Syllabus

for

Postgraduate programme in Textile Engineering

Department of Textile Engineering

Dhaka University of Engineering & Technology (DUET)

Gazipur-1700, Bangladesh

Dhaka University of Engineering and Technology
Department of Textile Engineering
Syllabus for Postgraduate programme

Course No.	Titles of the Courses	Credit
TE 6000	Thesis	18.00
TE 6001	Project	6.00
TE 6002	Seminar: Based on Selected Topics of TE	U/S
TE 6101	Advanced Polymer and Fiber Science	3.00
TE 6102	Textile Composites	3.00
TE 6103	Smart Textiles	3.00
TE 6104	Medical Textiles	3.00
TE 6105	Statistics for Textile Engineering	3.00
TE 6106	Environment and Waste Management in Textiles	3.00
TE 6107	Costing and its Application in Textiles	3.00
TE 6108	Science and Applications of Nanotechnology in Textiles	3.00
TE 6109	Advanced Textile Testing	3.00
TE 6110	Product Development	3.00
TE 6111	Functional and High Performance Textiles	3.00
TE 6112	Modeling and Simulation in Textile Assemblies	3.00
TE 6113	Energy Management in Textile Industry	3.00
TE 6114	Research Methodology	3.00
TE 6201	Process Control in Spinning	3.00
TE 6202	Theory of Yarn Structure	3.00
TE 6203	Theory and Design of Spinning Machinery	3.00
TE 6204	Textured Yarn Technology	3.00
TE 6205	Advanced Manufactured Fiber Technology	3.00
TE 6206	Mechanics of Spinning Processes	3.00
TE 6207	Spinning of Man-made Fibers and Blends	3.00
TE 6301	Theory and Design of Fabric Manufacturing Machinery	3.00
TE 6302	Advanced Knitting Technology	3.00
TE 6303	Advanced Nonwoven Technology	3.00
TE 6304	Fabric Mechanics and Properties	3.00
TE 6305	Advanced Fabric Structure and Analysis	3.00
TE 6306	Computer Aided Fabric Manufacturing	3.00
TE 6307	Process Control in Weaving	3.00
TE 6401	Theory and Design of Wet Processing Machinery	3.00
TE 6402	Modern Chemical Processing Systems	3.00
TE 6403	Advanced Science of Dyes and Auxiliaries	3.00
TE 6404	Modern Finishing Technology	3.00
TE 6405	Advanced Chemical Processing of Man Made Textiles	3.00
TE 6406	Modern Printing Technology	3.00
TE 6407	Applied Bio-Technology	3.00
TE 6501	Advanced Apparel Fashion and Design	3.00
TE 6502	Advanced Apparel Engineering and Quality Control	3.00

TE 6503	Physiological Aspects of Clothing	3.00
TE 6504	Theory and Design of Apparel Manufacturing Machinery	3.00
TE 6505	Clothing Science and Textile Product Engineering	3.00
TE 6506	Global Textiles and Apparel Markets	3.00
TE 6507	Textile Marketing and Merchandising	3.00
TE 6601	Project Formulation, Costing and Appraisal	3.00
TE 6602	Total Quality Management	3.00
TE 6603	Management Information Systems in Textile (MIST)	3.00
TE 6604	Green Technology for Textile Industries	3.00
TE 6605	Advanced Textile Management and Entrepreneurship	3.00
TE 6606	Operation Research and Logistic Management	3.00
TE 6607	Brand Management and Corporate Identity	3.00

TE6101: Advanced Polymer and Fiber Science Credit: 3.00

Natural and synthetic polymers; Step-growth polymerization, Carother's equation, Chain growth polymerization, Free radical polymerization; Mayo's equation, cage effect, auto acceleration, inhibition and retardation; Polypropylene manufacturing; Acrylic manufacturing; Atom transfer radical polymerization, ionic polymerization, ring opening polymerization; Nylon-6 manufacturing; Co-polymerization and its importance, Techniques of chain polymerization; Bulk, solution, emulsion, micro emulsion and suspension polymerization; Chemical Modification of fibers; Polymer solution; Flory's theory; Interaction parameter; Molecular weight and its distribution; Spectroscopic methods of polymer characterization such as FTIR, UV spectroscopy, NMR.
Molecular architecture in polymers, configuration and conformation; Nature of molecular interaction in polymers; Glass transition temperature (Tg); WLF equation; Rubber Elasticity; Melting and Crystallization; Models describing fiber structure; Requirement of Fiber forming polymers; Crystallinity and orientation; X-ray diffraction measurement of crystallinity; Measurement of density of Fibers, Density crystallinity, Infrared spectroscopy for determination of orientation, crystallinity etc; Optical microscopy for measurement of birefringence; Internal and surface structure by electron microscopy; Thermal methods- DSC, TGA and TMA for structural investigation; Morphological structure of Cotton, Wool, Silk, Regenerated Cellulose, Polyester, Nylon, Polypropylene, Poly acrylonitrile.

TE6102: Textile Composites Credit: 3.00

Need of composites; Different techniques for producing composites; Testing methods for composites; Production methodology for composites; Test and analyze the effect of fiber parameters on composite application.
Types of composites: Fiber particulate and laminar composites & examples; Fiber composites: Constituents: functions of fiber and matrix; Properties of fibers; Critical fiber length; Aligned and random fiber composites; Property prediction; Rule of mixtures; Simple problems.
Types of high performance fibers: Properties; Types of matrix materials; Thermoset and Thermo plastics properties; Short fiber composites; Fiber matrix interface; Coupling agents; Coupling of interfaces and interfacial reaction in fiber composites; Tensile strength of continuous and discontinuous composites; Fracture mode in fiber composites.
Introduction to manufacturing techniques: Property requirements; Textile preforms; weaving, knitting and braiding; Vacuum bagging; Compression moulding; Injection moulding; Pultrusion; Thermoforming filament winding; Resin transfer moulding.
Testing of composites: Fiber volume fraction; Laminar tensile; Shear; Compression and Flexural properties; Interlaminar fracture/failure modes in composites; Applications for composites.

TE 6103: Smart Textiles Credit: 3.00

Outline the properties of smart textiles and discuss current issues of the research frontier of at least one aspect of smart textiles; To discuss what and how different parameters affect the textile-human interface and the possibilities offered by textile sensors and conventional sensors applied in a textile context; Different types of coatings on textiles can enable new features; Account for the options and limitations of electrically conducting and piezoelectric textiles; Present and discuss conclusions and the knowledge and arguments behind them, in dialogue with both industry representatives and laymen, orally and in writing; Comfort properties; Human-textile interface; Advanced coatings; Electrically conducting textiles; Textile sensors. Characteristics and beneficial properties of smart materials, technological applicability and limits of smart materials; Recent research works on smart textiles.

TE 6104: Medical Textiles Credit: 3.00

Textile materials and products for medical applications; Textile trend in medical application; Wound care and materials; Tissue engineering; Medical devices; Implantable devices; Design and development of biomaterials; Carbon nanomaterials; artificial joints and devices; Drug releasing textiles; Healthcare environment materials (surgical gowns); Textile with cosmetic effect; infection prevention & control & the role of textile; Non-woven materials & technologies for medical application; Reusable medical textile; Recent works on medical textiles.

TE 6105: Statistics for Textile Engineering Credit: 3.00

Probability distributions; sampling and testing of hypothesis; Process control using charts and process capability; Design of experiments for textile applications and Modeling the probabilistic phenomena; Design the experiment; conduct statistical tests and analyze the results to arrive at the conclusions; Study the capability of process and control the process based on data available and Make decisions with minimum error from available data; Applications of Binomial, Poisson, normal, t, exponential, chi-square, F and Weibull Distributions in textile engineering; point estimates and interval estimations of the parameters of the distribution functions; Sampling distribution; significance tests applicable to textile parameters: normal test, t-test, chi-square test and F-test; p-Values; selection of sample size and significance levels with relevance to textile applications; acceptance sampling; Analysis of variance for different models; non-parametric tests: sign test, rank test, concordance test; Control charts for variables and attributes: basis, development, interpretation, sensitizing rules, average run length; process capability analysis 2k full-factorial designs; Composite designs;robust designs; development of regression models, regression coefficients; adequacy test; process optimizations.

TE 6106: Environment and Waste Management in Textiles Credit: 3.00

Importance of ecological balance and environmental protection; Pollutant categories and types; International and Bangladeshi legislation and enforcing agencies in pollution control; Waste management approaches; Environmental Management Systems; Certification and criteria; Environmental impact assessment; Environmental monitory system; Environmental impact along the textile chain from fiber production to disposal: Toxicity of intermediates, dyes and other auxiliaries etc.; Pollution load from different wet processing operations; Textile effluents and their characterization; Technology and principles of effluent treatment;

Advanced color removal technologies, Recovery and reuse of water and chemicals; Air and noise pollution and its control; Eco labeling schemes; Industrial hygiene and safe working practices; Analytical testing of eco and environmental parameters; Eco-friendly textile processing: waste minimization, standardization and optimization, process modification; safe and eco-friendly dyes and auxiliaries; Industrial hygiene and safe working practices; Solid waste (fiber and polymer) recycling; Fiber waste modification; Environmental management systems: ISO 14000; Certification and criteria; case studies; Environmental impact assessment; Environmental monitory system; Air pollution; Noise pollutions; Protection of Textiles from environmental damage; Decoloration of effluent with ozone and reuse in dye bath; Case studies; Study on recent works on environmental issues related to textiles.

TE 6107: Costing and its Application in Textiles Credit: 3.00

Costing as an aid to management; Cost terms related to income measurement, profit planning and cost control for textile industry; Costing of materials, labor and factory overheads and their control; methods of inventory costing for textile industry, accounting of labor, factory over head absorption rate, overhead cost allocation in a composite mill; Job-order costing for a garment industry; Batch costing; Process costing; waste cost and its control in a textile mill; Joint and by-product costing; Unit cost; costs of yarns and fabrics, fabric processing cost; Absorption and variable costing; short-term decision making; Profit planning; cost-volume-profit-analysis, break-even point, contribution margin, margin of safety and capital budgeting; Cost control; standard costs, cost and revenue variances; Financial information; balance sheet and profit and loss account; Statement of changes in financial position; Ratio analysis.

TE 6108: Science and Applications of Nanotechnology in Textiles Credit: 3.00

Introduction to Nanoscience and Nanotechnology; Synthesis of Nanomaterials used in Textiles; carbon nanofibers, carbon nanotube, fullerenes, metal and metal oxide nanoparticles, such as nano silver, nano silica, nanotitania, nano zinc oxide, nano magnesium oxide; Size and surface dependence of their physical and chemical properties such as mechanical, thermo-dynamical, electronic, catalysis; Surface functionalization and dispersion of Nanomaterials; Nanotoxicity concerns; Nanomaterial applications in textiles and polymers; Nanocomposites: definition and types, synthesis routes, characterization techniques; nanocomposite fibers, coatings, their application e.g., gas barrier, antimicrobial, conducting; Nanofibers: preparation, properties and applications such as filtration, tissue engineering, Nanofinishing: water and oil-repellent, self-cleaning, antimicrobial, UV protective, Nanocoating methods on textile substrates: Plasma Polymerization, Layer-by-layer Self Assembly, Sol-Gel coating; Study on the adverse effect of nanotechnology; effect of size on properties of materials like mechanical, electrical, optical, melting point etc. as well as application of nanomaterials in diverse field; Study on recent works related to nanotechnology in textiles.

TE 6109: Advanced Textile Testing Credit: 3.00

Introduction to textile testing; Selection of samples for testing; Random and biased samples; The estimation of population characteristics from samples and the use of confidence intervals; Determination of number of tests to be carried out to give chosen degree of accuracy; Significant testing of means and variance; Quality control charts and their interpretation; Standard tests, analysis of data and test reports; Measurement of fiber properties; Measurement of twist, linear density and hairiness of yarn; Evenness testing of silvers, rovings and yarns; Analysis of periodic variations in mass per unit length; Uster classimat; Spectrogram and V-L curve analysis; Tensile testing of fibers, yarns and fabrics; Automation in tensile testers; Tearing, bursting and abrasion resistance tests for fabrics; Pilling resistance of fabrics.Bending, shear and compressional properties of fabrics; Fabric drape and handle; Crease and wrinkle behavior; Air, water and water-vapor transmission through fabrics; Thermal resistance of fabrics; Testing of interlaced and textured yarns; Special tests for carpets and nonwoven fabrics; Textile testing methods; Recent innovative and research work on textile testing.

TE 6610: Product Development Credit: 3.00

Overview of developments; Scope of product development in textiles and clothing; Designing for functions aesthetics; Designing for apparel, clothing and industrial applications; Product improvement and product innovations in textiles; Demand estimation and product development objectives; Interaction between- properties of Fiber, yarn, fabric and garments properties; The product development process- requirements, key characteristics, recourses, conceptual design, technology selection, material selection, sampling, design and evaluation; Design logic, specifications, costing, manufacturing strategies and evaluation of new products; Standards, testing and specifications for new products; Case studies from the point of view of developing textile products for selected end use applications; Study on recent research works related to textile product development.

TE 6111: Functional and High Performance Textiles Credit: 3.00

Passive and active functionality; Textile with high protection and comfort properties; Extreme winter clothing with low heat transmission, heat absorbing, heat storing systems; Phase change materials, incorporation of PCMs in fibers and fabrics; Breathable textile; Multifunctional textiles with incorporated electronics for integrated communication, music, health monitoring, defence support functions, wearable computers; Environmentally sensitive textiles- photo chromic and thermo chromic (chameleonic) fabrics, camouflage (radar shielding) fabrics, variable heat absorption surfaces, stimuli sensitive polymers such as temperature, pH, ionic, magnetic sensitive materials, design and their applications to textile; Fibers as solar cells; Recent advances in multifunctional textiles.

Protective clothing: Clothing requirements for thermal protection, ballistic protection, UV-protection, protection from electro-magnetic radiation and static hazards, protection against micro-organisms, chemicals and pesticides. Design principles and evaluation of protective clothing. Medical Textiles: Textiles in various medical applications, Application oriented designing of typical medical textiles; Materials used and design procedures for protecting wounds; cardiovascular application, sutures etc.; Sportswear: Clothing requirements for different sports. Development of highly functional fibers, yarns and fabrics for temperature control and moisture management; Stretch, bulky and light weight fabrics; Composites: Two

and three dimensional fabrics and tri-axially braided materials for composites; Production and properties of preforms and composites; Properties and uses of rigid composites; Stimuli sensitive intelligent textiles- their production, properties and applications; Smart textile incorporating functional devices; Miscellaneous: Glass, ceramic and metallic fibers and their textile products; Study on recent works related to Functional and High Performance Textiles.

TE 6112: Modeling and Simulation in Textile Assemblies Credit: 3.00

Introduction of Textile Modeling and Simulation, Stochastic and Stereological Methods; Random fibrous assemblies, anisotropy characteristics in fibrous assemblies, two and three dimensional fibrous assemblies, neural networks: biological neural system; Mathematical models of artificial neurons, Artificial Neural Networks (ANN) architecture, Single and multilayer perceptions, Learning rules, Back propagation algorithm, Applications of ANN; Fuzzy Logic: Introduction of crisp and fuzzy sets, Concepts of uncertainty and imprecision, Operations of classical and fuzzy sets, Membership functions, Fuzzification, Fuzzy rule generation, Defuzzification Applications of fuzzy logic; Genetic Algorithm (G.A): Basics of G.A, Implementation of G.A in fabric engineering; Computational Fluid Dynamics: Newtonian and Non-Newtonian Fluids and their applications in extrusion processes, Computer simulation of fluid flows through porous materials, heat and mass transfer in fibrous assemblies; Statistical Mechanics: Monte Carlo simulation of random fibrous assemblies, Application of Ising Model and fluid transport phenomenon through textile structure; Multiscale Modeling: Geometrical modeling of textile structures, modeling of properties of fibrous assemblies using object oriented programming techniques; Curve Fitting Techniques: Prediction of mechanical properties of fibrous assemblies, process-structure property relationship of fibrous structures; Study on recent works related to modeling and simulation related to textile engineering.

TE 6113: Energy Management in Textile Industry Credit: 3.00

Concept of energy management in textile industry; Concept of energy consumption and conservation; Energy efficient equipment & application of Non conventional energy sources; Concept of energy management in Textile Industry; Energy efficient equipment & application of Non conventional energy sources; Need for energy conservation; Global energy scenario; Demand side management (DSM); Role of energy service companies (ESCOs).

Textile machines: Ancillaries; Component wise consumption; Specific energy consumption (UKG); Cost of energy Vs sales value of textile product.

Electrical and Thermal audit: Productive and ancillary machines; Preparatory; Spinning; Post spinning.

Weaving and Wet processing machines: Ancillaries; Humidification/Air conditioning; Lighting; Compressors and Boilers and Generators; Different types of fuels and then notes in energy conservation.

Energy efficient equipment for various processing machines and ancillaries; Economics with payback period and Return on Investment (ROI)

Energy instrumentation: Energy monitoring instruments; Analog; Digital and computerized instruments and measurement techniques; maintenance of instruments/equipment.

Solar energy: different type of collectors; photovoltaic cells; Wind energy; Bio energy; environmental impact on energy and co-generation by using different techniques.

TE 6114: Research Methodology Credit: 3.00

Objectives and types of research: Motivation and objectives, Types of research: Descriptive, Analytical, Applied, Fundamental, Quantitative, Qualitative, Conceptual, Empirical, Significance of research problems encountered by researchers in Bangladesh. Research formulation: Defining and formulating the research problem, Importance of literature review in defining a problem, literature review and its sources.
Research design and methods: Basic Principles, Features of good design, important concepts relating to research design, Observation and Facts, Laws and theories, Prediction and explanation, Induction, Deduction, Development of Models, Developing a research plan, Exploration, Description, Diagnosis, Experimentation, Determining experimental and sample designs. Data Collection and analysis: Execution of the research, Observation and Collection of data Methods of data collection, Sampling Methods, Data Processing and Analysis strategies, Data Analysis with Statistical Packages, Definition, Testing of hypothesis, Parametric and non-parametric tests for testing of hypothesis, Limitations of tests of hypothesis.
Reporting and thesis writing: Structure and components of scientific reports, Types of report, Technical reports and thesis, Different steps in the preparation, Layout, structure and Language of typical reports, Illustrations and tables Bibliography, referencing and footnotes, Oral presentation, Planning, Preparation, Practice, Marking presentation. Application of results and ethics: Environmental impacts, Ethical issues, Copy right, royalty, Intellectual property rights and patent law, Reproduction of published material, Plagiarism, Citation and acknowledgement, Reproducibility and accountability.

TE 6201: Process Control in Spinning Credit: 3.00

Importance of process control; Control of mixing quality and cost, using LP.; Bale management; Control of cotton contamination; Control of cleaning efficiency and waste in blow room and card; Control of waste in comber; Control of neps in sliver; Control of imperfections and faults in yarns; Control of yarn count and count CV%; Control of strength and CV%; Control of periodic mass variations; Machine and energy audit; Analysis and interpretation of statistical data; Total quality control management; Study on recent innovative works.

TE 6202: Theory of Yarn Structure Credit: 3.00

Elements of yarn geometry; Yarn geometry of helix and its application to yarn structure; Analysis of packing density of yarn; Characterization of yarn properties and influence of fiber properties on yarn structure; Role of yarn structure on yarn and fabric properties; Compare and analysis the structure and properties of ring, flyer, rotor, air-jet, air-vortex, friction and electrostatic; system manufactured yarn; Structure of blended and different fancy yarn; Morphology and topography of staple and different filament yarn;Effect of fiber properties and their geometrical configuration on the tensile and bending properties of yarn; Design of yarn structures for certain functional uses; Twisting form and yarn contraction; Theories of yarn strength; Theoretical analysis of yarn irregularity; Fiber migration characteristics of continuous filament and spun yarns; Blend irregularity; Concept of

elongation balance; Effect of properties of constituent fibers and blend composition on behavior of composite yarns.

TE 6203: Theory and Design of Spinning Machinery Credit: 3.00

Difference in aerodynamics of lint and trash and its utilization in blow room machinery design; Redesigning of conventional openers for t/better performance; problems associated with high production and modifications in card design for improved performance; associated with high production and modifications in card design for improved performance; Fiber arrangement in sliver and its influence on the design of drawing and combing machinery; Problems of wingding in fly frames; Dynamic and static friction of fibers and their influence on ring frame drafting equipment designs; Twist flow; Twist tension, insertion and its influence on end breakages, travelers, ear of traveler and rings for high speed spinning; The tensile, bending and torsional rigidity of fiber and their determination; Elements of yarn geometry; Geometry of helix and its application to yarn structure; Geometry of folded yarns; yarn diameter and density.

TE 6204: Textured Yarn Technology Credit: 3.00

Principles of texturing and modern classification; False twist texturing process- mechanisms and machinery, optimization of texturing parameters, barre', structure-property correlation of textured yarns; Draw-texturing- the need and fundamental approaches; Friction texturing- the need and development, mechanics of friction texturing, latest development in twisting devices, optimization of quality parameters; Noise control in texturing; Air jet texturing- Principle, mechanisms, development of jets and machinery, process optimization and characterization, air jet texturing of spun yarns; Air interlacement - Principle and mechanism, jet development and characterization. Bulked continuous filament yarns - Need, principle, technology development. Hi-bulk yarns - Acrylic Hi-bulk yarn production, mechanism and machines involved; other such products. Solvent and chemical texturing - Need, texturing of synthetic and natural fibres; Study on recent works related to textured yarn.

TE 6205: Advanced Manufactured Fiber Technology Credit: 3.00

Polymerization of nylon-6, nylon-66, poly (ethylene terephthalate) and poly acrylonitrile; Important reactions and their kinetic rate equations. Batch versus continuous reactors; Modification of PET and nylons; Introduction to polymer transport phenomena, Polymer rheology, Shear flow through a capillary, elongation flow in a spinning line; Melt instabilities; Melt spinning lines; stress induced crystallization in high speed melt spinning; Characteristic features of PET, polyamide and polypropylene spinning; Spin finish and its components; Wet and dry spinning processes; Effect of parameters on fiber breakage and fiber structure; Importance of dry, jet and wet spinning of PAN; Introduction to drawing and heat setting in thermoplastic fibers; Study on recent works related to manufactured fiber technology.

TE 6206: Mechanics of Spinning Processes Credit: 3.00

Forces acting on fiber during opening and cleaning processes; Carding process; Analysis of cylinder load and transfer efficiency; Fiber configuration in card and drawn sliver; Fiber straightening and hook removal; Sliver irregularity; Fiber movement in drafting field, Suppression of drafting wave, drafting force; Roller slip, roller eccentricity and vibration;

Fiber fractionation in comber; Analysis of forces on yarn and traveler; Spinning tension in ring and rotor spinning; Twist flow in ring and rotor spinning; End breaks during spinning; False twisting principles, blending of fibers; Evaluation of blending efficiency.

TE 6207: Spinning of Man-made Fibers and Blends Credit: 3.00

Significance of manmade fiber sector; Fiber characteristics and spinnability of man-made fibers; Fiber properties and end uses, Relationship between fiber properties and yarn quality and yarn characteristics; Role of spin finish and fiber crimp in processing; Blending and its objectives; Estimation of blend intimacy and blend irregularity and factors affecting them. Migration; Selection of blend constituents, Rotor, Friction and Air-jet spinning; Process changes for spinning of dope-dyed and fiber-dyed fibers; Effect of blend composition on yarn properties; Processing of man-made fibers and blends on cotton and worsted system of spinning; Production of bulk yarn.

TE 6301: Theory and Design of Fabric Manufacturing Machinery Credit: 3.00

Electronic data acquisition in a loom shed; Computer control weaving machine programming; Electronic direct ordering system.; Production planning for weaving process: planning considerations for the production or specific design &construction; Plant layout; Study of supply chain management system on weaving plant; Air conditioning for weaving plant; Design considerations of high speed knitting machines: Development of Cams, needles, sinkers, yarn feeding devices on circular m/c's and warp knitting m/c's; design of positive feeders, fabric take up and controlling etc.; warp knitting m/c's, multi-axial m/c's, Analysis of Tricot and Raschel machineries and their elements co-ordinations for smooth high speed production, Machine arrangement for various warp knit structures; 3D form giving for technical, industrial and fashion design; Concept of fabric relaxation, Warp knit fabric geometry and its correlation to machine elements settings.

TE 6302: Advanced Knitting Technology Credit: 3.00

Classification of knitted fabric; Machines and techniques for producing weft and warp knit structures; Fabric geometry general terms for weft and warp knit structure; Need for different types of knits and its production; Patterning devices for producing weft and warp knit structure; Comparison of with woven structures; Commercial plain single jersey, double jersey: Rib, Interlock and Purl structures and their end uses; flat knitting and its application areas; Tricot warp knitting: end uses; Raschel warp knitting and simplex warp knitting: end uses; special knit structures; Spirality and other defects of knitted structures; tightness factor. Passage of materials and knitting action and mechanism of operation; Patterning Devices: Principles of selection; effect of positive yarn feeding mechanism: auto stop motions, fabric take up mechanism, patterning in weft and warp knitting: pattern needles and chain links, tension control; relation between loop length and construction; fabric relaxation and shrinkage. Mathematical analysis of yarn tension and forces involved; effect of cam shape; increase in number of feeder; increase in linear speed; needle breakages and their control; Elastomeric yarn knitting and pile knitting; Modern Techniques of Knit Processing;Advances in chemical processing of knits; Study on recent research works related to knitting technology.

TE 6303: Advanced Nonwoven Technology Credit: 3.00

Introduction to nonwovens; Materials used in nonwovens; Principles of nonwoven processes: web formation processes, bonding processes, spun melt processes and chemical processes; Testing and evaluation of nonwovens: international standards, structure of nonwovens and properties of nonwovens; Scientific analysis of structure and properties of nonwovens: fibers and their arrangement, pores and their organization, mechanics of nonwovens, fluid flow and fluid absorption, filtration, barrier and breathability, thermal insulation and acoustic absorption; Engineering of advanced nonwoven products: medical nonwovens, nonwoven wipes, nonwoven filters, automotive nonwovens and home furnishing nonwoven; Design and development of new nonwoven products: theories, market study, product costing, case studies and intellectual property rights; Study on recent research works related to nonwoven technology.

TE 6304: Fabric Mechanics & Properties Credit: 3.00

Fabric parameters (Thread densities, fineness of yarn and yarn crimp). Influence of fabric parameters on fabric properties (weight, thickness Breaking load & extension. cover & permeability, stiffness, frictional behavior, etc.) Crimp distribution, control of weft density, control of warp tension, distribution of warp-weft tension, effect of yarn irregularities on fabric structure, effect of irregularities in the take up & let off motion, Influence of weaving conditions on woven structures. Designing fabrics to meet specific mechanical properties; Geometry & Mechanics of woven, knitted and nonwoven fabrics; Mechanical properties of woven, knitted and nonwoven fabrics (beg, extension module), bending, buckling, shearing, deformation, etc.); Properties of fabric produced from polymer cotton blended fabrics. Comparison of physical properties of fabrics woven from open-end and ring spun yarns. Face weaving&its effect on fabric properties; Air flow through textile fabrics; Three dimensional analysis of a plain knitted fabric subject to biaxial stress. Fabric structures and comfort properties.

TE 6305: Advanced Fabric Structure and Analysis Credit: 3.00

Introduction to various conventional fabrics like poplin, sheeting, cheese cloth, damask, denim, drill and jean, and gabardine etc.; Characteristics and building up of granite weaves. Diamond and diaper weaves; Geometric patterns in checker board weaves; Color effects in woven fabrics. Honeycomb and huckaback weaves; Leno and gauge structure; Study of whipcord and Bedford cord, Pique, Wadded structure; Extra warp and extra weft figuring. Detailed treatment of backed and double clothes; Interchanging warp and weft structure with figure effects; Center stitched double fabrics. Warp and weft pile fabrics; Velvet and velveteen; Analysis of fabrics referred to above for constructing weave (with draft and peg plan), constructional details and loom particulars etc.; Computerized designing; Overview of sub continental traditional woven textile designs.

TE 6306: Computer Aided Fabric Manufacturing Credit: 3.00

Electronic Dobby: Working principle, machine parameters, microelectronics electronics, design features, drive arrangement, systems for pattern data transfer and design development. Electronic Jacquard: working principle, constructional variants, various electronic jacquard systems, selection system, pattern data, transfer and management. CAD for dobby, jacquard, label and carpet: Design algorithm, development of Jacquard designs, process of drafting and

sketch design, development of figures, composition of design, geometric ornamentation, arrangement of figures, weave simulation; Study on recent research works related to CAD.
Field work: Working on electronic dobby and electronic Jacquard, working on CAD, development of various designs for Jacquard, level and carpet; Development of design samples.

TE 6307: Process Control in Weaving Credit: 3.00

The importance and consideration of developing a system for process control; Machine and energy audit; Housekeeping and material handling; Statistical interpretation of data on waste and quality; Controls for quality, machine stoppage and productivity in winding, warping, sizing, drawing, and weaving; Standard norms for settings speeds and production rates; Fabric defects and their control; Control and norms of hard waste in various processes; Care, selection and consumption norms of accessories; The importance and types of maintenance, maintenance schedule in winding, warping sizing and loom shed; Machine audit: Energy norms in winding, warping sizing and loom shed and scope of its control; Calculations pertaining to production, efficiency and machine allocation in winding, warping, sizing and loom shed.

TE 6401: Theory and Design of Wet Processing Machinery Credit: 3.00

Preparatory Machine: Water and heat supplying system; Water treatment plant; Boiler; Singeing; Desizing; Washing; Scouring/bleaching; Mercerizing.
Machines for Textile Dyeing: Woven: Jigger, JT Tank, Pad-Batch-Continuous dyeing, Loop steamer machine; Knit-Dyeing: Jet, Winch, Dewatering, Stenter, Slitting machine; Machines for Textile Printing: Thickener, printing past and screen preparation machinery; Flat bed, rotary screen and transfer printing; Polymerizing machine; Machines for Textile Finishing: Dryer; Sander; Stenter; Sanforising; Sueding; Raising; Shearing; Brushing; Calendaring and Folder m/c; Compactor.
Laboratory Machines & Equipments: Gas Chromatography & Mass Spectrophotometer; Fourier transform infrared spectrophotometer; GCMS; HPLC; TLC; Light fastness & other quality control equipment; Conditioning machine; Effluent treatment (process and mechanism); Optimization of dyeing and finishing parameters and recovery of ingredients.

TE 6402: Modern Chemical Processing Systems Credit: 3.00

Chemical Preparatory Processes: Combined preparatory processes; Oxidative Desizing; Assistants used; Solvent preparatory process; ATIRA cold process; National Peroxide Process; Scouring and bleaching through foam. Mercerization: Hot Mercerization combined with Flash Scouring; Liquid Ammonia Process; Mercerization of Ramie & Flax Yarns. Finishing: Foam Finishing; Properties of foam; Blow ratio; Foam stability; Method of application; Foam finishing recipes; Simultaneous dyeing and Resin finishing of cotton; Crease recovery finishing; Durable flame retardant finishes for cellulosic fabrics and polyester cellulosic blends; Assessment of flammability characteristics. Garment Dyeing and Finishing: Dyeing of garments of cotton, viscose, polyester-cellulosic blends; Processing of leather garments; Preparatory, Dyeing and Finishing processes of sewing threads, knitted fabrics and coated fabrics; Sequence of processes; Machinery types and precautions; Information to multifunctional agent used in pretreatment dyeing and finishing. Natural Dyes: Classification; Colors derived; Color extraction; Mordant used; Application of Natural Dyes on cotton, wool and silk; Natural mordanting agents.

Energy Conservation and Pollution Control: Energy conservation steps in chemical processing; Low wet pick-up techniques; Recipe monitoring; low temperature dyeing methods; Causes and remedies for water and air pollution; Toxicity of chemicals and dyes; Eco-labels and Eco-regulations. Bio Processing: Application of enzymes in textile chemical processing; Mechanism of enzyme reactions; Bio-scouring and Bio-bleaching and the other combined processes; Enzymatic de-colorization of denim fabrics; Bio-polishing and Bio-finishing; Bio-technology in textile effluent treatment plants; Developments of new fibers using bio technology.

TE 6403: Advanced Science of Dyes and Auxiliaries Credit: 3.00

Modern theories of color; Intermediates from benzene, aniline and phenol; Use of reactions like halogenations, nitration, sulphonation, diazotization and arylation of amines; Classification of dyes on the basis of application and chromophores; Azines, Oxazines, Thiazines, Xanthine, Acridine, Triazole, Quinoline, Cyanine, Anthraquinones, Indigoids, Diphenyl and Triphenyl methane, Induline, Nitrosines, Phthalocyanine dyes; Advances in Thio- indigoid dyes, Solublised vat, Metal complex dyes, Sulfur dyes, Disperse dyes, Acid dyes, Cyanine and Mercyanine; Solvent soluble dyes; Advances in oxidation colors (aniline black, prussiate black); Study about important reactive dyes like triazine and vinyl sulphone; Latest developments in reactive dyes; Fluorescent brightening agents; Mechanism of surface activity; Classification of surfactants and their importance; HLB value and its importance; Cationic, anionic & amphoteric surfactants; Auxiliaries associated with sizing, desizing, scouring, bleaching and dyeing with Reactive, Vat, Azoic, Basic and Disperse dyes; Auxiliaries used in printing; Auxiliaries in the dyeing and finishing of blends like P/C, P/W and Acrylic/Cotton; Antistatic agents; Flame retardants and resins used in textile industry; Soil resist & soil release; Water repellent & water proof; Softening & stain removing agents; Anti-pilling auxiliaries; Enzymes used in textile industry; Study on recent research works related to dyes and auxiliaries.

TE 6404: Modern Finishing Technology Credit: 3.00

Introduction: Commercial importance of finishing; Brief study about the conventional finishing techniques like anti-creasing, flame retardency, water repellency and soil repellency etc.; Conventional mechanical finishing techniques. Finishing of Cellulosics: UV stabilizer; Cool; Anti-ocean; Anti-ozone; Odor free; Deodorant; Multi color and ayurvedhic finish; Problems and remedies in the finishing of denim fabrics like back staining; Micro and macro emulsion softening techniques; Recent developments in the mechanical finishing of cellulosic fibers; Finishing of Lyocell materials. Protein Fiber Finishing: Herchosett process and its importance; Importance of anti-microbial finishing of protein fibers; Different methods; Developments in silk; Finishing; Mechanical and chemical; Advantages and limitations of each method. Finishing of Synthetics and its Blends: Mechanism in the weight reduction of PET by using alkali; Recent developments in the antistatic finishing of synthetics; Finishing of P/W & P/C materials;
Recent Trends in Finishing: Developments in the finishing machine; Foam finishing; Micro encapsulation techniques in finishing process; Use of smart textiles in the finishing of textiles; Development in the finishing of garments; Micro denier polyester materials; Assessment of efficiency of finished materials.

TE 6405: Advanced Chemical Processing of Man Made Textiles Credit: 3.00

Various Preparatory processes for manmade textile; Heat setting of synthetic fabrics; Effects of heat setting on dyeing; Mass Coloration of Polyester, Nylon, Acrylic and polypropylene; Advantages & Disadvantages of Mass Coloration; Difference between Mass Coloration and Dyeing. Polyester Dyeing: Carrier, HTHP and thermosal methods of dyeing; Practical problems and their solutions; Stripping of dyed PET; Dyeing of nylon; Dyeing with acid dyes; High temperature dyeing; Low temperature dyeing of Nylon 66; Dyeing with disperses dyes; Barriness of dyeing; Dyeing of Acrylic Fibers; Dyeing with cationic dyes; Stripping of cationic dyes; Dyeing with disperse dyes; Dyeing of acrylic blends; Differentially dye able acrylic fibers. Dyeing of Polyester Blends: Various shop floor practices of dyeing of polyester/cellulosic blended fabrics; Practical problems and their solutions; Various shop floor practices of dyeing of polyester/wool blended fabrics; Dyeing of polyester with cationic dyes; Dyeing of Micro polyester fabric; Dyeing of polyamide cellulosic blends, polyamide/wool blends, polyamide/polyester blends; Stripping of Nylon dyed material; Practical problems and remedies in Nylon Dyeing; Dyeing of unmodified and modified polypropylene.
Printing of synthetic and blended fabrics with different dye classes; Direct, resist and discharge styles of printing; Transfer printing of polyester and blends; Different functional and easy care finishes on synthetics and blends like anti-static, soil- release, soil-resistant, flame-retardant; Study on recent research works related to chemical processing of man made textiles.

TE 6406: Modern Printing Technology Credit: 3.00

Computer aided design systems for textile printing; Recent developments in textile printing machinery including automation; Developments in Digital printing; Developments in Photo printing and blast printing with indigo; Developments in Xerox printing and Laser printing for fancy effects; Developments in preparation of printing inks; Developments in Auxiliary chemicals used in printing; Developments in post-printing operations; Study on recent research works related to printing technology.

TE 6407: Applied Bio-Technology Credit: 3.00

Industrial Bio-Technology: Industrial microbial products; Applications; Primary metabolloids produced by fermentation; Enzymes & Proteins; Sources and applications; Cell and enzyme immobilization; Industrial plant products; Production of enzymes and polysaccharides. Environmental Bio-Technology: Waste water treatment systems; Anresibic & Aerobic systems, Bio-degradation; Micro organizing in pollution control; Biomass production; Waste as renewable sources of energy; Biomass conversion production of ethanol; Production of bio gas production of hydrocarbass; Hydrogen fuel.
Enzymes used in textile industry: Desizing, scouring & bleaching enzyme activity; Initiation, Propagation and Termination reactions; Reaction conditions; Properties of substrates and results of enzyme treatment; Enzyme activity of amyloglucosidase, pectinase, glucose oxiclase, peroxidases and other enzymes used for bleaching decolorization of textiles using laccases; Bio-Polishing enzymes such as cellulases; Bio-washing enzymes using cellulose profeases for scouring of animal fibers; Degumming of silk and modification of wool properties. Evaluation of Enzyme Treated Fabrics– Weight loss; Whiteness index; Absorbency; Tensile strength; Handle of fabric and Abrasion resistance; SEM analysis and other structure related studies. Research Studies on Bio-scouring: Bio bleaching; Combined

processes; Bio washing; Bio polishing; Denim fading; Anti odor and anti microbial finishes; Bio finishing and other applications; Research methodology; Results and conclusions.

TE 6501: Advanced Apparel Fashion and Design Credit: 3.00

Geometrical, naturalized, stylized and traditional motifs in relation to textiles design development and adjustment; The effect of yarn, weave and finishing process of textile on fashion color and general tone of the design; Effect of textile design on the designed garment, Selection of textile design for apparel home furnishing and other household; Costume designing and flat pattern making; Basic pattern and its fitting, Fitting problems in blouse, sleeves and skirts, Fabric textures, surface interest and body in relation to garment design; Standardization of garments: Formation of standards and their care application; CAD system for fashion design study; Recent research works related to fashion and design.

TE 6502: Advanced Apparel Engineering and Quality Control Credit: 3.00

Mechanics of sewing operation; Measurement and controls in sewing operation; Automation in sewing operation; Fabric quality assessment for clothing industry: Fabric quality requirement for high quality garments; Low stress fabric mechanical properties and their effect on sewing operation; Use of FAST and KES system; Fabric mechanical properties and sewing operation interaction: Tailorability and formability; Lindberg theory; Optimization of sewing parameters by using fabric mechanical property; Optimization of finishing parameters such as steam, pressure, vacuum, for getting desired effect; Fabric defect analysis for clothing industry: Defect identification, bow and skewness, correlating defect with back process, value loss;
Quality control in apparel manufacturing: Determination of sewability, seam pucker, seam slippage and needle cutting index, evaluation of cutting defect, fusing defect, sewing defect, inspection of dimension, appearance, drape, change in color, shape and spots; Measurement and selection of sewing thread properties for different fabrics: Optimization of sewing parameters such as ticket number, needle number, yarn tension, stitch density and stitch type for desired sewability; Selection of lining and interlining fabrics for various shell fabric: Evaluation of lining and interlining fabric; Determination of compatibility; Packaging of finished garment; Final random inspection of finished garments, Packaging method, Safety norms; Recent research works related to trimmings and quality control in apparel manufacturing.

TE 6503: Physiological Aspects of Clothing Credit: 3.00

Protective, decorative and technical clothing; Details Study on thermal Underwear, wind proof garments, breathable fabrics & garments; fire proof garments; rain coats, racing drivers garments, drivers suits, NASA recommended space shuttle suit, aircraft suite, clothing for coal miner etc.
Psychological Properties of Clothing: The Textile and Apparel construction and planning or comfort clothing, functional clothing, human body system with atmospheric weather, skin model analysis, skin sensorial effects, thermo-physiology of body and clothing, thermal regulation and ventilation by Clothing; Evaluation of the properties and clothing comfort: Sweating, evaporation; Humidity sensation and water vapor resistance of clothing; Tolerance for heat, cold and working environment; Mechanical and electrostatic behavior; Protective effect against electrical fields, sunlight, UV irradiation, ozone, acids, microorganism, sand and dust; Protective coating in clothing by nanotechnology for extreme dirt rejection.

TE 6504: Theory and Design of Apparel Manufacturing Machinery Credit: 3.00

Study or different types or conventional spreading machines, modem development of spreading machines in fabric spreading; Difference between conventional and modern machine, Brief description or computerized CAD system for marker making, study or different types of pattern machines and digitizing machine for making marker, Description of different types of conventional cutting machines, brief study of computerized fabric cutting machine, plasma torch cutting. Brief study or computerized fabric cutting by CAM system; Recent development in fusing machine; Study or different types or sewing needles and sewing machines; Modern sewing machines, Mechanics of basic lock stitch sewing operation, different automation used in sewing machines, modern development in ironing systems; Label making and tag making machines.

TE 6505: Clothing Science and Textile Product Engineering Credit: 3.00

Hygral expansion; Relaxation, Shrinkage; Felting shrinkage; Methods of measuring dimensional stability to dry cleaning and dry heat; Serviceability; Snagging; Pilling; Abrasion resistance; Tearing strength; Tensile strength; Bursting strength; Corrosive strength; Launder ability; Crock resistance; Flammability; Scorching; Fusing; Static electricity; Seam strength and slippage; Thermal comfort & conductivity: Air permeability; Water vapor permeability; Moisture transport: Wetting, wicking; Sensorial comfort; Water absorption; Water repellency; Oil repellency; Soil resistance. Aesthetics: Color: Color fastness, shade variation, color measurement. Bending; Drape; Crease recovery; Fabric thickness; Shear; Bias extension; Formability; Fabric friction; Objective evaluation of fabric hand by KES and FAST; Classification of textile products and components; Yarn design: Material, technology, specifications; Yarn design elements, design based on structure and material properties. Fabric design: Material, technology, specifications; Fabric design elements: Design based on structure and material properties; Design of women's & girl's wear: Fabric types and materials for European, American and Indian styles; Design of men's and boys wear: Fabric type and materials for European, American and Indian styles;
Tailor ability of fabrics; Tailor ability of woven and knitted garments; Tailor ability of leather garments; Tailor ability of fur garments.

TE 6506: Global Textiles and Apparel Markets Credit: 3.00

Forms of business: Organization, Proprietorship, Partnership, Public, Private limited company; Export Organization. Establishment and registration: ICE & CLE; Council; Government promotional activities; Role of AEPC; Export order processing; Export marketing of apparel: Global scene; Prospects for Indian apparels in overseas market; Globalization; Export credit: Short term; Anticipatory letter of credit (L/C); Packing credit; Negotiation of bills; Short, medium & long term export credits methods; Role of terms of payment in international trading; Factors responsible for counter trade growth; Export documentation: Introduction and various types of export documents; Pre- shipment and Post-shipment documents; Pre-Shipment and Post Shipment finance; Export duty draw back; Pass book; Capital goods import license and assistance; Domestic trade Vs international trade: Regional trades; Blocks; Nature of foreign exchange market; Main functions; Business & environment; Social & logical; Business ethics; Standard policies; Indian trade policies; India's foreign trade policy; Export & import policy. Export barriers: Impact of WTO, GATT,

MFA phase out; Globalization and Quota implications; Tariff and non-tariff system of operations.

TE 6507: Textile Marketing and Merchandising Credit: 3.00

Marketing; Marketing Concepts; Marketing Management; Marketing System; Marketing environment; Marketing Organization; Strategic Marketing Process; Competitive marketing strategy; Marketing of Apparel and Fashion Products; Buying behaviour; Buying process; Segmentation; Target Marketing; Market measurement; Demand Forecasting; Methods of forecasting; Marketing mix; Advertising and Sales Promotion; Public Relations; Product life cycle; Marketing strategy for various stages of life cycle; New product development; Marketing research; Merchandising; Apparel and Fashion Merchandising; Buying Agency and Comparison between them; Selection of Buyers and Buying Agencies; Merchandising Correspondence; Orders; Handling of orders and dealing with manufacturers; Trade fair participation and other methods of sales promotion in merchandising.

TE 6601: Project Formulation, Costing and Appraisal Credit: 3.00

Cost Concepts: Direct/indirect, Fixed/variable, total cost. Inventory costing: FIFO, LIFO, Weighted average methods; System of costing: Job, order, batch, process, unit & operating cost joint & byproduct; Cost Standards in Textiles: Cost structure in textile industry, Cost of raw material/labor/utilities. Cost Control: Standard costs, variance analysis, determination of cost per kg of yarn, per kg (meter) of fabric, measures for cost reduction, selling price decision for yarn/fabric; Profit planning: Cost volume - profit analysis, Break Even point; Budgeting, definition, purpose, types; Financial Statement & Investment Analysis: Profit & Loss account and Balance sheet analysis, Fund flow statement, Ratio analysis, Concept of cost of capital, IRR, DRC, DSCR, ERR, payback period and techniques for calculation.
Project Cycle: Phases of project cycle identification, preparation evaluation and documentation & supervision; Various functions in project cycle-Technical, commercial, financial, economic, and managerial. Project formulation and Appraisal: Appraisal concept, Need for appraisal, Methodology, Various aspects- market, management, technical, financial and economic, Key financial indicators in appraisal, Investment decision from appraisal report, Post-project appraisal. Evaluation of Technological Content of Textile Projects: The choice of technology and their assessment, operating constraint, appropriateness of technology, factors influencing selection, various aspects of technology transfer; Project utilities and environmental aspects for textile projects: Power, Steam, Fuel, Water, Compressed air, Air conditioning, Pollution (air, water, and ground noise); Special Appraisals: For Modernization projects, balancing equipment, expansion and diversification projects (including backward & forward integration).

TE 6602: Total Quality Management Credit: 3.00

TQM concepts; Dimensions of quality planning; Principles of TQM; Leadership concepts; Role of senior management; Quality council; Quality statements; Strategic planning; Deming philosophy; Barriers to TQM implementation; Juran Trilogy; PDSA cycle; 5S; Kaizen; The seven tools of quality; Statistical fundamentals: Measures of central tendency and dispersion; Population and sample; Normal curve; Control charts for variables and attributes; Process capability; Concept of six sigma; New seven management tools; Statistical process control

(SPC); Taguchi quality loss function; House of quality; QFD: process, benefits; Quality Function Deployment(QFD); Benchmarking: Reasons to Benchmark, Benchmarking process; FMEA concept: Improvement needs, Stages of FMEA; Total Productive Maintenance (TPM): Employee involvement; Motivation; Empowerment; Teams recognition and reward; Performance appraisal; Benefits; Continuous process. Customer satisfaction: Customer perception of quality; Customer complaints; Service quality; Customer retention; Supplier partnership: Partnering; Sourcing; Supplier selection; Supplier rating; Relationship development. ISO 9000 and other quality systems; Implementation of quality system, documentation, quality auditing; ISO 14000: concept, requirements and benefits; Quality assurance and acceptance: Acceptance sampling; Operating characteristics curve; Development of single sampling plan; Concept of AQL; LTPD: producers and consumers risk; Average outgoing quality (AOQ) curve; Other acceptance sampling plans; Sampling tables. Reliability and maintainability: Definition of reliability; Factors affecting reliability; MTTF; MTBF; Evaluation of reliability; Quality management; Organizing for quality; Economy of quality; Techniques of ABC analysis; Quality management education; Zero defects concept; Quality circles concept; Applying total quality management in enterprise; Recent research work in TQM in textiles.

TE 6603: Management Information Systems in Textile (MIST) Credit: 3.00

Management Information System Concepts: Definition, Computer Based Information System, Functions of an Information System. The Role of Managers, Management Levels; Types of Information Systems: Transaction Processing Systems, Decision Support Systems, Executive Support Systems. The System Development Life Cycle: Reasons to Develop New Information Systems, System Analysis, Problem Definition, Requirements Analysis, Project Justification, Tools, System Design; Logical Design Stage, System Design Tools, Prototyping and its Effects on the System Development Life Cycle, Automating System Analysis and Design; System Implementation; Testing and Installation Stage, Training Stage, and System Maintenance; File and Database Processing: File Processing, File Management Systems, Database management Systems, Database Models: The Hierarchical Model, The Network Model, The Relational Model, Object-oriented Model; Database Design; Managing Database: Distributed Databases, Knowledge-Based Systems. Expert System Shells, Knowledge Engineering, Uses of Knowledge-Based Systems; Production planning, Inventory control, Cost model; Group tooling economic analysis. Costing of Yarn, Fabric, Fabric Dyeing (Woven, Knitted, Fleece), Yarn Dyeing, Sewing thread; Payroll, Organogram charts, Different management formats of textile.

TE 6604: Green Technology for Textile Industries Credit: 3.00

Importance of ecological balance and environmental protection; Definition of waste and pollutant; Pollutant Categories and types; International and Bangladeshi legislation and enforcing agencies in pollution control: Waste management approaches: Environmental Management Systems, ISO 14000; Environmental impact along the textile chain from fiber production to disposal; Toxicity or intermediates, dyes and other auxiliaries etc.; Pollution load from different wet processing operations; Textile effluents and their characterization; Technology and principles of effluent treatment; Advanced color removal technologies; Recovery and reuse of water and chemicals; Air and noise pollution and its control; Eco labeling schemes; Industrial hygiene and safe working practices; Analytical testing or eco and environmental parameters; Eco friendly textile processing: waste minimization; Standardization and optimization, process modification; Safe & ecofriendly dyes and

auxiliaries; Organic cotton; natural dyes, naturally colored cotton, Solid (fiber & polymer waste) recycling recovery of monomers, energy recovery and chemical modification of fiber waste.

TE 6605: Advanced Textile Management and Entrepreneurship Credit: 3.00

Provides knowledge in many aspects of project management such as process control and optimization, logistics, quality management, flows and storage; Du Pont connections; Lean principles and applicable soft wares; Risk management, maintenance, sustainability and environmental control systems; Concepts in logistics and quality management applicable for the textile value chain; How to choose production and distribution systems based on business case; Implement improvement systems and lean production in textile producing companies; CSR and sustainability aspects.

TE 6606: Operation Research and Logistic Management Credit: 3.00

Introduction to operation research; Historical development; Phases of operation research study; General linear programming, simplex method, sensitivity analysis; Transportation problem, methods of finding an initial solution, degeneracy, optimum solution, post optimality analysis, variation in transportation problems, assignment problems, variation in assignment problems, queuing, game theory, minimax and maximin strategies; Decision theory, replacement decisions; Inventory management techniques- selective inventory control: ABC analysis, economics order quantity, ordering cost, acquisition cost, inventory carrying cost or holding cost, just in time, information systems for inventory management, store management and merchandising, make or buy decision, analysis of investment in inventory, value analysis and material management; Enterprise resource planning.

TE 6607: Brand Management and Corporate Identity Credit: 3.00

Definition of a brand (versus product) and the concept of added value; Tangible and intangible dimensions of brands; Brand identity versus brand image; Brand/customer interface and the concept of brand associations; Strategic brand management process; Product brand versus corporate brand; Process of corporate identity development; Brand equity valuation; Study on recent research work related to brand management.