fox all.
(6) The Apparel Design and Production Hand Book: A Technical Reference, Fashiondex Incorporation | Jan 1, 2000.
Reference Books
(1) Apparel Production Terms and Processes, by Janace E Bubonia, Fairchild Books, 2017
(2) The Technology of Clothing Manufacture, 4th Edition, David J Tyler, Wiley 2008.
(3) Garment Manufacturing Technology, By Rajkishore Nayak and Rajiv Padhye, Woodhead Publishing 2015.
(4) Design of Clothing Manufacturing Processes: A Systematic Approach to Planning, Scheduling and Control, By Jelka Geršak, Woodhead Publishing, 2013.

PROJECT WORK PHASE – 1			
Course Code	20JTT34	CIE Marks	100
Number of contact Hours/Week	2	SEE Marks	--
Credits	02	Exam Hours	--

Course objectives:

- Support independent learning.
- Guide to select and utilize adequate information from varied resources maintaining ethics.
- Guide to organize the work in the appropriate manner and present information (acknowledging the sources) clearly.
- Develop interactive, communication, organisation, time management, and presentation skills.
- Impart flexibility and adaptability.
- Inspire independent and team working.
- Expand intellectual capacity, credibility, judgement, intuition.
- Adhere to punctuality, setting and meeting deadlines.
- Instil responsibilities to oneself and others.
- Train students to present the topic of project work in a seminar without any fear, face audience confidently, enhance communication skill, involve in group discussion to present and exchange ideas.■

Project Phase-1 Students in consultation with the guide/s shall carry out literature survey/ visit industries to finalize the topic of the Project. Subsequently, the students shall collect the material required for the selected project, prepare synopsis and narrate the methodology to carry out the project work.

Seminar: Each student, under the guidance of a Faculty, is required to

- Present the seminar on the selected project orally and/or through power point slides.
- Answer the queries and involve in debate/discussion.
- Submit two copies of the typed report with a list of references.

The participants shall take part in discussion to foster friendly and stimulating environment in which the students are motivated to reach high standards and become self-confident. ■

Course outcomes:

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

- Demonstrate a sound technical knowledge of their selected project topic.
- Undertake problem identification, formulation, and solution.
- Design engineering solutions to complex problems utilising a systems approach.
- Communicate with engineers and the community at large in written an oral forms.
- Demonstrate the knowledge, skills and attitudes of a professional engineer.■

Continuous Internal Evaluation
CIE marks for the project report (50 marks), seminar (30 marks) and question and answer (20 marks) shall be awarded (based on the quality of report and presentation skill, participation in the question and answer session by the student) by the committee constituted for the purpose by the Head of the Department. The committee shall consist of three faculties from the department with the senior most acting as the Chairperson. ■

MINI PROJECT			
Course Code	20JTT35	CIE Marks	40
Number of contact Hours/Week	2	SEE Marks	60
Credits	02	Exam Hours/Batch	03

Course objectives:

- To support independent learning and innovative attitude.
- To guide to select and utilize adequate information from varied resources upholding ethics.
- To guide to organize the work in the appropriate manner and present information (acknowledging the sources) clearly.
- To develop interactive, communication, organisation, time management, and presentation skills.
- To impart flexibility and adaptability.
- To inspire independent and team working.
- To expand intellectual capacity, credibility, judgement, intuition.
- To adhere to punctuality, setting and meeting deadlines.
- To instil responsibilities to oneself and others.
- To train students to present the topic of project work in a seminar without any fear, face audience confidently, enhance communication skill, involve in group discussion to present and exchange ideas. ■

Mini-Project: Each student of the project batch shall involve in carrying out the project work jointly in constant consultation with internal guide, co-guide, and external guide and prepare the project report as per the norms avoiding plagiarism. ■

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

- Present the mini-project and be able to defend it.
- Make links across different areas of knowledge and to generate, develop and evaluate ideas and information so as to apply these skills to the project task.
- Habituated to critical thinking and use problem solving skills.
- Communicate effectively and to present ideas clearly and coherently in both the written and oral forms.
- Work in a team to achieve common goal.
- Learn on their own, reflect on their learning and take appropriate actions to improve it. ■

CIE procedure for Mini - Project:
The CIE marks awarded for Mini - Project, shall be based on the evaluation of Mini - Project Report, Project Presentation skill and Question and Answer session in the ratio 50:25:25. The marks awarded for Mini - Project report shall be the same for all the batch mates.

Semester End Examination
SEE marks for the mini-project shall be awarded based on the evaluation of Mini-Project Report, Presentation skill and Question and Answer session in the ratio 50:25:25 by the examiners appointed by the University. ■

INTERNSHIP / PROFESSIONAL PRACTICE			
Course Code	20JTTI36	CIE Marks	40
Number of contact Hours/Week	2	SEE Marks	60
Credits	06	Exam Hours	03

Course objectives:

Internship/Professional practice provide students the opportunity of hands-on experience that include personal training, time and stress management, interactive skills, presentations, budgeting, marketing, liability and risk management, paperwork, equipment ordering, maintenance, responding to emergencies etc. The objective are further,

To put theory into practice.

To expand thinking and broaden the knowledge and skills acquired through course work in the field.

To relate to, interact with, and learn from current professionals in the field.

To gain a greater understanding of the duties and responsibilities of a professional.

To understand and adhere to professional standards in the field.

To gain insight to professional communication including meetings, memos, reading, writing, public speaking, research, client interaction, input of ideas, and confidentiality.

To identify personal strengths and weaknesses.

To develop the initiative and motivation to be a self-starter and work independently. ■

Internship/Professional practice: Students under the guidance of internal guide/s and external guide shall take part in all the activities regularly to acquire as much knowledge as possible without causing any inconvenience at the place of internship.

Seminar: Each student, is required to

- Present the seminar on the internship orally and/or through power point slides.
- Answer the queries and involve in debate/discussion.
- Submit the report duly certified by the external guide.
- The participants shall take part in discussion to foster friendly and stimulating environment in which the students are motivated to reach high standards and become self-confident. ■

Course outcomes:

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

- Gain practical experience within industry in which the internship is done.
- Acquire knowledge of the industry in which the internship is done.
- Apply knowledge and skills learned to classroom work.
- Develop a greater understanding about career options while more clearly defining personal career goals.
- Experience the activities and functions of professionals.
- Develop and refine oral and written communication skills.
- Identify areas for future knowledge and skill development.
- Expand intellectual capacity, credibility, judgment, intuition.
- Acquire the knowledge of administration, marketing, finance and economics. ■

Continuous Internal Evaluation

CIE marks for the Internship/Professional practice report (20 marks), seminar (10 marks) and question and answer session (10 marks) shall be awarded (based on the quality of report and presentation skill, participation in the question and answer session by the student) by the committee constituted for the purpose by the Head of the Department. The committee shall consist of three faculties from the department with the senior most acting as the Chairperson. ■

Semester End Examination

SEE marks for the internship report (30 marks), seminar (20 marks) and question and answer session (10 marks) shall be awarded (based on the quality of report and presentation skill, participation in the question and answer session) by the examiners appointed by the University. ■

***** END OF III SEMESTER*****

SEMESTER – IV

PROJECT WORK PHASE -2			
Course Code	20JTT41	CIE Marks	40
Number of contact Hours/Week	4	SEE Marks	60
Credits	20	Exam Hours	03

Course objectives:

- To support independent learning.
- To guide to select and utilize adequate information from varied resources maintaining ethics.
- To guide to organize the work in the appropriate manner and present information (acknowledging the sources) clearly.
- To develop interactive, communication, organisation, time management, and presentation skills.
- To impart flexibility and adaptability.
- To inspire independent and team working.
- To expand intellectual capacity, credibility, judgement, intuition.
- To adhere to punctuality, setting and meeting deadlines.
- To instil responsibilities to oneself and others.
- To train students to present the topic of project work in a seminar without any fear, face audience confidently, enhance communication skill, involve in group discussion to present and exchange ideas. ■

Project Work Phase - II: Each student of the project batch shall involve in carrying out the project work jointly in constant consultation with internal guide, co-guide, and external guide and prepare the project report as per the norms avoiding plagiarism. ■

Course outcomes:

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

- Present the project and be able to defend it.
- Make links across different areas of knowledge and to generate, develop and evaluate ideas and information so as to apply these skills to the project task.
- Habituated to critical thinking and use problem solving skills
- Communicate effectively and to present ideas clearly and coherently in both the written and oral forms.
- Work in a team to achieve common goal.
- Learn on their own, reflect on their learning and take appropriate actions to improve it. ■

Continuous Internal Evaluation:

Project Report: 20 marks. The basis for awarding the marks shall be the involvement of the student in the project and in the preparation of project report. To be awarded by the internal guide in consultation with external guide if any.

Project Presentation: 10 marks.

The Project Presentation marks of the Project Work Phase -II shall be awarded by the committee constituted for the purpose by the Head of the Department. The committee shall consist of three faculties from the department with the senior most acting as the Chairperson.

Question and Answer: 10 marks.

The student shall be evaluated based on the ability in the Question and Answer session for 10 marks.

Semester End Examination

SEE marks for the project report (30 marks), seminar (20 marks) and question and answer session (10 marks) shall be awarded (based on the quality of report and presentation skill, participation in the question and answer session) by the examiners appointed by the University. ■