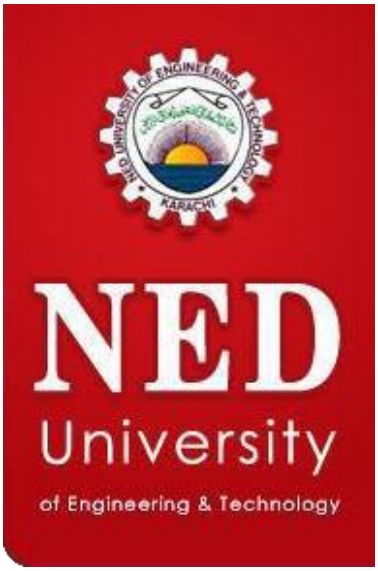
NED UNIVERSITY OF ENGINEERING TECHNOLOGY
TEXTILE ENGINEERING DEPARTMENT



CURRICULUM
OF
BACHELORS OF TEXTILE ENGINEERING

Applicable from Batch 2025 onwards

NED University of Engineering & Technology
Textile Engineering Department Scheme of studies for B.E Textile Program

Textile Engineering									
First Year									
Fall Semester					**Spring Semester**				
		Credit Hours					**Credit Hours**		
Course Code	**Course Title**	**Th**	**Pr**	**Total**	**Course Code**	**Course Title**	**Th**	**Pr**	**Total**
ES-105/ ES-127	Pakistan Studies / Pakistan Studies (for Foreigners)	2	0	2	ES-206/ ES-209	Islamic Studies / Ethical Behaviour (for non-Muslims)	2	0	2
EA-128	Functional English	3	0	3	ES-108	Ideology and Constitution of Pakistan	2	0	2
MT-116	Calculus & Analytical Geometry	3	0	3	MT-221	Linear Algebra & Ordinary Differential Equations	3	0	3
MF-101	IT Fundamentals and Application	2	1	3	TE-111	Textile Chemistry	3	1	4
PH-129	Applied Physics	3	0	3	ME-112	Thermodynamics	3	0	3
TE-113	Introduction to Textile Engineering	2	0	2	TE-224	Polymer and fiber science	2	0	2
	Total	15	1	16		**Total**	15	1	16
Second Year									
Fall Semester					**Spring Semester**				
		Credit Hours					**Credit Hours**		
Course Code	**Course Title**	**Th**	**Pr**	**Total**	**Course Code**	**Course Title**	**Th**	**Pr**	**Total**
ME-101	Engineering Mechanics	3	1	4	TE-205	Pretreatment of Textiles	3	1	4
TE-218	Material Science	2	0	2	ME-311	Manufacturing Processes	3	1	4
TE-216	Fluid Mechanics for Textiles	2	0	2	MM-205	Mechanics of Materials	3	1	4
TE-211	Textile Yarn Manufacturing	3	1	4	MF-201	Civics and Community Engagement	2	0	2
EE-122	Basic Electricity & Electronics	3	0	3	TE-312	Textile Fabric Manufacturing Processes	3	1	4
TE-251	Engineering Drawing & Graphics	0	2	2	MF-205	Community Services	0	0	0
					ES-109/ES 210	Understanding of Holy Quran – I / Introduction to Ethics – I	0	1	1
	Total	13	4	17		**Total**	14	5	19

Third Year									
Fall Semester					**Spring Semester**				
		Credit Hours					**Credit Hours**		
Course Code	**Course Title**	**Th**	**Pr**	**Total**	**Course Code**	**Course Title**	**Th**	**Pr**	**Total**
TE-307	Utilities for Textile Industry	3	1	4	TE-463	Garment Manufacturing	2	1	3
MF-304	Engineering Economics	2	0	2	TE-323	Textile Product Evaluation-I	2	1	3
TE-326	Textile Dyeing	3	1	4	TE-319	Heat & Mass Transfer	2	1	3
EA-304	Business Communication and Ethics	3	0	3	TE-318	Textile & Environment	2	0	2
TE-207	Machine Design	3	0	3	TE-305	Quality Control in Textiles	2	0	2
ME-104	Workshop Practice	0	2	2	MT-333	Advanced Calculus & Fourier Analysis	3	0	3
ES-110/ES 211	Understanding of Holy Quran – II / Introduction to Ethics – II	0	1	1	TE-351	Computer Aided Design	0	1	1
					EA-###/ ES-###	Foreign Language-I	0	0	0
	Total	14	5	19	**Total**		13	4	17
Final Year									
Fall Semester					**Spring Semester**				
		Credit Hours					**Credit Hours**		
Course Code	**Course Title**	**Th**	**Pr**	**Total**	**Course Code**	**Course Title**	**Th**	**Pr**	**Total**
MG-257	Organizational Behavior	2	0	2	MG-485	Entrepreneurship	2	0	2
TE-462	Advanced Fabric Manufacturing Mechanism	3	1	4	TE-406	Textile Production Management	3	0	3
TE-###	Elective - I				TE-###	Elective - II			
TE-408	Textile Engineering Design project	0	3	3	TE-408	Textile Engineering Design project	0	3	3
TE-413	Textile Product Evaluation-II	3	1	4	TE-424	Textile Printing	3	1	4
EA-###/ ES-###	Foreign Language-II	0	0	0	TE-464	Occupational Health and Safety	1	0	1
TE-###	**Elective - I**			**4**	**TE-###**	**Elective - II**			**3**
TE-452	Textile Finishing	3	1	4	TE-454	Textile Merchandising	3	0	3
TE-455	Advanced Garment Manufacturing	3	1	4	TE-451	Automation & Control in Textiles	3	0	3
TE-461	Advanced Yarn Manufacturing Mechanism	3	1	4	ME-438	AI and Internet of Things	2	1	3
	Total	11	6	17		**Total**	12	4	16
** Duration one academic year: Requires literature survey and preliminary work during this Semester*									

ES 105: PAKISTAN STUDIES

Historical and Ideological Perspective of Pakistan Movement

Two Nation Theory, Factors leading to the creation of Pakistan, Jinnah and demand for Pakistan.

Land of Pakistan

Geophysical conditions of Pakistan, Geopolitical and strategic importance of Pakistan, Natural resources of Pakistan: mineral, water and power resources.

Constitutional process

Early efforts to make a constitution (1947-1956), Salient features of the Constitution of 1956, 1962, Political and Constitutional crisis of 1971, Salient features of the Constitution of 1973, Constitutional amendments from 1973 to date.

Contemporary issues of Pakistan

A brief Survey of Pakistan's economy, The Current Economic Situation of Pakistan: Problems & Issues and future perspective, Social Issues: Pakistan's society and culture: broad features, Literacy and education in Pakistan: problems and issues, Scientific and technical development in Pakistan, Citizenship: national and international. Environmental Issues: Environmental pollution: causes, hazards and solutions, National policy, international treaties, conventions and protocols.

Pakistan's Foreign Policy

Pakistan's Foreign Policy from 1947 to present, Relations with immediate neighbors, Relations with major powers, Relations with the Muslim world.

Human Rights

Conceptual foundations, Western and Islamic perspective of Human Rights, Human Rights in the Constitution of 1973, Human rights issues in Pakistan.

ES-127 PAKISTAN STUDIES (FOR FOREIGNERS)

Literature, A short history of Urdu literature

Land of Pakistan:

Land & People-Strategic importance- Important beautiful sights, Natural resources.

A Brief Historical Background:

A brief Historical survey of Muslim community in the sub-continent, British rule & its impacts, Indian

reaction, Two nation theory, Origin & development, Factors leading towards the demand of a separate Muslim state, Creation of Pakistan

Government & Politics in Pakistan:

Constitution of Pakistan, A brief outline, Governmental structure, Federal & Provincial, Local Government Institutions, Political History, A brief account.

Pakistan & the Muslim World:
Relations with the Muslim countries

Language and Culture:
Origins of Urdu Language, Influence of Arabic & Persian on Urdu Language & Literature, A short history of Urdu Literature

EA 128 FUNCTIONAL ENGLISH

Listening skills and subskills

Effective listening techniques: listening for gist, details, and specific information in a range of situations (AV lectures, interviews, documentaries etc.)

Speaking skills

Speaking with fluency and accuracy in a variety of situations including conversations, group discussion, academic and social interaction, public speaking, presentation skills, and interviews; Pronunciation improvement exercises (through websites, apps, and in class worksheets)

Reading and subskills

Reading strategies: Skimming, scanning, and detailed reading, identifying main ideas, supporting details, and inferences (multiple genres including newspapers, books, stories, documentaries etc.). Reading Practice: Reading comprehension tasks. Reading output tasks (notes, summary, discussion, counter argument etc.)

Study skills

Effective note-taking strategies for lectures, meetings, and reading texts. Taking in varied forms paragraph, lists, infographics etc.); Interpreting instructions oral and written. Effective examination taking technique (comprehending instructions, planning, and writing answers ensuring relevance and precise

Writing skills

Writing process, Pre-writing strategies (Mind mapping, cubing, outlining, clustering etc.); Writing to describe, argue, compare and contrast, persuade through writing prompts; Writing academic and professional genres: emails, letters, short report, resume, cover letter, building profiles on various job portal; Writing accuracy: Identifying and overcoming grammatical problems.

Vocabulary and grammar development

Vocabulary Development strategies. Exposure and practice to develop every day and academic vocabulary for formal contexts.

MT-116 (CALCULUS & ANALYTICAL GEOMETRY)

Set and Functions

Define rational, irrational and real numbers; rounding off a numerical value to specified value to specified number of decimal places or significant figures; solving quadratic, and rational inequalities in involving modulus with graphical representation; Definition of set, set operations, Venn diagrams, De Morgan's laws, Cartesian product, Relation, Function and their types (Absolute value, greatest integer and combining functions). Graph of some well-known functions. Limit of functions and continuous and discontinuous functions with graphical representation.

Differential Calculus

Differentiation and Successive differentiation and its application: Leibnitz theorem. Taylor and Maclaurin theorems with remainders in Cauchy and Lagrange form, power series. Taylor and Maclaurin series, L' Hopitals rule, extreme values of a function of one variable using first and second derivative test, asymptotes of a function, curvature and radius of curvature of a curve, partial differentiation, extreme values of a function of two variables with and without constraints. Solution of non-linear equation, using Newton Raphson method.

Integral Calculus

Indefinite integrals and their computational techniques, reduction formulae, definite integrals and their convergence. Beta and Gamma functions and their identities, applications of integration relevant to the field.

Sequence & Series

Sequence, Infinite Series, Application of convergence tests such as comparison, Root, Ratio, Raabe's and Gauss tests on the behaviour of series.

Analytical Geometry

Review of vectors, scalars and vector products, Three-dimensional coordinate system and equation of straight line and plane and sphere, curve tracing of a function of two and three variables, surface revolutions, coordinate transformation.

Complex Number

Argand diagram, De Moivre formula, root of polynomial equations, curve and regions in the complex plane, standard functions and their inverses (exponential, circular and Hyperbolic functions).

MF-101 IT FUNDAMENTALS AND APPLICATIONS

Fundamentals of IT

Introduction to Information and Communication Technologies (ICT), Components and scope of ICT, ICT productivity tools, Emerging technologies and future trends, Ethical Considerations in Use of ICT Platforms and Tools, Applications of ICT in education, healthcare and finance. Digital citizenship.

Data Representation and Number Systems:

Binary, octal, decimal, hexadecimal systems, data representation: characters, numbers, multimedia.

Databases:

Fundamentals of databases, organization and storage, introduction to Information Systems (IS) and Management Information Systems (MIS), real world IS and MIS applications.

Data Communication and Computer Networking:

Network topologies, Types of networks

Programming Languages:

Evolution and structures: syntax, semantics, special purpose vs. general-purpose languages, comparative study of data types, control structures and algorithms, basics of coding, practical problem solving.

PH-129 APPLIED PHYSICS

Vectors & Mechanics:

Review of vectors, Newton Laws and their Applications, Frictional Forces and determination of Co-efficient of Friction, Work-Energy Theorem, applications of law of Conservation of Energy, Angular Momentum, Centre of Mass.

Waves and Oscillations:

Simple Harmonic Oscillator, Damped Harmonic Oscillation, Forced Oscillation and Resonance, Types of Waves and Superposition Principle

Optics and Lasers:

Huygens Principle, Two-slit interference, Single-Slit Diffraction, Types of Lasers, Applications of Laser.

Modern Physics:

Planck's explanations of Black Body Radiation Photoelectric Effect, De-Broglie Hypothesis, Electron Microscope, Atomic structure, X-rays, Radioactive Decay and Radioactive Dating, Radiation Detection Instruments

Electrostatics and Magnetism:

Electric field due to different Charge Distribution, Electrostatic Potential Applications of Gauss's Law, Lorentz Force Ampere's Law, Magnetism, Magnetization, Magnetic Materials.

Electrical Elements and Circuits:

Review of electric current, voltage, power, and energy, Ohm's law, inductance, capacitance, Basic Electrical circuits, Electromechanical systems.

Semiconductor Physics and Electronics:

Energy levels in a Semiconductor, Hole concept, P-N junction, Diodes, Transistors, Basic Electronic circuits (e.g. rectifier).

Thermodynamics:

Review of Laws of Thermodynamics, conduction, convection, and radiation. Thermal conductivity, specific heat, and overall heat transfer coefficients. Heating, Ventilation and Air Conditioning (HVAC).

TE 113: INTRODUCTION TO TEXTILE ENGINEERING

General Fibre properties & their importance:

Textile Spinning:

Introduction of the processes and machinery in blow room, card, draw frame, speed frame, and ring frame

Winding:

Study of various winding machines and processes; study of different yarn packages

Textile Weaving:

Introduction to weaving; difference between weaving and knitting; Flowchart of weaving processes Brief description of warping systems.

Importance of sizing and preparation of various sizing materials for different yarns cotton, synthetic.

Brief Description of a Loom:

Basic primary motions, weft insertion mechanism, layout and outline of a loom.

Wet Processing:

Fabric preparatory processes, brief description of common batch and continuous methods of scouring,

bleaching and dyeing. Theory of dyeing and classification of dyes considering application, textile printing.

ES-206 ISLAMIC STUDIES

Fundamentals of Islam

Tauheed, Arguments for the Oneness of God; Al-Ambiya-22, Al-Baqarah-163-164, Impact of Tauheed on human life, Place of Man in the Universe: Al Israa/Bani Israil-70; Purpose of creation: Al zariyat-56, Prophethood, Need for Prophet, Characteristics of Prophet, Finality of Prophethood: Al-Imran-79, Al-Hashr-7, Al-Maidah-3, and Faith in Hereafter (Aakhirat), Effects on worldly life: Al-Hajj-5, Al-Baqarah-48, Hadith

Ibadah

Concept of Ibadah, Major Ibadah, Salat, Zakat, Hajj and Jihad. Al-Mu'minun-1-11, Al Anfaal- 60, & Two Ahadiths

Basic Sources of Shariah:

The Holy Quran, Its revelation and compilation, the authenticity of the Text, Hadith, Its need, Authenticity and Importance, Consensus (Ijmaa), Analogy (Qiyas)

Moral and Social Philosophy of Islam

The concept of Good and Evil; **A'l e Imran - 110, Al Nahl-125,** Akhlaq-e-Hasna with special reference to **Surah Al-Hujrat, verses 10, 11, 12, 13,** Professional Ethics (Kasb-e-Halal) **Al Taha-81, Al Baqar 188, one hadith.**

Seerat of the Holy Prophet(PBUH)

a) Moral and ethical teachings of the Holy Prophet (PBUH) with special reference to Hajjat-ul-Wida, (Fundamentals of Islam, Social aspects, Economics aspects, political aspects

b). Personal Characteristics: perseverance & trust in Allah, honesty & integrity, simplicity & humility, mercy & compassion, clemency & forgiveness, bravery & valor, generosity, patience.

c) Engagement and communication with collaborators and foes:
Cases Study from Seerah: Charter of Madina, Ghazwa e Khandaq, Treaty of Hudaibya , Ghazwa e Khayber, Najran's Delegation, Victory of Makkah.

d) Social values and rights, (peace & harmony, tolerance, solidarity, collaborations, inclusivity & cohesion)
Case Studies from Seerah:
Al –Fudoul Confederacy, Placement of Black stone, charter of Medina, Treaty of Hudaibya)

Leadership skills

Vision, communication, negotiation, conflict management, decision making, relationship building, Integrity, positivity, compassion, empathy, loyalty, accountability, confidence, delegation, empowerment, problem-solving, foresightedness, openness, gratitude and justice.

Teaching of Holy Quran

Translation and tafseer of **Surah-e- Fatiha**, and The Selected Section of Sura Al-Furqan verses (63-77), Surah**-e-Luqman** (verses (12-19)).

Nazraah and Tajveed of: Suratul Fatiha, Ayatal Kursi, and last 10 surahs of the Holy Quran. (Ghunnah, Qalqalah, Al-Madd, Noon Sakinah & Tanween Rules)

ES-209 ETHICAL BEHAVIOUR (FOR NON-MUSLIMS)

Nature, Scope and Methods of Ethics

Ethics and Religion, Ethical teachings of World Religions

Basic Moral Concepts

Right and Wrong, Good and Evil

Ethical Systems in Philosophy

Hedonism, Utilitarianism, Rationalism & Kant, Self-Realization Theories, Intuitionism

Islamic Moral Theory

Ethics of Qur'an and its Philosophical basis, Ethical precepts from Qur'an and Hadith and Promotion of Moral Values in Society.

ES-108 IDEOLOGY AND CONSTITUTION OF PAKISTAN

Two-Nation Theory

Nation and Nationalism in British India. Inclusive nationalism, Exclusive nationalism, Freedom movement in British India, Two-Nation Theory.

Ideology: definition and its significance

Difference between Philosophy, Ideology, and Theory. Evolution of Islamic ideology in British India. Pakistan movement: role of ideology. Ideological factors that shaped the Constitution(s) of Pakistan (Objectives Resolution 1949).

Introduction to the Constitution of Pakistan

Definition and importance of a constitution. First Constituent Assembly of Pakistan. Main issues that delayed the Constitution-making in Pakistan. Dissolution of the Constituent Assembly. Second Constituent Assembly of Pakistan. Third Constituent Assembly of Pakistan.

Constitution and State Structure

Federal form of State. Parliamentary form of government. Structure of Government (executive, legislature, and judiciary). Distribution of powers between federal and provincial governments.

Fundamental Rights, Principles of Policy, and Responsibilities

Duty of the citizens of Pakistan (Article 5). Overview of fundamental rights to citizens of Pakistan guaranteed by the Constitution 1973 (Articles 8-28). Overview of Principles of Policy (Articles 29-40).

Constitutional Amendments

Procedures for amending the Constitution. Notable constitutional amendments and their implications: 8th, 13th, 17th, and 18th.

MT-221 LINEAR ALGEBRA & ORDINARY DIFFERENTIAL EQUATIONS

Linear Algebra

Linearity and linear dependence of vectors, basis, dimension of a vector space, field matrix and type of matrices (singular, non- singular, symmetric, non- symmetric, upper, lower, diagonal), Rank of a matrix using row operations and special method, echelon and reduced echelon forms of a matrix, determination of consistency of a system of linear equation using rank, matrix of linear transformations, eigen value and eigen vectors of a matrix, Diagonalization. Applications of linear algebra in relevant engineering problem.

1st Order Differential Equations

Basic concept: Formation of differential equations and solution of differential equations by direct integration and by separating the variables: Homogeneous equations and equations reducible to homogeneous from; Linear differential equations of the order and equations reducible to the linear form; Bernoulli's equations and orthogonal trajectories: Application in relevant Engineering.

2nd and Higher Orders Equations

Special types of IInd order differential equations with constant coefficients and their solutions: The operator D; Inverse operator I/D; Solution of differential by operator D methods; Special cases, Cauchy's differential equations; Simultaneous differential equations; simple application of differential equations in relevant Engineering.

Partial Differential Equation

Basic concepts and formation of partial differential equations: Linear homogeneous partial differential equations and relations to ordinary differential equations: Solution of first order linear and special types of second and higher order differential equations; D' Alembert's solution of the wave equation and two dimensional wave equations: Lagrange's solution; Various standard forms.

Fourier Series

Periodic functions and expansion of periodic functions in Fourier series and Fourier coefficients: Expansion of function with arbitrary periods. Odd and even functions and their Fourier series; Half range expansions of Fourier series.

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TE-111 TEXTILE CHEMISTRY

Liquids and Solutions

Viscosity, colloidal solution, coagulation, adsorption, absorption and diffusion. Intermolecular forces in liquids, surface tension, osmosis and osmotic pressure, desalination of saline water by reverse osmosis. Ways of expressing concentration of solutions.

Electrochemistry

Theories on acids, bases, electrolytes, buffers. Conductance of electrolytes & measurement of electrolytic conductance & cell constant, pH scale & its measurement, buffer solution & Handersen-Hasselbalch equation.

Aromatic Compounds

Concept of a dye and a pigment, parts of a dye molecule. Organic and inorganic raw materials for the manufacturing of dyes/intermediates. Synthesis of dyestuff intermediates through chemical conversion reactions, Resonance and orbital theory of color.

Carbohydrates

Mono, di & polysaccharides and structure of Starch & cellulose, properties and uses of starch & cellulose. Chemistry of cellulose and its degradation products. Physical properties of cellulosic materials.

Surface Active Agents

Soap and soap manufacturing, theory of detergency, synthetic detergents. Surfactants (anionic, cationic, non-ionic & amphoteric) and their properties. Laundry detergents.

Chemical Auxiliaries used in Textile Processing

Enzymes and Catalysts; mechanism and application, Salts, wetting agents, sequestering/chelating agents, dispersing and solubilizing agents, leveling and dye-fixing agents. Waxes.

ME-112 (THERMODYNAMICS)

Introduction, Working substance, System, Pure substance, PVT surface, Phases, Properties and state, Units, Zeroth law, Processes and cycles, Conservation of mass.

Relation of mass and energy, Different forms of energy, Internal energy and enthalpy, Work, Generalized work equation, Flow and non-flow processes, Closed systems, First law of Thermodynamics, Open systems

and steady flow, Energy equation for steady flow, System boundaries, Perpetual motion of the first kind.

Thermodynamic equilibrium, Reversibility, Specific heats and their relationship, Entropy, Second law of Thermodynamic property relation from energy equation, Frictional energy.

Gas laws, Specific heats of an ideal gas, Dalton's law of partial pressure, Third law of Thermodynamics, Entropy of an ideal gas, Thermodynamic process.

Cycle work, Thermal efficiency and heat rate, Carnot cycle, Sterling cycle, Reversed and reversible cycles, Most efficient engine.

Clausius inequality, Availability and irreversibility, Steady flow system.

Two phase system of a pure substance, Changes of phase at constant pressure, Steam tables, Superheated steam, Compressed liquid and vapour curves, Phase diagrams, Phase roles, Processes of vapours, Mollier diagram, Rankine cycle, Boilers and auxiliary equipment.

Otto cycle, Diesel cycle, Dual combustion cycle, Four stroke and two stroke engines, Types of fuels
Condition for minimum work, Isothermal efficiency, Volumetric efficiency, Multi-stage compression, Energy balance for a two stage machine with intercooler.

TE 224: POLYMER & FIBRE SCIENCE

Fundamental Concepts of the Fibrous Polymers:

Monomer and Polymers, Classification of Polymers, polymerization methods, Degree of polymerization, orientation of chain molecules, Chemical bonds in important textile polymers, Glass transition temperature

Textile Fibres:

Definition and classifications of textile fibres. Essential requirements of the fibre forming polymers

Natural Fibres:

Cellulosic fibres, Seed Fibre: Processing, morphological structure, physical and chemical properties and uses of cotton fibre, Varieties of Pakistani cotton, Cotton grading, Bast fibres: Processing, extraction (retting process), morphological structure, physical and chemical properties and uses of Jute, flax, hemp, and ramie fibre Leaf fibres: Processing, extraction, morphological structure, physical and chemical properties and uses of Abaca and Sisal fibres

Protein Fibres:

Wool: Introduction, classification, morphological structure, production, physical and chemical properties, grading and uses of wool fibre. Scouring, carbonization and heat-setting of wool. Introduction of fibres such as Camel, Mohair, Cashmere, Alpaca and Angora

Silk: Production, morphological structure, physical and chemical properties and uses

Regenerated Fibres:

Introduction and classification of regenerated fibres; manufacturing processes, properties and uses of Rayons such as viscose, high wet modulus rayons, lyocell, and acetate.

Synthetic Fibres:

Introduction and classification of synthetic fibres; manufacturing processes, properties and uses of polyester, polyamide, acrylic, polypropylene, elastomers, aramid, glass and carbon fibres

ME-101 ENGINEERING MECHANICS

Statics of Particles

Forces in a plane; Newton's First Law, Freebody diagram; Forces in space (rectangular components); Equilibrium of a particle in space.

Kinematics of Particles

Rectilinear and curvilinear motion of particles; Components of velocity and acceleration; Motion relative to a frame in translation.

Kinetics of Particles

Newton's Second Law; Dynamic equilibrium; Rectilinear and curvilinear motion; Work and energy; Kinetic energy of particle; Principle of Work and Energy; Conservation of energy; Impulse and momentum; Impulsive forces and conservation of momentum; Impact, direct and oblique; Conservation of angular momentum.

Rigid Bodies

Equivalent systems of forces; Principle of transmissibility; Moment of a force; Couple; Varignons Theorem. Centre of gravity of a three-dimensional body and centroid of a volume. Moments of inertia, radius of gyration, parallel axis theorem.

Equilibrium of Rigid Bodies

Free-body diagram; Equilibrium in two and three dimensions; Reaction of supports and connections; Equilibrium of two-force and three-force bodies.

Kinematics of Rigid Bodies

General Plane motions; Absolute and relative velocity and acceleration.

Plane Motion of Rigid Bodies

Forces and acceleration; Energy and momentum; Conservation of linear and angular momentum.

Friction

Laws of dry friction; Angles of friction; Wedges; Square-threaded screws; Journal and thrust bearings; Belt friction.

Analysis of Structures

Internal forces and Newton's Third Law; Simple and space trusses; Joints and sections; Frames and machines. Forces in cables.

TE-218 MATERIAL SCIENCE

Introduction

Material science and Material Engineering, types of materials, structure & properties, selection criteria of materials.

Metals and Alloys: Metals, ferrous alloys, non-ferrous alloys and their mechanical properties, Iron-carbon phase diagram, binary diagrams. Heat treatments of steel, hardenability, annealing.

Ceramics & Glasses

Composition, properties, structures, application of ceramics, glasses & refractory materials and their manufacturing methods.

Polymers

Polymerisation, structural feature of Polymers, Thermoplastic Polymers, Thermo setting Polymers, and their mechanical properties.

Composites

Introduction, types, method of fabrication and their mechanical properties, Textile reinforced composite materials in modern applications.

Material Degradation

Material degradation by atmospheric, aqueous and galvanic corrosions. Forms of corrosion and methods of corrosion prevention. Chemical degradation of ceramics and polymers. Radiation damage, wear and surface analysis.

TE-216: FLUID MECHANICS FOR TEXTILES

Fluid properties

Pressure, Vapour pressure, Density, Specific weight, Specific gravity, Viscosity, Bulk modulus of elasticity, Surface tension, capillary action, Ideal, Newtonian and non-Newtonian fluids, Relevance of fluid properties to textiles and textile processes.

Fluid statics

Pressure variation in a static fluid; Pascal's law; hydrostatic force on a plane surface, Pressure prism method; hydrostatic force on a curved submerged surface; buoyant force, Archimedes' principle; the stability of floating and submerged objects, Constant velocity rotation of a liquid around fixed axis.

Fluid dynamics

Flow characteristics; Equation of continuity; Application of Newton's second law to fluid flows; development, uses, and limitations of the Bernoulli equation; static, dynamic and stagnation pressures; Laminar and turbulent pipe flow; losses in pipe flows.

Fluid flow applications in textile processing

Air jet spinning, Nozzle design and performance in air jet spinning, Spun bonding process of non-woven, fabric like structures, Textile wet processing, Air-jet and water jet weft insertion mechanisms.

Dimensional analysis

Buckingham Pi Theorem and its application in dry and wet textile processing.

Fluid measurement

Measurement of static pressure, stagnation pressure, flow velocity and flow rate.

Fluid machinery

Turbo machinery: Hydraulic Turbines, Pumps and blowers. Minimizing losses in turbo machines; Turbo machinery applications in textile industry.

TE 211: TEXTILE YARN MANUFACTURING

Definitions, yarn classification & numbering systems.

Preparatory processes

Blow Room: Principles and objectives. Layout of blowroorn line. Components; feeding apparatus, opening devices, grid and their interaction. General factors influencing opening, cleaning, blending and transport of material. Conventional and modern blow rooms. Foreign contamination detection and removal system, waste

recycling.

Carding

Principles and objectives. Operating zones of carding, Components; feed device, taker-in, auxiliary carding devices, main cylinder, flats, doffer, detaching apparatus, can coiler, Card clothing, autoleveling and machine drive.

Drawing Frame

Principles and objectives. Roller drafting, equalizing, parallelizing, blending and dust removal. Components; creel, coiling, drafting arrangement, sliver formation and transport. Can. changer, autoleveling.

Lap Forming and Combing

Lap former, conventional and modern preparatory systems. Combing theory and principles, sequence of operations, comparison of carded and combed slivers.

Roving Frame

Principles and objectives, Operating zones, drafting arrangement, twist insertion, winding system, package formation, machine drives and doffing systems.

Ring Frame

Principles and objectives, operating zones, drafting system, ring traveler and clearer, spindle, guide devices, balloon control ring, bobbin building mechanism and machine drives.

Spinning calculation

Yarn count system, Calculation of count, draft, production and twist.

EE-122 BASIC ELECTRICITY & ELECTRONICS

Fundamentals of Electric Circuits

Charge, current, voltage and power, voltage and current sources, Ohm's law.

Voltage and current Laws

Node, path, loops and branches, Kirchhoff's Current Law, Kirchhoff's Voltage law, the single loop circuits. The single Node-Pair Circuits. Series and Parallel Connected independent sources. Resistors in Series and Parallel, Voltage and Current Division.

Circuit Analysis Techniques.

Multi-Nodal Analysis, the super Nodal, Mesh Analysis, The Super Mesh, Linearity and Superposition, Source Transformations, Thevenin and Norton Equivalent Circuits, Maximum Power Transfer, Delta-Wye Conversion. Capacitor, inductor, Inductance and Capacitance Combination, The Source-Free RL Circuit, Properties of Exponential

Response, the Source-free RC Circuit.

Introduction Machines

Induction Motors, Construction, Types, Rotating field theory, Principal of working, slip and its effect on motor current quantities, Overexcited and under-excited motor, power factor and power factor control, starting of synchronous motor, parallel operation of alternators and sharing of load, working alternator on infinite bus bars.

Introduction to Transformer

Construction, Principal of working, efm equation Transformation ratios, No load working and vector diagram on load.

Online Diagram

Symbols of different components, understanding of one line diagram.

Basic Electronics

P-N Junction, diode and applications Transistor construction, operation and applications Fundamental concepts of Digital Electronic.

TE-251 ENGINEERING DRAWING AND GRAPHICS

Introduction to Engineering Drawing

Principles of engineering drawing, drawing instruments, drawing sheet planning, scaling, line types, dimensioning, lettering and free-hand sketching, technical drawing standards and symbols.

Geometrical Construction

Plane figures, conic sections, cyclical curves and involutes, sectioning. Development of surfaces: Prisms, pyramids, cylinders and cones

Orthographic Projections

Projection of points, lines, Planes and solids, Practice projections and surface development. Practice and drawing of three views of different objects using

Orthographic projection

Conversion of orthographic projection into isometric view. Creating drawings of engineering fasteners like rivets, cotter joints, threads etc, Principles of Orthographic and Isometric projection

Introduction to Geometric dimensioning and Tolerances

Development of surfaces, Fits, Tolerances and Allowances Assembly Drawing.

Assembly drawings

Assembly Practice Drawing for Installation, catalogues, and instruction manuals.

Computer Aided Drafting

Overview of CAD Software, Function keys, Drawing entities, Drafting aids, Editing of a drawing (modify commands), Two-dimensional drawing, 3D Geometrical modelling techniques, Three-Dimensional Drawing

TE-205: PRETREATMENT FOR TEXTILES

Pre-Treatment Process

Chemical reactions & mechanisms involved in pre-treatment of cotton, wool and silk fibrous substrate viz. Desizing; Scouring; bleaching, shearing and singeing; Mercerising; Carbonizing and rabbing. Effects of effective pre-treatment on dyeing properties

Hydroextraction

Mechanism of removal of water from fibrous substrate by mechanical, electrical and thermal system

Pre-Treatment Machines

Descriptions of machines used in different pre-treatment processes in fibre, yam and fabric forms. Machinery for knit and pile fabrics Continuous and batch processes for pre-treatment and their comparison

Fluorescent Brightening Agents

Introduction of FBA's, Mode of action, Chemistry and application of FBA's Whiteness and measurement of whiteness.

ME-311 MANUFACTURING PROCESSES

Sand Casting

Introduction; Sand casting procedure; Patternmaking; Material types and construction of patterns; Pattern allowances.

Moulding Process

Moulding materials; Tools and equipment; Testing of sand; Moulding machine, Core making; Types of cores; Core making machine; Shell moulding; Plaster Moulding

Centrifugal Casting

Trimming and finishing of castings; Seasoning of casting; Inspection of castings. Die Casting; Pressure die casting; Vacuum die casting;

Gravity Die Casting

Die casting machines; Hot chamber and Cold Chamber methods; Die casting alloys; Die design, construction, and material

Welding Processes

Classification of welding Processes; Oxyacetylene welding. Oxygen torch cutting and flame straightening;

Arc welding

Shielded arc welding, Gas tungsten are welding, Gas metal arc welding, Flux-Cored arc welding, submerged are welding. Plasma arc welding, stud welding, spot welding, Seam welding, Projection welding; Brazing and Soldering.

Fabrication of Plastics Casting

Blow Moulding Compression Moulding; Transfer Moulding Cold Moulding; Injection Moulding; Reaction Induction Moulding; Vacuum Forming; Welding of Plastics

Machining Process and Machine Tools

Machine tools using single edge cutting tools; and multiple edge cutting tools, Description, and Operations; Performed on Lathe, Shaper, Planner, Drilling, Milling, Gear cutting, and broaching Machines; Work holding devices

Machine Tools using Abrasive Wheels

Description and Functions of various types of grinding machines; Wheel dressing; and Wheel Balancing; Honing, Lapping, and super Finishing Operations: Thread Manufacturing Cutting Tools for Manufacturing; Cutting Tools Material Characteristics; Cutting Tool Materials; Tool, Geometry; Non-Traditional Machining Processes such as EDM, ECM, & Ultrasonic Machining

Hot & Cold working Metals

Advantage and Limitation of hot and cold working processes: Methods of Forging; Hammer forging;

Die forging

Drop, Press and Upset forging; Construction of drop forging hammers; Forging defects and their cause, Cold working processes such as Bending, Shearing, Rolling Extrusion, Blanking, Perforating. Notching, Tube drawing, Wire drawing and embossing.

MM-205: MECHANICS OF MATERIALS

Review mechanics of materials.

Deformation; strain; elastic stress-strain behavior of materials; Introduction to stress-strain diagram, working stresses, unit design, Introduction to elastic and nonlinear continua.

Poisson's ratio; Determination of forces in frames; Simple bending theory; general case of bending; Shear force and bending moment diagrams; Relationship between loading, shear force and bending moment.

Stress; Skew (antisymmetric) bending Direct, shear, hydrostatic and complementary shear stresses; Bar and strut or column; Theory of buckling instability, Thin ring, Elementary thermal stress and strain; General stress-method.

Theory of elasticity, Analytical solution of elasticity problems brittle fracture. strain energy in tension and compression.

Analysis of bi-axial stresses, principal planes, principal stress-strain, stresses in thin walled pressure vessels. Mohr's circles of bi-axial stress.

Torsion of circular shafts, coiled helical spring, strain energy in shear and torsion of thin walled tubes, torsion of non- circular sections.

Shear centre and shear flow for open sections, General case of plane stresses, principal stress in shear stresses due to combined bending and torsion plane strain.

Composite materials, Volume dilatation, Theories of Yielding, Thin Plates and Shells Stress Concentration

MF-201 CIVICS AND COMMUNITY ENGAGEMENT

Introduction to Civics and Citizenship: Definition of civics, citizenship and civic engagement, Historical evolution of civics participation, Types of citizenship:active, participatory, digital etc. The relationships between democracy and citizenship Civics and Citizenship: Concepts of civics, citizenship and civic engagement, Foundation of modern society and citizenship. Types of citizenship: active, participatory, digital etc. State, Government and Civil Society: Structure and functions of government in Pakistan, The relationships between democracy and civil society, Right to vote and importance of political participation and representation Rights and Responsibilities: Overview of fundamental rights and liberties of citizens under constitution of Pakistan 1973, Civic responsibilities and duties, Ethical considerations in civic engagement (accountability, nonviolence, peaceful dialogue, civility, etc.) Community Engagement: Concept, nature and characteristics of community, Community development and social cohesion, Approaches to effective community Engagement, case studies of successful community driven initiatives Advocacy and Activism: Public discourse and public opinion, role of advocacy in addressing social issues, Social action movements Digital Citizenship and Technology: The use of digital platforms for civic engagement, Cyber ethics and responsible use of social media, Digital divides and disparities (access, usage, socioeconomic, geographic etc.) and their impact on citizenship

Diversity, Inclusion and Social Justice: Understanding diversity in society (ethnic, cultural, economic, political etc.), Youth, women and minorities' engagement in social development, Addressing social inequalities and injustice in Pakistan, Promoting inclusive citizenship and equal rights for societal harmony and peaceful co-existence.

TE-312 TEXTILE FABRIC MANUFACTURING PROCESSES

Properties of textile fibres

Span length, strength, fineness, elongation, stiffness, cleanness, Yarn faults, Neps, slubs, thin and thick places.

Winding process

Types of packages. Objectives, principle and mechanisms of winding. Pirn winding. Mechanism of doubling, twisting, reeling and winding off machines.

Warp Preparation process

Principle and operation of warping systems, warping calculations. Sizing machine, types of sizes and sizing calculations

Loom design and motion

Weave design: Plain, twill and satin weaves and their derivatives. Colour & weave effects. Computer aided weave designing.

Loom Mechanisms: Primary, secondary & auxiliary motions of loom. Let-off mechanisms and its type. Take-up mechanisms and its types. Specification and material analysis of various parts of loom. Shuttle weaving machines: Parts, mechanisms and loop timings.

Weaving calculations

Humidity

Importance of humidity in a weaving unit, air quality in weaving shed. Types of humidification systems.

Weft Knitting

Mechanisms and Structures Knitting terminologies. Basic knitted structures. Elements of knitting machine, types of knitting needles. Designing of structures by needle notation. Flat and Circular machines. Application of CAD/CAM. Whole Garment knitting system.

MF-205 COMMUNITY SERVICE

Orientation to Community Service: [Taught component] Introduction to the concept and practice of community service. Need, objectives and benefits of community service. Foundational theories (educational, undergraduate curriculum, humanities, social science, corporate social responsibility etc.). Tools and skills needed in community service. Contextual examples in community service; case examples.

Professional and ethical conduct during community service Community Service Attachment Completing 30-35 hours of formal assignment at an organization Community Service Experience Documentation Writing a report documenting the experience and submitting it on the prescribed format.

TE-307 UTILITIES FOR TEXTILE INDUSTRY

Utilities for Textiles

Water, Natural Gas, Steam, Compressed Air and Electrical power; Piping Network for Utilities

Power Generation

Basic principles and Cycles used; Steam Power Plant and its types; Gas Power Plant; Combined Heat and Power Generation; Solar Cells and Fuel Cells

Internal combustion engines

Internal Combustion Engines: Types and Classification; Fuels; Speed and Load Control; Supercharging; Exhaust Gas Recovery; Engine Lubrication System; Knocking and Detonation

Combustion

Stoichiometric Equations; Higher and Lower Heating Values; Fuel Rating; Adiabatic Flame Temperature

Water Supply

Sources and Demand of Water; Quality and Treatment of water; Water Desalination

Steam Generation

Properties of Steam, Boilers and Types; Heating Surface Area calculations; Fuels, Feed Water Systems; Air Preheaters; Economizers; Super heaters; Condensers; Separators; Ejectors

Turbines

Steam and Gas Turbines: Classification, Operation and Maintenance

Air Conditioning & Ventilation

Principles of Air conditioning; Relevant Codes & Standards; Primary and Secondary Refrigerants; Vapour

Compression and Absorption cycles, Simple Air-conditioning System; Ventilation Equipment

Psychrometric Chart and its Uses

Air Distribution Systems; Duct Design; Distribution Equipment

HVAC Equipment Selection

Humidifiers, Dehumidifiers, Fans, Diffusers and Cooling Towers

MF-304 ENGINEERING ECONOMICS

Introduction

Introduction and Principles of Engineering Economics.

The Economic Environment

Consumer and producer goods, measures of economic worth. price, supply, & demand relationship. Cost Concepts.

Time Value of Money

Simple interest, compound interest, cash flow diagrams, interest formulas, nominal versus effective interest rate, continuous compounding. Depreciation.

Comparing Alternatives

Present economy, selection among machines, materials, processes, and designs, payback period method, present worth method, uniform annual cost method, rate of return method, alternatives having identical lives, alternatives having different lives. Cost-Benefit Analysis.

Linear Programming

Mathematical statement of linear programming problems graphic solution.

TE-326 TEXTILE DYEING

Dye stuff classification

Early attempts to classify dyes and pigments, Colour index classification

Chemical Class

Azo, Anthraquinone, Indigoid, Polycyclic, aromatic, Carbonyl, Polymethine, Azine, Ox igine, Thiazines, Xanthene, thiazole, Quinoline, Sulphur and cyanine dyes

Application Class

Direct Dyes, Sulphur Dyes, Azoic Dyes, Reactive Dyes, Anthraquinone Vat and solubilized Vat Dyes, Disperse Dyes, Acid Dyes, and Basic Dyes. Principle of dye selection for various fibrous substrates, Theories of dyeing of natural and manmade fibres. dyeing equilibrium, thermodynamics of dyeing isotherms, dyeing kinetics

Dyeing

Application of Direct, Vat, Sulphur, Reactive and Azoic dye-stuff to cellulosic substrate, Acid dye to protein and Disperse to synthetic substrate through various dyeing techniques. Dyeing of blended fabric. RFT dyeing Descriptions of machines used in dyeing of fibre, yam and fabric forms. Dyeing Machinery for knit and pile fabrics. Continuous and batch processes for dyeing and their comparison

Colour physics & measurement

Colour Spectrum, nature of light, light sources, illumination and standard illuminant, principles of colorimetry, CIE system, Beer - Lambert law, Kubelka-Munk theory, computerized colour match ing, metamerism, Shade sorting

Pigments

Pigments as colorants. Classification and properties of pigments Viz. Inorganic and orgamc pigments. Pigment dyeing.

EA-304 BUSINESS COMMUNICATION & ETHICS

Introduction to Communication

Definition, Types (nonverbal/oral/written/technological), Levels (intra/inter/small group/ organizational/public/mass), Nonverbal Communication (temporal/environment/person-oriented); Principles, Channels (internal/external), Modes (upward/downward/lateral/formal/informal, Feedback & its types (positive-negative/immediate-delayed/low-high monitoring/critical-supportive/judgmental-non- judgmental) Multicultural/Intercultural communication - International Communication; Characteristics (7C's), Barriers/Problems (Noise/Distortion/Gender differences/language/lacking communication skills/problems in the message/information over/underload); Listening (skills/process and stages/problems and coping strategies/dimensions or types (participatory – passive/surface-deep/non-judgmental-judgmental/empathic-objective)

Oral Communication

Interviews: Theory and preparation

Presentations: Theory

Business Writing

Planning Audience Centered Business Messages: Audience Analysis (psychographic & demographic profile, Five Types of Audiences (initial/ gatekeeper/ primary/ secondary/ watchdog) Features of written style, way to make writing optimally readable, criteria for effective messages, process of writing effective messages; Letter Elements and formats: practice in writing letters); Three types of Business Messages & organizational plans (Direct/Indirect/Persuasive); Practice in writing business messages (letters/memo) for situations (Enquiries, responses, special announcements, granting and rejecting requests etc); Employment communication: job application and resume; Tenders, Inter Office Communication: Memorandum, Meetings: notice, agenda, and minutes; Report Writing: Report Types (letter –memo/analytical-informational/based on purpose), report structure, practice in writing short formal report.

Engineering / Business Ethics

Development of Engineering Ethics, Key issues in Engineering Ethics, Code of Ethics and Conduct of different national and global bodies, Development of Engineering ethics and impact, Criteria for classifying a professional Four moral theories as the basic ethical framework (utilitarianism/duty/rights/virtue ethics), Ethical problem-solving Techniques (line drawing/flow charting/conflict problems), Key Ethical Concerns and concepts: confidentiality, risk and safety, environment and computer ethics, whistleblowing, bribes and gifts, sexual harassment etc. (Course pack will be provided to students for reading)

TE-207 MACHINE DESIGN

Basic principles of machine design

Basic criteria of design of machine parts, determination of permissible and actual stresses, factor of safety

Design of simple machine elements

Design of keys, cotters, and couplings Design of brakes and clutches, flywheel, Design of welded, riveted and bolted joints, Design of translation screws

Design of flexible elements

Design of belts, Design of chains, Design of ropes

Design of shaft

Design of shafts Introduction to flexible shafting; Connecting rods and crank shafts

Design of gears

Gearing; Design of spur, helical, bevel & worm gears Cam follower system; Classification of Cam Mechanisms; Cam Nomenclature; Cam Design; Pressure angle; radius of curvature; Cam size and Cam Profile; Weaving and Knitting Machine Cams, Bearing & lubrication. Types and theory of lubrication and its application in textiles, Design of rolling contact bearings, Design of journal bearings

Industrial design codes

Design codes (ASME, BS, ANSI, JIS, DIN or ISO) and standards, tolerances, standards of fits & tolerances.

ME-104 (WORKSHOP PRACTICE)

Use of carpenter's tools, Exercise in preparing simple joints, Bench fitting practice, Exercise in marking and fittings, Use of measuring instruments.

Smith's forge, Exercise in bending, Upsetting and swaging.

Familiarizing the students with the following processes:

- Soldering and brazing, Welding, Heat treatment, Molding and casting.
- Simple machine shop processes, Such as turning, shaping, Milling and sheet metal work.

TE 463 GARMENT MANUFACTURING

Importance of readymade garment manufacturing units in Pakistan opportunities and challenges. Brief description of garment and manufacturing.

Fabric inventory management, Fabric quality parameters, GSM, shrinkage, skew and bowing, Shade variation, shade bands, shade and shrinkage report development for marker making and spreading.

Manual pattern drafting principles, CAD systems for pattern making, Pattern Grading Marker Plan, CAD marker making techniques, Marker efficiency, fabric utilization, fabric reconciliation.

Spreading requirements and ply control. Concept of end bits and end loss. Types of fabric spreading methods (manual, semi-automatic, automatic). Cutting Equipment's, Cut panel inspection and tracking.

Introduction to stitch and seam types/sewing machine types and uses. Different types of sewing production systems.

TE-323 TEXTILE PRODUCT EVALUATION -I

Textile Testing

Objectives, General requirements and standards for textile testing (ASTM, AATCC, ISO, BS, etc.)

Textiles and Moisture

Importance of standard conditioning in textile testing. Moisture regain and its measurement.

Fibre Testing

Sampling and determination of fibre characteristics such as length and uniformity, fineness, strength, maturity and other properties by conventional and modern testing instruments and techniques

Yarn Testing

Sampling and determination of count, twist, strength, elongation, evenness, hairiness of yarn by conventional and modern testing instruments.

Fabric Testing

Sampling and measurement of fabric strength viz Tensile, Tear, Bursting, Seam Strength, Rip, Ballistic, stretch and recovery and their relation with usage of fabric. Assessment of fabric construction.

TE-319: HEAT AND MASS TRANSFER

Conduction

General equation for conduction; One-dimensional steady-state analysis.

Convection

Momentum and thermal boundary layer fundamentals; Forced convection heat transfer (internal and external flow geometries); Free convection; Boiling; Condensation

Radiation

Basic concepts of electromagnetic radiation; Surface characteristics; Blackbody; Gray body; Emission in defined wave band; Energy exchange between black bodies.

Mass transfer

Diffusion mass transfer: Rate equation; Steady-state molecular diffusion in gases and liquids (diffusion through a stagnant layer, equimolar counter diffusion, diffusion in multi-component mixtures); Diffusion through solid materials (non-porous and porous); Diffusion through a polymeric film Analogy of heat, mass and momentum transfer Convective mass transfer; Concentration boundary layer; Mass transfer coefficients for various geometries and flow situations Interphase mass transfer; Batch and continuous drying (rate of drying curve & drying mechanisms, drying time).

Equipment and textile processes

Heat and mass transfer in wet processes; Heat and mass transfer equipment.

TE-318 TEXTILE & ENVIRONMENT

Atmospheric Pollution

Origin and prevention; emission and control technology; industrial air pollution; air quality pollution and criteria setting

Noise & Noise Control

General consideration; environmental noise sources evaluation; methods and techniques to control and reduce noise level

Solid Waste Management

Composition of textile wastes; collection systems and alternatives for treatments and reuse

Health & Industrial Safety

ESSA requirements related to the safety of workers; OHSA standard

Environmental management systems and eco-labeling

ISO14000, Oeko-tex 100, EU-EcoLabel Environmental impact assessment, Environmental audits, National Environmental Quality Standards

Cleaner production technologies in textiles

Sources, impact, monitoring, reduction and control of pollution in textile industry

Water pollution

Wastewater characteristics, effluents standards, terminology in wastewater treatments, primary treatments, secondary treatments, recycle and reuse of wastewater.

TE-305: QUALITY CONTROL IN TEXTILE

Fundamentals of Probability and Statistics

Set theory and set operations; Venn diagram; Definition of probability; Probability laws; Conditional probability. Bayer's rule Deterministic and probabilistic data; Grouping of data; Measures of central tendency and dispersion; Calculation of mean, mode, median; standard deviation, and range, weighted average, and coefficient of variation. Random variable; discrete and continuous random variable; Mathematical expectation; Laws of expectation

Probability Distribution

Discrete probability distributions: Uniform, Binomial, Multinomial, Hyper geometric, Poisson, & Negative Binomial distribution. Continuous probability distributions: Normal, Exponential, Weibull, Chi-square, F&T distributions. Transformation of variables; Moment generating function; Random sampling; Sampling distribution of mean; Central limit theorem

Control Charts

Properties of the distribution of sample means, sample range estimation of standard deviation, chance and assignable causes, control charts for mean and range, control charts for mean and standard deviation, control charts for proportion defective and defects per assembly. Tests of significance to compute confidence limits

Acceptance Sampling

Introduction, OC curve, consumer and producer risks, AQL & LTPD, sampling errors, acceptance sampling for continuous production, Acceptance by variables, single, double, and sequential sampling.

Quality, Reliability, & Maintainability

Definitions, management of quality control, total quality control, Taguchi method, economic aspects of quality decisions, Process capability and variability analysis, Various aspects of life testing, reliability, & maintainability, introduction to ISO 9000.

Application of QC in Textile Engineering

International and Pakistan standard of various textile products such as fibers, Yarn, filaments, woven and knitted fibers, finished goods and garments, with emphasis on cotton products.

MT-333 ADVANCED CALCULUS & FOURIER ANALYSIS

Partial Differential Equation

Basic concepts and formation of partial differential equations; Linear homogeneous partial differential equations and relations to ordinary differential equations; Solution of first order linear and special types of second and higher order differential equations; D' Alembert's solution of the wave equation and two dimensional wave equations; Lagrange's solution; Various standard forms.

Fourier series

Periodic functions and expansion of periodic functions in Fourier series and Fourier coefficients; Expansion of function with arbitrary periods. Odd and even functions and their Fourier series; Half range expansions of Fourier series, “OFT and FFT, Fourier Spectrum”.

Advance calculus

Define a stationary point of a function of several variables, define local maximum, and saddle point for a function of two variables the stationary points of a several variables, obtain higher partial derivatives of simple functions of two or more variables, iterated integrals, double and triple integrations with applications (area, centoroid, moment of inertia, surface area, and volume, use multiple integrals in solutions of engineering problems.

Vector Calculus

Vector differential operator, directional derivative, gradient, divergence, curl of a vector Field, and-laplacian operators with applications, (Solenoid, conservative, etc). Vector Integrations; Evaluate line integrals along simple paths, apply line integrals to calculate work done, apply Green's theorem in the plane to simple examples, evaluate surface integrals over simple surface, use the jacobian to transform a problem a new coordinate system, apply Gauss' divergence theorem to simple problems, apply Stokes' theorem to simple examples.

TE 351 COMPUTER AIDED DESIGN

Exploration of 3D Apparel CAD Software Tools and Applications

Hands-on experience with the interface, tools, and design list of options of 3D apparel CAD software. Apply materials, trims, and accessories to transform digital garments into realistic 3D models. Understand the use of graphic design and all-over prints in pattern development within the 3D environment.

Advanced Techniques in 3D Pattern Design and Visualization

Graphic placement and cut mark techniques essential for 3D pattern making. Use color way tools to apply, modify, and manage color palettes for garment visualization. Enhance understanding of digital aesthetics through advanced pattern design applications.

Digital Asset Creation, Garment Review, and 3D Fit Validation

Understand key factors in digital asset creation and the role of Virtual Quality Standards (VQS). Evaluate garment specifications and review processes to meet order requirements. Explore stitching types, simulation tools, and review garment fit and styling across avatars and sizes.

MG-257 ORGANIZATIONAL BEHAVIOUR

Introduction to Organizational Behaviour

Foundations of OB: Management Functions, roles, and skills; Effective versus successful managerial activities; Replacing intuition with systematic study, Exploring OB challenges and opportunities facing globalization, OB Model

Foundations of Individual Behaviour

Biographical traits and ability, Personality, Perceptions and individual decision making, Values, attitudes, and job satisfaction, Motivation – basic concepts and applications, Work stress

Foundations of Group Behaviour

Group in OB, Defining and classifying groups, Stages of group development, work group behaviour, dynamics of groups, Understanding work teams, Leadership: basic approaches and contemporary issues; Conflict & negotiation

Foundations of Organizational Structure

Organizational structure and design, Organizational culture, Organizational change and development

TE-462 ADVANCED FABRIC MANUFACTURING MECHANISM

Shedding systems

Tappet shedding Mechanism, Types of shedding and sheds, Types and designing of tappet.

Dobby shedding
Mechanism, Types and parts.

Jacquard shedding
Mechanism, types and fabric designing.

Weft insertion systems

Projectile: Mechanism, specifications of different types of projectile, Parts of projectile weft insertion system. Lubrication system. Weft mixer system.

Rapier: Mechanism. Types of rapier, Parts of rapier weft insertion system.

Air jet: Introduction. Parts. Machine operating pressure. Air compression system, quality of compressed air.

Water Jet: Introduction, parts of water jet weft insertion system. Sensing systems in shuttle-less looms. Weaving cost calculations.

Beat up system for Shuttless loom.

Selvedge formation: Technical requirement and Types.

Terry-towel weaving

Mechanism, Types of terry fabrics, designing, machine settings, calculation for contraction of pile warp threads.

Braiding Technology

Types of braid and braiding machine. Braiding geometry. 2 step and 4 step braiding process.

Speciality weaving

3-dimensional concept of weaving. Multilayer fabrics. Distinguishing features of loom for weaving cotton, woollen, worsted and synthetic yarns.

Warp Knitting

Comparison of weft and warp knitting technology. Principles of warp knitting: parts of machine, pattern mechanisms, basic overlap and underlap variations. Classification of machines. Development of lapping diagram and chain notation of basic warp knitted structures.

Fabric defects

TE-413: TEXTILE PRODUCT EVALUATION II

Qualitative and Quantitative Analysis:

Difference between Qualitative and Quantitative analysis; Identification of various fibres viz Cotton, Viscose, Polyester, Wool, Acrylic and Nylon by, microscopic viewing, burning, dissolving and staining techniques. Quantitative analysis of common blends and Qualitative analysis of damaged cotton

Oil and Water Repellency Tests:

Wicking and Wetting of Textiles, Water Proofing, Shower proofing, water and oil Repellency

Flammability Tests:

Factor affecting textile Flammability 45° and vertical flammability tester. Flammability regulations. Process and equipment used to determine Dimensional Stability; Factors Affecting Dimensional Stability, Garment and Fabric Appearance, Bow and Skewness evaluation

Pilling and Abrasion Tests:

Introduction and Factors effecting Pilling and Abrasion and its measurement. Subjective and Objective handle evaluation. Care labels and their importance.

Colour fastness Tests:

Importance of Fastness properties, Methods and equipment used to determine colour fastness to sun light, Washing, Laundering, Dry and Wet, rubbing, Perspiration, Dry cleaning, bleaching, Water, Sea water, Identification of dyes: powder form and on dyed fabric.

MG- 485 ENTREPRENEURSHIP

Introduction to Entrepreneurship

The concept of entrepreneurship, entrepreneurial mindset, social entrepreneurship, and essential entrepreneurial skills

Initiating entrepreneurial ventures

Innovation and creativity, assessment of entrepreneurial opportunities, pathways to entrepreneurial ventures, sources of capital

Developing the entrepreneurial plan

Legal challenges, marketing challenges, financial planning, export orientation, developing an effective business plan

Growth strategies

Strategic entrepreneurial growth through scaling, valuation of entrepreneurial ventures, and harvesting the entrepreneurial venture

TE-406 TEXTILE PRODUCTION MANAGEMENT

Production Management and Systems

Introduction to production Management; System concept; Functions of management; Managerial decision making; Models as decision aids.

Plant Location & Plant Layout

Selection of region; Selection of community; Site selection; Location factor dependence; Sources of assistance; Plant location trends; Quantitative analysis and Plant layout; Product and process layout analysis and comparison; Material handling considerations in layout.

Production Planning and Control

Formalized production planning; Production planning methods; Master scheduling; MRP; MRP inputs, MRP outputs; Product Structures; Types of MRP; Capacity planning and control; Production control systems; Scheduling techniques.

Planning & Control techniques

Inventory control; types of inventory; Inventory costs; Independent versus dependent demand; EQQ/EPÑ models; Types of control systems; Selective inventory control; Inventory system development; Project Planning; CPM/PERT; Network development; Determination of activity times; Establishment of critical path; Probabilistic statements.

Method Study

Definition; Objectives; Procedure; Process chart symbols; Outline process chart; Flow process charts; Multiple activity chart; Two handed chart; Critical examination, Principles of motion economy, Case studies and Application.

Work Measurement

Definition; Objectives; Techniques of work measurement; Stop watch time study; Timing methods; Performance rating; Standard timing; Allowance factors. Work sampling; Confidence level; Determination of samples size; Making random observations; Scope of work sampling. Predetermined time standards; Definition; Advantages and criticisms; Motion classification; TMU; Use of PTS systems.

Maintenance

Types of maintenance; Breakdown maintenance; Preventive maintenance; Individual versus group replacement; Internal versus external maintenance; Queuing theory; Application of queuing theory; Input characteristics; Queue characteristic; Service characteristic; Mathematical approach.

TE-424 TEXTILE PRINTING

Textile Printing

Pre-treatment and fabric requirements for printing, design details of printing. Repeats and its types. Style and methods of printing. Special printing processes. Print designs

Printing Auxiliaries

Auxiliaries for printing with pigments and dyes, General characteristics of, classification, Rheology and selection criteria for thickeners.

Pigment Printing

Pigment systems and preparations, different style of application.

Dyestuff Printing

Printing system for Direct, Reactive and Vat dyes with various styles.

Printing of Blended Materials

Dye selection and Printing Process for common Blends. Identification of printing faults (Mechanism and Process) and remedies.

Inkjet printing

Fabric preparation for inkjet printing, dye selection, inkjet printing process and application

Printing machines

Block, Roller, Manual and automatic carriage flat screen printing machine, rotary printing machine and dryers for printing. Rotary Screen Engraving, CAD/CAM Inkjet printing machines

Fixation machines

Fixation Mechanism for dyes and pigments. Different types of steamers and agers their advantages and disadvantages. After treatment processes and machinery for printing

TE-464: OCCUPATIONAL HEALTH AND SAFETY

Safety Management

Understanding accidents and hazards, hazard control and loss control, company policy and management responsibilities, direct and indirect costs, accident causes and their control, principles and processes of loss control, and knowledge of existing safety codes and standards.

Hazards and Risk

Hazard identification, risk assessment, risk control.

Accident Prevention and Control

Fire safety, electrical safety, safety in boilers and unfired pressure vessels and high-pressure systems, safety in material handling and storage, safety in production operations.

Industrial Hygiene and Worker Protection

Understanding industrial hygiene, various hazards encountered in the workplace, types of personal protective equipment (PPE), availability in the market, their design standards, and selection criteria.

Process Safety Management

Development of facility operation and procedures, analysis of process hazards, permit-to-work systems, hazard communication (Material Safety Data Sheet), chemical inventory record, accident reporting and investigation, OHSAS 18001:1999, ISO 45000.

TE-408 TEXTILE ENGINEERING DESIGN PROJECT

Final Year Design Project activities over a span of Fall and Spring Semesters.

TE-452 TEXTILE FINISHING

Mechanical Finishing

Processes and machines involved in mechanical finishing of various textile substrates viz Heat Setting, Napping, Shearing, Sueding, Calendering, Sanforizing, Compacting, Relaxation, Decatizing

Chemical Finishing

Application processes and mechanism of chemical finishing of various textiles substrates. Softening finishes, Hand-building finishes, Easy-care and durable press finishes, Oil and Water repellent finishes, Soil release finishes, Flame retardant finishes, Antistatic and Anti-pilling finishes, Elastomeric finishes, Nonslip finishes. Finishes to improve colour fastness; Ultraviolet protection finishes, Antimicrobial and bio-finishes.

TE-455 ADVANCED GARMENT MANUFACTURING

Spreaders and spreading tables, capacity calculations.

Cutting equipment's, automatic cutter and numbering equipment's. Malfunctioning of auto cutters and spreaders. Garment software application: Lectra, Gerber and Tukatech techniques and uses.

Stitches and seam classification and their implication. Pleats, flares, flounces, smocking, tucking.

Sewing machine maintenance: Causes of machine malfunction, classification of machine maintenance, sewing machine cleaning and troubleshooting sewing problems. Intelligent sewing systems: Application of electronic control systems in sewing machines design

Capacity calculations, quality in finished goods, line concepts, identification and rectification of sewing faults. shading and sizing techniques. Packing techniques and types, reporting systems.

Chemical requirement, Effects of chemical, concept of wash and neutralization process. Types of equipment for dry finishing: whisker and scrapping techniques. Laser Technology: Heat control mechanism during laser process. Design and implication of grading software applications.

Ergonomics principles in designing: workplace, working processes, determining working time, handling material and tools. Introduction of Methods Time Measurement (MTM) standards. Design of Work aids.

TE 461 ADVANCED YARN MANUFACTURING MECHANISM

Compact Spinning

Types of compact spinning systems, Spinning triangle and its reduction, Comparison of ring and compact yarns.

Rotor Spinning

Principle, operation and components. Automated piecing, material transport and package change. Draft and yarn twist. Economics of rotor spinning.

Air-jet Spinning

Principle operation and objectives, Raw material requirements, component; Drafting, nozzle, winding. False twist, Economics. Comparison of air-jet and vortex spinning systems.

Friction Spinning

Principle, operation and objectives. Assessment of DREF-II and DREF-Ill yarn properties.

Bulked Yarn texturing

Texturing of the synthetic filaments, texturing types; air-jet, false twist, stuffer box, edge crimping, gear crimping.

Fancy Yarn

Types and structures of fancy yarns, Multi count, multi twist, slub and siro yarns

Mill Planning

Planning the machine sequence for establishing a new mill, Cost calculation for manufacturing yarn.

TE-454 TEXTILE MERCHANDISING

Introduction to Merchandizing and scope; Merchandize: Raw and finished merchandizes; Main markets and potential markets; Sampling and new developments; Outsourcing; Costing; Communication; Coordination and follow ups; Merchandising process: Program purchase order, Time & Action, Approval phases, Fabric working, follow up, Inspection , Shipments, Export Documents, Modes of Payment,; Compliant handling and claims; Quality Assurance and compliance; Retail trends: International markets and local market; International trends and policies; case studies.

TE-451 AUTOMATION & CONTROL IN TEXTILE

Automation

Automation defined; Types of automation; Reasons for automation; Arguments for a against automation;

Production Operation & Automation Strategies

Manufacturing industries; Types of production; Functions in manufacturing; Organization and information processing in manufacturing; Plant layout; Production concepts and mathematical models; Automation strategies.

Automotive Type Automation

Automated flow lines; Methods of workpart transport; Transfer mechanism; Buffer storage; Control functions; Automation for machining operations; Design fabrication considerations.

Analysis of Automated Flow Lines

General terminology & analysis of transfer lines without storage; Partial automation; Automated flow lines with storage buffers; Computer simulation of automated flow lines.

Linear Feedback Control Systems

Process model formulation; Transfer functions and block diagrams; Laplace Transforms; Control Actions; Linear system analysis; Root-locus method; System Design.

Optimal Control

Structural model of á manufacturing process; Steady state optimal control; Adaptive control; on line search strategies.

Computer Assisted Optimal Control

Structural model of a manufacturing process; Steady state optimal control; Adaptive control; on line search strategies.

Computer Process Control

The computer process interface; Interface hardware; Computer process monitoring; Types of computer process control; direct digital control; supervisory computer control; Programming for computer process control.

ME-438 AI AND INTERNET OF THINGS

Fundamental Elements

Review of programming fundamentals, Internet of Things (IoT), Artificial Intelligence (AI), Data Analysis, Fourth Industrial Revolution (Industry 4.0), Foreseeable industrial Revolution through AI. Real world interaction devices and linkage to mechanical engineering applications such as automotive sector, energy etc.

AI / M L Algorithms

Introduction to AI and Machine Learning, Data preprocessing, Supervised learning, Regression algorithms, Classification algorithms, Unsupervised leaning, Clustering, Applications in Mechanical Engineering.

Data Acquisition end Visualization

Data acquisition and storage on open cloud platforms. Cloud based data analytics and data visualization.

Microcontroller interfacing and Automation

Microcontroller internal architecture, Instruction execution, ALU, Memory, Peripherals. Computer Networks, TCP/IP protocol. Sensors and actuators, I/O communication protocols. (UART, Wireless protocols). Single board computers, interfacing with Arduino and Raspberry Pi, Introduction to Programmable Logic Controllers (PLCs) and similar technologies