First Year

FALL SEMESTER

ME-101 Engineering Mechanics

Static's of Particles:

Forces in a plane; Newton's First Law, Free body 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; Virginians 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

ME-111 Engineering Drawing

Drawing equipment and the use of instruments; Basic drafting techniques and standards; Geometrical curves including plane curves; Cycloid, Hypocycloid, and the Involute.

Intersections at various positions of geometrical bodies such as prisms, pyramids, cylinders and cones Development of surfaces of prisms Pyramids, cylinders and cones

Freehand sketching of machine and engine components; Locking arrangements; Foundation bolts; Stuffing box; Shaft couplings; Foot-step bearing; Pulleys; Engine connecting rod.

Concept of working drawing of component parts of machines and engines; Size, description, dimensions, and specifications; Limit dimensioning and geometric tolerancing; limits; Fits and tolerances, conventional symbols.

Sectioning of machine and engine components; Orthographic projections and standard practices.

Isometric views with particular reference to piping and ducting

MT-111 Calculus

Set and Functions:

Define rational, irrational and real numbers; rounding off a numerical 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, DeMorgan'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.

Propositional Logic:

Definition of Proposition, Statement and Argument, Logical Operators, Simple and Compound proposition, various types of connectives, Truth table, tautology, Contradiction, Contingency & Logical equivalence.

Boolean Algebra:

Definition, Boolean function, duality, some basic theorems & their proofs, two valued Boolean algebra, Truth functions, Canonical sum of product form, Digital logic Gates & Switching circuit designs.

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)

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` Hospitals 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, exact differential and its application in computing errors, 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. Centre of pressure and depth of center of pressure.

Solid Geometry:

Coordinate Systems in three dimensions. Direction cosines and ratios, vector equation of a straight line, plane and sphere, curve tracing of a function of two and three variables, Surfaces of revolutions, transformations (Cartesian to polar & cylindrical).

ME-104 Workshop Practice

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

Smith's forge; Exercise in bending, upsetting and swage.

Familiarizing the students with the following processes:

Soldering and brazing, Welding, Heat treatment, Moulding and casting

Simple machine shop processes, such as turning, shaping, milling, and sheet metal work.

HS-105 Pakistan Studies

An Outline of Emergence of Pakistan:

A brief historical survey of Muslim community in the sub-continent War of Independent 1857 and After match Sir Syed Ahmed Khan, Development of Two Nation Theory Formation of Muslim League Lucknow Pact Khilafat & Non-Cooperation Movement Political Events from 1924 to 1937 Pakistan Resolution - Struggle for Pakistan from 1940 to 1947 Emergence of Pakistan

Land of Pakistan:

Geophysical conditions, Territorial situation and its importance, Natural Resources - Mineral and Water

Constitutional Process:

Early effects to make constitution - Problems and issues Constitution of 1956 and its abrogation The constitution of 1962 and its annulment Constitutional and Political Crisis of 1971; The constitution of 1973. Recent constitutional developments

Post-Independence Development:

Education in Pakistan; Planning & Development in the Field of Education Development of Science and Technology with special reference to Engineering and Architecture

Brief survey of Pakistan Economy: Industrial and Agricultural Development. Internal and external trade Economic planning and prospects

Cultural Development in Pakistan: Definition, Contents and Contributing factors in culture, Development of Art, Philosophy and literature.

Foreign Policy:

Relations with neighbors, Super powers and the Muslim World

HS-127 Pakistan Studies for Foreigners

Land of Pakistan:

Land & People –Strategic importance – Important beautiful sights – Natural resources (some portion of economics of Pakistan)

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 and development – Factors leading towards the demand of a separate Muslim state – Creation of Pakistan.

Government & Political Development in Pakistan:

Constitution of Pakistan – A brief outline – Governmental structure Federal and 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 - Dominant Culture features

SPRING SEMESTER

IM-101 Computer Applications in Engineering

Computer Programming Basics

General terminologies, Computing application software, General and scientific programming languages, Computer programming methods Compilation and interpretation Programming environment Workspace, Files and file management, Data types, Display options, Accuracy and Precision, Scripts

Functions and Graphs

Solving and plotting functions: Trigonometry, Complex numbers, Logarithm. Polynomials. Partial function expansion, Vector Array, Matrix Array Developing algorithms and using built-in functions of scientific software packages for solving mathematical problems in Matrix algebra, Calculus and Computational geometry

EE-122 Basic Electricity and Electronics

Fundamentals of Electric Circuits : Charge, Current Voltage, and Power, Voltage and Current Sources, Ohm's Law;

Voltage and Current Laws : Nodes, Paths, 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, The venin and Norton Equivalent Circuits, Maximum Power Transfer, Delta-Wyes 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 file theory, Principle 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• of alternator on infinite bus bars.

Introduction to Transformer: Construction, Principle of working, elf equation, Transformation ratios, No load working and vector diagram, magnetizing current, Vector diagram on load.

One line 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 Electronics.

PH-122 Applied Physics

Introduction:

Scientific notation and significant figures Types of errors in experimental measurements Units in different systems Graphical Techniques (Log, semi-log and other non-linear graphs)

Vectors:

Review of vectors, Vector derivatives. Line and surface Integrals. Gradient of a scalar

Mechanics:

The limits of Mechanics Coordinate systems. Motion under constant acceleration, Newton laws and their applications Galilean invariance Uniform circular motion Frictional forces Work and Energy Potential Energy. Energy conservation Energy and our Environment Angular momentum

Electrostatics and Magnetism:

Coulombs Law Electrostatic potential energy of discrete charges Continuous charge distribution Gauss's Law. Electric field around conductors Dielectrics Dual trace oscilloscope with demonstration
Magnetic fields. Magnetic force on current Hall effect. Biot-Savart Law Ampere's Law Fields of rings and coils. Magnetic dipole Diamagnetism, Para magnetism and Ferromagnetism

Semiconductor Physics:

Energy levels in a semiconductor. Hole concept. Intrinsic and Extrinsic regions Law of Mass Action*P-N* junction
Transistor Simple circuits

Waves and Oscillations:

Free oscillation of systems with one and more degrees of freedom Solution for Modes Classical wave equation Transverse modes for continuous string Standing waves Dispersion relation for waves LC network and coupled pendulums Plasma oscillations

Optics and Lasers:

Harmonic traveling waves in one dimension .Near and far fields Two-slit interference Huygens Principle Single-slit diffraction Resolving power of optical instruments Diffraction Grating Lasers. Population inversion Resonant cavities Quantum efficiency He-Ne, Ruby and CO_2 lasers Doppler effect and sonic boom.

Modern Physics:

Inadequacy of classical physics,Planck's explanations of black body radiation Photoelectric effect, Compton effect. Bohr theory of Hydrogen atom, Atomic spectra, Reduce mass, De-Broglie hypothesis Braggs Law, Electron microscope, Uncertainty relations Modern atomic model, .Zeeman effect, Atomic nucleus, Mass-energy relation, Binding energy, Nuclear forces and fundamental forces, Exponential decay and half-life. Radioactive equilibrium in a chain, Secular equilibrium,Nuclear stability, Radiation detection instruments, Alpha decay, Beta decay, Gamma decay attenuation Nuclear radiation hazards and safety, Medical uses of Nuclear Radiation. Fission, Energy release Nuclear Reactors Breeder Reactor Nuclear Fusion

HS-111 Functional English

Objectives of the Course

• The course aims at improving the four language skills –listening, speaking, reading and writing.

• The functional aspect of language will be stressed further through development of students' vocabulary and use of grammar.

Speaking and Listening

• Listening actively through the use of skills and sub skills, and in a variety of situations.

• Speaking: Fluency and confidence building through group discussions, role plays and public speaking

Vocabulary development

• Tips / strategies in vocabulary enhancement

• Practice in vocabulary development

Reading

• Reading skills, Sub skills

• Reading strategies

• Reading practice through variety of reading texts and comprehension exercises

• Précis writing

Writing

• Note taking: Techniques for taking notes from lectures, from books (integrated with listening & reading)

• Process of Writing with practice in pre writing strategies, in revising, and in, editing for grammar.

• Writing well- structured and effective paragraphs, essays and letters (routine communication) using proper writing mechanics. Writing descriptions, narrations, cause and effect, compare and contrast etc

IM-105 Thermo Fluids

Thermodynamics

Basic concepts, Different forms of energy, energy conservation, laws of thermodynamics, Entropy, Two phase systems, Phase diagrams, Steam Tables.

Thermodynamics Cycles

Cycle work, Thermal efficiency and heat rate, Carnot cycle, Stirling cycle, Otto cycle, Diesel cycle.

Fluid Mechanics

Basic concepts, Fluid pressure, Interconnected vessels, Force calculations (walls, flat and curved surfaces), Stability of a floating body, lnviscid and viscous flow, Continuity, Euler's and Bernoulli's equations, Laminar and turbulent Flow, Measurements of pressure and flow rate, Dimensional Analysis.

Heat Transfer

Fundamentals of conduction, convection and radiation heat transfer