Syllabus
for
Undergraduate Studies

Department of Textile Engineering

Dhaka University of Engineering & Technology
(DUET)
Gazipur-1707

1st Year 1st Semester

Sl. No.	Course No.	Course Title	Contact Hrs/Week	Credit
1	TE-1601	Introduction to Textile Engineering	3	3.00
2	ME-1700	Engineering Drawing (Sessional)	3/2	0.75
3	Math-1501	Engineering Mathematics-I	3	3.00
4	Ph-1501	Physics-I	3	3.00
5	Ph-1502	Physics-I (Sessional)	3/2	0.75
6	Ch-1501	Chemistry-I	3	3.00
7	Ch-1502	Chemistry-I (Sessional)	3/2	0.75
8	HSS-1501	English Language-I	2	2.00
9	HSS-1502	English Language-I (Sessional)	3/2	0.75
		Total	**20**	**17.00**

Contact Hours: 14 (T) + 06 (S) = 20
Total Credits: 17.00
No. of Theory Courses: 5
No. of Sessional Courses: 4

1st Year 1st Semester

TE-1601: Introduction to Textile Engineering
3 Hours/Week Credit: 3.00

Different textile terms and definitions; Study on textile sectors in our country; An introduction to the historical development of textile processing industries, its applications and product; Textile fibers, their properties, testing and uses; Fiber to yarn- different terms related to yarn spinning; Spinning process and machineries for various fibers; Quality parameters for yarns; Yarn to fabric- different basic terms of weaving process; Preparatory of weaving process and it's functional effects; Flow chart of weaving process and machines; Knitting; Nonwoven fabric formation; Elements of fabric structure and design; Quality parameters for fabric; Basic concept of dyes and chemicals used in textiles; Dyeing process for major types of fabrics; Printing and finishing; Fabric to apparels- a brief history of the development of garments industries with particular reference to Bangladesh garment industries; Fashion trends in different countries; Nomenclature of different types of garments; Quota and category numbers of different items.

ME-1700: Engineering Drawing (Sessional)
3/2 Hours/WeekCredit: 0.75

Instruments and their uses; Planning of drawing sheet, lettering, dimensioning, projection and its types; First and third angle- projection of elementary machine parts, models or pictorial, orthographic drawings; Isometric views, auxiliary views; Assembly drawing and sectional views; Specifications for manufacture, working drawings, plan and elevation of building; Drawing of gear tooth profile, cam profile, fasteners, key and springs; Free hand drawing of different textile machine parts, drawing of assemblies of textile machinery parts from given details; Computer graphics.

Math-1501: Engineering Mathematics – I
3 Hours/Week Credit: 3.00

Set Theory: Operations; Venn diagrams; Equivalence relations and Mapping.

Algebra: Permutation and combination; Binomial theorem; Exponential series and logarithmic series; Determinant; Solution of simultaneous equations with the help of determinant.

Calculus: Basic concept of function, limit and continuity; Differential coefficient from first principal; Differentiation of various functions with basic applications; Fundamental integral, indefinite integral, definite integral; Application of integration for finding area and volume.

Introduction to Co-ordinate Geometry: Equations of straight lines; Concept of gradient and the y-intercept; Graph sketching.

Ph-1501: Physics-I
3 Hours/Week Credit: 3.00

General Physics: Units and measurement; Vector and scalar quantities; Force and motion; Newton's law of motion; Gravity and gravitation; Work, power & energy.

Elasticity: States of matter; Elastic properties of solids; Stress, strain, elastic limit, stress-strain diagram of materials; Elastic moduli and relation between elastic constants; Work done in a strain; Twisting couple on a cylinder; Torsional pendulum; Determination of Young's Modulus and Rigidity Modulus; Factor affecting elasticity; Hook's law; Poisson's ratio.

Hydrodynamics: Flow of liquids; Equation of continuity; Laminar and turbulent flow; Reynold's number and its significance; Bernoulli's theorem; Torricelli's theorem; Venturimeter; Pilot tube.

Viscosity: Viscosity and co-efficient of viscosity; Poiseulli's equation; Motion in a viscous medium-Stoke's law; Determination of the co-efficient of viscosity; Variation of viscosity with temperature.

Surface Tension: Surface tension; Molecular theory of surface tension; Surface tension and surface energy; Capillarity; Excess pressure inside a liquid drop and a soap-bubble; Excess pressure across a curved film; Capillarity and angle of contact; Determination of surface tension across a curved surface.

Sound: Sound and waves; Velocity of sound; Ultrasonic.

Light: Behavior and nature of light; Reflection and refraction of light through plane and spherical surfaces; Optical instruments.

Heat and Thermodynamics: Different types of thermometers; Kinetic calculation of pressure, temperature and energy; Ratio of specific heats; Atomicity of gas molecules; Mean free path; Equation of state-Van der Waal's equation of state; Critical constants; Van der Waals constant; First and second law of thermodynamics; Different thermodynamic processes and their work done; Carnot cycle; Entropy.

Ph-1502: Physics – I (Sessional)
3/2 Hours/Week Credit: 0.75

Laboratory experiments based on Ph-1501

Ch-1501: Chemistry – I
3 Hours/Week Credit: 3.00

General and Inorganic Chemistry

Mass: Conversion of mass into energy; Mass number; Atomic mass unit; Mass defects; Decay of mass; Radioactivity; Half-life of radioactive elements; Binding energy; Atomic structure; Dalton's theory; Rutherford's atomic model; Bohr's atomic model; Quantum number; Pauli's exclusion principle; Spectra.

Chemical Bond: Electronic theory of valency; Electrovalency; Co-valency; Co-ordinate co-valency; Valence-bond theory; Molecular orbital theory; Co-ordination complexes; Chelate complexes; Periodic table; Periodic law; Classification of elements; Defects of periodic table; Application of periodic table; Oxidation number; Electro-negativity; Metal and Non-metals; Difference between metals and non-metals; Principles of metallurgy; Methods for extraction of metals.

Acids, Bases and Salts: Modern theories of acids and bases; Salts; Concept on pH; Buffer solution indicators.

Bleaching Agents: Introduction and general concept on bleaching agents: Ca(OCl)Cl, H_2O_2, HOCl, $NaClO_2$, SO_2.

Chemical Reactions: Isomeric transformation; Condensation Polymerization; Association; Dissociation; Decomposition; Synthesis; Metathesis; Neutralization; Hydrolysis; Aminolysis; Addition reaction; Pyrolysis; Chain reaction; Photo-chemical reaction; Exothermic reaction; Endothermic reaction; Electrophilic and nucleophilic reactions; Catalytic and induced reactions; Redox reactions.

Physical Chemistry
Kinetic Theory of Gases: Vander Waal's forces and equation.

Thermodynamics: First and second law of thermodynamics; Thermo-chemistry.

Chemistry of Dilute Solutions : Osmotic pressure; Van Hoff's theory of dilute solution; Raoult's law of vapor pressure lowering; Elevation of boiling point and depression of freezing point.

Homogeneous Equilibrium: Law of mass action; Thermodynamic derivation of law of mass action; Application of law of mass of action to chemical reactions; Heterogeneous equilibrium.

Chemical Kinetics: 1^{st} and 2^{nd} order reactions; Mathematical formulation of the 1^{st} and 2^{nd} order of reactions; Methods of determination of the order of reaction.

Colloids: Classification; Preparation; Properties and importance of colloids
Ch-1502: Chemistry – I (Sessional)
3/2 Hours/WeekCredit: 0.75

Laboratory experiments based on Ch-1501

HSS-1501: English Language – I
2 Hours/Week Credit: 2.00

Synonyms and antonyms; Affixes; Present tense verb forms, sentence fragments;
The writing process- from sentences to paragraphs, paragraph development, transitions, descriptive and narrative paragraphs.

Reading strategies and comprehension; Past and Future tense verb forms; Active and Passive; Words commonly confused; Subject – Verb agreement, word order, the subjunctive; Cause and effect; Comparison and contrast paragraphs.

HSS-1502: English Language – I (Sessional)
3/2 Hours/Week Credit: 0.75
Sessional based on HSS-1501

1st Year 2nd Semester

Sl. No.	Course No.	Course Title	Contact Hrs/Week	Credit
1	TE-1603	Polymer Engineering	3	3.00
2	Math-1503	Engineering Mathematics-II	3	3.00
3	Ph-1503	Physics-II	3	3.00
4	Ph-1504	Physics-II (Sessional)	3/2	0.75
5	Ch-1503	Chemistry-II	3	3.00
6	Ch-1504	Chemistry-II (Sessional)	3/2	0.75
7	HSS-1503	English Language-II	3	3.00
8	HSS-1504	English Language-II (Sessional)	3/2	0.75
		Total	**19.50**	**17.25**

Contact Hours: 15 (T) + 4.50(S) = 19.50
Total Credits: 17.25
No. of Theory Courses: 5
No. of Sessional Courses: 3

1st Year 2nd Semester Courses

TE-1603: Polymer Engineering
3 Hours/Week Credit: 3.00

Introduction to Fiber Polymers: Polymer, monomer, oligomer, repeating unit, degree of polymerization; History of polymer; Classification of polymers; Monomer, repeating unit & degree of polymerization of textile fibers; Importance of polymer science in textile field.

Chemistry of Polymerization: Introduction; Mechanism of chain polymerization-free radical polymerization, ionic polymerization, co-ordination polymerization; Mechanism of step polymerization-poly condensation, poly addition, ring-opening etc.; Polymerization of different textile fibers.
Kinetics of Polymerization: Introduction; Kinetics of free radical, cationic and anionic polymerization; Kinetics of non-catalyzed and acid catalyzed polycondensation; Extent of reaction and degree of polymerization.

Polymerization Techniques: Introduction; Factors and conditions of polymerization techniques; Features and techniques of liquid, gas and solid phase polymerization.

Molecular Weight and Size: Average molecular weight-number average, weight average, viscosity average & Z average molecular weight; Concept on number average & weight average molecular weight; Polydispersity and molecular weight distribution in polymers; Practical significance of polymer molecular weight; Determination of molecular weight of polymer.

Geometrical Structure of Polymer Molecules: Remarks on polymer microstructure; Microstructure based on chemical and geometrical structure; Tacticity; Configuration and conformation of polymer chains

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Crystallinity in Polymers: Introduction; Polymer orientation-crystalline and amorphous orientation; Degree of crystallinity, cristallisability and crystallization of polymer; Factors affecting crystallisability; Crystalllites; Spherulites; Effect of crystallinity on the properties of polymer.

Glass Transition Temperature: Introduction; Glass solids and glass transition; Transition and associated properties; Crystalline melting temperature; Glass transition temperature and molecular weight; Glass transition temperature and plasticizers; Factors influencing the glass transition temperature; Importance of glass transition temperature.

Polymer Degradation: Introduction; Types of degradation; Physical and chemical factors of polymer degradation; Thermal degradation; Photo degradation, Mechanical degradation; Oxidative degradation etc.

Polymer Processing: Introduction; Processing of textile fibers; Basic concepts melt, wet and spinning process; Requirements of polymers for various spinning.

Fiber Forming Polymers: Criteria of fiber forming polymers; Intra polymer bonding; Inter polymer forces of attraction; Effect of polymer attraction force on the properties of fiber.

Individual Polymers: Polyethylene; Polystyrene; Polyester; Polyurethanes; Polyvinyl alcohol; Polyvinyl chloride; Polyisoprenes; Silicone polymer.

Math-1503: Engineering Mathematics-II

3 Hours/week Credit: 3.00

Differential Calculus: Limit; Continuity and differentiability; Differentiation of explicit and implicit function; Significance of derivatives; Differential coefficient; Successive differentiation of various types of functions; Leibnitz's theorem; Indeterminate forms; L' Hospital's rule; Expansion of functions; Rolle's theorem; Mean value theorems; Taylor's theorem; Maclaurin's theorem; Lagrange's remainder theorem; Partial differentiation; Euler's theorem on homogeneous function; Maxima and minima; Tangent and normal; Curvature; Asymptotes; Curve tracing.

Integral Calculus: Definitions of integration; Integration by method of substitution; Integration by parts; Standard integrals; Integration by the method of successive reduction;

Definite integrals; Beta and gamma function; Length of curve; Area bounded by plane curves volume and surface area of solid of revolution; Multiple integration and application.

Ph-1503 Physics – II
3 Hours/week Credit: 3.00

Thermal Physics: Calorimetry; Newton's law of cooling; Specific heat of solid and liquid; Kinetic theory of gases; Thermal conductivity; Rectilinear; Cylindrical and spherical flow of heat; Heat flow through compound walls; Accretion of ice on ponds.

Oscillations and Waves: Oscillations; The simple harmonic wave equation and its solution; Composition of simple harmonic motion; Lissajou's figures; Wave motion; Types of wave motion; Expression for plane progressive wave; Energy calculation of stationary and progressive wave; Interference of sound wave; Beats; Doppler effect.

Optics: Interference; Huygen's principle; Young's experiment; Coherent sources and it's production methods; Analytical treatment of Interference; Interference due to thin films; Newton's rings; Diffraction; Fresnel and Fraunhoffer diffraction; Fraunhoffer diffraction by single and double slit; Plane diffraction grating; Resolving and dispersive power of a grating; Polarization; Polarization by reflection; Refraction and double refraction; Brewster's law and Malus law; Elliptical and circular polarization of light.

Electricity and Magnetism: Electrostatics; Electric charge; Electric force; Electric field; Coulomb's law; Gauss' law; Electric potential and their applications due to continuous charge distribution; Electric dipole and quadruple; Capacitance and capacitors; Magnetism; The magnetic field and flux; Magnetic force on a current carrying conductor; Hall effect; Biot-Savart law and Ampere's law and their applications.

Modern Physics: Classification of solids; Crystalline; amorphous; Ceramics and polymer; Different types of bonds in crystal and cohesive energy; Crystal structure; Different types of crystal structure; Simple cubic; Body centered cubic and face centered cubic crystal structure; Packing fraction; Miller indices and crystal plane; Defects in solids; Band theory of solids; Particle properties of wave; Quantum theory of light; Photoelectric effect; Compton effect; Pair production; X-rays diffraction; de Broglie waves; Atom model and hydrogen spectrum.

Ph-1504: Physics – II (Sessional)
3/2 Hours/Week Credit: 0.75

Laboratory experiments based on Ph-1503

Ch-1503: Chemistry – II
3 Hours/Week Credit: 3.00

Organic Chemistry
Basic concepts of organic chemistry;Classification of organic compounds and nomenclature.

Bonding of Carbon: Tetra-covalency of Carbon; Hybridization of atomic orbitals of carbon.

Isomerism: Structural isomerism; Chain isomerism; Positional isomerism; Functional group isomerism; Stereoisomerism like geometrical isomerism and optical isomerism.

Aliphatic Hydrocarbon: Preparation; Properties; Reactions and uses of Alkane; Alkene; Alkyne.

Derivatives of Aliphatic Hydrocarbons : General methods of preparation and important reactions of Alkylhalides; Mono, Di and Trihydric alcohol; Aldehydes; Ketones; Amines; Mono-Carboxylic acids and their halides; Esters; Anhydrides and Amides.

Aromatic Hydrocarbons: Kekule's structure of benzene; Orbital theory; Isomers and nomenclature; Orientation in benzene derivatives; Electrophilic Aryl Substitution; Aromaticity.

Derivatives of Aromatic Hydrocarbons: General methods of preparation and important reactions of Aromatic Amines and Amides; Aromatic sulphonic acids; Aromatic Aldehydes; Ketones; and Phenols.

Carbohydrates: Mono, Di and Polysaccharides.

Proteins: Classification and Properties of Amino acids.

Ch-1504: Chemistry – II (Sessional)
3/2 Hours/Week Credit: 0.75
Laboratory experiments based on Ch-1503

HSS-1503: English Language – II
3 Hours/Week Credit: 3.00

Prefixes and suffixes; Synonyms and antonyms; Phrases and idioms; Sentence structure; Grammatical principles and structures; Correction of errors; Transformation of sentences; Vocabulary

Precise Writing: Paragraph and its kinds; formation of a paragraph; Amplifications; Writing an essay and its kinds.

Letter Writing: Drafting private letters; Applications; Letters of complaint; Letters to the press; Apology and explanation; Request letters; Business letters; Planning your letters; Selecting formats; Using short-cuts; Evaluating letters.

Characteristics of Business Letters: Kinds of letter; Purposes of letter; Functions of first, middle and last paragraph (s); Characteristics and drafting process of positive letters, negative letters, persuasive letters, routine letters and memos.

Report Writing: Types of report; Characteristics and importance of different types; Purpose and scope; Different styles of writing reports- industrial, thesis/project report, etc.

Proposals: For new equipment; Increasing production; Description of visits; Experiments etc.

Explaining: Process explaining; Complaining; Reporting damage.

HSS-1504: English Language – II (Sessional)
3/2 Hours/Week Credit: 0.75

Sessional based on HSS-1503

2nd Year 1st Semester

Sl. No	Course No.	Course Title	Contact Hrs/Week	Credit
1	TE-2101	Yarn Manufacturing Engineering-I	4	4.00
2	TE-2102	Yarn Manufacturing Engineering-I (Sessional)	3/2	0.75
3	TE-2201	Fabric Manufacturing Engineering-I	4	4.00
4	TE-2202	Fabric Manufacturing Engineering-I (Sessional)	3/2	0.75
5	TE-2601	Fibrous Materials and Textile Physics-I	4	4.00
6	Math-2501	Engineering Mathematics-III	3	3.00
7	ME-2701	Engineering Materials	3	3.00
8	ME-2700	Workshop Practice (Sessional)	3/2	0.75
		Total	**22.50**	**20.25**

Contact Hours: 18 (T) + 4.50 (S) = 22.50
Total Credits: 20.25
No. of Theory Courses: 5
No. of Sessional Courses: 3

2nd Year 1st Semester

TE-2101: Yarn Manufacturing Engineering – I
4 Hours/Week Credit: 4.00

Short Staple

Introduction: Characteristics of fiber considered by a spinner; Quality characteristics of cotton fiber of different origins with their trade names; Influence of fiber properties on subsequent processes; Flow chart for the manufacturing of carded, combed, compact and rotor yarn; Machines used in short-staple spinning; Mixing and blending- definition, importance, basic elements of cotton fiber selection, information required for setting the cotton mix profile, basis steps for selection of cotton mix profile, factors influence the cotton mix variability; Bale management- definition, objects, methods; Fiber properties required for the production of various cotton yarn count; Purchase procedure of raw cottons

Blow Room: Goals of blow room; Different types of blow room lines; Basic operations involved in blow room; Opening- need for opening, type and degree of opening, intensity of opening, openness index; Cleaning- importance, possibilities for cleaning, grid and mote knives, influencing factors, degree of cleaning and resistance to cleaning, elimination of impurities; General factors affecting the degree of opening, cleaning and fiber loss; Blending- importance, evaluation of the blend, de-blending, blending procedure; Dust/waste removal- methods, filtering system, size of dust; Recycling of dirty waste; Transport of material; Control of material flow; Separation of heavy, foreign and other particles: schematic diagram, working principle; Fire elimination system; Causes and remedies of neps formation, excessive lint loss in blow room; Basic parameters in blow room process; Technological points in blow room; Feeding system to card- advantages & disadvantages chute feed and lap

feed, schematic diagram of chute feed; Clothing used for blow room beaters; Calculation- Waste%, Cleaning efficiency, Production.

Carding : Definition; Objects; Operating principles; Types of design- Basic considerations, Duo or tandem cards; Operating zones of the card; Material feed, Feed device to L-in, Auxiliary carding devices, Main cylinder, Flats, Doffing, Detaching; Machine drive; Card clothing- choice of clothing, classification; Coiling mechanism- objects, types, description; Auto leveling; basic, classification, principle of short-term, medium term & long term leveling; Maintenance; stripping, burnish, grinding, high performance maintenance system; Settings and their impact on the carding process- factors affecting the optimum card setting, setting procedure, hints for successful setting of card, gauges employed in card setting; Defects and remedies; Recent development; Calculation- Production, Neps removal efficiency, Mechanical draft, Actual draft.

Drawing: Introduction; Tasks; Operating principle; Operating devices- Creel, Drafting arrangement (requirements, influence on the draft, elements of drafting arrangement, types of drafting system, roller setting), Suction system, Coiling; Stop motion; Effects of draft and doubling on sliver quality; Drafting wave; Auto leveling- aims, classification, principles; Draw frame blending; Defects and remedies; Calculations- Surface speed of various parts (delivery, middle, back roller), Main draft, Back draft, Total draft, Production.

Long Staple

Introduction: Flow chart of jute manufacturing process; Godown price; Issue price & batch price; Batch & batching; Batch selection technique; Piecing out- pucca bales, kutcha bale, bale cuttings, habijabi& tangled jute; Batch composition.

Batching: Objects; Ingredients of batching emulsion; Role of ingredients; Preparation of emulsion; Automatic batch mixer machine; Amount of emulsion necessary for different types of jute; Method of application, distribution system; Roller softener machine; Cutting softener; Rope guillotine machine; Jute spreader machine- description, specification, advantages & disadvantages, clock length change & draft change; Emulsion metering unit; Softener cuttings feeder- description, advantages; Pile; Maturity of pile; Over batching & under batching; Quantity of raw jute in a pile; Calculations- Percent of emulsion added on the weight of raw jute, Dollop weight, Clock length, Draft, Delivery speed, Weight per 100 yards of delivery batched jute, Production& efficiency of spreader machine.

Carding: Objects; Methods of feeding; Types of cards; Breaker card- Machine description, Action of breaker card, Wire gauge setting of rollers, Card pinning, Drive, Breaker card clock gearing, Clock length, Dollop weight, Dollop feed, Change of dollop weight and clock length, Changeable pinion of breaker card; Finisher card- Machine description with schematic diagram, Feed arrangement, Wire gauge setting of rollers, Drive, Changeable pinion of finisher card, Speed balancing; Card pinning; Factors to modify carding action; Responsible factors for effectiveness of carding; Standard wire gauge blade; Setting of rollers; Pin projection and pin wire gauge; Pitch of pins and pin density; General operational technique- Cleaning procedure, Re-pinning, Cross blending; Waste teaser card; Cuttings teaser card; Cuttings finisher card; Sliver dispersal unit; Tendam arrangement; Suitable list of

dollop weight for different counts of yarn; Calculations- Dollop weight, Clock length, Draft, Delivery speed, Weight per 100 yards of delivery or feed sliver, Production & efficiency of carding (breaker/finisher) machine; Production balancing.
Manufacturing steps for woolen, worsted and silk yarn and their description.

TE-2102: Yarn Manufacturing Engineering – I (Sessional)
3/2 Hours/WeekCredit: 0.75

Short Staple

Bale management system; Draw schematic/material passage/gearing/motion transmission diagram of Bale opener/Automatic bale pucker (Uniflock/Blendomat), Pre-cleaner (Uniclean/Multifuction separator), Multi-mixer, fine cleaner (Uniflex/Cleanomat), Foreign fiber/heavy metal separator; Draw schematic/material passage/gearing/motion transmission diagram of carding machine and calculate draft, production, surface speed of taker-in, cylinder, doffer of carding machine; Draw schematic/material passage/gearing/motion transmission diagram of drawing machine and calculate draft, break draft, surface speed of back, middle & delivery roller, production.

Long Staple

Batch selection; Automatic machine for producing stable batching emulsion; Draw schematic/material passage/gearing/motion transmission diagram of jute softener, cutting softener, rope guillotine machine, jute spreader machine with explanation; Draw schematic/gearing diagram of breaker card, finisher card, waste teaser card; cuttings teaser card; cuttings finisher card; Draft calculation; dollop weight calculation; Wire gauge setting of rollers.

TE-2201: Fabric Manufacturing Engineering – I
4 Hours/Week Credit: 4.00

Weaving Preparation: Introduction & flow chart of weaving; Introduction to yarn preparation for weaving.

Winding: Winding requirements; Parallel, near-parallel winding & winding packages; Precision and non-precision winding; Types of yarn guide; Theory of yarn tensioning; Yarn tensioning devices; Traversing mechanism; Theory of balloon formation; Yarn withdrawal; Methods of driving the packages; Winding efficiency; Types of winding machine; Working principle of cone winding machine; Winding defects and remedies.

Warping: Techniques of warping- direct, sectional & ball warping system; Essential parts of warping machines and their functions; Types of warping creel; Function of V-wraith & lease yarn; Faults in warping and their remedies; Related calculations of direct & sectional warping.

Sizing: Introduction to sizing; Objectives of sizing; Sizing ingredients; Properties & uses of size film formers; Preparation, size cooking & classification of sizing methods and sizing machines; Features of sizing machine, machine elements & control points; Sizing variables; Sizing of blended and synthetic yarns; Comparative study of different techniques of sizing; Disadvantages of sizing; Recycling of size chemicals; Analysis of weaving performance of sized yarn; Methods of drying; Mechanism of size take up; Functions of lease rod; Scopes for

substitution of sizing operation; Defects in sizing and their remedies; The performance assessment and calculations related to sizing.

Preparation of Weaving Machines: Types & procedure of drawing-in; Denting, tying-in & gaiting; Classification of reed; Reed count &heald count; Selection of reed.

Knitting: Introduction and historical background of knitting technology; General terms and principles of knitting technology; Basic knitting needles and their knitting actions; Basic mechanical principles of knitting technology (knitting needles, knitting cams, sinkers, jack etc.); Methods of forming yarn into needle loops; Methods of feeding yarn to knitting machine; General features of knitting machine and functions of its different components, General arrangement of Cam system (raising cam, lowering or stitch cam, up throw cam); Elements of knitted loop structures; Basic weft knitted structures (plain, rib, interlock, purl).

Plain Circular Machine: Machine's description of plain circular latch needle knitting machine; Knitting action; Cam system; Sinker timing.

Circular Rib Machine: Description; Knitting action; Needle timing & related operation parameters; Needle and Cam arrangement for 1x1, 2x1, and 2x2 rib structures.

Circular Interlock Machine: Description; Knitting action; Interlock cam system and related operation parameters; Needle and cam arrangement for 1x1, 2x2, 4x4 interlock structure.

Purl knitting Machine: Description; Purl needle transfer action; Use of dividing cams; Use of spring loaded cams; Characteristic features of the knitted fabric.

Hosiery Machine: Hosiery machine drive; Control mechanism and sequences; Hosiery yarns; Mechanism for welts; Heel and toe production; Hosiery stitch control mechanism.

Flat Bed Knitting Machine: Yarn feeding system, Machine parameters; Operations; Knitting action; Cam arrangement; Fabric control during production.

Knitting Calculation: Calculation related to production and efficiency**.**

TE-2202: Fabric Manufacturing Engineering – I (Sessional)
3/2 Hours/Week Credit: 0.75

Weaving: Working principle & production of cone winding machine; Pirn winding machine; Direct warping machine; Sectional warping machine & modern sizing machine; Preparation of size solution & performance analysis.

Knitting: Study on different knitted loops, knitting element-needle, sinker & cam; Knitting action.

Machine study of plain, rib, interlock, purl circular and flatbed knitting machines including yarn to fabric path & knitting action and cam box.

Hosiery Machines: Hosiery machine drive, control mechanism, mechanism for welts, heel and toe production; Hosiery stitch control mechanism.

TE-2601: Fibrous Materials and Textile Physics – I
4 Hours/Week Credit: 4.00

Fibrous Materials

Introduction to Textile Fibers: Concept on textile fiber, fibril, textile fiber, raw material, filament, staple fiber etc.; Classification & properties of textile fibers; Source & type of different natural fibers; History of natural fibers; Application of textiles; Comparative study among natural fibers in terms of characteristics (chemical composition, molecule, repeating unit, X-sectional shape, moisture regain %, length to breath ratio, tenacity, elongation% etc.).

Cotton Fiber: Introduction; Geographical area of main cotton producing countries; Cultivation, harvesting & varieties; Concept on glucose, cellulose, cellubiose, pyranose ring, lint, linters, gin motes etc.; Chemical composition; Polymeric system; Fiber morphology- Micro & macro structure, microscopic appearance; Ginning; Physical & chemical structure and properties with explanation; Grading system; Organic cotton; Defects; End uses.

Jute Fiber: Introduction; Geographical area of main jute producing countries; Cultivation, harvesting, retting & varieties; Sorting; Chemical composition of jute allied fibers; Polymeric system; Jute grading system with characteristics; Physical & chemical structure and properties with explanation; Fiber morphology- Micro & macro structure, microscopic appearance; Defects; End uses- common & diversified uses**.**

Wool Fiber: Introduction; Geographical distribution of main wool producing countries; Chemical composition; Functional group of wool; Structure of poly peptide, wool molecule; Fiber morphology- Micro & macro structure, microscopic appearance; Polymeric system; Explanation of hydrogen bonding, cysteine linkage & salt linkage; Classification of wool; Grading system; Physical & chemical properties of wool with explanation; Physical structure of wool; Felting of wool; Process involved in wool processing; End uses.

Silk Fiber: Introduction; Geographical area of main silk producing countries; Sericulture; Life cycle of silk worm; Processing stages of raw silk- degumming, reeling, filature operation, shearing etc.; Types of silk; Chemical composition; Concept on fibrils, fibrilar bundles, fibroin & sericin; Functional group of silk; Fiber morphology- Micro & macro structure, microscopic appearance; Polymeric system; Physical & chemical structure and properties with explanation; Comparison of wool & silk structure; End uses;

Flax Fiber: Introduction; Geographical area of main flax producing countries; Physical & chemical properties with explanation; Fiber morphology- Micro & macro structure, microscopic appearance; Polymeric system; Processing stages; End uses.
Characteristics, end uses of hemp, ramie, sisal, kapok, hair, asbestos and others natural fibers.

Textile Physics

Physical Structure of Fibers: General introduction; Crystallinity and orientation; Approaches to polymer fiber structure; Basic concepts of methods for investigating fiber structure, e.g. X-ray diffraction, optical and electron microscopy infra-red absorption; Relations between fiber properties and structure of fiber.

Mechanical Properties: Tensile properties; Stress-strain curve; Modulus of elasticity; Plasticity; Work of rupture and work factor; Elastic recovery and work recovery; Creep-primary and secondary creep; Time and tensile testing; Stress relaxation; Basic method of tensile experiment; Factors determining the results of tensile experiment; Flexural properties; Flexural rigidity and determination of magnitude of flexural rigidity; Torsional properties; Shear modulus and torsional rigidity; Determination of torsional rigidity.

Frictional Properties: Friction-static and kinetic friction; Laws of static and kinetic friction; Coefficient of friction and limiting force of friction; Measurement of fiber friction; Effect of friction in textile processing; The friction of wool; Theory of the directional frictional effect; Effect of moisture regain and lubricant on frictional force; Effect of static and kinetic friction.

Effects of Moisture Absorption: Effect of water absorption on fiber-swelling; Change of fiber dimension; Measurement of swelling; Hydrophilic groups of fiber for moisture absorption; Absorption in crystalline and non-crystalline regions; Quantitative theories of absorption; Effect of moisture absorption on fiber properties.

Optical Properties: Optics; Reflection and refraction of light; Refractive index and birefringence; Measurement of refractive indices and birefringence; Refractive index, density and swelling; Birefringence and orientation; Absorption and dichroism; Optical properties of textile materials; Reflection and luster; The general effect of fiber cross-sectional shape upon luster; Factors influence the luster of textile material; Reduction of luster of synthetic fiber.

Thermal Properties: Introduction; Thermal conductivity; Thermal expansion and co-efficient of thermal expansion; Thermal expansion and contraction of textile fiber; Thermodynamic equation of deformation; Specific heat and its variation with temperature; Energy changes associated with changes of state including transition temperature of fibers; Structural changes in fibers on heating; Heats of sorption-heat of absorption and heat of wetting; Effect of evolution of heat; Heat setting; Mechanism of heat setting of thermoplastic fibers; Technical importance and characteristic features of fiber due to heat setting; Effect of thermal transition on heat setting of thermoplastic fibers.

Math-2501: Engineering Mathematics – III
3 Hours/Week Credit: 3.00

Vector Analysis: Definition of scalar and vectors; Vector algebra; Cross product; Triple product and multiple products; Angle between planes and line of intersection; Differentiation and integration of vectors together with elementary applications; Definitions of line; Surface and volume integrals; Gradient of a scalar function; Divergence and curl of a vector functions; Various formulae; Green's theorem; Stoke's theorem and gauss's theorem.

Two Dimensional Co-ordinate Geometry: Transformation of coordinates; Pair of straight lines; Circle; System of circles; General equation of second degree parabola; Ellipse; Hyperbola in Cartesian and polar coordinates.

Ordinary Differential Equations: Formation of differential equation; Differential equation where variables are separable; First order homogeneous equation; Equation reducible to homogeneous form; First order linear equation; Clairaut's form; One variable absent; Exact differential equation; General linear equation of second order with constant coefficients; Solution of homogeneous linear equations; Series solution and applications.

ME-2701: Engineering Materials
3 Hours/Week Credit: 3.00

Definition of stress and strain; Various types of stress and strain – tensile, compressive, shear, Calculation of various stress; Mohr's circle of stresses.

Hook's law of elasticity; Definition of modulus of elasticity and rigidity; Analysis of typical tensile strain curve for a ductile material showing yield points, breaking point, yield stress and ultimate stress; Poison's ratio.

Springs; Types of spring; Closely coiled spring; Spring subjected to axial loads and axial twist; Open coiled spring.

Columns and strut; Buckling of column; Euler's column theory; Euler's crippling load for column; Ranking's crippling load for column; Eccentric loading on column.

Mechanical properties of iron and steel; Strain; Energy and resilience; Breaking energy and toughness; Repeated loads and fatigue; Hysteresis; Endurance limit; Time effect; Creep and relaxation of stresses; Hardness and its methods of measuring; Structure and properties of wood; Alloys of metals and their properties; Material in hostile environment (high temp., sub-normal temp. and corrosion).

ME-2700: Workshop Practice (Sessional)
3/2 Hours/Week Credit: 0.75

Identification and use of hand-tools and measuring instruments; Reamers; Taps and dies; Bench vice and carpentry tools; Makings of models.

Identification, use and practices on lathe, drill, grinder, shaper, planner, circular saw and milling machine.

Sheet metal work – Cutting of sheet material to make some useful objects.

Metal joining processes – Soldering, brazing, riveting, Gas welding and electric arc welding.

Heat treatment of steel such as annealing, normalizing, quenching tempering and surface hardening; Sand moulds, core moulding; Pattern for casting; Sand casting.

2nd Year 2nd Semester

Sl. No.	Course No.	Course Title	Contact Hrs/Week	Credit
1	TE-2103	Yarn Manufacturing Engineering-II	4	4.00
2	TE-2104	Yarn Manufacturing Engineering-II (Sessional)	3/2	0.75
3	TE-2203	Fabric Manufacturing Engineering-II	4	4.00
4	TE-2204	Fabric Manufacturing Engineering-II (Sessional)	3/2	0.75
5	TE-2603	Fibrous Materials and Textile Physics–II	4	4.00
6	TE-2600	Application of Computer in Textile-I (Sessional)	3	1.50
7	ME-2703	Basic Mechanical Engineering	3	3.00
8	ME-2704	Basic Mechanical Engineering (Sessional)	3/2	0.75
9	Math-2503	Statistics	3	3.00
		Total	**25.50**	**21.75**

Contact Hours: 18 (T) + 7.50 (S) = 25.50
Total Credits: 21.75
No. of Theory Courses: 5
No. of Sessional Courses: 4

2nd Year 2nd Semester

TE-2103: Yarn Manufacturing Engineering – II
4 Hours/Week Credit: 4.00

Short Staple

Lap Former: Function, Features of modern lap former machine; Different types of lap former; Scenario of fiber hook from card to comber; Aspects of lap quality; Factors influencing lap characteristics & hairiness; Description of drafting units; Draft amount; Roller setting; Calculations- Surface speed of various parts (delivery, middle, back roller), Main draft, Back draft, Total draft, Production.

Comber: Objects of the combing process; Benefits of combing; Sequences of combing operations; Parameters influencing the combing operation; Influence of the feed stock on combing system, Modern preparation system (sliver doubling system); Influence of combing operation on quality; The noil extraction; The quality of the combing operation in forward and backward feeding; The influence of machine components and settings on combing operations; Drafting arrangement; Sliver coiling system; Automation in the combing section; Causes & remedies of too many neps, higher Um% in the sliver; Calculations- Surface speed of various parts (delivery, middle, back roller), Main draft, Back draft, Total draft, Nips/min, Waste%, Production.

Roving Frame: Objects of roving frame; Main components of roving frame; Description of different types of drafting systems, Arrangement and distance setting of drafting elements; Amount and distribution of draft, Objects of using condenser, distance clip, false twister in roving frame; Principle of twist insertion; Amount of twist for different roving hank & materials; Principle of winding; Bobbin building mechanism; Roving tension; Process parameters in roving frame; Block creeling& piecing; Changeable gears and their impacts; Calculations- Surface speed of various parts (delivery, middle, back roller, flyer), Main draft, Back draft, Total draft, Twist, Teeth of changeable pinion & pulley (DCP, TCP, Motor & machine pulley etc.), Production, Efficiency, Faults & remedies etc.

Ring Frame: Introduction; Functions and mode of operation; Structural configuration-Machine components, Bobbin creel, Drafting system-influence on quality and economy, conceptual structure of the drafting system, spinning geometry, spinning triangle, Top rollers, Pressure roller loading, Fiber guidance devices; Spindle- thread line, spindle structure, spindle bearing, influence of spindle on spinning process; Spindle drive- types, 4-spindle tape drive, tangential belt drive; Thread guide devices- thread guide, anti-ballooning device, separator; Ring- importance, features, requirements, shape, ring material; Ring traveler- task, types, shape, traveler material, traveler mass & number, traveler clearer, Winding of cops-build of cops, cops shape, winding process, winding mechanism, winding forming the base, motor powered cop formation, force and tension relationships during winding by using travelers; Automation, Doffing, Waste extraction, Causes and remedies of end breakage, Limitations; Calculation-Surface speed of various parts (front roller, middle roller, spindle, traveler etc.), Draft, Twist, Teeth of changeable pinion & pulley (DCP, TCP, motor & machine pulley etc.), Production, Efficiency etc.

Compact Spinning: Principle of compact spinning, Comparison of ring and compact spinning, Advantages and limitation, Compact yarn quality.

Winding: Objects; Waxing process; Yarn faults and clearing; Types of electronic yarn clearers; Yarn clearer settings; Fault channels and fault classification; Splicing; Different types of winding package; Winding package defects and their remedy.

Long Staple

Drawing Frame: Definition & objects of drawing& doubling; Reach & nip; Types of drawing frame; Drafting system; Push bar first drawing frame; Double thread screw gill second drawing frame; Screw gill triple thread finisher drawing frame; Arrangement of drawing & doubling; Pitch of faller and pitch of screw; Percent lead; Suitable drafts and roller settings; Sliver weight at delivery of different machine; Faller bar propelling mechanism; Importance of roller pressure; Can driving & tramping arrangement; Size of sliver can; Desirable features of drawing frame; Changeable gear and pulley in draw frame; Calculation- Surface speed of various parts (fluted feed roller, back roller, delivery roller etc.),Faller bar lead%, Faller bar drops per minute, Draft, Draft constant, Teeth of changeable pinion & pulley (DCP, speed change pinion etc.), Sliver weight of feed & delivery, Production, Efficiency etc.

Spinning Frame: Grist and twist; Structural configuration of the flyer spinning machine; Description of slip draft, gill and apron draft spinning machine; Types of drafting system; Pitch; Bobbin traverse; Bobbin sizes; Inverted breast plate; Drag; Bobbin building mechanisms; Winding on revolution and winding on motion; Builder traverse motion; Back dropping & ends down; Twisting; Twist factors; Disturbance of twist; Balanced & unbalanced yarn; Amount of twist necessary in jute yarns; Relationship of twist, yarn count and twist change pinion; Relationship of draft, yarn count and draft change pinion (DCP); Calculation- Surface speed of various parts (flyer, bottom roller, retaining roller etc.), Draft, Draft constant, Teeth of changeable pinion & pulley (DCP, TCP, speed change pinion etc.), Yarn count, Production, Efficiency etc.

Winding: Spool winding- Principle motions of spool winding, automatic stop motion, Diameter of spool, Defects in spool; Cop winding- Adjustment of cop length & diameter.

TE-2104: Yarn Manufacturing Engineering – II (Sessional)
3/2 Hours/Week Credit: 0.75

Short Staple

Draw schematic/material passage/gearing/motion transmission diagram of lap former, Drafting arrangement of lap former; Draw schematic/material passage/gearing/motion transmission diagram of comer, Drafting arrangement & combing operation of comer; Draw schematic/material passage/gearing/motion transmission diagram of roving frame, Drafting arrangement, draft calculation of roving frame; Calculation of required teeth of changeable gears (DCP, TCP, DCCP, TCCP, LCP, rachet etc.) for processing a particular roving hank in roving frame, Bobbin building mechanism and twisting mechanism of roving frame; Draw schematic/material passage/gearing/motion transmission diagram, drafting arrangement &

draft calculation of ring frame; Delivery, middle, back roller & spindle speed calculation from gearing diagram; Bobbin building mechanism and twisting mechanism of ring frame; Calculation of required teeth of changeable gears (DCP, TCP, DCCP, TCCP, LCP, rachetetc) for processing a particular count in ring machine.

Long staple

Schematic/material passage/gearing/motion transmission diagram, drafting arrangement, draft calculation and coiling mechanism of draw frame-I, draw frame-II; draw frame-III; Calculation of required teeth of changeable gears (DCP, DCCP etc.) for processing a particular sliver hank in draw frame-I, draw frame-II; draw frame-III machine; Draw schematic/material passage/gearing/motion transmission diagram, drafting arrangement, draft calculation, winding mechanism of jute spinning frame; Calculation of required teeth of changeable gears (DCP, TCP, DCCP, TCCP etc.) for processing a particular count in slip draft/apron draft spinning machine; Schematic/material passage/gearing/motion transmission diagram of spool & cop winding machine.

TE-2203: Fabric Manufacturing Engineering – II
4 Hours/Week Credit: 4.00

Weaving Mechanism: Chronological development of loom; Basic principle of weaving; Classification of loom; Types of loom; Basic loom motion; Loom drive and brakes.

Shedding: Geometry of shed; Shed characteristics; Different types of shed; Types of shedding mechanism; Crank shedding; Negative & positive tappet shedding; Construction of shedding tappet.

Dobby Shedding: Scope and classification of dobby; Conventional dobby mechanism; Electronic dobby & electronic shedding mechanism; Limitation of tappet & dobby shedding.

Jacquard Shedding: Scope; Types and Basic principle of Jacquard shedding.

Picking: Types of conventional picking; over picking, under picking; Calculation the velocity of weft inserting element, energy of picking, picking force& time for picking; Picking faults.

Shuttleless Weaving: An elementary idea on Projectile, air jet, water jet, rapier weaving machine; Special features of these machines.

Beating : Principle of crank and crank arm beating; Effect of crank arm and crank length; Sley eccentricity and its effects; Mechanism of cam beat-up, link beat-up & special beat-up; Forces involved in beating action.

Take-up and Let-off: Classifications of Take-up & let-off; Calculation of take-up constant from 5-wheel & 7-wheel take-up; picks/cm and rate of let off; Electronic take-up & electronic let-off mechanism; Necessary calculation.

Knitting: Study on weft knitting machines – Fabric machine, garment length machine.

Stitches Produced by Varying the Timing of Intermeshing: Held, tuck, miss/drop stitch formation technique & their uses; Notation diagram, cam & needle arrangement for single jersey derivatives.

Straight Bar Frame: Features, knitting elements, operations, knitting actions, advantage & disadvantage.

Basic Warp Knitting Principles: Terminology mechanism and classes of warp knitting machinery; Different components of warp knitting machine and their role (guide bar, needle bar, sinker bar, take up roller, yarn delivery, form of yarn delivery to warp knitting m/c., chain link and pattern drum mechanism); Lapping movement of guide bar (swinging and shogging motion); Basic overlap-underlap variations of guide bar; Basic stitches of warp knitting technology and their influences to fabric structure.

Tricot and Raschel machines; Knitting cycle of bearded needle; Tricot and single needle bar Raschel machines; Compound needle warp knitting machine; Crochet machine; Warping for warp knitting;

Tricot two full set guides bar m/c and its product; Rules for product. Rules for locknit, tricot, sharkskin etc. Fabric production; Surface interest, relief and open work fabrics; Calculations related to weft and warp knitting.

Laying in Warp Knitting: General rules; Fall plate patterning; Full width weft insertion; Cut presser and miss-press structures. Aspects of knitting science – loop shape and loop length control; Yarn let-off; Weft knitted fabric relaxation; Knitted fabric geometry; Tightness factor; Robbing back.

TE-2204: Fabric Manufacturing Engineering – II (Sessional)
3/2 Hours/Week Credit: 0.75

Weaving
Mechanism of loom drive; Tappet shedding; Dobby shedding; Jacquard shedding; Crank beat-up; Cam beat-up; Conventional & electronic let-off & take-up.

Knitting
Stitches Produced by Varying the Timing of the Needles: Held, truck, miss/drop stitch formation technique; Notation diagram; Cam & needle arrangement for single jersey derivatives;

Straight Bar Frame: Knitting elements, operations & knitting actions.
Warp Knitting: Study on guides, guide bar, lapping movement, pattern mechanism and chain links; Machine parts, knitting element and knitting action of tricot, raschel, & crochet warp knitting machine; Let-off mechanism of warp knitting machine.

TE-2603: Fibrous Materials and Textile Physics – II
4 Hours/Week Credit: 4.00

Fibrous Materials

History of Man-made fibers, Classification of Man-made fibers (Concept of Chemical, Regenerated and Chemical Fibers) and their generic coding system, General principles of production processes (Polymerization, Poly-condensation and Poly-addition; Spinning-Dry

spinning, Wet spinning; Spinnerets; Drawing; Texurization; Twisting), Most important Fiber Raw Material's structures and their properties, Types of different orientation system (LOY, POY, HOY, MOY) and their typical spinning speed; Typical twist values for different single yarn continuous filament, World manmade fibre production volume and consumption, Points to be considered before going to produce a new commercial manmade fiber.

Definition and classification of Chemical fibers and regenerated fibers.

Regenerated Fibers: Technologies of formation of regenerated fibers, Types of regenerated cellulose fiber, Viscose fiber production, Different types of Viscose and acetate rayon and their properties.Understanding the three generations of viscose fiber (conventional viscose rayon, Modal and Lyocell (Tencel), Technical advantages of NMMO-process, Comparative performances of regenerated cellulose fibers, Innovative applications of regenerated cellulose fiber, different types of regenerated protein fibers and their respective physical and chemical properties.

Polyester Fibers: Raw materials of polyester fibers, Production of ethylene glycol, ethylene oxide from ethylene, ethylene glycol from ethylene oxide, Flow chart for TPA and DMT route, Technical aspect of polyester fiber manufacturing, Forms of different commercial polyester fibers and their respective applications. Physical and chemical properties of polyester fiber and fiber identification.

Polyamide Fiber: Raw materials for polyamide fiber**,** Nomenclature of fiber, chemical structure, physical structure, Difference between Nylon 6,6 and Nylon 6, Fiber manufacturing process, properties of fiber and fiber identification.

Acrylic Fibers: Raw materials, chemical structure, physical structure, Fiber manufacturing, Fiber properties and end use applications.

Polyurethane Fibers: Polyurethane fiber formation and its structural analysis, Two step and one-step process, Raw materials, Reactions of isocyanates, the order of reactivity of isocyanates with compounds containing active hydrogen, Spandex fiber, Spandex structure, chemical composition of hard and soft segment, Fiber manufacturing, Fiber properties and end use applications, identification of fiber

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Polypropylenes; PVA; PVC and Elastomeric fibers.

High Performance Fibers: Concept of high performance fiber, different types Glass, Aramid, Carbon, Metalic , and Multicomponent fibers and their chemical composition, properties and end use applications.

Present trends of chemical fibers production and their economic and social aspects.

Textile Physics

Electrical Properties: Electronic properties of solids; Conductors and insulators; Capacitance; Di-electric constant; Effect of moisture; Measurement of di-electric constants of fibers, yarns and fabrics.

Static Electricity Formation: Theories of static electrification; Measurement of static charge; Explanation of the phenomenon of static electrification in textile; Its effect and remedies in textile processes.

Textile Yarns: Introduction; Interrelations between the structure and properties of fibers, yarns and fabrics; Definition of yarn; Classification of yarns; Yarn designation; Yarn Twist; Direction of twist; Amount of twist; Level of twist; Fabric appearance and twist direction; Yarn twist and fabric properties; Determination of twist

Mechanical Properties of Yarns: Introduction; Mechanical properties; Tensile properties; Analysis of tensile behavior of continuous filament yarn; Limitations of Platt's low strain equation; Modification of Platt's low strain equation; Theoretical model of yarn; Analysis of large extension of yarns or geometry of large strains; Relation of filament extension to yarn extension; Effect of fiber length, strength and fineness on yarn properties;Effect of twist on the structure and properties of yarns

Yarn Geometry: Assumption of idealized yarn geometry; Basic geometry of twisted yarn; Derivation of equation for yarn count, twist angle and twist factor from idealized yarn geometry; Optimum Twist Factor; Twist contraction; Contraction factor; Retraction factor; Derivation of equation for contraction and retraction factor; Determination of limits of twist; Twist and fiber packing in the yarns; Open packing; Hexagonal close packing; Deviations from ideal forms; Concentrating factors; Disturbing factors; Packing fraction or packing density; Specific volume of yarn; Derivation of yarn diameter- For staple yarn, For Filament yarn; Relation of yarn twist, diameter and twist angle.

Fiber Migration: Defects of idealized helical yarn geometry; Fiber Migration; The parameters on which fiber migration depends; Ideal migration; Measurement of migration; Tracer fiber technique; Effect of tension on fiber migration; Condition of migration to occur; Fiber migration in ring spinning; Structural properties of rotor yarn.

Fabric Geometry: Geometry of plain woven fabrics; Calculation knowing crimp ratio and thread spacing; Geometry of jumped conditions; Crimp interchange; Effect of yarn flattening; Deformation of fabric; Application of cloth geometry; Tensile testing; Geometrical change during extension of fabrics; Fabric buckling, shear and drape; Geometry of plain knitted structure; Engineering design of fabric to meet specific mechanical properties; Prediction of tensile properties of fabrics;Cover factor; Fractional cover; Total cover.

TE-2600: Application of Computer in Textile – I (Sessional)
3 Hours/Week Credit: 1.50

General programming principles used in developing business and Textile applications of computers (Payroll, stock control, whole sale, retailing etc.); Series of structure on C-language: System analysis, system design; Documentation and planning; Critical path analysis, linear programming; Understanding the process simulation & its usefulness in textile process; Simulation techniques; Application of Mini Tab, SPSS, MATLAB; Concept of fuzzy tool box; Image processing toolbox etc.; Automation in weaving & knitting; Preparation of weaving CAD using suitable software; Use of bale management software, Principles of Uster Tester software; Use of available textile related software.

ME-2703: Basic Mechanical Engineering
3 Hours/Week Credit: 3.00

Thermodynamics and Heat Transfer: Fundamental concepts and definitions; Revision of gas laws; Properties of perfect gas and steam; Laws of thermodynamics; Thermodynamic process and cycles; Thermodynamics of steam generation, Boilers.

Basic refrigeration cycle & Air conditioning: Application of refrigeration & air conditioning; Vapor compression refrigeration & absorption refrigeration; Classification of air conditioning system; Cooling load calculation.

Internal combustion engines: Diesel and Petrol engine.

Hydraulics : Properties of fluids; Pressure head of a liquid; Pressure gauges; Flow of fluids; Bernoule's equation; General energy equation for steady flow; Head loss due to friction in a pipe.

Turbo machineries: Fan; Compressor**;** Pump.

Transmission of motion and power: Belt, Ropes, Chains, Gears and gear trains.

Conversion of motion: Shedding; Tappets and cams.

Types & application: Keys and couplings; Journal; Ball and roller bearings.

ME-2704: Basic Mechanical Engineering (Sessional)
3/2 Hours/Week Credit: 0.75
Sessional based on ME-2703

Math-2503: Statistics
3 Hours/Week Credit: 3.00

Mathematical Methods: Laplace transforms; Fourier series and Fourier transform.

Statistics
Historical development of the subject; Collection of data – Primary data and secondary data; Presentation of data – Tabular and diagrammatic.

Frequency Distribution: Grouped frequency distribution and their presentation in the form of frequency polygon and histogram.

Measures of Central Tendency: Mean; Arithmetic Mean, Geometric Mean, Harmonic Mean; Median; Mode; Definition; Computation; Advantage; Disadvantage and uses.

Measures of Dispersion: Absolute measure; Range; Mean deviation; Quartile deviation; Standard deviation; Relative measure; Co-efficient of variation; Definition; Computation and uses.

Moment, Skewness and Kurtosis: Definition, Computation and uses.

Probability: Simple idea of probability; Different definitions related to probability; Addition law of probability for mutually exclusive and not mutually exclusive events; Multiplication law of probabilities for dependent and independent events; Calculation of successive probabilities using addition law and multiplication law of probability; Probability distribution: Binomial, Poission; Simple idea about normal distribution and its probability curve.

Estimation: Simple idea about estimation.

Correlation and Regression: Correlation – Ideas of correlation; Measurement of correlation; Pearsonian correlation co-efficient and spearman's Rank correlation co-efficient; Multiple

correlation; Regression–Ideas about simple regression; Equation of the regression line; Estimation of the parameters of the regression line.

Test of Significance: Some definitions related to test of significance; T- test–(a) Comparison of a sample mean with a know population mean when S.D. is known and when S.D. is not know, (b) Comparison of two sample means when S.D. is known and also when it is unknown, (c) Paired t – test, its practical use in Textile Industry. X^2 test – Simple application and its practical use in Industry.
Time Series: Definition; Characteristics and components.

Sampling: Definition of population; Sample; Parameter; Census etc.; Simple random sampling; Stratified random sampling; Their definition; Computation; Use; Advantage and disadvantage.

Design of Experiment: Basic principles of experimental design; Ideas about CRD, RBD and LSD.

3rd Year 1st Semester

Sl. No.	Course No.	Course Title	Contact Hrs /Week	Credit
1	TE-3301	Wet Processing Engineering-I	4	4.00
2	TE-3302	Wet Processing Engineering-I (Sessional)	3/2	0.75
3	TE-3401	Apparel Manufacturing Engineering-I	4	4.00
4	TE-3402	Apparel Manufacturing Engineering-I (Sessional)	3/2	0.75
5	TE-3600	Application of Computer in Textile-II (Sessional)	3	1.50
6	TE-3801	Human Resource & Industrial Management	4	4.00
7	TE-3803	Engineering Economy	3	3.00
8	CSE-3701	Computer Applications and Programming	3	3.00
9	CSE-3702	Computer Applications and Programming(Sessional)	3/2	0.75
		Total	**25.50**	**21.75**

Contact Hours: 18 (T) + 7.50 (S) = 25.50
Total Credits: 21.75
No. of Theory Courses: 5
No. of Sessional Courses: 4

3rd Year 1st Semester

TE-3301: Wet Processing Engineering – I
4Hours/Week Credit: 4.00

Water: Water and its importance in wet processing; Sources of water; Water quality for boiler & dye house; Water hardness; Methods of expressing hardness; Properties of hard water; Consequences of using hard water; Methods of softening hard water; Sequestering agents, types, sequestration chemistry; formation constant; Estimation of water hardness.

Soaps & Detergents: General concepts of soaps & detergents; Properties & classification of detergents; Surface activity and micelle formation; Emulsification, detergency and wetting; Hydrophilicity and hydrophobicity; HLB value; CMC value.

Pretreatment

Singeing: Importance & scope of singeing; Types of mechanical singeing (plate, roller & gas); Control parameters of gas singeing; Concept on enzyme application for chemical singeing; Comparison between mechanical & chemical singing.

Desizing: Necessity of desizing; Mechanism of removal of size materials; Classification of desizing- hydrolytic & oxidative; Enzymatic desizing& its optimum conditions; Classification of enzymes for desizing and desizing efficiency of enzymes; Continuous desizing process; Desizing of synthetic fibers & blends; Measurement of desizing efficiency.

Scouring: Description of natural impurities of cotton fiber with chemical constitutional difference among them; Removal of impurities by scouring, steps of mechanism; Comparison of conventional scouring & bio-scouring; Scouring of natural & manmade fibers; Estimation of scouring effect; Fiber damage due to scouring.

Bleaching: Importance of bleaching; Bleaching agents & their scopes of dissociation; Application of oxidative & reductive bleaching agents; Bleaching of natural & manmade fibers; Hydrogen peroxide- its properties & use in bleaching textiles; Function of peroxide killer; Bleaching process (batch, semi continuous & continuous process); Strength measurement of Bleaching agents-Estimation of available chlorine in bleaching powder, strength of hydrogen peroxide; Fiber damage due to bleaching; Measurement of whiteness and brightness of bleached fabric.

Technology of Dyeing

Color: Elementary concepts on color; Primary, secondary & tertiary color; Theory of color mixing; Dimension of color- hue, value &chroma; Color & chemical constitution (Chromophore&Auxochrome theory); Modern theory (Resonance & molecular orbital theory) of color.

Dyes & Pigments: Definition of dyestuff; History of dyes & dyeing; Properties & classification of dyestuffs; Nomenclature of dyes; Selection of dyes; Pigments and their classifications; Difference between dyes and pigments.

Dyeing: Elementary concepts on dyeing; Consequences of woven, knit, yarn, denim and garment dyeing; Different types of dyeing processes (loose fiber stocks, yarn- packages & hanks, fabrics, garments); Methods of dyeing (continuous, semi-continuous and exhaust process); Dyeing auxiliaries & their functions; Important terms used in dyeing (exhaustion, affinity, substantivelity, absorption, adsorption, sorption, desorption, dye migration, fixation).

Dyeing Machineries: Basic features of dyeing machines; Machineries used for continuous, semi-continuous and discontinuous dyeing process; Introduction to energy efficient dyeing machines.

Application of Different Types of Dyes

Direct Dye: Properties of direct dyes; Classification according to dyeing characteristics & chemical constitution; Substantivity of direct dyes to cellulosic fibers; Methods of direct dyeing with chemistry; The effects of variations in dyeing conditions (temperature, liquor ratio, pH etc.); Reasons for lower wash fastness; Improvement of wash fastness of direct dyes by after treatment; Problems in direct dyeing; Stripping of direct dye.

Acid Dye: General description of acid dyes; Classification according to chemical structure & dyeing characteristics; Application of acid dyes for wool, silk & nylon; The effects of variations in dyeing conditions (temperature, liquor ratio, pH, salt etc.); Mechanism of dyeing wool & nylon fiber with acid dye; Improvement of dye exhaustion in nylon fiber.

Basic Dye: Chemical structures of basic dyes; Dyeing of acrylic & jute fiber with basic dyes; Nature of affinity to cotton & wool fibers; The effects of varying the concentration of the retarder on dyeing of acrylic fibers; Problems in dyeing acrylic fibers with basic dyes.

Vat Dye: Properties of vat dye; Classification of vat dye based on chemical structure & method of application; Principles of application of vat dyes- vatting& dyeing; Steps & conditions of vatting; Dyeing cotton with leuco vat dyes; After treatment of vat dyeing; General properties of solubilized vat dye, substantivity to textile materials; Classification & dyeing process of solubilized vat dye; Fastness properties of vat & solubilized vat dyes; Stripping of vat dye.

TE-3302: Wet Processing Engineering – I (Sessional)
3/2 Hours/Week Credit: 0.75

Measurement of temporary & permanent hardness; Mechanical and chemical singeing of textile materials; Enzymatic desizing of fabrics; Conventional and bio-scouring of textile materials; Estimation of scouring effect; Bleaching of textile materials with convenient bleaching agents; Estimation of available chlorine in bleaching powder; Measurement of strength of H_2O_2; Dyeing of cotton & jute fiber with direct dye; Improvement of wash fastness of direct dye; Dyeing of wool & nylon fiber with acid dye; Dyeing of jute & acrylic fiber with basic dye; Dyeing of cotton fiber with vat dye.

TE-3401: Apparel Manufacturing Engineering – I
4Hours/Week Credit: 4.00

Introduction: Brief introduction of the clothing industry; Structure and historical development of apparel industry in Bangladesh; Garments terms and definitions; Garments manufacturing sequences;

Pattern drafting: Pattern construction principles and style development for the lower and upper body.

Pattern cutting: Fit and Measurement- body shape related to age, sizing and ranges for global production

Skirt Block: Manipulation of the block through seams; pleat creation-knife, accordion, dior, inverted, box; shaped pleats; pleat stays; linings; waistline shaping and accessories; developing toile from flat pattern.

Trouser Block: Trousers; utility wear; fashion; ladies; gents; children's; trouser shapes eg flares, straight, tapered; yokes; pockets.

Bodice Block: Manipulation of the block through seams; dart movement; necklines and fullness; developing toile from flat pattern.

Sleeve Block: Shapes and types.

Necklines: Collar reveres; opening and fastening.

Dress and Shirt Styles; Jackets and Coats- casual and tailored.Cutting for different fabrics.Tolerance.

Marker Making: Definition of Marker efficiency; Objectives, constraints, methods, drawing, duplicating and wastage in marker making; Marker utilization variation; Fabric loss outside & inside of marker.

Fabric Spreading: Requirements; Fabric packages; Methods, machines and splices of fabric spreading.

Fabric Cutting: Requirements; Methods (Computerized and manually technique), Machineries and quality in cutting; Factors considered for choice of cutting**.**

Interlining: Definitions; Advantages of fusible interlining; Conditions of fusing, properties of fusible interlining; Methods of coating; Fusing machineries; Types of fusible interlining; Quality control in fusing; fusing performance analysis.

Material Management in the Clothing Production: Principle of purchasing; Fabric utilization variation; Control of material wastage; Manufacturing resource planning; Production engineering; Production engineering; Cost control; Total quality control; Production and people training; Material handling and transportation system of garment components advances study on scheduling in cutting room.

TE-3402: Apparel Manufacturing Engineering – I (Sessional)
3/2 Hours/Week Credit: 0.75

Standard body measurement (women, man & children); Practice for taking measurement on dress form (T-shirt, Shirt, Pants etc.); Development of pattern based on anthropometric data (T-shirt, Shirt, Pant etc.); Pattern grading for different components of garments; Calculating the manual marker efficiency for different garments; Attaching different types of interlinings (sewn, fusible); Cutting operation of fabric using different cutting machines-straight knife, round knife;

TE-3600: Application of Computer in Textile – II (Sessional)
3 Hours/Week Credit: 1.50

Potential of IT in Textile Manufacturing, need and framework of IT use in textile; Basic elements of IT in textile mills, past and present IT in textile mills; Basic use of computer applications as used by Textiles & Clothing industry specifically Adobe Photoshop and Illustrator; Understand basic use of Production Database Management and Excel software; Use of computer in textile processing (machine/process control; Use of data color software in textiles; Dye recipe formulation, quality control, color matching, mixing ratio formulation etc.); Use of garments CAD software (Rich Peace, Lectra, Garber, Bokecad); Digitizing

process; Develop basic Computer Aided Design (CAD) skills with application of pattern making; Apply basic CAD skills to creating a marker for garments.

TE-3801: Human Resource & Industrial Management
4Hours/Week Credit: 4.00

Management and Organization: Concept of management and industrial management; History and different period of management; Scope of industrial management; Different level of managers and their respective responsibilities; Flexible knowledge based resources in industrial management; Development of modern industrial organization; Scientific management; Functions of an industrial undertaking organization- development, structure, differentiation and integration.

Personnel Management: Concept of human resource management and its range of functions; Motivation; Job evaluation and merit rating; Recruiting sources; Selection process; Selection devices; Socializing the new employee; Employee training and management development; Career development; Motivation; Performance appraisals; Rewarding the productive employee; Work compensation; Leadership; Organizational behavior; Negotiations; Safety; Health and organizational environment; Trade unions; Collective bargaining.

Cost Management
Introduction: Meaning; Scope; Objectives; Advantages; Financial accounting vs Cost accounting; Factors influencing the design of a cost; Limitation; Characteristics of an ideal cost accounting system; Installation of costing system- steps, Difficulties; Measures to overcome the difficulties; Cost unit; Methods of costing types; Development of cost accounting.

Cost Elements: Costing for materials; Costing for labor and overheads.

Costing Techniques: Standard costing; Costing by products and joint products; Direct costing.

Financial Management
Introduction: The function of financial manager; The goal of the financial management; Value maximization as a goal; The agency problem; Financial decisions- functions of the financial officers.

The time Value of Money: Future value; Present value; Future value vs. present value; Future value of an annuity; Present value of an annuity; Installment payment of an accumulation of a future sum.

Risk and Return: Risk uncertainty and return; Probability distribution and expected return; Total risk analysis for assets in isolation; Variance; Standard deviation and coefficient of variation.

Technology Management: Introduction to technology; Growth of technology; Types and components of technology; Technology and environment; Technology forecasting; Technology assessment, Transfer of technology; Technological development and planning.

Marketing Management:
Understanding Marketing Management: Defining market, marketing & marketing management; Marketing tasks; Marketing concepts & tools; Marketing management philosophies; Market oriented strategic planning-corporate and division strategic planning, business strategic planning, marketing process, nature and contents of a marketing plan;

Global marketing environment-company's microenvironment, company's macro environment.

Marketing Opportunities: Gathering information & measuring market demand; scanning the marketing environment; Consumer market and buyer behavior; Business markets and business buying behavior; Market segmentation, targeting and positioning for competitive advantage

Marketing Strategy: Product and services strategy; New product development and product life cycle strategies; Pricing products- pricing considerations and approaches; Pricing strategies- new product pricing strategies, product mix pricing strategies, price adjustment strategies.

TE – 3803: Engineering Economy
3 Hours/Week Credit: 3.00

Introduction: Economics; Microeconomics and Macroeconomics; Engineering economy and its importance; Decision making problems in engineering economy.

Theory of Production in Engineering Economy: Production function; Iso-cost and iso-quant; Returns to scale; Law of returns; Law of diminishing marginal returns; Least cost combination of factors; Producers equilibrium.

Cost-driver Design Optimization: Various types of cost; Variable costs, fixed cost, marginal cost, real cost, opportunity cost; Cost function.

Market Structure: Market and kinds of market; Perfect competition; Average and marginal revenue; Decision making under perfect competition; Imperfect competitive market; Types of imperfect competition and decision making under these markets; Determination of cost under various market structures.

Principles and Applications of Money–Time Relationship: Definition of money; Time value of money and its application; Simple and compound interest; Interest formulas; Notation and cash flow diagrams; Concepts of equivalence; Nominal and effective interest rates.

Evaluating Projects and Decision Making with Benefit/Cost Ratio Method: Investment appraisal criteria for economic decisions; Concepts of discounting; Internal rate of return (IRR); NPV method; Legal and social considerations in investment.

Comparing Alternatives: Basic concepts; Analysis period; Comparing of alternatives using capitalized worth; Mutually exclusives investment alternatives in terms of combination projects.

Dealing with Uncertainty in Engineering Economy: Definition of risk, uncertainty and sensitivity; Source of uncertainty in textile sector; Breakdown analysis; Optimistic and pessimistic estimates; Reduction of useful life.

Depreciation and Income Taxes: Depreciation and income taxes concepts and terminology; Depreciation methods; After tax economic analysis.

Inflation and Prices Changes: General price inflation; Differential price inflation; Application strategy; Foreign exchange rate and purchasing power concepts; Comprehensive example.

Replacement Analysis in Projects: Introduction; Reasons of replacement analysis; Typical replacement problems; Determination of economic life of a new asset; Decision roadmap for replacement analysis.

Capital Financing and Allocation: Cost of capital; Capital financing; Financing with debt capital; Financing with equity capital; Capital allocation among projects; Overview of corporate capital allocation policy.

CSE-3701: Computer Applications and Programming

3 Hours/Week Credit: 3.00

Computer Application: Introduction to computers; Different scopes and concepts of computer application; Operating system; Basic hardware; Assembling of a personal computer; Microsoft office; MS Word, Excel, Power point; Database Concepts; Access; Basic ideas of networking; Internet and worldwide web; Efficient Browsing; Searching for academic information; Web page creation; Front page; Graphics; Different adobe and Macromedia Software.

Types of computer; Functional units of computer; Typical input and output devices; Auxiliary storage devices; Commonly used DOS commands; GUI; Numerical method; Programming techniques.

Programming: Programming concepts; Structured programming language; Data types; Variables; Constants; Operators; Type of expressions; Data input and output; Conditional statements; Control structures; Functions and program structures: function basics, parameter passing conventions, iteration, recursion; Input and output: standard input and output, formatted input and output; Arrays, String and Pointers; User defined data type: structures, unions; file access: reading, writing text and binary files.

CSE-3702: Computer Applications and Programming (Sessional)

3/2 Hours/Week Credit: 0.75

Writing algorithm and drawing flowchart; Use of different commands; C/C++/ JAVA (variables, operators and formulas, input-output statements, branching and looping, library functions, defining functions and subroutines, arrays and subscripted variables, sequential and random data files, use of color and sound, microcomputer graphics).

3rd Year 2nd Semester

Sl. No	Course No.	Course Title	Contact Hrs/Week	Credit
1	TE-3303	Wet Processing Engineering-II	4	4.00
2	TE-3304	Wet Processing Engineering-II (Sessional)	3/2	0.75
3	TE-3403	Apparel Manufacturing Engineering-II	4	4.00
4	TE-3404	Apparel Manufacturing Engineering-II (Sessional)	3/2	0.75
5	TE-3601	Fabric Structure and Design	3	3.00
6	TE-3602	Fabric Structure and Design (Sessional)	3/2	0.75
7	TE-3805	Supply Chain & Operations Management	4	4.00
8	EEE-3711	Introduction to Electrical & Electronic Engineering	3	3.00
9	EEE-3712	Introduction to Electrical & Electronic Engineering (Sessional)	3/2	0.75
Total			**24.00**	**21.00**

Contact Hours: 18 (T) + 6.00 (S) = 24.00

Total Credits: 21.00
No. of Theory Courses: 5
No. of Sessional Courses: 4

3rd Year 2nd Semester

TE-3303: Wet Processing Engineering – II

4 Hours/Week Credit: 4.00

Technology of Dyeing:

Ractive Dye: Introductoion**;** Components of dye structure; Reactive system–neucleophilic substitution, neucleophilic addition; Classification of reactive dye- halogenated heterocyclic & vinyl sulphone dyes, monofunctional&bifunctional dyes, hot brand & cold brand dyes, alkali controllable, salt controllable & temperature controllable dyes ; Substantivity of different groups; Factors governing dye uptake; Preparation & application; Hydrolysis; Stripping.

Disperse Dye: Introduction; Classification; Dispersing system; Theory of dyeing in high temperature method; Function of carrier; Difference between high temperature, carrier &thermosol method; Applicaion of dispers dye on different synthetic fibres; Dyeing of microfiber with disperse dye; Scope of addition of ionic nature; Reduction cleaning.

Sulphur Dye: Introduction; Sulphur linkage; Solubilizing; Classification- water insoluble, leuco, solubilized & condense sulphur dye; Theory of dyeing; Application of sulphur dye; Bronziness& tendering.

Azoic Dye: Introduction; Classification according to chemical structure; Different ways of naptholation; Concept of fast base for azoic dye; Diazotization principle; Developing/coupling reaction; Application on cotton fabric, Stripping.

Technology of Printing: Flow chart of Printing; Thickeners (types of thickeners, rheology); Methods and styles of printing; Machineries used for printing; Printing processes for different fibers with Direct, Acid, Basic and Vat dyes, Reactive, Azoic and Disperse dyestuff; Assistants used in printing operations and their functions; Structure of Pigments; Pigment printing.

Technology of Finishing: Introduction to textile finishing.

Physical and Mechanical Finishing

Raising, Shearing and Calendering: Mechanism of raising /Brushing &sueding; Different raising techniques used in different textile fibers; Scope of shearing and cropping for different fibers; Calendering process; Parameters affecting the calendering process; Engineering aspects of calenders; Control of calender parameters; Different types of calendaring techniques with their effects and mechanism.

Sanforizing, Stentering and Compacting: Dimensional stability of textile woven and knit fabrics; Control parameters for Shrinkage, GSM and Spirality; Basic mechanism of Shrinkage, GSM and Spirality control by Sanforizing machine, Stenter and Compactor; Effect of knitting parameters on dimentional stability of knit fabrics; Diversified application of stenter.

Chemical Finishing

Mercerization: Mercerization and causticization; Objects of mercerization; Conditions for mercerization; Structural modification of cellulose due to mercerization; Changes in the properties of cellulose; The effect of mercerizing conditions; Mercerization of blended fiber

fabrics; Mercerization of ramie and flax fibers; Mercerizing wetting agents; Requirements of good mercerizing wetting agent; Commercial mercerizing wetting agents; Mercerizing machineries-Cloth (woven) mercerizing, yarn mercerizing and knit goods mercerizing machines; Liquid ammonia mercerization; Hot mercerization; Advantages of hot mercerizing process; Comparison of hot and conventional mercerization.

Resin Finishing: Introduction; Mechanism of creasing of cotton fabric; Concept of anticreasing of cotton fabric; Resin and resin finishing; Basic chemistry of cross linking agents; Effect of cross linking on the properties of cotton fabric; Problems of formaldehyde based finishes; Linkages responsible for HCHO release; Durable press catalyst and their use; Stability of crosslink to laundering; Application methods; Compatibility with other finishes; Troubleshooting and practical problems.

Water Repellency: Introduction; Physical chemistry of wetting; Mechanisms of repellency; Repellency of textile fabrics; Conditions for high fabric repellency; Fabric construction and preparation for water-repellent finishing; Application of different water repellent finishes with their chemistry-paraffin repellents, stearic acid-melamine repellents, silicone repellents, fluorocarbon-based repellents; Improvement of the durability of fluorochemical finishes; Limitations and troubleshooting of different repellent finishes.

Flame Retardancy: Introduction; Theory of combustion; Combustion cycle of cellulosic fibers; The chemistry of fire-retardant finishing-exclusion of oxygen, modification of the pyrolysis route, the role of Lewis acids in promoting dehydration, synergistic flame-retardant effects; Mechanisms of flame retardancy during condensed phase and gas phase; Comparison of condensed phase and gas phase mechanism; Non durable, semi durable and durable flame retardant chemicals and processes for cellulose; Scope of formaldehyde free flame retardants for cellulose; Boron, phosphorus and halogen based flame retardants; Flame retardants for polyester, wool, nylon and blends; Application of flame retardant compounds.

Anti Pilling Finish: Introduction; Pilling mechanism; Factors affecting pill formation; Mechanisms and chemistry of anti-pilling finishes; Approach of different anti-pilling finishes in textiles; Evaluation of anti-pilling finishes; Troubleshooting for anti-pilling finishes and compatibility.

Anti Static Finishes: Introduction; Generation of static electricity; Problems caused by static electricity; Measurement of electrostatic propensity; General requirements for antistatic finishes; Mechanisms of antistatic finishes; Chemistry of antistatic finishes; Approach of different antistatic finishes in textiles; Durability of antistatic finishes; Conductive fibers; Evaluation of antistatic finishes; Troubleshooting for antistatic finishes and compatibility.

TE-3304: Wet Processing Engineering – II (Sessional)
3/2 Hours/Week Credit: 0.75

Dyeing of textiles with sulphur& reactive dye; Stripping of reactive dyed textiles; Dyeing of textiles with disperse dye by carrier, HT &thermosol method; Dyeing of cotton with azoic dye; Screen Printing of textiles with reactive & vat dye; Block printing of polyester fabric with disperse dye; Estimation of mercerization effect; Printing of textiles with pigments; Application of water repellent finish, resin finish, flame retardant finish on textile fabric.

TE-3403: Apparel Manufacturing Engineering – II
4 Hours/Week Credit: 4.00

Sewing: Seam and its properties, types and usage's, factorial study of seam strength, mechanism of seam slippage, seam strength prediction, seam strength testing.

Stitch: Definition of stitch and stitch types, properties and usage's, principle of lock stitch and chain stitch; Sewing machine-feed mechanism;

Sewing Needles; Sewing thread; Sewing problem and remedies; Sewing machines; Work aids in sewing; Automation in sewing machine

Alternative Methods of Joining Fabrics: Welding & Adhesives; Fusing; Moulding and their comparison.

Trimmings: Discussion on label and motifs; Chain; Buttons; Zipper; Lining; Hood and loop fastening; Shoulder pad; Velcro tape; Lace braid and elastic; Performance of trimmings.

Pressing and Finishing: Objects; Types; Methods; Various pressing machineries.

Label: International care labeling codes; Brief study on various labels (size label; main label; functional label).

Folding and Packing: Types; Methods; Equipment's; Symbol and markings; Materials and attachment details for various packaging for apparel.

Fundamentals of Fashion: Fashion, Fad, Classic, Style, Design, Trends.

Trend Forecasting: Fashion forecasting process, Trade shows.

Element of Design: Shape, Form, Value, Line, Color, Texture, Space.

Principle of Fashion: Balance, Proportion, Emphasis, Rhythm, Harmony/Unity.

Color Theories in Fashion Design: Properties of Color/ Color Dimension; Color Theories; Color Wheels – Color systems use of color in designing.

Fashion Cycle & Movement: The movement of fashion, the cycling of fashion, stages of fashion cycle-consumer buying and the fashion cycle-factors influences fashion movement-recurring fashions. The leader of fashion: the designer's role.

TE-3404: Apparel Manufacturing Engineering – II (Sessional)
3/2 Hours/Week Credit 0.75

Stitching practice with paper exercises: (Pedal control at maximum velocity, Precise stops at maximum speed, Straight stitches at maximum velocity, Sewing curves, Over lock sewing straight line); Threading of single needle lock stitch machine (Thread the machine and draw up the bobbin thread, Threading the bobbin case, Bobbin winding); Fabric exercises (Sewing 6″x 6″ sewing off the material, Sewing 6″x 6″ staying within material, Sewing 6″x 6″ back tack.); Stitch classifications (Seams & stitches of men`s shirt, Seams & stitches of men's trouser, Seams & stitches of denim trouser, Seams & stitches of polo T–shirt, Seams & stitches of round neck T–shirt); Preparation of Swatch card for T-shirt, Polo shirt, Woven shirt, Jacket, kids item and bottom garments.

TE-3601 : Fabric Structure and Design
3 Hours/Week Credit: 3.00

Introduction: Classification of woven fabrics; Identification of warp and weft; Terminology to fabric structure and design; Fabric weight and GSM calculation from given particulars;

Classification or parts of a complete design for a woven fabric; Methods of fabric representation; Systems of drafting; Point paper diagram in textile design; Factors affecting the fabric structure.

Plain Weave Fabrics: Main features of plain weave**;** Classification of plain cloth**;** Derivatives of plain weave and their characteristic (rib weave, warp rib, weft rib, matt weave, regular, irregular, fancy and stitched matt weave); Ornamentation of plain weave fabrics by varying set; Yarn linear density; Crimp; Twist and material; Different commercial examples of plain weave and their applications.

Twill Weaves: Main features of twill weave; Classification of twill weave; Derivatives of twill weave (zig-zag, herringbone, diamond, diaper, broken, re-arranged, stepped, elongated, combined, shaded, curved twill); Relative firmness of twill weave; Angle of inclination of twill weaves; Commercial examples of twill weave and their applications.

Satin and Sateen Weaves: Main features of satin and sateen weave; Concept of move number and move number selection criteria; Uses of satin and sateen weave; Commercial examples of satin and sateen weave and their applications.

Fancy Designs of Fabrics: Characteristic; Appearance and texture of simple fancy weaves (viz. mock leno including distorted thread effects); Huckaback; honeycomb; basic crepe weaves; Bedford cord structures and pique weave; stripe and check effects using basic and simple fancy weaves; Designs of fabrics figured with extra weft and extra warp and weft.

Color and Weave Effect: Color in combination with weave effects; Simple order of coloring; Compound order of coloring; Pattern chart for color and weave effects; Different commercial examples i.e. continuous line effect; End and end coloring pattern; Pinstripe; Crowfoot; Dog's tooth; Shepherds check; Allover effects; Birdseye effect; Stepped twill pattern.

Double Cloths: Introduction; Classification of double cloths; Points to be considered before designing double cloths; Construction principle of self-stitched and center-stitched double cloths; Commercial examples and end use applications.

Knitted Fabric Structure: Structure of 1 x 1 rib and 1 x 1 purl weft knitted fabrics and their representation on design paper; Comparison of the properties of plain, 1 x 1 purl weft knitted fabrics; Structures of simple, tuck and miss stitches and their representation using loop diagrams; Representation using conventional notation 1 x 1 interlock; Half-cardigan; Full-cardigan; 1 x 1 weft locknit and 2 x 1 weft locknit structures, etc.

TE-3602: Fabric Structure and Design (Sessional)
3/2 Hours/Week Credit: 0.75

Reproduction of supplied sample : Plain weave derivatives; Twill weave derivatives; Fancy design; Color & Weave effect; Double cloth; knit samples

TE-3805: Supply Chain & Operations Management
4 Hours/Week Credit: 4.00

Introduction to Production and Operation: Definition of operation management; Field of operation management; Historical development of operation management; Transformation process; Concept of production; Production system and its classification & characteristics; Production management system; Scope of production and operation management; Major issues facing by executives in textile operation management.

Textiles Project Management: Definition of project management; Project control; Critical path analysis (CPA); Program evaluation review technique (PERT).

Textiles and Apparel Product Design and Process Selection: Product design process; Product process matrix; Major decision variables in equipment selection; Process flow design and analysis; Application of work study (method study, time study and work measurement) in textile and apparel production process.

Inventory Management: Inventory system for independent demand; Definition and purpose of inventory management, Inventory costs, Inventory system, fixed order quantity models, fixed time period model; Inventory system for independent Demand: Materials requirements planning system (MRP), Purpose advantages and disadvantages of MRP, Demands for products, BOM file, Inventory records file, Economic order quantity (EOQ), Enterprise resources planning (ERP) in textile operation management.

Supply Chain in Operation Management: Supply chain for textile manufacturing, Purchasing, JIT; Global textile and apparel sourcing; Measure of supply chain management; Lean supply chain.

Lean System in Operation Management: Lean system in textile manufacturing; Various wastages in lean system; Various tools and techniques in lean system (Kanban, Value stream mapping, Continuous improvement, JIT, Pull methods of work, 5'S, Lean Six Sigma).

Capacity Planning, Facility location and Facility Layout: Capacity planning and capacity strategy; Facility location; Plant location methods; Products and process layout.

Forecasting: Definition and types of forecasting; Forecasting across the textile and apparel organization; Demand pattern; Designing the forecasting system; Judge methods and sales force estimates; Forecast performance.

EEE-3711: Introduction to Electrical & Electronic Engineering
3 Hours/Week Credit: 3.00

Electrical Engineering
DC Current: DC fundamentals; Generators and their characteristics motors and their characteristics; Speed control process.

AC Current: A.C. Fundamentals; Flow of A.C. through coils; Inductance and resistance in series and in parallel; Power in A.C. Circuits; Power Factor and Power Factor Improvement; Resonance circuit; Transformer; Poly phase circuits; Induction motors.

Sub-station: Its purpose; Substation equipments (HT. LT Switch gear etc.); Distribution board and sub-distribution board.

System network: Typical distribution circuits; Cables and wiring systems and their selection.

System protection: Types of faults (transformer and motor); Principles of protection; Protective devices: circuit breaker, switches and starter.

Electrical hazards: Protection against shock and fire; Earthing and its importance; Procedure to be adopted when a person is in contact with a live contact.
Electronics

Amplifiers; Rectifiers and transistors diodes and their uses voltage amplification; Power amplification; Photo sensor and transducer; Integrated Circuits (I.C.).

EEE-3712: Introduction to Electrical & Electronic Engineering (Sessional)
3/2 Hours/Week Credit: 0.75
Sessional based on EEE-3711

4th Year 1st Semester

Sl. No.	Course No.	Course Title	Contact Hrs/Week	Credit
1	TE-4601	Textile Testing and Quality Management-I	4	4.00
2	TE-4602	Textile Testing and Quality Management -I (Sessional)	3	1.50
3	TE-4603	Environmental Pollution and Control	3	3.00
4	CSE-4701	Introduction to Microprocessor, Robotics and Control Engineering	3	3.00
5	HSS-4501	Industrial Sociology & Business Law	3	3.00
6	TE-4000	Project & Thesis	3	1.50*
Optional (any one Optional Set)				
I	TE-4101	Advanced Yarn Manufacturing Engineering-I	3	3.00
	TE-4102	Advanced Yarn Manufacturing Engineering-I (Sessional)	3/2	0.75
II	TE-4201	Advanced Fabric Manufacturing Engineering-I	3	3.00
	TE-4202	Advanced Fabric Manufacturing Engineering-I (Sessional)	3/2	0.75
III	TE-4301	Advanced Wet Processing Engineering-I	3	3.00
	TE-4302	Advanced Wet Processing Engineering-I(Sessional)	3/2	0.75
IV	TE-4401	Advanced Apparel Manufacturing Engineering-I	3	3.00
	TE-4402	Advanced Apparel Manufacturing Engineering-I(Sessional)	3/2	0.75
V	TE-4801	Textile Market Research and Product Development	3	3.00
	TE-4800	Management Tools & Engineering Graphics (Sessional)	3/2	0.75
VI	TE-4901	Fashion Distribution & Logistics	3	3.00
	TE-4900	Fashion Illustration(Sessional)	3/2	0.75
Total			**23.50**	**19.75**

Industrial AttachmentStarts at the end of the 4thyear1st semester

TE-4002	Industrial Attachment (Training & Practice)	4 weeks	3.00
Total		**4 weeks**	**3.00**

* Credit transferred to 2nd Semester.
Contact Hours: 16 (T) + 7.50 (S) = 23.50+ 4 Weeks (FW)
Total Credits: 19.75+3.00=22.75
No. of Theory Courses: 5
No. of Sessional Courses: 2

4th Year 1st Semester

TE-4601: Textile Testing and Quality Management-I
4 Hours/Week Credit: 4.00

Fiber Testing

Introduction: Definition of quality, quality control, quality assurance; Purpose of textile testing; Standard testing atmosphere; Queries and orders; Concept on calibration; Quality audits.

Sampling: Introduction; Purpose of sampling; Principles of sampling; Methods of sampling; Sampling of fibers, slivers, rovings, yarns, fabrics and garments.

Textiles & Moistures: Introduction; Effect of moisture on physical, mechanical, dimensional and electrical properties; Vapor pressure; Moisture content and moisture regain; Standard moisture regain of different fibers; Importance of moisture regain; Relative humidity& measurement of relative humidity; Correct invoice weight; Methods of measurement of moisture in textiles.

Fiber Dimensions: Fiber length- mean length, staple length, effective length, span length, upper half mean length, upper quartile length, length dispersion and short fiber %.

Fineness & Maturity: Fiber fineness; Importance of fiber fineness in textile processing; Determination of fiber fineness; Maturity of fiber; Importance of maturity in processing; Relationship between fineness and maturity; Methods of measurement of fiber maturity; Maturity ratio; Measurement of foreign matters in fiber sample.

Fiber Testing Instruments: Working principle of HVI & AFIS; Discussion of HVI & AFIS test parameters- SCI, Mic, Length, Maturity Index, Uniformity Index, UHML, SFI, Strength, Elongation, Moisture, Rd, +b, color grade, trash content, trash area, fluorescence, Mean length by weight, length variation by Weight, UQL(w), SFC(w), L(n), L(n) CV%, L (n) 5%, SFC (n), Fine(mtex), MAT, IFC%, Dust(Ctn/g) , dust size, UQL(w), SFC(w), VFM%; Nickerson-hunter scale.

Yarn Testing

Linear Density: Measurement of linear density of lap, sliver, roving and yarn; Counting systems; Different methods of measuring yarn count.

Yarn Twist: Definition and types of twist; Measurement of twist; Level of twist; Amount of twist for warp, weft, denim & knitted goods; Influence of twist on fabric properties.

Yarn Strength: Measurement of tensile strength of yarn- single thread, skein or lea strength test; Comparison of results; CRT, CRE and CRL methods.

Yarn Evenness: Principles of yarn evenness measurements (Uster Tester, Premier Tester etc.); Optical and capacitive methods; Index of irregularity; Limit of irregularity; Testing Parameters- Um%, CVm%, CV5m%, Index, thick, thin places, neps, hairiness; Spectrogram analysis; Length variance curves; Standard value of yarn testing parameters; Comparison of results with Uster statistics.

Yarn Hairiness: Definition of hairiness; Influencing factors; Zwigle& USTER hairiness tester and their measuring principles.

TE-4602: Textile Testing and Quality Management-I (Sessional)
3 Hours/Week Credit: 1.50

Measurement of relative humidity using Wet-and-Dry Bulb Hygrometer; Determination of moisture regain by digital moisture meter; Determination of sliver count; Determination of count of cotton yarn in Ne (from yarn package) using Wrap Reel & Electronic balance; Determination of the amount of twist (TPI) in cotton yarn by digital twist tester; Determination of percentage of trash content in cotton fiber by trash analyzer; Identification of various types of textile fibers; Single & bundle fiber strength, length, finness identification

TE-4603: Environmental Pollution and Control
3hrs/week Credit: 3.00

Environmental Challenges: Definition of environment; Soil erosion; Desertification; Biodiversity loss; Deforestation; Water pollution; Fisheries resources; Large dam projects; Climate change; Urbanization; Greenhouse effects and global warming; Acid rain; Green chemistry; Carbon foot print; Effluents and their effects on environment; Related health issues.

Pollution and its effects: Definition of pollution; The atmosphere and its structure; Types of pollution and pollutants; Toxicity of textile dyes and chemicals.

Types of Textile Pollution and its Control and Treatment

Air Pollution: Definition; Emission and control technology; Criteria setting.

Noise Pollution: General consideration; Evaluation of industrial noise sources; Methods and techniques to control and reduce noise level.

Water Pollution: Water quality parameters (pH, color, turbidity, dissolved solids, BOD, COD etc.); Textile wet processing effluents and their characteristics; Various types of effluent treatment methods (physical, chemical and biological) and disposal systems; Electro-chemical technology for textile effluents treatment; Wastewater quality standard for disposal to environment; Reduction of textile wastewater using automatic process control; Reclamation and reuse; Filtration; Effects of textile waste on environment; Heavy metal contamination; Cost analysis.

Solid Waste Management: Composition of solid wastes; Sludge management; Collection systems and alternatives for treatment and re-use; Cost analysis.

Regulatory Issues
Environmental Policy and Law: Environmental law of Bangladesh; Role of the governmental and non-governmental organizations in the protection and conservation of environment in Bangladesh; International treaties (Health and industrial safety; Environmental regulatory affairs for dyes and pigments; Risk vs Hazard communication, penalties and compliance).
ISO 14000; WRAP certification; OKEO-Tex 100; GOTS; REACH; SA-8000.

CSE-4701: Introduction to Microprocessor, Robotics and Control Engineering
3 Hours/Week Credit: 3.00

Microprocessor: Introduction to different types of microprocessors; Microprocessor architecture; Instruction set; I/O operations; Interrupt structure; Interfacing and Interfacing Ics; Microprocessor based system design.

Robotics: Introduction to robotics; Industrial robots; Robot structure and robot configuration; Robot drive and control systems; Robot sensors; Robot applications.

Control Engineering: Introduction to control systems and their representation; Different types of control systems- hydraulic and pneumatic control systems; Elements of electro-mechanical controls; Introduction to digital computer control.

HSS-4501: Industrial Sociology & Business Law
3 Hours/Week Credit: 3.00

Definition and Usage: Definition of sociology; Nature of sociology; Importance of sociology; Importance of industrial sociology.

Social Research: Meaning and definition; Importance of social research; Problems involved in social research; Different methods of social research.

Scope of Sociology: Micro and macro sociology; Some fundamental concepts; Society from savagery to civilization (table); Social evolution and techniques of production; Social structure of Bangladesh; Oriental and occidental societies: feudalism.

Industrial Revolution: The growth of capitalism; Features; Social consequences; Social fascism.

Urban Ecology: City; Pre industrial and industrial; Growth and nature of cities in Bangladesh; Rural sociology; Features of village community in Bangladesh; Urban Rural contrast; Social structure of the tribal people of Bangladesh.

Social Pathology: Crime; Juvenile delinquency; Causes of juvenile delinquency; Remedies of juvenile delinquency; Slum.

Social Mobility: Social mobility as a process; The mobility ethics; Factors contributing to social mobility.

Social Stratification: Definition; Open and closed social system, Theories of social stratification; Global stratification; Racial and ethnic stratification; Gender stratification.

Concept of Work: Work and art; Nature of industrial work; Work ideology; Work values; Role of work in man's life; Work and mental health; Work attitudes; Work involvement; The motivation to work; Work satisfaction; Commitment to industrial work; Development and commitment of the industrial labor force in Bangladesh.

Worker and the Factory: The factory system; Its characteristics; The formal relations of production in the factory system.

Industrial Bureaucracy: The executive in the industrial bureaucracy; The role of worker; Industrial production and the worker's role; Social Relations at work; Management as a social elite.

Commercial Law
Law of Contract: Definition, rules of offer and acceptance, consideration, types of contract, breach of contract, contract through agents, Laws relating to sales of goods, negotiable instruments, carriage of goods by Land and sea, Law of insolvency.

The Companies Act 1994.Partnership act.Other Acts: Trade Marks Act 1940 Patent Design Act, 1911,Standard Weight and measure Ordinance, 1982

Industrial Law

Factories Act, 1965: Health, Hygiene, Welfare and Safety measures, Working Hours, Employment of young persons, Leave and Holidays, etc.

Industrial Relations Ordinance, 1969: Importance of study of Industrial Relations, Trade Unions, Unfair Labor Practice, Collective Bargaining Agent (CBA), Strikes and Lock out Court and Labor Appellate Tribunal.

Employment of Labor (Standing Orders Act, 1965): Conditions of Employment, Recruitment procedure, Classification of workers, Leave and holidays, Stoppage of work, Calculation of period of continuous service, lay-off etc. Retirement, Dismissal, Punishment, Termination, Penalties and Provident Fund Rules.

Payment and Wages Act, 1936: Difference between Salary and Wages, Wages calculation; Responsibility of wage payment; Deductions, Fines, etc, Workmen; Compensation Act, 1923;Companies Profits (Workers; Participation) Act, 1968.;Maternity Benefit Act, BEPZA Act

TE-4000: Project & Thesis

3 Hours/Week Credit 1.50*

For successful completion of course work every students shall submit a project report on his project work, which would be selected and approved by the department. Every candidate shall be required to appear at an comprehensive oral examination on a date fixed by the head of the department and must satisfy the examiners that he is capable of intelligently applying the results of this research to the solution of problems of undertaking independent work and also afford evidence of satisfactory knowledge related to the theory and technique used in his research work.

TE- 4002: Industrial Attachment (Training & Practice)

4 weeks Credit: 3.00

For mill training or internship, the students will be placed in selected textile mills or organizations for four weeks. On completion of the internship, the student will prepare and defend a mill training report.

Optional Courses (any one set)

Set – I :

TE-4101: Advanced Yarn Manufacturing Engineering – I

3 Hours/Week Credit: 3.00

Short Staple Spinning

Introduction: Assessment, Calculation and control of mixing cost and quality; Basic elements of yarn quality.

Modern trends and development in a ring spinning mill from blow room to baling; Technological points of blow room, carding, drawing, lap former, combing, roving, ring frame; Theoretical considerations of fiber disentanglement during carding and formation of fiber hooked ends; Reduction of fibers hooks during drafting; Theory of ring spinning and

ballooning; Evaluation of properties and characteristics of spun yarns; Sliver data; Ring data and Winding data; Limitation of ring spinning.

Processing Parameters and Their Influence: Processing parameters of blow room, carding, drawing, lap former, combing, roving, ring frame and winding machine; Impact of process variables such as Hanks, Speeds, Roller settings, Draft, Twist, Twist multiplier, Traveller weight, Traveller clearer setting, Spacer, cot shore hardness; Suitable processing parameters for knitting, weaving, denim, mélange and blended yarn manufacturing.

Automation in Spinning Mill: Automation in all sections of spinning industries for Creeling, Doffing, Piecing, Cleaning, Materials handling and linking of machines, Data processing; Relationship of automation with quality and productivity and its relevance in the Textile Industries of Bangladesh; Application of on-line instrumentation for consistent yarn quality.

Wastage of Spinning Mill: Standard waste% and efficiency of all manufacturing stages, Waste control, Centralized waste collection, Dust filtration bags and setting chambers; Processing of soft waste, hard waste; Yarn realization.

Spinning Calculation: Production of various machines; Speed of various parts of machine; Average spindle speed; Average count; Conversion of count; Spin plan; Blend ratio etc.

Conditioning: Principle; Necessity; Conditioning parameters for different material.

Doubling and Twisting: Doubling and twisting machines; Different systems of doubling; reeling and baling.

Rotor Spinning: Tasks; Principle of operation; Speed relationship; Raw material requirements and preparation; Opening unit; Yarn formation; Rotor; Yarn withdrawal and winding; Automation; Technical and technological data; Economic aspect of rotor spinning; Ring vs. Open-end Spinning process & yarn properties**.**

Long Staple Spinning

Modern trends and developments of batching, Softening, Carding, Drawing, Drafting systems and Spinning machine; Processing parameters of different qualities and counts of jute yarns; Yarn faults; Causes& remedies of end breakages; Waste recovery; Dust extraction and utilization of waste; Evaluation of properties and characteristics of jute yarns; Blending of jute with other fibers.

TE-4102: Advanced Yarn Manufacturing Engineering – I (Sessional)

3/2 Hours/Week Credit: 0.75

Schematic/material passage/gearing/motion transmission diagram of rotor machine; Calculation of rotor speed, opening roller speed, feed roller speed; Calculation of changeable gear teeth no., draft and twist for particular a yarn count; Industrial visit.

Set – II :

TE-4201: Advanced Fabric Manufacturing Engineering – I
3 Hours/Week Credit: 3.00

Jacquard Weaving: Classification of Jacquards; S.L.S.C., D.L.S.C., D.L.D.C. & electronic Jacquard mechanism; Comparison between various types of jacquard; Building of jacquard harness system; Jacquard harness ties; Method of increasing the figuring capacity of Jacquard; Casting-out; Lifting loss in jacquard; Defects of jacquard; Jacquard calculations.

Tertiary Motion of Loom: Features of automatic loom; Definition, objectives & classification of weft replenishment; Modern weft replenishment system; Methods of weft patterning; Weft patterning system in modern loom; Operation of weft accumulator; Objectives & classifications of warp protecting motion; Objectives & classification of warp & weft stop motion; Mechanism of modern warp & weft stop motion.

Modern Weaving: Problems in shuttle weaving; Features of modern weaving machine; Types of modern loom.

Projectile Loom: Introduction to projectile; Features; Advantages; Projectile circulation, projectile launching mechanism and insertion cycle of projectile machine.

Rapier Loom: Introduction to rapier; Advantages; Various types of rapier with their advantages & disadvantages; Rapier drives, rapier heads & recent development of rapier loom.

Air Jet Loom: History; Advantages; Yarn feeders; Main jets; Relay jets; Tractive force and its necessities for jet weaving; Methods of air jet control; Timing diagram, principle of filling insertion, performance of yarn, air compressor, air quality, propulsive force on weft, nozzle design & practical problems of air jet machine.

Water Jet Loom: Quality of water, merits, demerits, weft supply system, weft insertion system, amount of water & nozzles of water jet machine.

Multi-phase Loom: Introduction, history, merits, demerits, types, weft insertion mechanism by rapier & air in warp way & rotary beat-up of multi-phase loom; Mechanism of circular weaving machine.

Comparisons among modern looms

Knitting: Fabric structure and designs in weft knitting – weft knitted Jacquard e.g. single jersey Jacquard, rib Jacquard; Pattern and selection devices – Butt length, butt position, multi step butt set-out; Element selection; Full Jacquard mechanical and electronic needle selection; Pattern wheel and Pattern area calculations; Production of weft knitted fabrics – Simple Tuck and float stitch single jersey fabrics, non jacquard double jersey fabrics; Double jersey inlay; Loop transfer stitches – plain loop, fancy lacing, Rib loop and sinker loop; Welts; Garment sequences and knitting to shape calculation of fashioning frequencies; Flat knitting principles and structures.

Multiple guide bars warp knitting machines and their product; Fabric controls mechanism: run-in, yarn feeding and tension control; Fabric take up and batching mechanisms; Specialty weft knitted fabrics and machines-loop wheel frame; Production of fleecy on sinker top m/c; Fleecy interlock; Sinker wheel m/c; Plush in sinker top latch needle m/c; Sliver or high pile knitting; Percentage calculation of fleecy fabric; Knitted fabric faults and their remedies.

TE-4202: Advanced Fabric Manufacturing Engineering – I (Sessional)
3/2 Hours/Week Credit: 0.75

Weaving: Mechanism of weft replenishment, warp stop & weft stop motion. Working principle, design & calculation of S.L.S.C., D.L.S.C., D.L.D.C jacquard mechanism, needle loom & braiding machine.

Knitting: Fabric design analysis; Pattern and selection devices – Butt length, butt position, multi step butt set-out; Element selection Full Jacquard mechanical and electronic needle selection; Pattern wheel and Pattern area calculations.
Study on sweater knitting machine; Knitting action; Loop transfer mechanism; Widening and narrowing; Shaping calculation.
Study on special weft knitted fabric-Fleecy fabric; Percentage calculation of fleecy fabric; Fabric fault analysis.

Set – III :

TE-4301: Advanced Wet Processing Engineering – I
3 Hours/Week Credit: 3.00

Pretreatment: Different types of surface active agents (synthesis, effects, degradability); Special scouring process - solvent scouring of cotton; Suitable solvents; Reasons for using solvents; Vapor-loc system of scouring**;** Process sequence ofsolvent and vapor-loc scouring; Advantages and disadvantages; Solvent and vapor-loc scouring.

Pigment Dyeing:
Introduction to pigments; basic requirements of good pigments; how pigments act as colorants; chemical classification of pigments; requirements of white pigment; Steps in pigment dyeing process, Application of pigments in textiles, Binder; properties & classification of binder; role of binder in pigment dyeing; Faults in pigment dyeing.

Natural Dyes & Dyeing: Sources of natural dyes; classification of dyes (based on chemical structure, based on color, based on mordants); Introduction to some common natural dyes with their sources, botanical name; Parts used & their suggested mordants; Natural & synthetic mordants; Functions of mordants in natural dyeing process; Chemistry of dyeing of textile fibers with natural dyes.

Mordant & Metal Complex Dyes:
Mordants; properties of mordants; classification of mordants; functions of mordants, Mordant dyes; properties of mordant dyes, Fundamental concepts about mordants; legand systems; coordination number; chemistry of mordant dyes, Method of application of mordant dyes, Chemistry of dyeing of wool with chrome mordants; Limitations of using metallic mordants in dyeing.

Dyeing Theory: Understanding of some terms related to thermodynamics of dyeing (affinity, effects of dye structure in affinity, substantivity, adsorption, sorption, desorption, absorption, exhaustion, fixation, diffusion & migration), Dyeing equilibria; adsorption isotherms, Kinetic behavior of dyeing systems, Dye-fiber interactions; Factors affecting dye-fiber interaction systems; Role of fiber functional groups in dye-fiber interaction systems; Role of water & other auxiliaries in dye-fiber interaction systems, Forces responsible in fixation of dyes, Dye aggregation; causes of dye aggregation in dye bath; Dye diffusion; diffusion models(pore model, free volume model); Diffusion coefficient; methods of measuring diffusion coefficient.

Printing: Special types of thickeners (Synthetic Polymers, Emulsion thickeners); Methods of screen and roller preparation; Fundamental mechanism in screen printing; Application of screen printing in textiles; Flat screen preparation; Fully automatic flat screen printing; Rotary screen preparation; Squeeze systems in screen printing; Design aspects; Maintenance and lubrication plan for printing machine; Screen and roller printing faults; Special printing methods (Transfer Printing, Jet printing, Flock printing, Burn-out printing); Faults in printing and their remedies.

Finishing: Removal of excess water (dewatering &hydroextracting); Various drying systems in wet processing (convection, conduction); Slitting; Low-wet pick-up finishing and its Importance; Critical application value; Techniques used in low-wet pick-up finishing; Chemistry & classification of brighteners; Physical principles of whitening; Application of optical brightening agents.

Softener Finish: Introduction; Mechanism of softening effect; Cationic softeners; Anionic softeners; Non-ionic softeners- paraffin and polyethylene based, ethoxylated based; Silicone softeners; Suitability of softeners for differently constructed fabrics; Important softener characteristics; Compatibility; Troubleshooting.

Soil Release Finish: Introduction; Mechanisms of soil release; Main factors affecting soil release; Fibre-oil-water interfaces; Chemistry of soil release finish; Carboxy based finishes; Hydroxy based finishes; Ethoxy based finishes; Fluorine based finishes; Scope of modification of soil relerase finish; Scope of combination of finishes; Troubleshooting for soil release finish.

Antimicrobial Finish: Introduction; Properties of effective antimicrobial finish; Mechanism of antimicrobial finish; Chemistry of antimicrobial finish; Evaluation of antimicrobial finish; Troubleshooting of antimicrobial finish.

Insect Resist and Mite Protection Finish: Introduction; Mechanism of insect resist finish; Chemistry of insect resist finish; Evaluation of insect resist finish; Troubleshooting of insect resist finish.

TE-4302: Advanced Wet Processing Engineering – I (Sessional)
3/2 Hours/Week Credit: 0.75

Dyeing of textiles with mordant dye, pigments & natural dye; Application of OBA on textile fibers; Application of silicone, cationic & nonionic softeners on dyed textiles; Dyeing of blended fabrics with relevant dyes; Printing of textiles using synthetic & emulsion thickeners.

Set – IV:

TE-4401: Advanced Apparel Manufacturing Engineering – I
3 Hours/Week Credit: 3.00

Garments Washing: Concept of washing, requirements of washing; Discussion on garments washing; Dyeing and Drying machines; Different types of washes – Caustic wash, Bleach

wash, Pigment wash, Enzyme wash, Stone wash, Acid wash, Super white wash; Dry processes- whiskering, grinding, destroying etc.; Concept on modern fading process.

Garments Dyeing: Basic Theory of garments dyeing; Concept of swatch making; Garments dyeing with reactive and other dyes; Problems associated with garments dyeing; Smart colorants in garments dyeing, Special finishes in garments.

Garments Inspection and Quality Control: Raw material and finished garment inspection; Quality from design to dispatch; In-process inspection, Final inspection, Garment inspection using different methods, Product quality audits and comparability tests; TQM in Apparel industry; Application of Six Sigma, Lean and 5's in Apparel Production System etc. ; Fabric sew ability assessment; Selection and setting of machines per line for the production of shirt/trouser and T-shirt.

TE-4402: Advanced Apparel Manufacturing Engineering – I (Sessional)
3/2 Hours/Week Credit: 0.75

Different wet wash process of garments item (Normal wash, Bleach wash, Stone wash, Acid wash); Different dry wash process of garments item (PP spray, Whiskering, Grinding & Destroying.); Garments inspection (Tee-Shirt, Full sleeve Shirt,Pants); Human body illustration); Fashion CAD(Design a garment for children, women,man – any 3 designs)

Set – V:

TE- 4801: Textile Market Research and Product Development
3Hours/Week Credit: 3.00

Marketing Research
Introduction of Marketing Research: Nature of marketing research; Classification of marketing research, Role of marketing research in MIS and DSS; Marketing research suppliers, selecting a research supplier; Marketing research process.

Defining of Marketing Research: The Process of problem; Developing an approach to the problem; Environmental context of the problem, management decision problem and marketing research problem; Defining of marketing research problem; Component of the approach.

Research Design: Exploratory; Descriptive and casual research; Relationships among exploratory, descriptive, and Casual research; Potential Sources of error; Budgeting and scheduling the project; Marketing research proposal.

Questionnaire and Form Design : Questionnaire design process; Overcoming inability to answer; Overcoming unwillingness to answer; Choosing question structure; Choosing question wording; Determining the order of question; Form and layout; Reproduction of the questionnaire; Pre-testing and Observational forms.

Sampling, Design and Procedures: Sampling design and process; Classification of design techniques; Non-probability sampling techniques and probability sampling techniques; Choosing non-probability versus probability sampling; Uses to non-probability and probability sampling; Final and initial sample size determination; The sampling distribution; Statistical approach to determining sample size; Confidence interval approach; Multiple characteristics and parameters; Adjusting the statistically determined sample size.

Field Work : Nature of field work**;** Field work and data collection process; Selecting field workers; Training field workers; Supervising field workers; Validating field workers and Evaluating field workers.

International Marketing Research: Marketing research international context; A framework for international marketing research.

Ethics in Marketing Research: Importance of ethics in marketing research; Stakeholders in marketing research; Guidelines for ethical decision making; An ethical framework; Ethics and marketing research process.

Product Development
Introduction of Product Management: Marketing organizations; Role of the sale force; Marketing organization implications of global marketing; Product management; Fact versus Fiction; Change affecting product management; Change in marketing organizations.

Marketing Planning: Planning Process; Components of marketing plan.

Market Potential and Sales Forecasting: Definitions; Market potential; Methods of estimating market and sales potential; Area potential; Sales forecasting.

Developing Product Strategy: Element of a product strategy; Setting objectives; Selection of strategic alternatives; Positioning: choice of customer targets; positioning: choice of competitors targets; positioning: the core strategy, managing brand equity, customer strategy, product strategy over the life cycle.

New Product Development and Management: Introduction; Innovation; Strategy, strategic planning for new product; Process and management organization concepts and option implementation of concepts; Generation creative process and people new product; Concept - Generating process, stimulating techniques, collecting and handling new product ideas; Evaluation concepts, tools, economic analysis, commercialization tolls, controls.

TE-4800: Management Tools & Engineering Graphics (Sessional)
3/2 Hours/Week Credit: 0.75

Understanding the operation of different management tools software: ERP; MIS; GSD; Pay roll; RFID etc.
Plane curves and free hand sketching; Curves used in engineering practices; Conic, Ellipse, Parabola, Hyperbola, Practical applications, Free hand sketching;
Projection of Points, Lines And Plane Surfaces; Projection of solids;
Section of solids and development of surfaces; Orthographic
projection; Isometric and perspective projections .

Set – VI:

TE-4901 :Fashion Distribution and Logistics
3hrs/week Credit: 3.00

In this course, student will learn to source materials and resources for production of fashion designs and textiles within Country as well as overseas.
Different sourcing materials such as fabrics, trims or accessories in the production of fashion products; Locate and compare materials in order to find the most appropriate and cost effective resources. Through research on the needs of clients; Social and cultural aspects of

specific target market; Student will learn to make appropriate judgments about the acquisition of raw materials. This course will also provide student with the skills to strengthen their ability to work collaboratively in solving problems related to fashion product distribution and logistics.

TE-4900: Fashion Illustration (Sessional)
3/2 Hours/Week Credit: 0.75

Introduction: Observational drawing from life; Attention to fashion pose; Fashion stills; Fashion model drawing; Front and back lay figure ; The fashion figure; Movement/poses, line, value and proportion; Representing form by various methods and techniques.

Lines, Silhouettes and Texture: Fashion details- necklines, collars and sleeves, shirts, trousers, skirts, blouses and tops, jackets and formal suits; Textures and exploring various techniques.

Rendering Techniques: Pencil; Color pencil; Charcoal; Poster color; Oil and acrylic; Fabric rendering – Samples (introduce at least 30 most common samples) of different varieties of fabric.

Photo Analysis: Different garments of kids, male and female.

Drawing various accessories and shading: Illustration of headgears; Foot wears bows; Ties; Belts; Handbags; Gloves; Jewellery.

Stylization: Garment and pose together; Detail of drapes; Frills and other details; Specification drawings of shirt and formal trousers.

Presentation methods: Mood board presentation; Color board; Layout planning and presentation.

4th Year 2nd Semester

Sl. No.	Course No.	Course Title	Contact Hrs/Week	Credit
1	TE-4605	Textile Testing & Quality Management-II	4	4.00
2	TE-4606	Textile Testing & Quality Management-II (Sessional)	3	1.50
3	TE-4607	Advanced Technologies in Textiles	3	3.00
4	HSS-4503	Accounting and Marketing	4	4.00
5	TE-4000	Project & Thesis	3*	3.00*
Optional (any one set)				
I	TE-4103	Advanced Yarn Manufacturing Engineering-II	3	3.00
	TE-4104	Advanced Yarn Manufacturing Engineering-II (Sessional)	3/2	0.75
	TE-4609	Maintenance and Management of Textile Machinery	3	3.00
	TE-4100	Maintenance and Management of Yarn Machinery (Sessional)	3/2	0.75
II	TE-4203	Advanced Fabric Manufacturing Engineering-II	3	3.00
	TE-4204	Advanced Fabric Manufacturing Engineering-II (Sessional)	3/2	0.75
	TE-4609	Maintenance and Management of Textile Machinery	3	3.00
	TE-4200	Maintenance and Management of Fabric Machinery (Sessional)	3/2	0.75
III	TE-4303	Advanced Wet Processing Engineering-II	3	3.00
	TE-4304	Advanced Wet Processing Engineering-II (Sessional)	3/2	0.75
	TE-4609	Maintenance and Management of Textile Machinery	3	3.00
	TE-4300	Maintenance and Management of Wet Machinery (Sessional)	3/2	0.75

IV	TE-4403	Advanced Apparel Manufacturing Engineering-II	3	3.00
	TE-4404	Advanced Apparel Manufacturing Engineering-II (Sessional)	3/2	0.75
	TE-4609	Maintenance and Management of Textile Machinery	3	3.00
	TE-4400	Maintenance and Management of Apparel Machinery (Sessional)	3/2	0.75

V	TE-4803	Economic Issue and International Marketing of Textile & Apparel Business	3	3.00
	TE-4804	CAD/CAM (Sessional)	3/2	0.75
	TE-4805	Entrepreneurship and Business Project Development	3	3.00
	TE-4806	Entrepreneurship and Business Project Development (Sessional)	3/2	0.75

VI	TE-4903	Trend Forecasting and Portfolio Development	3	3.00
	TE-4904	CAD/CAM in Fashion and Textiles (Sessional)	3/2	0.75
	TE-4905	Product Development and Marketing	3	3.00
	TE-4906	Apparel Design Analysis (Sessional)	3/2	0.75
		Total	**26.00**	**21.50**

Contact Hours: 17 (T) + 09(S) = 26
Total Credits: 21.50
No. of Theory Courses: 5
No. of Sessional Courses: 3

TE-4605: Textile Testing and Quality Management– II
4 Hours/Week Credit: 4.00

Statistical Quality Control (SQC**):** Introduction-Control charts; Types of control charts; Setting up a control procedure- r-chart, c-chart, p-chart; Benefits and limitation of SQC; Acceptance sampling- Role of acceptance sampling, types of acceptance sampling plans, advantages of double sampling plan, selection of a sampling plan; Construction of an OC curve; Operating characteristics (OC) curve; Acceptable quality level (AQL) and Lots tolerance percentage (LTPD); Shape of an ideal OC curve; Shape of a typical OC curve; Evaluating an acceptance sampling plan; Miscellaneous illustration; Problems.

Analysis of Variance: Introduction- Assumption in analysis of variance; Computation of analysis of variance; One way classification- i) calculate the variance between samples ii) Calculate the variance within samples, iii) calculate the F-ratio, iv) compare the calculated value of F; Analysis of variance table; Coding of table; Two way classification; Miscellaneous illustration; Problems.

Tests of Hypothesis: Introduction- procedure of hypothesis testing; Type of I and type of II errors; One-tailed and Two-tailed test; Tests of hypothesis concerning large samples; Testing hypothesis about the difference between two means; Test of hypothesis concerning attributes; Testing hypothesis about a population proportion; Testing hypothesis about the difference between two proportions; Miscellaneous illustration; Problems.

Test Standards: Use of standards BSTI, ISO, ASTM, British, Pakistan and Indian standards.

Fabric Testing:
Introduction : Introduction; Fabric testing for innovation and commercial needs; Need for integration of fabric testing literature; Scope of fabric testing; Importance of fabric testing; Current trends of fabric testing; Standards for tests; Current status.

Physical and Mechanical Testing of Textiles: Introduction; Measurement of fabric weight and length; Fabric thickness; Points required consideration in fabric thickness measurement; Methods of measurement of fabric thickness; Fabric tensile strength; Measurement of tensile strength of fabric; Factors affecting the tensile testing; Bursting strength of fabric-Ball

bursting and diaphragm bursting test; Tearing strength test; Measuring tearing strength-single rip tear test, wing rip tear test, 48lmendorf tear tester; Fabric stretch and recovery properties; Methods for testing fabric stretch and recovery**.**

Serviceability: Introduction, Serviceability and wear; Abrasion resistance; Factors affecting abrasion resistance and abrasion test; Method of assessment; Instrument of abrasion resistance measurement.

Objective Evaluation of Fabric Handle: Handle; Bending length; Measurement of fabric stiffness; Drape; Fabric crimp; Measurement of fabric crimp; Standard tension; Crimp and fabric properties; Shear of fabric; Bias extension; Formability.

Fabric Appearance Testing: Crease and crease resistance; Mechanism of creasing; Factors affecting wrinkling; Method of measuring crease recovery; Pilling and snagging; Methods of pilling and snagging test.

Moisture Transport: Wetting; Explanation of wetting; Wicking and longitudinal wicking; Wicking test, Sensorial comfort, Water absorption-static immersion, wettability of textile fabrics, sinking time; Water repellency and water resistance; Methods of measurement of water repellency or resistance**;** Innovative test methods for fabric permeability.

Thermal Comfort: Heat balance; Heat loss; Measurement of thermal conductivity; Air permeability; Air permeability and fabric properties; Measurement of air and water vapor permeability.

Dimensional Stability of Fabric: Introduction; Hygral expansion; Relaxation shrinkage; Swelling shrinkage; Felting shrinkage; Methods of measuring dimensional stability; Dimensional Stability to dry cleaning & dry heat.

Flammability Testing of Fabrics: Introduction; Key issues of fabric flammability; Measurement of fabric flammability; Standard testing methods; Textile flammability standards.

Dyeing and Coloring Tests for Fabrics: Introduction; Key issues in the testing of dyes and colors; Assessing color and color change; Change in shade and staining tests; Test standards; Sample preparation and outline of color fastness tests-light fastness, wash fastness and fastness in relation to environmental factors; Fastness in relation to manufacturing processes; Printing tests ; Applications.

Testing Intelligent Textiles: Role of intelligent textile testing; Understanding existing materials and technologies; Development of new products; Research and development in new products; Types of testing; Shape memory effect and evaluation methods for shape memory fabrics: Thermal regulation property of phase change materials , Self-cleaning testing, Electronic responsive testing, Applications.

Fabric Composition Testing: Introduction; Importance of testing fabric composition; Methods of testing fabric content and composition; Traditional testing methods; New testing methods; Identification of textile fibers- feeling tests, burning behavior, microscopic test, chemical tests; Identification of cashmere and wool fiber scale.

Key Issues in Testing Damaged Textile Samples: Introduction; Causes of damage; Types of damage; Stages of damage occurrence; Practical significance of damage analysis; Textile damage analysis: sample preparation; Methods of textile damage analysis; Factors affecting accurate testing; Applications of textile damage analysis.

Garment Testing: Raw material & finished garments inspection; Final inspection; Seam strength, seam slippage; Sewability testing; Button pull testing; Zipper testing.

TE-4606: Textile Testing and Quality Management– II (Sessional)

3 Hours/Week Credit: 1.50

Sessional based on TE-4605

TE-4607: Advanced Technologies in Textiles

3 hrs/week Credit: 3.00

Advanced Polymers and Fibers: Introduction; Characteristics; Structure & chemistry; Manufacturing; Uses & limitations of high performance fibers; Carbon fiber; Glass fiber; Sulfar fiber; Melamine fiber; Aramid fiber; PLA fiber; Olefin fiber; Lyocell fiber; High density polyethylene (HDPE) fiber**.**

Polymers Used in Nano Fiber Synthesis:

Natural Polymeric Materials: Monomers; Co-polymers; Field of applications; Collagen; Hyaluronic acid; Gelatin; Chitosan; Elastin; Silk.

Medical Textile: Introduction and classification of medical textile; Fibers used for medical applications; Medical drapes and Linen**;** Tissue Engineering; Implantables- sutures, soft tissue implants, hard tissue implants, vascular implants.**;** Non-implantables- surgical dressing, bandages; Extracorporal devices; Healthcare and Hygiene products; Super absorbent polymers; Hydrogels.

Technical Textile

Protective Textile: Different types of protective clothing; Functional requirements of defense clothing including ballistic protection, parachute, temperature and flame retardant clothing; Chemical and Biological protective clothing; Water proof breathable fabric.

Technical Textiles in Apparel Sector: Introduction to smart technology for textile and clothing; Areas of application of smart textile; Pathogen barrier fabric; Fibers used for pathogen barrier application; Clothing for extra climatic conditions; Wearable technology for snow clothing; High altitude clothing; Electromagnetic radiation protective clothing.

Other Applications:

Geotextile: Introduction to geotextiles; Geosynthetics; Classification; Market growth; Applications; Fiber properties; Product properties according to their nature of application.

Automotive Textile: Application of textiles in automobiles; Requirement and design for pneumatic tyres; Airbags and belts; Methods of production and properties of textiles used in these applications.

Composites: Type of composites; Textile reinforcement in different types of composites; Two and three dimensional fabrics and triaxially braided materials for composites; Production and properties of performs and composites; Properties and uses of rigid composites.

Sport Tech: Sport uniforms; Sporting equipment; Textiles in sport wear; Functional product development.

Agrotech: General applications; Fibers used in agriculture product; Horticulture, Fishing and Animal husbandry.

Smart Textile: Organic electronics; Band gap concept; Organic thin film transistor; Organic light emitting diode.

HSS-4503: Accounting and Marketing
4 Hours/Week Credit 4.00

Accounting
Principles and practice of book-keeping; Single entry and double entry system; Journal; Ledger; Cash book; Trial balance; Partnership; Shares joint stock company; Sole tradership manufacturing; Trading and profit and loss accounts; Balance sheet; Consignments; Forms of sales consignments; Consignee proforma invoice; Bill of exchange; Description of assets and equipment; Function and advantage of costing; Methods of cost accountancy; Elements of cost accounting; Direct and indirect expenditures; Cost of overhead and cost accounts and financial accounts for firms; Standard cost preparation of cost sheets and statements; Break even analysis; Stock taking and control of stock and stores; Payroll; Dummy worker on payroll.

Cost Accounting
Introduction: Meaning, Scope, Objective, Advantages, Financial Accounting vs Cost Accounting, Factors influencing the design of a cost, limitation. Characteristics of an ideal Cost Accounting, System, Installation of costing system – steps, difficulties, Measures to overcome the difficulties, Cost unit, Methods of costing types, Development of Cost Accounting.

Cost Behavior and Terminology: Basic cost behavior patterns, Economic, Accounting and other cost patterns, product Costing Concept Need for Knowledge of cost behavior, Methods of estimating cost relationship.

Cost Elements: Costing for materials, Costing for labor, and costing for Overheads.

Cost Accounting system: Job order costing, Contract Costing and Process Costing.

Costing Techniques: Standard Costing, Costing by products and joint products, Direct Costing.

Marketing
Concept; Scope and functions of marketing tools; Product concept; Types and product development; Types of markets; Market segmentations; Approaches of marketing; Sales promotion and advertisement; Export marketing; Distribution channel and pricing of product for local and export markets; Export marketing and documentation methods of market study; Elementary marketing research.
Field of Marketing : Nature and Scope of marketing –Historical development of marketing-Marketing management and its evolution -Marketing concept -Role of marketing in the society.

Marketing System and MarketingEnvironment: System approach to Marketing –External environment of marketing systems -Internal variable of marketing systems.

Marketing and Byers Behavior: Definition-Market segmentation, targeting and positioning-Classification of Market -Psychological influence on buyer's behavior -Cultural and social-group influences of buyer behavior -Model of buyer behavior.

Elements of Product Planning: Definition of product -Classification of product -Marketing considerations of product -New product development product life cycle -Understanding of branding, Packaging, labeling.

Place Distribution Structure: Retailing –Wholesaling -Channels of distribution and logistic management.

Price System: Pricing objectives and price determination -Methods of setting price.

Promotional Activities: Promotion mix Integrated marketing communications strategy, advertising Sales promotion, personal selling and sales management. Direct and online marketing, New marketing model.

Managing Marketing: Competitive Strategic, Arranging, Retaining and growing customers. Marketing and society: Social responsibility and marketing ethics.

TE-4000: Project & Thesis

3 Hours/Week Credit: 3.00

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Optional (any one set)

Set-I

TE-4103: Advanced Yarn Manufacturing Engineering – II

3 Hours/Week Credit:3.00

Short staple

Man-made Fibers and Their Processing: Details study of processing chemical staple fiber, Vz. Viscose rayon, polyester, acrylic and their blends with cotton on cotton processing machineries. Changing in machine speeds, setting and production, Properties of blended yarn, analysis of blends.

Air Jet Yarn: Air jet spinning system, Principle of air jet spinning, Yarn formation, Factor affecting the air jet yarn, advantages and disadvantages.

Slub Spinning: Types of slub yarn, Manufacturing methods, Effect of process variables, Yarn characteristics and their uses.

Woolen and Worsted Spinning: Cleaning and preparing process, Worsted and woolen spinning.

Other New Spinning Process: Electrostatic spinning, Friction spinning, Twist spinning, Repco spinning, Wrap spinning, False-twist process, Adhesive processes.

Twisted Yarn: Study of two-fold, manifold, cabled yarn. Twisting and doubling machines including up-twisters and 2-for-1 twisters. Effects of amount and direction of twist at each twisting stage on strength, elongation, luster and balanced twist. Twist setting.

Textured Yarn: Different types of textured yarn, Texturing methods and their description.Effect of process variables on characteristics of textured yarns.Characteristics of textured yarn and their application fields.

Production Of Twines And Ropes: Raw material, production process, Machinery and equipment used.

Fancy Yarn: Boucle, grimp& loop yarn, Snarl yarn, Knop yarn, Corkscrew yarn, Chenille yarn, Ribbon yarn, Self twisted yarn, Network yarn.

Tow-To-Top Conversion: Tow-to-top conversion technology and their description.

Recently Published Research Works: Lectures on recently published research and development works for short and long staple materials.

Long Staple:
Manufacture of jute blended yarns using different spinning systems, Properties and end use of blended yarns,
Details study of modern long staple spinning systems such as: Repco, Spin guard, Wrap spun, core spun and twist less spinning.

TE-4104: Advanced Yarn Manufacturing Engineering – II (Sessional)
3/2Hours/Week Credit: 0.75

Study on polyester- cotton blend yarn, Study on cotton- viscose blend yarn, Study on acrylic yarn, Study on viscose yarn, Details study on air jet spinning, Details study on friction spinning; Details study on texturing process.

TE-4609: Maintenance and Management of Textile Machinery
3 Hours/Week Credit: 3.00

Maintenance: Types of maintenance, planning and organizing maintenance; Repair cycle maintenance stages; Lubrication and lubricants; Inspection.

Inventory Management : Types of inventory; Cost analysis of inventory; Inventory control; Economic order quantity (EOQ); Economic lot size; Lead time; Mean absolute deviation (MAD); Re-order level.

Material Handling: Conveyors used in textile mill – belt conveyor; Chain conveyer; Hydraulic press and lift; Truck hoist.

Air Conditioning: Comfort condition; Psychometric chart; Heating; Cooling; Dehumidification; Humidification; Ventilation; Filtration; Mill illumination.

Ergonomics: Definition; Importance and application of ergonomics to work place and layout.

Machine Erection: Floor preparation; Foundation; Machine fixation; Leveling etc.

Safety in Textile Mill : Industrial hazards; Safety rules; Factory act; First aid and pollution control.

TE-4100: Maintenance and Management of Yarn Machinery (Sessional)
3/2Hours/Week Credit: 0.75

Safety: Drives to any machines on which maintenance is being carried out should be isolated and machine unable to be switched on. Safety must be stressed. In particular, maintenance of guards, guard door solenoids and position of emergency stop buttons. All maintenance should be related to the quality of product from each machine.
Examination of all gearing for wears and corrects depth of setting; also flat belt, V-velt, Tape, Rope and Chain drives for wear, correct setting and slippage where appropriate. Positioning of oiling and greasing points; schedules for cleaning, Oiling and Greasing, scouring and re-setting schedules.

Blow-Room: Inspection for wear and setting of beater bars, lattices, regulating and lap forming mechanisms.

Draw Frames: Maintenance of drafting system, stop mechanisms, Comber check cylinder half laps, top combs and brushes for wear, check and adjust all settings, care of drafting system.

Speed & Ring Frame: Maintenance of drafting systems, rings and travelers, spindles, drive to ring rail.

Rotors Spinning Machine: Maintenance of opening roller rotor driving systems, suction unit.

Set-II

TE-4203: Advanced Fabric Manufacturing Engineering – II
3 Hours/Week Credit: 3.00

Special Fabric Production: Definition; Feature; Structure; Production; Properties; End-uses etc. of tape, ribbon, webbing, belt, label, braid, laminate, bonded, coated & Pile fabric, carpet weaving.

Denim Fabric Production: Types of denim manufacturing; Warping, sizing, dyeing & weaving process of denim fabric manufacturing.
Conventional and various unconventional selvedges and calculation of weft waste percent.

Weaving Management: Preparing of a weaving plan; Cloth costing & yarn consumption; Time studies in weaving and calculation of weaver's load; Causes of warp and weft breakage in weaving; Factors controlling loom efficiency; Relevant calculations of weaving machinery allocation; Production management; Project balancing and modernization; Current issues in weaving; Factors to be considered before purchasing commercial loom.

Weft Knitting: Production of high quality cotton knit goods; Production of knit goods from yarns containing man-made fiber; Study on linear and non linear cams in weft knitting; Kinetics and economics of weft knitting; Automation in knitting industry; VDQ pulley adjustment; Positive feeder; Inverter, Lubricating system; Spirality-measurement, causes and remedies; Calculation related to GSM, stitch length, yarn count, machine speed.

Warp Knitting: Multi-axial knitted fabric construction; Multi-axial Raschel machine; Uses of multi-axial fabrics; Recent Research and Development in Knitting; Machine setting change with fabric design; Knitting floor management;

Factors to be considered before purchasing knitting machine.

Nonwoven: Definition and classification of non-woven; Fiber and fiber consumption; Present and future fiber requirements; Methods of web formation; Dry laying; Wet laying; Spun laying; Flash spinning; Melt blown; Web bonding: Chemical bonding; Thermal bonding; Solvent bonding; Mechanical bonding; Properties and uses of nonwoven fabrics; Fault and remedies of nonwoven fabrics; Environmental problems caused by nonwoven fabrics.

TE-4204: Advanced Fabric Manufacturing Engineering – II (Sessional)
3/2Hours/Week Credit: 0.75

Weaving: Manufacturing process of tape, ribbon, webbing, label, braid, laminate, bonded, coated & Pile fabric; Preparation of various types of selvedge.

Knitting: Automation in knitting industry; VDQ pulley adjustment; Positive feeder; Inverter; Lubricating system; Fabric take down mechanism; Calculation related to GSM; Stitch length; Yarn count; Machine speed; Machine setting change with fabric design.

Nonwoven: Methods of web formation- Dry laying, wet laying, spun laying, flash spinning, melt blown; Web bonding- chemical bonding, thermal bonding, solvent bonding, mechanical bonding.

TE-4609: Maintenance and Management of Textile Machinery
3 Hours/Week Credit: 3.00

TE-4200: Maintenance and Management of Fabric Machinery (Sessional)
3/2Hours/Week Credit: 0.75

Thorough understanding of different preparatory and fabric manufacturing machinery; To become familiar with various parts of the machines; To become familiar with the maintenance tools and their functions; Cleaning; Oiling/Lubricating and greasing of various machine parts. Understanding the basic principles of tightening and loosing of nut, bolt, screw, belt, etc. and skill development thereof; Proper meshing of the gears, putting, on and putting off the belts etc. locking / fixing of cam, cone, pulley, toothed gear etc; Fitting of bush, bearing collars and bracket; Systems of dismantling and reassembling of machine parts; Changing and setting of various machine parts and observing their effects on changing; Overhauling and erecting of preparatory and fabric manufacturing machinery.

Set-III

TE-4303: Advanced Wet Processing Engineering – II
3 Hours/Week Credit: 3.00

Dyeing:

Foam Dyeing: Introduction of foam in dyeing & finishing; Essential foam parameters; Requirements for Foam stabilizer; Requirements for Foaming agents; Lamella; Foam density; Blow ratio; Foam criteria according to fabric specification; Different types of foam application systems: knife-over roll method, horizontal padder method.

Super Critical Fluid Dyeing: Concept of super critical fluid; Phase diagram of SCF state of solvents; Explanation of the terms- super, critical and fluid; Triple point; Sub critical liquidstate; Super critical fluid state; Introduction of CO_2 as suitable SCF; Scopes of super critical fluid dyeing of textile fibers.

Solvent Dyeing: Scope of solvent dyeing; Properties of solvents; Conventional & latest solvents; Reasons for using solvents; Typical solvent dyeing of manmade fiber; Eco-friendly aspect of solvent dyeing.

Dyeing of Blended Fibers and Fabrics: Types of blends and blend dyeing; Dyeing of polyester-cotton fabric with disperse-vat, disperse-reactive dyes; Two bath and one bath dyeing of blend, High temp. method; Carrier method; Thermosol process; Effect of dispersing agent; Effect of carrier-different theories; Typical application of blend dyeing.

Color and Color Vision: Introduction to color & light; Additive and subtractive color theory (primary & secondary color, color filter concept); Color parameters for determination and measurement- hue, chroma and value.

Theories of Color Measurement: Munsell theory; Hue; Value; Chroma & color coding. Concept on chromaticity co-ordinates & chromaticity diagram; CIE XYZ theory; Chromaticity diagram; Color saturation; Color gamut; Complementary color; CIE LUV theory; CIE Lab Systems of Color Measurement; CIE LCH theory; dE value determination; CMC pass fail.

Color Vision Matters: Scope of color geometry; Viewing geometry; Color temperature; Spectral power distribution and its significance; Light source & illuminants; Color rendering index; Metamerism; Types of metamerism.

Instrumental Color Measurement: Spectrophotometer; Computer color matching; Data base creation; Computer assisted recipe calculations; Kubelka-Munk theory; K/S value; Reflectance.

Human Color Vision: Cross-sectional view of human eye indicating relevant parts; Photosensitive cells; Rod and cone cells; Scotopic, photopic and mesopic visions; Retinal pathway to optic nervous system to brain; Color vision defficiencies.

TE-4304: Advanced Wet Processing Engineering – II (Sessional)

3/2Hours/Week Credit: 0.75

Study on Spectrophotometer; Study on illuminants & viewing geometry on spectrophotometer; Study on CIE Lab &CIE LCH color theory on spectrophotometer;

Determination of color difference value (dE) of dyed textiles; Determination of CMC value of dyed textiles; Study on K/S value measurement; Determination of brightness measurement of dyed textiles; Study on computerized recipe formulation; Measurement of color yield % of dyed fabrics; Dyeing of PET-cotton fabrics (Reactive – disperse & vat-disperse dyes).

TE-4609: Maintenance and Management of Textile Machinery
3 Hours/Week Credit: 3.00

TE-4300: Maintenance and Management of Wet Machinery (Sessional)
3/2Hours/Week Credit: 0.75

Preparatory Machinery's: Maintenance of singeing; kier boiler; J-box; Rope washing machines; Boilers.

Dyeing Machinery's: Maintenance of jigger dyeing; Winch dyeing; HTHP; Dyeing; Hank dyeing machinery's.

Finishing Machinery's: Maintenance of different padding mangles; Dying machinery's, Stenter mercerizing machines; Calendaring and folding machines.Compacting machine; Brushing machine.

Printing Machineries: Maintenance of different roller printing and screen printing machineries.

Laboratory Machineries: Maintenance of different laboratory machineries.

Set- IV

TE-4403: Advanced Apparel Manufacturing Engineering – II
3 Hours/Week Credit: 3.00

Production Planning & Production Control; Production management; Line balancing; Production systems (UPS, PBS, MPS etc.); Tools & technique of productivity improvement; CSR in apparel manufacturing; KPI's in Garments Industry.

Tools of Planning: Work measurements; elements, timing, timing errors, rating, allowances, standard time calculation; Predetermined motion time system (PMTS); Time study, motion study and method study.

Merchandizing in the Garment Factory: Introduction; Role of merchandiser; Types of merchandising.

Garments Costing &Consumption: System of garments costing; Determination of fabric consumption; Thread consumption and trimmings; Analysis of fabric requirements in relation to garments costing; Determination of costs.

Fully Fashioned Garments: Design details; Production process; Consumption and Costing.

Clothing Comfort: Physiological process of maintaining constant core temperature of human body; Mechanism of heat transfer from human body; Concept of heat transfer and comfort; Sportswear and performance textiles; Thermal underwear; Wind proof garments; Breathable fabrics; Jogging suits; Racing drivers suits; Protective Clothing-fire proof, water proof, antibacterial.

Lecture on latest trend in garments manufacturing; Lecture on recently published research and development works.

TE-4404: Advanced Apparel Manufacturing Engineering – II (Sessional)
3/2Hours/Week Credit: 0.75

Garments analysis & Spec sheet development; Study on SMV and production capacity (T-Shirt, Long Sleeve shirt, Woven pant); Preparation of CM cost sheet (T-Shirt, Long Sleeve shirt, Woven pant); Study on operation breakdown and machine layout for different garments (T-Shirt, Long Sleeve shirt, Woven pant, Kids item); Line balancing for different garment products.

TE-4609: Maintenance and Management of Textile Machinery
3 Hours/Week Credit: 3.00

TE-4400: Maintenance and Management of Apparel Machinery (Sessional)
3/2Hours/Week Credit: 0.75

Repair, Maintenance, setting and replacement of different parts of rotary knife, Straight Knife, Band knife, Die cutting machine, Notcher and drill machines, Repair maintenance, setting and replacement of different parts of lockstitch, Blind stitch, Chain stitch, Over edge stitch and flat lock sewing machines. Repair, maintenance and setting of fusing machines and Pressing machines.

Set-V

TE- 4803: Economic Issues and International Marketing of Textile and Apparel Business
3Hours/Week Credit: 3.00

Economic Issues Affecting Textile and Apparel Business: Interest on different types of capital; Costs of utilities; Road communication & other infrastructure; Transport facilities and cost; Port facilities; Clearing and forwarding formalities; Banking and exchange rate; Law and order situation; Bi-lateral/multi-lateral trade agreement; Cash incentives/Export incentive; Export policy and import policy; Damping, anti-damping; Wages and productivity of labor; Availability & cost of raw material; Social compliance in environmental issue; Availability of skill manpower & latest technology; Effect of global issue and other related issues.

Taxation
Income Tax: Statutory definitions; Income tax authorities; Charge of income tax; Income tax base & tax rate; Type of accesses and their residential status; Heads of incomes; Income from salaries; Interest on Securities; Income from house property; Agricultural income; Income from business or profession; Share of profit in a firm; Income of the spouse or minor child; Capital gains and income from other sources, foreign income, exemption, (tax holiday and other tax incentive); Allowances, return and payment of income tax.

Value Added Tax: Scope of VAT; Registration & de-registration; Exemption and zero rating; Tax point of VAT; Taxable value for VAT; VAT computation; Turnover tax (TT) & Supplementary duty (SD) books of account to be maintained under the VAT laws; Piling of VAT return; Tax authorities under the VAT laws; Payment; Refund and recovery of taxes under the VAT Laws.

Custom Duty: Authorities; Customs port; Customs airport; Land customs station & Customs-house; Warehousing station & public/private warehouses; Prohibited goods or piece goods; Goods dutiable; Exemptions from customs duty; PSI; Value of imported and exported goods for imposing customs duty; General custom duty; Countervailing duty; Anti-damping duty and safeguard duty; Duty drawback; Infrastructure development surcharge; Offences and penalties; Prevention of smuggling- power and search, seizure and arrest adjudication of offences; Appeals and revisions.

Excise Duty: Goods and services subject to excise duty; Level of excise duties; Regulatory duty under the excise and salt act; Determination of value for imposing excise duty; License necessary for certain operations; Offences and Penalties; Recovery of sums due to Government; Exemption from excise duty.

Gift Tax: Statutory definition of gift; Valuation of gift; Tax exempted gifts; Return of gifts; Assessment and recovery to gift tax; Penalties and prosecution; Gift tax authorities; Taxes, VAT and duty applied to textile and apparel in Bangladesh and other countries.

Insurance

Insurance Contracts: Essentials; Principles; Insurance and Wagering; Insurance contingencies; Reinsurance; Types of reinsurance; Application of reinsurance to various branches of insurance; Double insurance; Brief history of insurance business.

Life Insurance: Life insurance contract; Types of policies; Certain aspects of life insurance.

Fire Life Insurance Contract: Material Loss Insurance; Consequential loss insurance; Settlement of claims; Extent of loss by fire in Bangladesh; Moral hazard; Management problems of life insurance.

Marine Insurance: Marine insurance contract; Types of policies; Marine losses; Settlement of claims; Act of god.

Other Insurance: Crop insurance; Cattle insurance; Civil aviation insurance; Export credit guarantee; Group insurance; Self-insurance etc.; Fidelity insurance; Bank deposit insurance.

International Marketing of Textile and Apparel

Definition of International Trade: Importance of international trade in the world economy; Trend of international trade with reference to Bangladesh.

International Trade and the Theory of Comparative Advantage: Economic basis for international trade; The source of international trade; The principle of comparative advantage; Economic gain from trade; Effects of trade quotas; Heckscher –Ohilion theorem.

Protectionism and Free Trade: Arguments/economics of protectionism; Instruments of protectionism; Multilateral trade negotiation; Removing barriers to free trade GATT as an initiative for liberalization trade; Controlling the international business.

The Economics of Foreign Exchange: Balance of international trade; International financial system.

International Trade Transaction: International transfer of bank deposits resulting from international transactions; Foreign trade and export and import transactions; Foreign exchange markets; Equilibrium exchange rates; Determinants of foreign exchange rates;

Nominal and real exchange rate; Appreciation and depreciation of currencies; International balance of payments; Current accounts; Capital accounts.

Export and Import Practices: Export strategy; Export intermediaries; Locating foreign markets; Freight forwards and their functions; Export financing; Other government incentives.

Import & Export Procedure: Registration procedure; Procedure in export import trade; Import procedure of industrial goods and commercial goods; Documentation-Invoice, packing list, bill of exchange, bill of lading, types of B/L, certificate of origin, certificate of analysis; Pre-shipment inspection (PSI); Shipments; Import strategy; Delivery and negotiation; Retirement of documents from bank; Clearing agent and their functions in customs clearance; Technology transfer; Technical assistance; Procedure for realization of export incentives; Back to back L/C.

Issues of International Economics: The Bretton Woods system; The international monetary fund (IMF); The world bank (WB); World trade organization (WTO) & other international arrangement.

Bangladesh and International Textile & Apparel Trade: World textile & apparel trade & production trends; International trade in textile clothing; Trends of export & import of Bangladesh with special reference to textile & apparel; Bangladesh position in the world; USA, EU, & Community of developing countries; Trade intensity and terms of trade of Bangladesh with the SAARC countries; Trends and composition of exports and imports of Bangladesh; Major trade partners of Bangladesh.

Export Procession Zone in Bangladesh: Bangladesh Export Procession Zone Authority (BEPZA); Reasons for setting EPZ in Bangladesh; Performance of the EPZ in Bangladesh.

TE- 4804: CAD/CAM (Sessional)
3/2Hours/Week Credit: 0.75

Practical experience will depend on the selected stream and encompass CAD/CAM systems for concept/mood board's development; Woven and knitted fabric design and development; Garment design and development; Virtual merchandizing; 3-D draping; Specification/costing management systems; Business management software.

This course will develop understanding of computer-aided textile design in the key areas of communication; Industry specifications and visual media presentation; Increasingly textile designers require communication tools to promote their concepts; Designs & product development ideas to a client; The course will provides with the appropriate skills in software, analysis, presentation styles and communication techniques to effectively promote students and their folio of work to clients and employers.

Course should develop good understanding and practice on the following design software- Adobe Photoshop, Adobe Illustrator CS4 with the Apple Mac and PC platforms.

TE- 4805: Entrepreneurship and Business Project Development
3Hours/Week Credit: 3.00

Concept and meaning of entrepreneurship; Theories of entrepreneurship; Characteristics of entrepreneurs; Entrepreneurial motivation; Environment of entrepreneurship; History of entrepreneurship development; Japan, USA, UK, India, Pakistan, Philippine; Bangladesh

sources and procedures of government and private assistance; Government regulations concerning entrepreneurship development; Problems of entrepreneurship development in Bangladesh; Preparation of business plan; Case studies of entrepreneurs.

Entrepreneurship and Small Business: Definition of small business; Small business and economic development; Problem an aid to small business; Different schemes of training; Problems in small business.

Entrepreneurship and Small Business in Bangladesh: A review of attempts; Success and failures; Different schemes of small business development; Existing schemes and future plans; Feasibility studies to set up a new mill; Economic; Market; Financial and technical feasibility studies; Economic evaluation and comparison of alternative investments; Capital budgeting technique; Payback period; Net present value; Internal rate of return; Benefit cost ratio; Project management through CPM/PERT.

TE-4806 Entrepreneurship and Business Project Development(Sessional)
3/2Hours/Week Credit: 0.75
Sessional based on **TE- 4805**

Set -VI

TE-4903: Trend Forecasting and Portfolio Development
3 hrs/week Credit: 3.00

Trend Forecasting: Theoretical methods and practical applications to predict the trends that will possibly influence the amount and types of products consumers will buy.

It will provide a framework to utilize students creative and analytical skills in developing skilled research methods; Incorporated with strategic decision making in recognizing the patterns, cycles and dissemination of information; This will include the study and application of micro environments and consumer behavior

Student will learn the practical challenges of translating trends in terms of objectives and how to incorporate the creativity of trends into development of commercially viable product.

It will be demonstrated to the student how these trends are communicated through written reports, folios and presentations. (Discuss, draw & practice only the issues permitted in Islamic regulation).

Portfolio Development: Enable the student to produce a comprehensive portfolio encompassing a collection of designs with relevant documented visual, creative and technical information to fulfill the design brief; Formulation; Concept; Direction; Ideas sourcing; Research and adaptation; Fabric theme and color story; Consolidation of ideas; Idea sheets; Illustrated designs as a story; Presentation of drawings; Working drawings for sample development; Accessory co-ordination; Total look enhancement by use of appropriate accessories; Transformation of 2D ideas into 3D Prototypes- pattern adaptation and development; Work stand and toile preparation; Making up prototypes; Toiles to actual garments; Fitting on work stand and mannequins; Costing and production spec sheets; Presentation of collection- different methods of display.

TE-4904: Computer Aided Design and Computer Aided Manufacture (CAD/CAM) in Fashion and Textiles (Sessional)
3/2Hours/Week Credit: 0.75

The course provides students with an understanding and practical experience of the role of CAD/CAM in the areas of textile design and technology; Fashion and apparel design and technology; Fashion merchandising and management.

The role of CAD/CAM systems in textile and apparel supply chain; From concept and sketch to market; Industry specific CAD systems (print design, weave/knit design, sketching/illustration, digitizing, grading, marker making, pattern design, 3D imaging, texture mapping, body measurement, specification management, supply chain management, virtual merchandizing etc); The ways of design, development, manufacturing and retail technologies integrate with digital communication and information applications used in textile technology, fashion technology, retail and merchandising management.

This course is not limited to currently available technologies, but also investigates emerging CAD/CAM technologies that are of significance to local and global textile, apparel and fashion market places. Practical experience will depend on the selected stream and encompass CAD/CAM systems for concept/mood boards development; Woven and knitted fabric design and development; Garment design and development; Virtual merchandizing; 3-D draping; Specification/costing management systems; Business management software; Computer-aided textile design in the key areas of communication; Industry specifications and visual media presentation; Increasingly textile designers require communication tools to promote their concepts, designs & product development ideas to a client; The course will provides with the appropriate skills in software, analysis, presentation styles and communication techniques to effectively promote students and their folio of work to clients and employers; Course should develop good understanding and practice on the following design software- Adobe Photoshop, Adobe Illustrator CS4 with the Apple Mac and PC platforms.

TE-4905: Product Development and Marketing
3 hrs/week Credit:3.00

Product Development: The course provides students with an understanding and practical experience of the role of textile product development process and textile product engineering in textile manufacturing and management; Students will learn to identify the textile product development strategy through market and product trend research; Identify customer expectations, market requirements, product appearance, aesthetics, performance and technical requirements; Students will research new and alternative technologies and equipment available (type, capability, capacity), raw materials and finishes; After carrying out feasibility analysis and developing an engineering brief; Students produce/source trial samples to required product engineering criteria and evaluate efficiency of the process; Product performance and cost effectiveness of the new product; Clear emphasis will be placed on improving the environmental credentials of the new products.

Marketing: Student will be introduced to the basic principles and concepts of marketing as a foundation to understand world fashion market; Lectures should include marketing overview; Strategic planning; Marketing mix; Decisions and competitive advantages; Consumer behavior; Organizational markets and buying behavior; Market research; SWOT; Market segmentation; Targeting; Product positioning; Planning; Details on new product development stages; Branding and packaging; Distribution; Advertising; Sales promotion and publicity; Pricing strategy.

TE-4906: Apparel Design Analysis (Sessional)
3/2Hours/Week Credit: 0.75

Introduce the students to the key skills and capabilities in the areas of textile design processes, colour usage, repeat patterning, storyboarding, resources and research and presentation techniques.
Design concepts, croquis and illustration will develop and then converted into technically and commercially printed, woven or knitted fabrics for Industry projects and/or small manufacturing enterprise product development.

The Textile design course will also introduce student to the basic practical skills for designing and sampling fabrics. Along with class lectures, One part will be workshop based and covers the principal areas of printed, woven and knitted textile design.

Emphasis will be given on creating original design using forecasting and research information, development in the use of color, themes, forecasting analysis and illustration styles. Students will be introduced to the fundamentals of repeat design for various textile outcomes, with an accent on colour accuracy and textile production specifications. Certain projects within this course are team focused and individual project work can be taken through to Textile Design. Student will select a specialist discipline in either - Surface Pattern: Printed textile design, or Constructed Textiles: Knitted and Woven textile design.
Presentation techniques for specific markets are introduced in this course. Drawing components are included in key projects to encourage development of original design concepts.