Group No.	Course Code	Course Title	Unique Code
1	20JTT12	Advanced Fiber Physics	201TX001
1	20JTT15	Advanced Knitting and Non-wovens	201TX002
1	20JTT22	Advanced Silk Technology	201TX003
1	20JTT23	Advanced Manufactured Fiber Technology	201TX004
2	20JTT14	Yarn Engineering	202TX001
2	20JTT21	Advanced Textile & Apparel Testing	202TX002
2	20JTT242	Fabric Engineering	202TX003
2	20JTT251	Developments in Fabric Formation	202TX004
3	20JTT13	Advanced Wet Processing	203TX001
3	20JTT241	Environmental Management for Textile Industry	203TX002
3	20JTT244	Nano Fibre Technology	203TX003
3	20JTT254	Biotechnology Applications in Textile Industry	203TX004
4	20JTT11	Advanced Textile Mathematics	204TX001
4	20JTT253	Marketing Management	204TX002
4	20JTT322	Financial Management	204TX003
4	20JTT323	Human Resource Management	204TX004
5	20JTT243	Friction in Textiles	205TX001
5	20JTT252	Variability and its Control	205TX002
5	20JTT324	Geo-Textiles in Geo-Technical Engineering	205TX003
5	20JTT332	Theory of Yarn Spinning	205TX004
5	20JTT333	Medical Textiles	205TX005
6	20JTT31	Advanced Apparel Production Technology	206TX001
6	20JTT321	Industrial Engineering	206TX002
6	20JTT331	Strategic and Technology Management	206TX003
6	20JTT334	Product Development	206TX004

VISVESVARAYA TECHNOLOGICAL UNIVERSITY BELAGAVI

Ph.D. Course - Work Courses-2020 (Textile Technology)

As per the regulation – 2020-21

Group No.	1	Subject Code	20JTT12	Exam Duration	03 Hours
				Exam Marks	100
Subject Title	**ADVANCED FIBER PHYSICS**				

Module-01

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-02

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

Module-03

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-04

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-05

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

Reference Books:

(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
(5) Characterization of polymers - Campbell and White
(6) Introduction to polymer visco-elasticity –Aklonis

VISVESVARAYA TECHNOLOGICAL UNIVERSITY BELAGAVI

Ph.D. Course - Work Courses-2020 (Textile Technology)

As per the regulation – 2020-21

Group No.	1	Subject Code	20JTT15	Exam Duration	03 Hours
				Exam Marks	100
Subject Title	**ADVANCED KNITTING AND NON-WOVENS**				

Module-01

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-02

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-03

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-04

NON-WOVENS:

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-05

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. ■

Reference Books:

(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
(5) Non-woven Fabrics – production and applications" - M.L. Gulrajani.
(6) Non-woven Technology – BTRA Conference papers.

VISVESVARAYA TECHNOLOGICAL UNIVERSITY BELAGAVI

Ph.D. Course - Work Courses-2020 (Textile Technology)

As per the regulation – 2020-21

Group No.	1	Subject Code	20JTT22	Exam Duration	03 Hours
				Exam Marks	100
Subject Title	**ADVANCED SILK TECHNOLOGY**				

Module-01

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 behaviour of silk, creep and stress relaxation inverse stress relaxation. Dynamic mechanical behaviour and thermal behaviour. ■

Module-02

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-03

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-04

Dyeing and Finishing: Types of dye used, factors affecting dyeing behaviour 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-05

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. ■

Reference Books:

(1) Silk Processing, Properties and Applications - K. MurugeshBabu, Woodhead Pub. Ltd., 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

VISVESVARAYA TECHNOLOGICAL UNIVERSITY BELAGAVI

Ph.D. Course - Work Courses-2020 (Textile Technology)

As per the regulation – 2020-21

Group No.	1	Subject Code	20JTT23	Exam Duration	03 Hours
				Exam Marks	100
Subject Title	**ADVANCED MANUFACTURED FIRE TECHNOLOGY**				

Module-01

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-02

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-03

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-04

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-05

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. ■

Reference Books:

(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.
(6) Carbon Fibres Third Edition -Donnet J. B, and others, Marcel Dekker, New York 1990.
(7) Spinning of Man Made fibres and blends on cotton systems - K R Salhotra, The Textile Association, India 2004.

VISVESVARAYA TECHNOLOGICAL UNIVERSITY BELAGAVI

Ph.D. Course - Work Courses-2020 (Textile Technology)

As per the regulation – 2020-21

Group No.	2	Subject Code	20JTT14	Exam Duration	03 Hours
				Exam Marks	100
Subject Title	**YARN ENGINEERING**				

Module-01

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-02

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-03

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

Module-04

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

Module-05

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

Reference Books:

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

VISVESVARAYA TECHNOLOGICAL UNIVERSITY BELAGAVI

Ph.D. Course - Work Courses-2020 (Textile Technology)

As per the regulation – 2020-21

Group No.	2	Subject Code	20JTT21	Exam Duration	03 Hours
				Exam Marks	100
Subject Title	**ADVANCED TEXTILE AND APPAREL TESTING**				

Module-01

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-02

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-03

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

Module-04

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-05

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. ■

Reference Books:

(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.
(5) International Apparel Quality Manuals – KESF and FAST Manuals
(6) Progress in Textile Science and Technology – Vol.1 Ed.by V.K. Kothari, IAFL, India, 2000

VISVESVARAYA TECHNOLOGICAL UNIVERSITY BELAGAVI

Ph.D. Course - Work Courses-2020 (Textile Technology)

As per the regulation – 2020-21

Group No.	2	Subject Code	20JTT242	Exam Duration	03 Hours
				Exam Marks	100
Subject Title	**FABRIC ENGINEERING**				

Module-01

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-02

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-03

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

Module-04

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

Module-05

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

Reference Books:

(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

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

VISVESVARAYA TECHNOLOGICAL UNIVERSITY BELAGAVI

Ph.D. Course - Work Courses-2020 (Textile Technology)

As per the regulation – 2020-21

Group No.	2	Subject Code	20JTT251	Exam Duration	03 Hours
				Exam Marks	100
Subject Title	**DEVELOPMENTS IN FABRIC FORMATION**				

Module-01

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

Module-02

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-03

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

Module-04

Management: Management of loom shed, maintenance. ■

Module-05

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

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 – OldrichTalavasek& Vladimir Svaty - Elsevier Science, Oxford, 1981.

(4) Handbook of Weaving – SabitAdanur

VISVESVARAYA TECHNOLOGICAL UNIVERSITY BELAGAVI

Ph.D. Course - Work Courses-2020 (Textile Technology)

As per the regulation – 2020-21

Group No.	3	Subject Code	20JTT13	Exam Duration	03 Hours
				Exam Marks	100
Subject Title	**ADVANCED WET PROCESSING**				

Module-01

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-02

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-03

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

Module-04

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

Module-05

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. ■

Reference Books:

(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
(6) Environment Problems in chemical processing of Tex tiles, NCUTE Publication – Dr.A.Asokan, Ms.Yogita
(7) Finishing of Khadi Garments - Dr.R.B.Chavan, R.Chattopadhyay, R.P.Tewari, IIT Delhi
(8) Instrumental Colour measurement and computer aided colour matching for textiles, H.S. Shah & Gandhi.

VISVESVARAYA TECHNOLOGICAL UNIVERSITY BELAGAVI

Ph.D. Course - Work Courses-2020 (Textile Technology)

As per the regulation – 2020-21

Group No.	3	Subject Code	20JTT241	Exam Duration	03 Hours
				Exam Marks	100
Subject Title	**ENVIRONMENTAL MANAGEMENT FOR TEXTILE INDUSTRY**				

Module-01

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-02

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-03

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-04

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

Module-05

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. ■

Reference Books:

(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.
(4) Waste water-An introduction to environmental pollution, Dr. B.K. Sharma, Krishna Prakashan, Media (P)Ltd., Meerut.
(5) Water pollution - V.P. Kudesia, PragathiPrakashan, Meerut.

VISVESVARAYA TECHNOLOGICAL UNIVERSITY BELAGAVI

Ph.D. Course - Work Courses-2020 (Textile Technology)

As per the regulation – 2020-21

Group No.	3	Subject Code	20JTT244	Exam Duration	03 Hours
				Exam Marks	100
Subject Title	**NANO FIBRE TECHNOLOGY**				

Module-01

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-02

Continuous yarns from electrospunnano 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-03

Controlling the morphologies of electrospunnanofibres: 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 nanofibers: 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-04

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-05

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. ■

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, MikhaelBechelany, 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) Electrospunnanofibes, Edited by Mehdi Afshari, Woodhead Publishing, 2017.

VISVESVARAYA TECHNOLOGICAL UNIVERSITY BELAGAVI

Ph.D. Course - Work Courses-2020 (Textile Technology)

As per the regulation – 2020-21

Group No.	3	Subject Code	20JTT254	Exam Duration	03 Hours
				Exam Marks	100
Subject Title	**BIOTECHNOLOGY APPLICATIONS IN TEXTILE INDUSTRY**				

Module-01

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-02

Production of cellulose-free polygalacturonase preparation by sclerotiumrolfsii 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-03

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-04

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-05

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. ■

Reference Books:

(1) Biotechnology in Textile Processing, George M Guebitz, ArturCavaco-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: ArturCavaco-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.

VISVESVARAYA TECHNOLOGICAL UNIVERSITY BELAGAVI

Ph.D. Course - Work Courses-2020 (Textile Technology)

As per the regulation – 2020-21

Group No.	4	Subject Code	20JTT11	Exam Duration	03 Hours
				Exam Marks	100
Subject Title	**ADVANCED TEXTILE MATHEMATICS**				

Module-01

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-02

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-03

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-04

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-05

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. ■

Reference Books:

(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
(6) Weaving calculation- Sen Gupta, D. B Tarpurwala& sons., 1956
(7) Mechanics of Textile Machinery-W A Hanton, Langmans, Green and Co., London 1950
(8) An introduction to quality control for the apparel industry, Pradeep V. Mehta

VISVESVARAYA TECHNOLOGICAL UNIVERSITY BELAGAVI

Ph.D. Course - Work Courses-2020 (Textile Technology)

As per the regulation – 2020-21

Group No.	4	Subject Code	20JTT253	Exam Duration	03 Hours
				Exam Marks	100
Subject Title	**MARKETING MANAGEMENT**				

Module-01

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-02

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-03

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-04

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 behavior. ■

Module-05

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. ■

Reference Books:

(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.
(7) Advertising and Promotion - Belch E. George & Belch A. Michael, 5th edition, Tata Megraw Hill, New Delhi, 2001.
(8) Brand building advertising: concepts and cases - Parameswaran, Tata Mcgraw Hill, New Delhi, 2002 .
(9) Strategic Brand Management - Jean Noel Kapferer, Global business press, Abhinav Publishing industry, 1st ed., New Delhi, 1994.
(10) Industrial Marketing, AITBS - Hill, M Richard, Alexander S. Ralph, Cross James S, 4Ed. New Delhi 1991.

VISVESVARAYA TECHNOLOGICAL UNIVERSITY BELAGAVI

Ph.D. Course - Work Courses-2020 (Textile Technology)

As per the regulation – 2020-21

Group No.	4	Subject Code	20JTT322	Exam Duration	03 Hours
				Exam Marks	100
Subject Title	**FINANCIAL MANAGEMENT**				

Module-01

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

Module-02

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

Module-03

Capital Budgeting: Methods of capital budgeting, investment criteria, NPV, IRR, Pay Back Period, Risk analysis in capital budgeting. ■

Module-04

Working Capital Management: Current assets, Cash and Inventory management, EOQ, ABC analysis. ■

Module-05

Financial Analysis and Planning: Financial ratios, Break – even analysis and Leverages, application of financial analysis. ■

Reference Books:

(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

(3) Financial Management – Keown Scott

(4) Financial Management –M.Y. Khan and Jain

VISVESVARAYA TECHNOLOGICAL UNIVERSITY BELAGAVI

Ph.D. Course - Work Courses-2020 (Textile Technology)

As per the regulation – 2020-21

Group No.	4	Subject Code	20JTT323	Exam Duration	03 Hours
				Exam Marks	100
Subject Title	**HUMAN RESOURSE MANAGEMENT**				

Module-01

Introduction to human resource management with reference to objectives and policies. Functions of HRM, Scope, importance and impact on Textile Industry. ■

Module-02

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-03

Modern methods of recruitment and selection. Industrial disputes, procedure for settlement of disputes. ■

Module-04

Welfare measures, bonus facilities, Wage and salary administration and incentive schemes. ■

Module-05

Motivation and Morale. Labour Management relations. Objectives and functions of trade unions. Factories act and their importance. ■

Reference Books:

(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
(5) Management of Personnel in Indian Enterprises - N.N. Chatterjee, Allied Book Agency, 1978
(6) Personnel Management - Derek Torrington, Laura Hall, Prentice-Hall, 1987

VISVESVARAYA TECHNOLOGICAL UNIVERSITY BELAGAVI

Ph.D. Course - Work Courses-2020 (Textile Technology)

As per the regulation – 2020-21

Group No.	5	Subject Code	20JTT243	Exam Duration	03 Hours
				Exam Marks	100
Subject Title	**FRICTION IN TEXTILES**				

Module-01

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-02

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-03

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

Module-04

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-05

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. ■

Reference Books:

(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

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

VISVESVARAYA TECHNOLOGICAL UNIVERSITY BELAGAVI
Ph.D. Course - Work Courses-2020 (Textile Technology)
As per the regulation – 2020-21

Group No.	5	Subject Code	20JTT252	Exam Duration	03 Hours
				Exam Marks	100
Subject Title	**VARIABILITY AND ITS CONTROL**				

Module-01

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-02

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

Module-03

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

Module-04

Irregularities of yarns produced on ring, rotor, friction and air jet spun systems. ■

Module-05

Instruments used for measurement of irregularity – analysis and interpretation of data and graphs remedial measures. ■

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

VISVESVARAYA TECHNOLOGICAL UNIVERSITY BELAGAVI
Ph.D. Course - Work Courses-2020 (Textile Technology)
As per the regulation – 2020-21

Group No.	5	Subject Code	20JTT324	Exam Duration	03 Hours
				Exam Marks	100
Subject Title	**GEO-TEXTILES IN GEO-TECHNICAL ENGINEERING**				

Module-01

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-02

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-03

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-04

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-05

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 . ■

Reference Books:

(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 DrP.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 – Swamysharan,
(12) Fundamentals of Geosynthetic Engineering by Sanjay Kumar Shukla, Jian-Hua Yin, CRC Press.
(13) Handbook on Geosynthetics and their applications, Sanjay Kumar Shukla, Thomas Telford, 2002.
(14) Reinforced soil structure – G.L.ShivakumarBabu

VISVESVARAYA TECHNOLOGICAL UNIVERSITY BELAGAVI

Ph.D. Course - Work Courses-2020 (Textile Technology)

As per the regulation – 2020-21

Group No.	5	Subject Code	20JTT332	Exam Duration	03 Hours
				Exam Marks	100
Subject Title	**THEORY OF YARN SPINNING**				

Module-01

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-02

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-03

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-04

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-05

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. ■

Reference Books:

(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.
(4) A Practical Guide to Combing, Drawing and the Roving Frame" - Klein W, The Textile Institute, Manchester, 1999.
(5) A practical Guide to Ring Spinning" - Klein W, The Textile Institute, Manchester, 1999.

VISVESVARAYA TECHNOLOGICAL UNIVERSITY BELAGAVI

Ph.D. Course - Work Courses-2020 (Textile Technology)

As per the regulation – 2020-21

Group No.	5	Subject Code	20JTT333	Exam Duration	03 Hours
				Exam Marks	100
Subject Title	**MEDICAL TEXTILES**				

Module-01

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

Module-02

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-03

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-04

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

Module-05

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 ■

Reference Books:

(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
(6) Adanur S., " Wellington Sears Handbook of Industrial Textiles"' Technomic Publishing Co., Inc., Lancaster Pennylvania 1995, ISBN 1-56676-340-1.
(7) Michael Szycher and Steven James Lee, "Modern Wound Dressing: A Systematic Approach to Wound Healing", Journal of Biomaterials Applications, 1992
(8) Rajendran S., "Advanced Textiles for Wound Care", Woodhead Publishing Ltd., 2009, ISBN 1845692713.

VISVESVARAYA TECHNOLOGICAL UNIVERSITY BELAGAVI

Ph.D. Course - Work Courses-2020 (Textile Technology)

As per the regulation – 2020-21

Group No.	6	Subject Code	20JTT31	Exam Duration	03 Hours
				Exam Marks	100
Subject Title	**ADVANCED APPAREL PRODUCTION TECHNOLOGY**				

Module-01

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-02

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-03

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-04

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-05

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**.** ■

Reference Books:

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

VISVESVARAYA TECHNOLOGICAL UNIVERSITY BELAGAVI

Ph.D. Course - Work Courses-2020 (Textile Technology)
As per the regulation – 2020-21

Group No.	6	Subject Code	20JTT321	Exam Duration	03 Hours
				Exam Marks	100
Subject Title	**INDUSTRIAL ENGINEERING**				

Module-01

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-02

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-03

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-04

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-05

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 ■

Reference Books:

(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.
(7) James M. Apple, Plant Layout and Materials Handling, John Wiley & Sons, 1997.
(8) Ralph M. Barnes, Motion and Time Study Design and Measurement of Work, John Wiley & Sons, New York, 1992.
(9) Elwood S. Buffa, Modern Production and Operations Management, Wiley Eastern, 1991.
(10) A. J. Chuter, Introduction to Clothing Production Management, Blackwell Publishing, Oxford, 2004.
(11) Introduction to Work Study, ILO, Geneva, Universal Publishing Corporation, Mumbai, 2006.

VISVESVARAYA TECHNOLOGICAL UNIVERSITY BELAGAVI

Ph.D. Course - Work Courses-2020 (Textile Technology)

As per the regulation – 2020-21

Group No.	6	Subject Code	20JTT331	Exam Duration	03 Hours
				Exam Marks	100
Subject Title	**STRATEGIC AND TECHNOLOGY MANAGEMENT**				

Module-01

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-02

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

Module-03

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

Module-04

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

Module-05

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

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.

VISVESVARAYA TECHNOLOGICAL UNIVERSITY BELAGAVI

Ph.D. Course - Work Courses-2020 (Textile Technology)

As per the regulation – 2020-21

Group No.	6	Subject Code	20JTT334	Exam Duration	03 Hours
				Exam Marks	100
Subject Title	**PRODUCT DEVELOPMENT**				

Module-01

Overview of product developments. Scope of product development in textiles and clothing. Designing for functions aesthetics. Designing for apparel, clothing and industrial applications. ■

Module-02

Product improvement and product innovations in textiles. Demand estimation and product development objectives. Interaction between properties of fibre, yarn, fabric and garments properties. ■

Module-03

The product development process - requirements, key characteristics, recourses, conceptual design, technology selection, material selection, sampling, design and evaluation. ■

Module-04

Design logic, specifications, costing, manufacturing strategies and evaluation of new products. ■

Module-05

Standards, testing and specifications for new products. Case studies from the point of view of developing textile products for selected end use applications. ■

Reference Books:

(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 Incorporation (Editor), Publisher: Dave Garza.
(4) New Product Development: from Initial Idea to Product Management, Marc A. Annacchino, Publisher: Butterworth-Heinemann.
(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.
(7) Apparel Production Terms and Processes, by Janace E Bubonia, Fairchild Books, 2017
(8) The Technology of Clothing Manufacture, 4th Edition, David J Tyler, Wiley 2008.
(9) Garment Manufacturing Technology, By RajkishoreNayak and Rajiv Padhye, Woodhead Publishing 2015.
(10) Design of Clothing Manufacturing Processes: A Systematic Approach to Planning, Scheduling and Control, By JelkaGeršak, Woodhead Publishing, 2013.