

**BE (TELECOMMUNICATIONS ENGINEERING)**  
**Courses of Studies**  
**Applicable from Batch 2005-06**

**FIRST YEAR**

S. No.	Course No.	Course Title	Maximum Marks	
			Theory	Practical
1	EE- 117	Fundamentals of Electrical Engineering	100	50
2	EL-182	Basic Electronics	100	50
3	CS-105	Fundamentals of Computer Engineering	100	50
4	CE-105	Engineering Surveying	100	50
5	ME-107	Basic Mechanical Engineering	100	50
6	EE-155	Engineering Drawing	100	50
7	MS-121	Applied Physics	100	50
8	MS-105	Applied Chemistry	100	50
9	MS-111	Calculus	100	-
10	HS-101	English	100	-
11	HS-105	Pakistan Studies	100	-
Total			1100	400

**SECOND YEAR**

S. No.	Course No.	Course Title	Maximum Marks	
			Theory	Practical
1	EE- 216	Circuit Theory	100	50
2	EL-236	Amplifiers and Oscillators	100	50
3	EE-262	Programming with C Language	100	50
4	EE-221	Instrumentation	100	50
5	EE-246	Electrical Machines	100	50
6	EE-281	Electromagnetic Fields	100	50
7	CS-208	Computer Architecture & Organization	100	50
8	MS-224	Complex Variable & Fourier Analysis	100	-
9	MS-222	Linear Algebra & Ordinary Differential Equations	100	-
10	EL-237	Digital Electronics	100	50
11	HS-205	Islamic Studies OR Ethical Behaviour	100	-
Total			1100	400

**B.E (TELECOMUNICATIONS ENGINEERING)  
Courses of Studies**

**THIRD YEAR**

S. No.	Course No.	Course Title	Maximum Marks	
			Theory	Practical
1	TC-382	Antenna and Microwave Engineering	100	50
2	EE-315	Electric Filters	100	50
3	EE-393	Digital Signal Processing	100	50
4	TC-394	Communication Systems	100	50
5	CS-309	Microprocessor and Assembly Language	100	50
6	TC-334	Communication Electronics	100	50
7	TC-335	TV and Radar Systems	100	50
	EE-372	Linear Controller System	100	50
8	MS-331	Applied Probability and Statistics	100	-
9	HS-303	Engineering Economics	100	-
10	HS-304	Business communication and Ethics	100	-
Total			1100	400

**FINAL YEAR**

S. No.	Course No.	Course Title	Maximum Marks	
			Theory	Practical
1	TC-494	Digital Communication and Information Theory	100	50
2	TC-495	Satellite Communication	100	50
3	TC-496	Wireless Mobile/Cellular Communication	100	50
4	TC-497	Multimedia Communication	100	50
5	TC-498	Communication Management	100	50
6	TC-499	Optical Fiber Communication	100	50
7	CS-418	Computer Communication Networks	100	50
8	CS-413	Internet Computing	100	50
9	MS-442	Numerical Methods	100	-
10	TC-490	Telecommunications Engineering Project		200
Total			900	600

## **EE 117      FUNDAMENTALS OF ELECTRICAL ENGINEERING**

**Electrical Elements and Circuits :** Energy and energy transfer, Electric charge, electric current, potential difference & voltage, Electric power & energy, Electric circuits, Sources & element resistance, Ohm's Law, Inductance, Capacitance, Fundamental circuit Laws, Kirchoff's Laws, Direct application of fundamental laws to simple resistive networks, Node voltage and loop current methods.

**Steady State AC Circuits :** An introduction to periodic functions, RMS or effective, Average and maximum values of current & voltage for sinusoidal signal wave forms, An introduction to phasor method of analysis, Applications of phasor methods to simple AC circuits, Power and reactive power, Maximum power conditions.

**Magnetic Circuits and Transformers :** Magnetic effects of electric current, Magnetic circuit concepts, Magnetization curves, Characteristics of magnetic materials, Magnetic circuits with AC excitation, Hysteresis and eddy current losses, Introduction to transformer, The ideal transformer.

**Electromechanical Energy Conversion :** Basic principles, Generated voltage, Electromagnetic Torque, Introduction of Magnetic Fields, Alternating current generators, Commutator action, DC machines, Direct current Generators, Electric motors, Losses and efficiency, Machine application consideration.

**Sinusoidal Steady State Analysis :** Network response to sinusoidal driving functions, Complex impedance and admittance functions, Development of concept of phasors, Power consideration, Complex power, Maximum power transfer, Tuned circuits, Series and parallel RLC tuned circuits, Definition of Quality factor.

The practical work will be based on the above course.

## **EL 182      BASIC ELECTRONICS**

### **Historical Evolution of Electronic Devices**

**Solid State Theory:** Atomic Structure of elements, Energy band diagram for solids, Intrinsic and Extrinsic Semi-conductors, Electron Hole Paris, Distribution of Electrons and Holes in a Semi-conductor.

**Diode & Its Application:** Diode, PN junction Diode, Forward and Reverse characteristics of a Diode, Diode as a switch, Diode as rectifier, Diode as Clipper, Diode as Clamper, Diode in gating circuits, Breakdown Diodes. Voltage Regulator.

**Transistor (BJTS):** Junction Transistors, Construction and Operation, Static characteristic, Transistors configurations, DC Biasing of a Transistor, Types of Biasing, Biasing Techniques DC circuit analysis, Load Line, Operating Point and bias stabilization, Transistor as amplifier.

Introduction to Field Effect Transistor. JFETS and MOSEFT.

The practical work will be based on the above course.

## **CS 105 FUNDAMENTALS OF COMPUTER ENGINEERING**

Number Systems, Historical evolution of computers, Structure and organization of computers and computer systems, computer peripherals, Introduction to software development process, introduction to common software packages and their applications, programming languages and their comparative study. High and low level languages, introduction to operating systems and data communications, Computer networking fundamentals, Introduction to Databases and information systems.

The practical work will be based on the above course.

## **CE 105 ENGINEERING SURVEYING**

**Basics of Surveying:** Definition, Evolution of Surveying, Types and Classes of Surveys, Plane Table Survey, Surveying Instrumentation, Survey References, Units of Measurement, Location Methods, Accuracy and Precision, Errors and Mistakes, Accuracy Ratio, Stationing, Field notes, Field management.

**Measurement of Horizontal Distances:** Methods of Linear measurement, Types of Measurement, Chains, Tapes, Standard conditions for use of Steel tapes, Taping Accessories and their use, Systematic Taping Errors and Corrections, Random Taping Errors and Mistakes in Taping, Field notes for Taping, Conventional and Electronic Field books.

**Levelling:** Definitions, Theory of Differential Levelling, Effects of Curvature and Refraction, Types of Levels, Automatic Level, Digital Level, Adjustment of Levels, Types of Levelling Staff, Levelling Operations, Techniques of Levelling, Benchmark Levelling (Vertical Control Survey), Profile and Cross-section Levelling, Reciprocal Levelling, Peg test, Errors in Levelling, Contours and their characteristics, Various methods of Contouring.

**Angles and Directions:** Horizontal and Vertical Angles, Meridians, Types of Horizontal angles, Azimuths, Bearing, Relationship between Bearings and Azimuths, Reverse Directions, Azimuth and Bearings computations, Magnetic Declination, Types of Compasses.

**Theodolites / Tacheometers:** Introduction, Types of Theodolites, Repeating, Directional and Electronic Theodolites, Temporary adjustments,

Measurement of Horizontal and Vertical Angles, Prolonging a Straight Line, Permanent Adjustments, Use of Tachometers in computation of Horizontal and Vertical Distances.

**Traverse Surveys:** Open and Closed Traverses, Latitude and Departures, Computation of Error of Closure, and the accuracy of a Traverse, Traversing with Total Station Instruments, Rules of Adjustment, Effects of Traverse Adjustments on the original data, Computation of Omitted Measurements, Area of Closed Traverse Methods, Use of computer programs.

**An Introduction to Geomatics and Global Positioning System:** Geomatics defined, Branches of Geomatics, Remote Sensing, Techniques of remote sensing, Background information on global positioning, receivers, Satellites, Errors, GPS Surveying techniques and applications.

The practical work will be based on the above course.

## **ME 107      BASIC MECHANICAL ENGINEERING**

### **Engineering Mechanics:**

**Statics:** Fundamental concepts, Definitions and Units, Newton's First Law, Forces, Moments and couples, Laws of Equilibrium, Free Body Diagrams, Structures, Frames and Mechanics,

**Dynamics:** Fundamentals of Dynamics, Rigid Body Dynamics, Newton's Second Law, Analysis of Motion in Two & Three Dimensional Spaces, Rectilinear & Curvilinear Motions, Work & Energy, Conservation of Energy.

**Solid Mechanics / Design:** Stress, Strain, Elastic & Plastic deformation, Hysteresis, Mechanical Power Transmission (Pulleys, Chains, Fly wheel, Shaft, Coupling etc.) Friction, Bearings.

**Thermodynamics:** Work, Heat, Open, Closed and Steady flow systems, Thermodynamics Properties and Processes, Absolute & Gauge Pressure, Pressure Temperature and Flow Measurement, Equation of Continuity, Bernoulli's Equation, Two Phase Systems, Ideal Gas, Conservation of Mass & Energy, Simple Heat Engine & Refrigeration Thermodynamic cycles.

The practical work will be based on the above course.

## **EE 155      ENGINEERING DRAWING**

**Mechanical Drawing :** Drawing equipment and the use of instruments. Basic drafting techniques and standards, Geometrical curves including plan curves, Cycloid, Hypocycloid and the Involute. Intersection at various

positions of geometrical bodies, such as pyramids, Cylinders and Cones, Development of surfaces, Freehand sketch of machine and engine components, locking arrangement, foundation bolts, stuffing box, shaft couplings, foot step bearing, Engine connecting rod, Concepts of working drawings of components and parts of machine and engines, dimension and specifications.

**Section of Machines and Engine Components :** Orthographic projections and standard practices, Isometric views with particular reference to piping and ducting.

**Civil Drawing :** Plan, Elevations (front, left and right) and details of buildings such as Bungalows, Flats, Offices, Workshops school and market etc., Elements of Perspective drawings.

**Electrical Drawing :** 11 KV Electric substation building plan including equipment layout, Trenches (for cabling etc.) Manholes, Doors, Windows, Ventilators etc.

Cable and Earth continuity conductors plan including the size and specifications. Cable laying in trenches, directly in ground, in pipes while crossing the roads etc. Details of plate type and Rod type, Earthing Electrodes.

Schematic Diagrams of substations, lighting and power distribution boards, Electrical Symbols and One line diagrams of a typical power system.

The practical work will be based on the above course.

## **MS 121 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, Paramagnetism 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<sub>2</sub> 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 Reactor, Breeder Reactor, Nuclear Fusion.

The practical work will be based on the above course.

## MS 105 APPLIED CHEMISTRY

**Gases :** Gas Laws, Kinetic Gas Equation, Van Der Vaal's Equation, Critical Phenomenon, Liquidification of gases, Specific heat (molar heat capacity)

**Properties of Solution and Liquids :** Surface Tension, Viscosity, Osmosis, Osmotic Pressure, pH-Buffer Solution, Spectrophotometry, Basic concepts of Colloidal Chemistry, Classification purification (dialysis).

**Thermochemistry :** Chemical Thermodynamics, Hess's Law, Heat of reaction, Relation between H and U measurement of heat reaction, Bomb Calorimeter.

**Electrochemistry :** Laws of Electrolysis, E.M.F. series, corrosion (Theories, inhibition and protection).

**Water and Sewage :** Sources of water, impurities, hardness, Water softening, Purification of water for potable and industrial purposes, electro dialysis. Introduction to environmental pollution, main sources and effects. Sewage treatment.

**Fuels :** Types of fuels, Classification of fossil fuels.

**Metals and Alloys :** Properties and General composition of metals and alloys such as Iron, Copper, Aluminum, Chromium, Zinc, Used in engineering field.

**Engineering Materials :** Inorganic Engineering materials, Cement, Glass. Organic Engineering Materials, Polymers, Rubbers, Plastics, Paints, Semiconductors and Dielectric materials.

**Practicals :** Determination of total alkalinity of a given sample, Determination of total acidity of a given sample, Determination of the amount of ferrous ion in a given sample, Determination of total hardness of a given sample of water, Determination of surface tension of a given sample, Determination of coefficient of viscosity of a given sample, Determination of chloride ion in a given sample, Determination of Bicarbonate and Carbonate ions in a given sample, Determination of turbidity in a given sample by precipitation, Determination of turbidity in a given sample by spectrophotometer, Plotting of titration curve and determination of total alkalinity in a given sample, Plotting of titration curve and determination of acidity in a given sample, Plotting a calibration curve and determination of ions present in a given sample.

The practical work will be based on the above course.

## **MS 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 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` Hospital's 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 centre 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).

## **HS 101 ENGLISH**

**Study Skills:** Reading, dictionary, library skills, speed reading, writing outlines, note taking.

**Oral communication:** confidence building, class discussions, speeches, verbal interaction.

**Advanced reading comprehension:** using texts dealing with science, literature and human rights.

**Précis writing:** rules of précis writing, practice précis.

**Controlled & guided writing:** pre writing (planning, information gathering, preparing to write). Writing, search for topic sentences, developing a theme, following up ideas and arguments, outline plans etc.

**Essay writing:** Types of writing – narrative, descriptive, expository, argumentative etc.. Using guided writing to organize essays, Including human rights as essay topics.

**Writing short reports:** short background of report and its importance, memo report, brief reports on events seen / experienced like visit to an exhibition etc.

**Letter writing:** format and layout, formal letters, types of letters – invitations (acceptance and refusals), condolence, thanks, congratulations, to the editor, chairman class advisor, dean, vice chancellor etc.

**Applied Grammar:** morphology, types of sentences, sentence analysis, tenses, jumbled sentences, question tags, homonyms and homophones and their use in sentences, punctuation – sentences and paragraphs, use of idioms

## **HS 105 PAKISTAN STUDIES**

### **Historical and Ideological Perspective of Pakistan Movement**

**Two nation theory:** Definition, Significance.

**Creation of Pakistan:** Factors leading to the creation of Pakistan, Quaid-e-Azam and the demand for Pakistan.

### **Land of Pakistan:**

Geo-physical conditions, Geo-political and strategic importance of Pakistan, Natural resources, water and power.

### **Constitutional Process:**

Early efforts to make a constitution-problems and issues, Constitution of 1956 and its abrogation, Constitution of 1962 and its abrogation, Constitutional and Political crisis of 1971, Constitution of 1973, Subsequent constitutional developments.

### **Contemporary Issues in Pakistan**

**A brief survey of Pakistan's Economy:** Agricultural and industrial development in Pakistan, Internal and external trade, Economic planning and prospects.

**Social issues:** Literacy & education in Pakistan, State of science & technology with special reference to IT education, Pakistan society and culture.

**Environmental issues:** Hazards of atmospheric pollution, Other forms of environmental degradation, their causes & solutions, Pakistan's role in preservation of nature through international conventions/efforts.

### **Foreign Policy**

Relations of Pakistan with neighbours, Relations with Super powers, Relations with Muslim world.

### **Human Rights**

**Conceptual foundations of Human Rights:** What are Human rights? Definition, significance and importance, Comparative analysis of Islamic and western Perspectives of Human rights.

**UN System for Protection of Human rights - an over-view:** UN Charter, International Bill of Human Rights, Implementation mechanism.

**Other important international treaties and conventions:** The convention on the elimination of all forms of discrimination against woman, International Convention on the rights of child (CRC), Convention against torture (CAT), Refugee Convention.

**Pakistan's response to Human rights at national and international level:** Constitutional Provisions, Pakistan's obligations to international treaties and documents, Minority rights in Pakistan, Pakistan's stand on violation of Human rights in the international perspective.

## **EE 216      CIRCUIT THEORY**

**Elementary Transient Analysis :** Differential and integral forms of circuit equations, Initial voltage on capacitor, Initial current in an inductor, First-order circuits, Solution of single first order differential equations, Particular and total solution of second order linear time invariant differential equations.

**Matrix Analysis :** Introduction and review of Matrix theory, determinants and Matrix inversion, Systematic formulation of network equations, Loop variable analysis, State variable analysis, formulation of state equations, source transformations, Duality.

**Elementary Time Functions :** Introduction to singularity functions, The impulse function and response, The unit step function and response, Ramp function, Exponential function and response.

**Exponential Excitation and the Transformed Network :** Representation of excitations by exponential functions, Single element response, Forced response with exponential excitation, Introduction to the transformed network, Driving point impedance and admittance.

**Laplace Transformation :** Analysis of Networks by Laplace transformation, Review of Laplace transformation, Application to network analysis.

**Two Port Network :** Introduction, Characterization of linear time invariant two-ports by six sets of parameters, Relationship among parameter sets, Interconnection of two ports.

**Network Functions and Frequency Response :** The concept of complex frequency, transform impedance and transform circuits, Network functions, One and two ports, Poles and zeros of network functions, Restrictions on pole and zero transfer function, magnitude and phase, Complex Loci's plots from the plane phasors.

The practical work will base on the above course.

## **EL 236      AMPLIFIERS AND OSCILLATORS**

**Amplifier Analysis:** Transistor as an Amplifier, Hybrid model of a transistor, Small signal analysis, Large signal analysis, Gain calculation of single stage amplifier, Cascading, Multistage gain calculations.

**Classification of Amplifier:** Classification of amplifier on the basis of biasing, Class A, Class B, Class AB and class C Amplifier, Push pull amplifier, Complementary symmetry amplifier.

Classification of amplifier on the basis of coupling, RC coupled amplifier, Transformer coupled amplifier, Direct coupled amplifier.

Classification of Amplifier on the basis of basis of Frequency, Audio Frequency Amplifier, Radio frequency amplifier, Tuned amplifiers.

**Feed Back:** Feed back concept, Feed back amplifiers, Voltage feed back amplifier, Current feed back amplifier, Effect of feed back on frequency response, Non linear distortion and noise, Series and shunt feed back amplifier.

**Practical Amplifier Consideration:** Input and output Impedance, Real and apparent gain, Amplifier loading, Impedance matching and cascading.

**Oscillators:** Basic theory of Oscillators, Tank circuit, Damp and Un-damp oscillations, Phase shift oscillator, colpitt oscillator, Hartley oscillator, Wein Bridge oscillator.

The practical work will be based on the above course.

## **EE 262      PROGRAMMING WITH C-LANGUAGE**

**The Turbo C Programming environment :** Setting up the Integrated Development Environment, File used in C program Development, using the Integrated Development Environment, the Basic Structure of C programs, Explaining the printf() Function.

**C Building Blocks :** Variables, Input/ Output, Operators, Comments.

**Loops :** The for Loop, The while loop, The do while loop.

**Decisions :** The if statement, the if-else statement: the else-if construct. The switch statement, the Conditional operator.

**Functions :** Simple Functions, Functions that return a value, using arguments to pass data to a function, using more than one functions, external variables, prototype versus classical K and R, Preprocessor directives.

**Arrays and strings :** Arrays, Referring to individual Elements of the Array, String.

**Pointers :** Pointer Overview, Returning data from functions, pointers and Arrays, Pointers and Strings, Double Indirection, Pointers to Pointers.

Structures, unions, and ROM BIOS.

**Turbo C Graphics Functions** : Text-mode Functions Graphics - Mode Functions. Text with Graphics.

**Files** : Types of Disk I/O, Standard, Input/ Output Binary Mode and Text mode, Record, Input/ Output, Random Access, Error Conditions, System-Level Input/ Output, Redirection.

**Advanced Variables** : Storage Classes, Enumerated data type, Renaming data type with typedef, Identifiers and Naming classes, type conversion and casting, labels and goto statement.

**C++ and Object Oriented Programming** : Object Oriented Programming, some useful C++ features classes and objects, constructors and memory Allocations, Inheritance, Function Overloading, Operator Overloading.

The practical work will be based on the above course.

## **EE 221 INSTRUMENTATION**

**General Theory** : Classification, performance and characteristics, absolute and secondary instruments, indicating, recording and integrating instruments, controlling balancing and damping, static and dynamic characteristics.

**Ammeter and Voltmeter** : Classification, moving iron, moving coil, thermal, electrostatic and induction type, errors, extension of ranges, CTs and PTs, their burden and accuracy.

**Power and Energy Meters** : Wattmeter types, Active and Reactive power measurement, Max. demand indicator, Calibration, Classification of energy meter, KWH meter and KVARH meters, p.f. meter.

**Electronic Instruments** : Electronic and digital voltmeters, counters, digital frequency meter, time interval measurement, RLC meter, Power and energy meter, oscilloscope and its use.

**Basic Concepts** : Basic concepts of measurement, measurement of resistance, inductance and capacitance, potentiometer and bridge methods.

**Magnetic Measurement** : Measurement of field strength flux, permeability, B-H curve and hysteresis loop, magnetic testing of materials.

**Transducers** : Variable resistance and inductance transducers, linear variable differential transformer (LVDT), capacitive, photconductive, and piezo-electric transducers, thermo electric transducers. Filtering, Instrument amplifiers, A/D conversion.

**Measurement of Non-electrical Quantities :** Measurement of temperature, pressure, flow, strains, thermal conductivity, motion, speed and vibrations, thermal and nuclear radiations.

**High Voltage measurement :** Measurement of dielectric strength of insulators, high voltage surges.

The practical work will be based on the above course.

## **EE 246 ELECTRICAL MACHINES**

**Three Phase Circuits:** Three phase voltages, Currents and power, Star and Delta connected circuits, Analysis of balanced three phase circuits, Line diagram, Power and power factor measurement in 3-phase circuits.

**Transformer:** Basic principles, Single and 3-phase transformers, Construction, General transformer equation, Voltage and current relations in transformer, Ratio of transformation, Loading a transformer, Equivalent circuits of a transformer, OC and SC tests, Regulations and methods of calculation of regulation, Efficiency and calculation of efficiency, Auto transformer, 3-phase transformer.

**Direct Current Machines:** Electric circuit aspects of DC machine, Magnetic circuit aspects, Types of DC generator, Performance, Types of motors, Performance, Motor speed control, Transient and dynamic responses, Transfer functions and frequency response.

**Alternating Current Machines:** Rotating magnetic field, Induction motor action, Induction motor characteristics and performance, Synchronous generator characteristics and performance, Synchronous motors, Induction motor, Speed control elementary AC two phase control motors, Constructional features of fractional horse power AC motors.

**Direct Current Machines Winding:** Gramme Ring winding, Simple lap and wave windings, Diagrams and developments and elementary calculations.

**Control Systems:** Motor drive systems, Introduction to feedback control systems, System aspects and classification, Elements of analysis of feedback control systems, Digital control systems.

The practical work will be based on the above course.

## **EE 281 ELECTROMAGNETIC FIELDS**

**Vector Analysis :** scalars and vectors, vector algebra, the Cartesian coordinate system, vector components and Unit vectors, the vectorfield, the dot product the cross product, other coordinate systems, circular cylindrical coordinates, the spherical coordinate system, transformations between coordinate systems.

**Coulomb's Law and Electric Field Intensity :** The experimental law of coulomb, Electric field intensity, field of a point charge, field due to a continuous volume charge distribution, field of a line charge, field of a sheet of a charge, stream-lines and sketches of fields.

**Electric Flux Density Gauss's Law and Divergence:** Electric flux density, Gauss's law, application of Gauss's law, some symmetrical charge distributions, differential volume element, divergence, Maxwell's first equation, electrostatics, the vector operator and the divergence theorem.

**Energy and Potential:** Energy expended in moving a point charge in an electric field, the line integral, definition of potential difference and potential, the potential field of a point charge, the potential field of a system of charges, conservative property, potential gradient, the dipole, Energy density in the electrostatic field.

**Conductor Dielectrics and Capacitances:** Current and current density continuity of current metallic conductors, conductor properties and bounded conditions, semi conductors, the nature of dielectric materials, capacitance, several capacitance examples, of a two wire lines. Curvilinear square, physical modules, current analogies, fluid flow maps the iteration method.

**Poisson's and Laplace's Equations:** Poisson's and Laplace's Equations, Uniqueness theorem, Examples of the solution of Laplace's equation, examples of the solution of poisson, product solution of Laplace's equation.

**The Steady Magnetic Field :** Biot Savart's Law, Amperes circuit law, curl, stoke's theorem, Magnetic flux and magnetic flux density, the scalar and vector magnetic potentials, derivation of steady magnetic field laws.

**Magnetic Forces Materials and Inductance :** Force on a moving charge, force on a differential current element, force between differential current elements, force and torque on a closed circuit, the nature of magnetic materials, Magnetisation and permeability, magnetic boundary conditions, the magnetic circuit, potential energy and forces on magnetic materials, inductance and mutual inductance.

**Time Varying fields and Maxwell's equations :** Faraday's Law, displacement current, Maxwell's equation in point form, Maxwell's equation in integral form, the retarded potential.

**The Uniform Plane Wave:** Wave motion in free space, wave motion in perfect dielectric, plane waves in lossy dielectrics. The Poynting vector and power considerations, propagation in good conductors, skin effect, reflection of uniform plane waves, standing wave ratio.

The practical work will be based on the above course.

## CS 208      **COMPUTER ARCHITECTURE & ORGANIZATION**

**Introduction to Computers :** Evaluation of Computer Hardware and Software; Computer Organization and Architecture; Types of Computers.

**Computer Interconnection Structures:** Computer Components Computer Function; Interconnective Structure, Bus Interconnection.

**Execution Unit:** Register Sections - General Register design, Combinational shifter Design, Flag Register; Computer Arithmetic; ALU design; Multiplication of Signed and unsigned Integers; Division of Unsigned Integers; Floating Point Numbers; Coprocessors

**Memory Organization:** Characteristics of Memory Systems; Access Methods; Main Memory Design; Performance Parameters; Memory Hierarchy; Cache Memories; Associative memory Virtual memory and memory Management Concepts.

**Input/ Output :** Basic Concepts; Programmed I/O; Interrupt I/O - Basic concepts, Main features of Interrupt I/O; Direct Memory Access (DMA); I/O Processor; Parallel and Serial I/O; Synchronous & Asynchronous I/O.

**Instruction Sets:** Op-code; Addressing Modes; Instruction Types – Data Transfer Instructions; Arithmetic Instructions; Logical Instructions, Program Control Instructions; System Control Instructions; I/O Instructions; Reduced Instruction Set Computers (RISC)

**Operating Systems:** Operating System Overview, Scheduling; Memory Management; Recommended Reading.

The practical work will be based on the above course.

## MS 224      **COMPLEX VARIABLE & FOURIER ANALYSIS**

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

**Complex Variable:** Limit, continuity, zeros and poles of a complex function. Cauchy-Reimann equations, conformal transformation, contour integration.

**Laplace Integral & Transformation:** Definition, Laplace transforms of some elementary functions, first translation or shifting theorem, second translation or shifting theorem, change of scale property, Laplace transform of the nth order derivative, initial and final value theorem Laplace transform of integrals, Laplace transform of functions  $t^n F(t)$  and  $F(t)/t$ , Laplace transform of periodic function, evaluation of integrals, definition of inverse Laplace transform and inverse transforms, convolution theorem, solutions of ordinary differential and partial differential equations using Laplace

transform ( I.V.P's & B.V.P's). Z and Inverse Z – transformations, properties of Z – transformation and applications.

**Fourier series:** Introduction to fourier series, Euler fourier formulae, even and odd functions, application of fourier series, Fourier transform and fast fourier transform and properties with applications.

## MS 222    **LINEAR ALGEBRA & ORDINARY DIFFERENTIAL EQUATIONS (B)**

**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 (Scaling, translation, rotation and projection) with graphical representation.

**Introduction to ODEs:** The Concepts & Terminologies: Order and Degree; Linearity & Non-linearity; A Brief Classification of ODEs; Formulation of ODEs: Concrete Examples; Solutions: General & Particular: Concrete Examples & Applications: Initial Value Problems (IVP) and Boundary Value problems (BVP): A Brief Introduction to Issues related to Existence & Uniqueness of Solutions.

**The First Order ODEs: Linear and Non-Linear:** Variable Separable Cases & Applications: Growth & Decay Problems, Newton's Law of Cooling, Torricelli's Law, Simple Kinematical Dynamical Applications; Exact and No-Exact ODEs: Solution Procedures and Integrating Factors; The Standard Linear Differential Equation of First Order: Solution Procedures and Applications to RL-Circuits and RC-Circuits, Bernoulli's Equations & Logistical Growth Models, Direction Fields and Euler's and Picard,s Iterative Schemes for the 1<sup>st</sup> Order ODEs,

**The Linear Second Order ODEs: Homogeneous and Non-Homogeneous Cases:** Linear Second Order Homogeneous ODE with Constant Coefficients: Solution Procedures and the Principle of Linear Superposition and Applications --- Mechanical Systems & Electrical Systems, Undamped and Damped Harmonic Oscillators; Linear Second Order Non-Homogeneous ODEs with Constant Coefficients: Solution Procedures and the Principle of General Linear Superposition: Complementary Functions & Particular Solutions---the Method of Undetermined Coefficients & Variation of Parameters: Applications: Spring-Mass Systems -- Damped & Undamped Harmonic Oscillators with Forcing Terms and their ODEs and Solutions; RCL-Circuits and their ODEs and Solutions; The Physics and Mathematics of the Phenomenon of Resonance in Mechanical & Electrical Systems; Cauchy-Euler ODEs and their Solution Procedures.

**Partial Differential Equation:** Formation of partial differential equations. Solutions of first order linear and special types of second and higher order differential equations. Homogeneous partial differential equations of order one, Lagrange's multiplier

**Advance Calculus & Vector Calculus:** Double & triple integral with application (Area, centroid, moment of inertia) vector differentiation & vector integral with applications, Green & Stokes theorem with applications.

## EL 237      DIGITAL ELECTRONICS

Diode and transistor switching times, MOS and CMOS inverters, propagation delays and power dissipation, NMOS and CMOS logic gates, Ideal OPAMP, 741 applications, Instrumentation amplifier, Non-linear applications of OPAMP, Multi vibrators, Latches and Flip Flops, Introduction to logic families, Logic circuit characterization, TTL logic gates, ECL and CML logic gates, Pseudo NMOS and CMOS logic, Pass transistor and fully differential CMOS logic circuits, BiCMOS logic gates, Digital to Analog converters and Analog to Digital converters.

The practical work will be based on the above courses.

## HS 205      ISLAMIC STUDIES

**Quranic Verses:** **Tauheed:** Al-Ambiya – 22, Al – Baqarah - 163&164. **Prophet hood:** Al – Imran – 79, Al – Huda – 7, Al- Maida0h-3. **Here-After:** Al – Baqarah – 48, and one Hadith. **Basic Islamic Practices:** Al – Mu' minun-1-11, and two Ahadith

**Amer – Bil – Ma ‘ Roof Wa-Nahi Anil Munkar:** the concept of Good & Evil, Importance and necessity of Da'wat-e-Deen      Al- Imran – 110, Method of Da'wat-e-Deen      An-Nehl-125, Al-Imran-104, and two Ahadith

**Unity of the Ummah:** Al-Imran-103, Al-Hujurat-10, Al-Imran-64, Al-An' am –108, and two Ahadith .

**Kasb-e-Halal:** Ta ha-81, Al- A'raf-32-33, Al-Baqarah-188, and two Ahadith.

**Haquq-ul-Ibad:** Protection of life (Al-Maidah-32), Right to Property (Al-Nisa-29), Right to Respect & Dignity (Al- Hujurat –11-12), Freedom of Expression (Al-Baqarah-256), Equality: (Al-Hujurat-13) , Economic Security: (Al-Ma' arij – 24-25), Employment Opportunity on Merit: (An-Nisa-58), Access to Justice: (An- Nisa-135)

**Women's Rights:** An-Nehl-97, Al-Ahzab-35, An-Nisa –07.

**Relations with Non-Muslims:** Al- Mumtahanah-8-9, Al-Anfa'al – 61 and The last sermon of Hajj of Holy Prophet (PBUH): Relevant extracts.

**Seerat (life) of the Holy Prophet (PBUH):** birth, life at Makkah, declaration of prophet hood, preaching & its difficulties, migration to Madina, brotherhood (Mawakhat) & Madina Charter, The Holy Wars of the Prophet (Ghazwat-e-Nabawi), Hujjat-ul-Wida, The last sermon of Khutbatulwida: Translation and important points

**Islamic Civilization:** a) in the sub continent: pre- Islamic civilizations. The political, social & moral impacts of Islamic civilization (b) EEin the world: academic, intellectual, social & cultural impact of Islam on the world.

## **HS 206 ETHICAL BEHAVIOUR**

Nature, Scope and methods of Ethics. Ethics and Religion teachings of world religions. Basic Moral concepts, Right and wrong, Good and evil.

An outline of Ethical systems in philosophy, Hedonism, Utilitarianism, Rationalism and Kant. Self Realization Theories, Intuitionism.

**Islamic Moral Theory :** Ethics of Quran and its philosophical basis. Ethical precepts from Quran and Hadith and promotion of moral values in Society.

## **TC 382 ANTENNA AND MICROWAVE ENGINEERING**

**Basic Features of Radio Communication Systems :** Radio communication systems, Modulation and Demodulation, Radiowave propagation techniques, Antennas and Aerials, Antenna Arrays, Antenna Distribution systems, Radio receiver properties, Types of receivers.

**Microwave Devices :** Microwave Hybrids, Attenuators.

**Array Antennas :** Uniform linear array of Isotropic elements, Polar diagram, Broadside array of equally spaced, equal amplitude radiators, End-fire array of equally spaced, equal amplitude radiators, Scanned line array beamwidth, Optimum element spacing, Array design using the theory of polynominals. Optimum spacing for broadside and end-fire arrays, Harsen Condition, The binomial array, Supergain array, Chebysev array, Pattern synthesis.

**Transmission Lines :** Basics, types of transmission lines, Line characteristics impedance and physical parameters. Signal propagation, Waveform distribution and frequency dispersion, Transmission line of finite lengths, Reflection, Transmission and Propagation constants of transmission line, Transmission line couplers.

**Smith Chart and Scattering Parameters** : Smith chart Impedance, Admittance manipulation on the chart, Smith chart theory and applications, Reflection coefficient, Impedance of distributed circuits, Impedance matching, S-Parameters.

The practical work will be based on the above course.

## **EE 315      ELECTRIC FILTERS**

**Introduction** : Circuit Design Problem, Kind of Filters and Terminology, Passive Filters, Choice of Analog filter.

**Active Device Used In Active Filters** : Operational amplifiers operational transconductance amplifiers, circuit based on OAs and OTAs, characteristics of OTAs, OA and OTA based integrators.

**Circuit Design Approach** : Direct form of synthesis approach, cascade form of synthesis, simulation of impedance.

**Design of 1st Order Filter Sections, Cascade** : Design with 1st order section, all pass circuits, phase shaping.

**The Biquad Circuit** : Design parameters  $Q$  and  $\omega_0$ , the biquad circuit and its response 4 opamp biquad circuit, phase response.

**Sensitivity Analysis** : Definition of Bode sensitivity, sensitivity analysis of sallenkey circuit, sensitivity comparison of circuit.

**Circuit Design With Simulated Elements** : The ideal gyrator circuit GIC and FDNR, realization of negative elements, realization of floating elements, circuit design.

**Switched Capacitor Filters** : The MOS switch, switched capacitor, analog operations, 1st and 2nd order filters.

**Better OP-AMP Models** : Realization of filter and oscillators, active R and active C Circuit approach.

**Discrete Time Filters** : Elements of FIR and IIR filter design, filter structures, windowing process, aliasing error and quantization effect.

The practical work will be based on the above course.

## **EE 393      DIGITAL SIGNAL PROCESSING**

Relationship between sampling frequency and Shannon's theorem, continuous time and discrete time signals, Z-transform, inverse Z transform, discrete fourier transform, fast fourier transform, elements of FIR and IIR

filter design, filter structures, FFT techniques for high speed, convolution, windowing process, aliasing error its reduction, quantization effects.

The practical work will be based on the above course.

## **TC 383      COMMUNICATION SYSTEMS**

**Introduction:** Communication System, Model elements of digital communication system, Fundamental limitations.

**Deterministic Signal Analysis:** Representation and classifications of signals, Fourier transform theory, Transmission loss and decibels, Filter and filtering.

**Random Signal Analysis:** Review of probability and random variables statistical measures, Probability models, Introduction to random processes.

**Analog Communication:** Signal and system models of linear CW Modulation and exponential modulation, CW modulation system, introduction to sampling and pulse modulation.

**Digital Communications:** Digital Transmission, PAM signals Noise and errors synchronization techniques, Pulse modulation and band pass digital transmission, Digital CW modulation, Coherent and non Coherent binary systems, Digital modulation error-control coding.

The practical work will be based on the above course.

## **CS 309      MICROPROCESSORS AND ASSEMBLY LANGUAGE**

**Introduction to the Microprocessors:** The evolution of the microprocessor, Basic microprocessor architecture; The programming model.

**Memory Interface:** Memory devices, address decoding, memory interface of microprocessors, Dynamic & Static RAM.

**Instruction Set and Assembly Language Programming:** Data Movement Instructions; Arithmetic and Logic Instructions; Program Control Instructions; Addressing Modes; Two pass Assemblers; Assembly Languages Program Format; Pseudo Instructions; Labels; Macros and Subroutines.

**Basic I/O Interface:** Serial & Parallel I/O; serial communications, the serial interface and the UART, serial communications line modems; I/O port address decoding, The programmable peripheral interface; The 8279 programmable keyboard/display interface; 8251A programmable communication interface; 8254 programmable interval timer; analog-to-digital (ADC) and digital-to- analog converters (DAC).

**Interrupts:** Interrupt processing; Hardware interrupts; Expanding interrupt structure; 8259A programmable interrupt controller, real time clock.

**The Microcontroller:** Single-chip microprocessor; An introduction to microcontrollers, The 8051 internal RAM and registers; The 8051 instruction set; Other microcontrollers in the 8051 family.

**Developing Microprocessor-Based Products:** An introduction to the design process; Preparing the specification; Developing a design; Implementing and testing the design.

The practical work will be based on the above course.

### **TC 334      COMMUNICATION ELECTRONICS**

Modulation and related hardware, AM Transmitter and receivers, TRF and Superhetrodyne receivers, Side band systems, suppresses carrier systems, SSB, VSB, FM generator, FM transmitter and receivers, PLL systems, RF amplifiers and Oscillators.

The practical work will be based on the above course.

### **TC 335      TV AND RADAR SYSTEMS**

**Application of the Television:** Video, Audio, Television and Radio signals, Television broadcasting, Television studio operation, Video tape recorders, Cable televisions, Closed circuit television, Video home entertainment center, Video text data terminal, Development of television broadcasting.

**The Television Picture:Picture elements,** Horizontal and vertical scanning, Video signal information, Motion pictures, Frame and field frequencies, Horizontal and vertical scanning frequencies, Horizontal and vertical synchronization, Horizontal and vertical blanking, The 3.58-MHz Color signal, Picture qualities, The –MHz television broadcast channel, standards of the television.

**Television Cameras:** Basic operation of a TV camera, Types of the camera tubes, Vidicon, Plumbicon, Camera adjustment, Optical color separation for red, green and blue, Gamma correction, Signal tube color cameras, Studio and field applications, Lenses and light values.

**Picture Tubes:** Picture tube construction, Anode high voltage, Screen phosphors, Electron gun, Electrostatic focus, Magnetic deflection, Tricolor picture tube, Shadow mask, Methods of phosphor masking, Television projection system, Picture tube precautions, Problem with picture tubes.

**Scanning and Synchronizing:** Sawtooth wave form for linear scanning, interfaced scanning pattern, Sample frame of interfaced scanning, Flicker, Raster Distortions, Synchronizing pulses, Scanning, Synchronizing and blanking frequencies.

**Television Transmission:** Negative transmission, Vestigial sideband transmission, Television broadcast channel, FM sound signal, Television transmission standards, Line-of sight transmission, Satellite television.

**Television Receivers:** Functional blocks for the signal, Functional blocks for synchronizing and deflection, Automatic gain control, DC power requirements, RF section, IF section, Video detector, Video amplifier section, DC component of the video signal, The 4.5 MHz sound IF section.

**An Introduction to Radar:** Basic Radar, The simple form of the Radar Equation, Radar block diagram, Radar frequencies, Application of the Radar, Origin of the Radar.

**Radar Equations:** Introduction, detection of signals in noise, receiver noise and signal to noise ratio, Probability density function, Probability of detection and false alarm, Integration of the Radar pulses, Radar cross section of targets, Transmitter power pulse repetition frequency.

**MIT and Doppler Radar:** Introduction to Doppler and MIT radar, Delay line cancellors, Staggered pulse repetition frequencies, Limitation to MIT performance.

**Tracking Radar:** Tracking with Radar, Monopulse tracking, Conical scan and sequential lobing.

**Radar Transmitters:** Introduction, Linear beam power tubes, Solid state RF power sources, Magnetron, Cross field amplifiers, Other RF power sources, Other aspects of Radar transmitters.

**Radar Receivers:** The Radar receiver, The receiver noise figure, Super Hetrodyne receiver, Duplexers and receiver protectors, Radar displays.

**Propagation of the Radar Waves:** Introduction, Forward Scattering from a flat earth, Scattering from the round earth surface, Atmospheric Refraction, Standard propagation, Non standard propagation, Diffraction, Attenuation by atmospheric gases, External environmental noise, other propagation effects.

The practical work will be based on the above course.

## **EE 372      LINEAR CONTRAL SYSTEMS**

**Introduction:** Introduction to control systems, examples and classifications, Feedback and its characteristics. Nature and representation of contral system problem, block diagram fundamentals, terminology of block diagram for a

feedback control system, block diagram representation of various control systems.

**Linear Systems and Differential Equations:** Methods of writing differential equations of various physical systems such as static electric circuits, mechanical translational and rotational systems, thermal systems, hydraulic linear and rotational transmission systems, electromechanical dynamic systems, DC and AC speed control systems.

**Time-Response of Linear Systems:** Types of standardized inputs to linear systems, steady state response and transient response of systems to standard inputs, response of second order systems, time response specifications.

**Laplace Transforms:** Definition, derivation of Laplace transforms of simple functions, Laplace transform theorems, transformations of differential equations of physical systems, inverse transformation techniques, stability, Routh's stability criterion.

**Block Diagram Algebra:** Transfer functions of physical systems, canonical and unity feedback forms of control system block, system block diagram, block diagram reduction techniques, signal flow graph algebra, block diagram reduction using signal flow graphs.

**Control System Characteristics:** Classification of feedback systems by type, analysis of system types, error coefficients, error constants, sensitivity.

**Root Locus:** Introduction, rules for construction of root locus, qualitative analysis of root locus, the spirule, analysis of performance characteristic of systems in the time domain, dominant pole zero approximations, gain margin and phase margin, root locus compensation. Phase & gain compensation, root locus compensation, PID Controller.

**Frequency Response:** Introduction, transfer function of systems in frequency domain magnitude and phase angle frequency response of plots of closed loop control systems, correlation of response in frequency and time domain.

**Bode Analysis:** Introduction to logarithmic plot, Bode plots of simple frequency response functions, bode plots of type 0, type 1 and type 2 systems, phase margin, Gain margin and stability, closed loop frequency response, gain factor compensation.

**Nyquist Analysis:** Introduction to polar plots, direct and inverse polar plots of type 0, 1 and type 2 systems, Nyquist stability criterion, phase margin, gain margin and stability on direct and inverse polar plots.

**Performance Analysis of Systems on Polar Plots:**  $M_m$  and  $W_w$  of simple second order system, correlation of frequency and time responses. Construction of  $M_m$  and  $W_w$  of simple second order system, correlation of frequency and time responses. Construction of  $M_m$  and  $W_w$  contours for

performance analysis on Direct and Inverse polar plots, gain adjustments on direct and inverse polar plots.

**Nichol's Chart Analysis:** The Nichols chart, decibel magnitude and phase angle plots of type 0, type 1 and type 2 systems, phase margin, gain margin.

The practical work will be based on the above course.

## **MS 331 APPLIED PROBABILITY & STATISTICS**

**Statistics:** Introduction, Types of data & variables, presentation to data, object, classifications, Tabulation, Frequency distribution, Graphical representation, Simple & Multiple Bar diagrams, Sartorial & Pie-Diagram, Histogram, Frequency Polygon, Frequency Curves & their types.

**Measures Of Central Tendency And Dispersion:** Statistics Averages, Median Mode, Quartiles, Range, Moments, Skew ness & Kurtosis, Quartile Deviation, Mean Deviation, Standard Deviation, Variance & its coefficient, Practical Significance in related problems.

**Curve Fitting:** Introduction, fitting of a first and second degree curve, fitting of exponential and logarithmic curves, related problems. Principle of least squares, Second order Statistics & Time series not in bit detail,

**Simple Regression & Correlation:** Introduction, Scatter diagrams, Correlation & its Coefficient, Regression lines, Rank Correlation & its Coefficient, Probable Error (P.E), Related problems.

**Sampling And Sampling Distributions:** Introduction, Population, Parameter & Statistic, Objects of sampling, Sampling distribution of Mean, Standard errors, Sampling & Non-Sampling Errors, Random Sampling, Sampling with & without replacement, Sequential Sampling, Central limit theorem with practical significance in related problems.

**Statistical Inference And Testing Of Hypothesis:** Introduction, Estimation, Types of Estimates, Confidence interval, Tests of Hypothesis, Chi-Square distribution/test, one tails & two tails tests. Application in related problems.

**Probability:** Basic concepts, Permutation & Combination, Definitions of probability, Laws of probability, Conditional probability, Baye's rule. Related problems in practical significance.

**Random Variables:** Introduction, Discrete & Continuous random variables, Random Sequences and transformations, Probability distribution, Probability density function, Distribution function, Mathematical expectations, Moment Generating Function (M.G.F.), Markove random walks chain/ Related problems.

**Probability Distributions:** Introduction, Discrete probability distributions, Binomial, Poisson, Hyper geometric & Negative binomial distributions. Continuous probability distribution, Uniform, Exponential & Normal distributions & their practical significance.

### **HS 303      ENGINEERING ECONOMICS**

**Introduction :** Basic concepts, Engineering economy defined, Measures of financial effectiveness, Nonmonetary values.

**The Economic Environment :** Consumer and producer goods, Measures of economic worth, Price, Supply, Demand Relationship.

**Selection between Alternatives :** Present economy, Selection among materials, techniques designs etc. A basic investment philosophy. Alternatives having identical lives. Alternatives having different lives.

**Value Analysis :** Important cost concepts, Cost-benefit analysis feasibility studies, Value analysis in designing and purchasing.

**Linear Programming :** mathematical statement of linear programming problems. Graphic solution, Simplex procedure. Duality problem.

**Depreciation and Valuation :** Types of Depreciation economic life, Profit and interest. Returns to capital. Discret and continuous compounding. Discounting sinking fund problems.

**Capital Financing and Budgeting :** Types of ownership. Types of stock, partnership and joint stock companies. Banking and specialized credit institution.

**Theory of Production :** Factors of production, Laws of Returns, Break-even charts and relationships.

**Industrial Relationship :** Labour problems, Labour organizations prevention and settlement of disputes.

### **HS 304      BUSINESS COMMUNICATION & ETHICS**

**N.B.** (Item marked with an astericks (\*) will be taught but not examined)

#### **PART-I (BUSINESS COMMUNICATION)**

Writing formal & business letter, Writing formal memos, Drafting notices and minutes of meeting, Drafting tender notices, Theoretical knowledge & Comprehension of contracts & agreements, Preparing proposal and technical report, Conducting & Writing a project report on a mini research (sessional work), Conducting seminar and interviews (\*), Writing and presenting conference papers (\*), Solving IELTS type papers (\*)

## **PART-II (ENGINEERING ETHICS)**

1. **Introduction** (1-2 Lectures)
  - \* Objectives of the course,
  - \* Definite of the course
  - \* Define needs for a code of ethics
  
2. **Need for a Code of Ethics** (2-3 Lectures)
  - \* For who and why
  - \* Review of Code of Ethics of international engineering and other bodies
  - \* Review of code of Ethics of other professional bodies of Pakistan
  
3. **COMPARING / CONTRASTING:** (1-2 Lectures)
  - \*Review of PECs' Code of Ethics, Code of Conduct
  - \* Comparison between PECs Codes and those of similar international bodies

## **TC 494 DIGITAL COMMUNICATION AND INFORMATION THEORY**

Basic transmission, Bits, baud, timing, Distortion and channel capacity, Digital input-output devices, Digital transmission on analog channel, OOK, FSK, PSK PCM (linear and companded), delta modulation, Multiplexing, Framing and synchronization, Information theory, Information measure, Entropy, Information rate, Coding for discrete memory less source.

The practical work will be based on the above course.

## **TC 495 SATELLITE COMMUNICATION**

Origin of Satellite Communication, Current state of Satellite Communication, Overview of satellite systems engineering, Orbital mechanics, Look angle determination, Orbital perturbations, Orbital effects in communication system performance space craft and its subsystem, Earth station (brief description).

The practical work will be based on the above course.

## **TC 496 WIRELESS MOBILE / CELLULAR COMMUNICATION**

Introduction to Wireless Communication Systems, The cellular concept system design fundamentals, Mobile radio propagation, Modulation techniques for mobile radio, Multiple access techniques for wireless communication, wireless networking, Wireless systems and standards, AMPS, GSM, Truncking theory, Wireless Application Protocol (WAP), Wireless Markup Language (WML), Bluetooth-compatible cellular telephone system.

The practical work will be based on the above course.

**TC 497      MULTIMEDIA COMMUNICATION**

**Introduction:** What is Multimedia, Multimedia scorecard: The PC, The Television, The Telephone.

**Digital Audio:** Analog to digital conversion techniques, sample rates and size, Codecs, Compression techniques, Audio synthesis, FM synthesis, IBM PC sound cards.

**Digital Video:** Building a digital picture, PC graphics controller, RGB and YUV Color representation, VGA and SVGA standards, Mixing video and graphics.

**Digital Picture Compression:** Compression techniques, JPEG and motion JPEG, JBIG.

**Digital Video Compression :** Video compression techniques, MPEG1 overview, MPEG1 video compression, MPEG1 video compression process, MPEG1 audio compression overview, The MPEG1 audio compression process, MPEG1 systems, MPEG2 overview, MPEG2 video compression, MPEG2 audio, MPEG2 systems, MPEG decoder, Indeo, Wavelet compression, Fractal compression, MPEG4, MPEG7

**CD-ROMs:** CD-ROM technology, CD-ROM, Recordable CD-ROMs, Digital video disc.

**Modem Networking Methods for Multimedia :** POTS/PSTN, ISDN, ADSL, LAN, ATM.

**Multimedia Conferencing :** What is multimedia conferencing, Achieving interoperability, Delivering conferencing data, H.320 multimedia conferencing standards, H.320 overview, H.261 video coding and decoding, H.320 terminals, Moving an H.320 cell, Conferencing applications, Transcoding.

**Digital Video Broadcasting:** The delivery mechanism, Encoding techniques, Coping with burst errors, DVB data streams, Digital audio broadcasting.

**The Multimedia PC:** Overview of MCI for audio-visual control, Overview of TSPI for Telecommunications, POTS call, Making a fax call, Identifying the media stream, Switched video sources, Mixed source dialing.

The practical work will be based on the above course.

## **TC 498      COMMUNICATION MANAGEMENT**

**Theories of Telecommunications Management :** A Concept of Management, Different Approaches to the Management, Components of Telecommunications Management, Telecommunications Management skills, Functions of Telecommunications Management, Roles for Telecommunications Management, Models of Telecommunication Management.

**Telecommunications Financial Management :** Basic financial Aspects of Telecommunications Management, Tangible assets, Intangible assets, Liabilities, Depreciation and Amortization, Methods of financial reporting, Financial Planning and projections, Computerized Telecommunication Management Traffic, Sales, Accounting, Programming.

**Personnel Management and Employee relations :** Functions of Personnel administration in Telecommunications, Organizational hierarchy, Core departments in Telecommunications, Job description in Telecommunications, Staffing: Recruitment, Training and evaluation policies, Telecommunications Management and Labor relations, Guilds and Unions, Union organization and operation Management and collective bargaining.

**Industry and Market structure of Telecommunication :** Elements of market structure, Elements of market conduct, Elements of market performance, Acquisition strategies, Media valuation, Market analysis.

**Telecommunications Management in future :** Globalization and vertical integration, Technological Convergence, Telecommunications Management and social changes, Successful management for new millennium.

The practical work will be based on the above course.

## **TC 499      OPTICAL FIBER COMMUNICATION**

Fiber attenuation measurement, Fiber dispersion measurement, Fiber reactive index profile measurements, Fiber cut-off wavelength measurement, Fiber numerical aperture measurements, Fiber diameter measurement, Mode-field diameter for single mode fiber, Reflectance and optical return loss, Field measurements.

**Application and Future Development :** Public network applications, Military application, Civil consumer and Industrial application, Optical sensor systems, Computer applications LAN.

The practical work will be based on the above course.

## CS 418      **COMPUTER COMMUNICATION NETWORKS**

Markov chains and queuing theory, Open and closed networks of queues, Priority queuing, Performance models of communication networks, Network design, Protocols, Evaluating, Circuit and data flow graph, Routing, Local area networks, Satellite protocols, Broadcast networks, Ring networks.

The practical work will be based on the above courses.

## CS 413      **INTERNET COMPUTING**

Introduction to internet systems & internet development, Technical project management, Transmission protocols, Current and emerging standards, Introduction to programming in JAVA, Control structure arrays etc, Object oriented techniques, Web page designing.

The practical work will be based on the above course.

## MS 442      **NUMERICAL METHODS**

**Error Analysis:** Types of errors (relative, Absolute, inherent, round off, truncation), significant digits and numerical instability, flow chart. Use any Computational tools to Analysis the Numerical Solutions.

**Linear Operators:** Functions of operators, difference operators and the derivative operators, identities.

**Difference Equations:** Linear homogeneous and non homogeneous difference equations.

**Solution of Non-linear Equations:** Numerical methods for finding the roots of transcendental and polynomial equations (Secant, Newton – Raphson, Chebyshev and Graeffe’s root squaring methods), rate of convergence and stability of an iterative method.

**Solution of Linear Equations:** Numerical methods for finding the solutions of system of linear equations (Gauss- Elimination, Gauss-Jordan Elimination, triangularization, Cholesky, Jacobi and Gauss – Seidel).

**Interpolation & Curve Fitting:** Lagrange’s, Newton, Hermit, Spline, least squares approximation. (Linear and non-linear curves).

**Numerical Integration & Differentiation:** Computation of integrals using simple Trapezoidal rule, Simpson’s rule, Simpson’s rule, Composite Simpson’s and Trapezoidal rules, computation of solutions of differential equations using ( Euler method, Euler modified method, Runge Kutta method

of order 4). Numerical Solutions of Partial differential Equations, Optimization problem ( Simplex Method ). Steepest Ascent and Steepest Descent Methods.

## **TC 490 TELECOMMUNICATION ENGINEERING PROJECT**

The final year students will be required to consult the Chairman of Electrical Engineering Department regarding the offering of various projects in the department and industry. The student or group of students will be assigned the project by teacher concerned and will carry out the assignment as required and directed by the teacher and / or external supervisor. At the end of the academic session, they will submit the written report on work of their project to the Chairman, preferably in the typed form. The students will be required to appear before a panel of examiners for oral examination.

**The Project will be of the Following Scopes:** A detailed theoretical study of some problem in Telecommunications. This may be of investigative research nature or it may be laboratory research oriented. The report may be purely economic, technical or both and may include the comparative study of different choice for the solution of the problems.