

DEPARTMENT OF ELECTRICAL ENGINEERING



SYLLABI OF COURSES FOR B.E. (ELECTRICAL ENGINEERING) DEGREE PROGRAMME

(APPLICABLE FROM BATCH 2017, 2018 & 2019)

**NED UNIVERSITY OF ENGINEERING & TECHNOLOGY,
KARACHI-75270 PAKISTAN**

Scheme of Studies Batch-2017, 2018 & 2019

	Course Code	Course Title	Credit Hrs		
			Th	Pr	Total
First Year Spring Semester	EE-156	Engineering Drawing	0	2	2
	EE-126	Circuit Analysis	3	1	4
	MT-227	Differential Equations	3	0	3
	CE-109	Engineering Surveying-I	2	1	3
	EE-163	Computers and Programming	3	1	4
	HS-105 HS-127	Pakistan Studies / Pakistan Studies (For Foreigners)	2	0	2
			13	5	18
First Year Fall Semester	Course Code	Course Title	Credit Hrs		
			Th	Pr	Total
	EE-125	Basic Electrical Engineering	3	1	4
	PH-122	Applied Physics	3	1	4
	HS-114	Functional English	3	0	3
	ME-107	Basic Mechanical Engineering	3	1	4
	MT-114	Calculus	3	0	3
		15	3	18	
Second Year Spring Semester	Course Code	Course Title	Credit Hrs		
			Th	Pr	Total
	EE-382	Electromagnetic Fields	2	0	2
	EE-223	Instrumentation and Measurement	2	1	3
	EE-231	Signals and Systems	3	1	4
	CS-205	Logic Design and Switching Theory	3	1	4
	MT-331	Probability and Statistics	3	0	3
		13	3	16	
Second Year Fall Semester	Course Code	Course Title	Credit Hrs		
			Th	Pr	Total
	EL-240	Electronic Devices and Circuits	3	1	4
	EE-264	Data Structures and Algorithms	2	1	3
	MT-272	Linear Algebra and Geometry	3	0	3
	MT-226	Multi Variable Calculus	3	0	3
	HS-214 HS-205/ HS-209	Academic Writing Islamic Studies / Ethical Behavior (for Non-Muslims)	3 2	0 0	3 2
		16	2	18	

Scheme of Studies Batch-2017, 2018 & 2019

Third Year	Course Code	Course Title	Credit Hrs		
			Th	Pr	Total
			Spring Semester	EE-362	Power System Analysis
	EE 352	Electrical Power Transmission	3	0	3
	EE-374	Feedback Control Systems	3	1	4
	TC-307	Communication Systems	3	1	4
	HS-304	Business Communication & Ethics	3	0	3
			15	3	18
Third Year	Course Code	Course Title	Credit Hrs		
			Th	Pr	Total
			Fall Semester	EE-345	Electrical Machines
	EE-394	Digital Signal Processing	2	1	3
	EE-359	Electrical Power System Distribution	3	1	4
	EL-343	Power Electronics	3	1	4
	MT-442	Numerical Methods	3	0	3
			14	4	18
Final Year	Course Code	Course Title	Credit Hrs		
			Th	Pr	Total
			Spring Semester	HS-405	Organizational Behaviour
	HS-403	Entrepreneurship	2	0	2
	EE-412	Alternate Energy Systems	3	0	3
	CS-418	Computer Communication Networks	2	1	3
	EE-401	Electrical Engineering Project	0	3	3
			10	4	14
Final Year	Course Code	Course Title	Credit Hrs		
			Th	Pr	Total
			Fall Semester	EE-457	Electrical Power System Protection
	EE-411	Power Generation	3	0	3
	CS-430	Microprocessor Programming and Interfacing	3	1	4
	EF-304	Occupational Safety and Health	2	0	2
	EF-305	Engineering Economics and Management	3	0	3
	EE-401	Electrical Engineering Project*	0	3	3
			14	5	16

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EE-125 Basic Electrical Engineering

Fundamentals of Electric Circuits: Charge, Current, Voltage and Power, Voltage and Current Sources, Ohm's Law. Equivalent resistance of a circuit.

Voltage and Current Laws: Node, Loop and Branches, Kirchhoff's Current Law (KCL), Kirchhoff's Voltage Law (KVL), single-loop circuits, single Node Pair Circuit, Series and Parallel Connected Independent Sources.

Circuit Analysis Techniques: Nodal Analysis, Mesh Analysis, Linearity and Superposition, Source Transformations, Thevenin and Norton Equivalent Circuits, Maximum Power Transfer theorem.

Capacitors and Inductors: Capacitor, Inductor, Inductance and Capacitance Combination, voltage current relationship for inductor and capacitor. Energy storage.

Introduction to AC Circuits: Sinusoids and Phasors, Phasor Relationships for Circuit Elements, Impedance and Admittance, Kirchhoff's Laws in the Frequency Domain, Impedance Combinations, Instantaneous and Average Power, Maximum Average Power Transfer, Effective or RMS Value, Apparent Power and Power Factor, Complex Power, Conservation of AC Power.

Sinusoidal Steady-State Analysis: Nodal Analysis, Mesh Analysis, Superposition Theorem, Source Transformation, Thevenin and Norton Equivalent Circuits.

EE-126 CIRCUIT ANALYSIS

Introduction to Circuit Analysis: Definition of circuit, analysis, modeling significance of circuit analysis for engineers

Basic RL and RC Circuits: The Source-Free RL Circuit, Properties of the Exponential Response, the Source-Free RC Circuit, the Unit-Step Function, Driven RL Circuits, Natural and Forced Response, Driven RL Circuits.

The RLC Circuit: The Source-Free Parallel Circuit, the over damped Parallel RLC Circuit, Critical Damping, the under damped Parallel RLC Circuit, the Source-Free Series RLC Circuit, the Complete Response of the RLC Circuit, the Lossless LC Circuit

Three-Phase Circuits - Balanced Three-Phase Voltages, Balanced Wye-Wye Connection, Balanced Wye-Delta Connection, Balanced Delta-Delta Connection, Balanced Delta-Wye Connection, Power in Balanced System, Unbalanced Three-Phase Systems

Magnetically Coupled Circuits - Mutual Inductance, Energy in a Coupled Circuit, Linear Transformers, Ideal Transformers, Ideal Autotransformers, Three-Phase Transformers

Two-Port Network - Impedance Parameters, Admittance Parameters, Hybrid Parameters, Transmission Parameters, Relationship between Parameters, Interconnection of networks

EE-156 Engineering Drawing

Mechanical Drawing - Drawing equipment and the use of instruments. Basic drafting techniques and standards, Pictorial Drawing and their Projections including Isometric view, Oblique view, Orthographic projections and standard practices, Development of Isometric views from orthographic Projects.

Section Views - Intersection at various positions of geometrical bodies, such as pyramids, Cylinders and Cones, section views of transformer and motor.

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 - Understand of basic electrical symbols, Schematic Diagrams of substations, lighting and power distribution boards, home electrical wiring, industrial wiring, electrical drawings of industrial buildings and their specifications. Control drawings and their operation using simple diagrams of automation systems used in substation.

Electrical Symbols and One line diagrams of a typical power system ,11 KV Electric substation building plan including equipment layout, Trenches (for cabling etc.) Manholes, Doors, Windows, Ventilators etc.

EE-163 Computers and Programming

Introduction and History of Computing: Contribution of Charles Babbage, foundation of IBM, Allan Turing's Bombe, Post-WWII era: digital electronic computers, Micro-processor revolution, evolution of computer programming (programming paradigms) and its modern outlook.

Introduction to C/C++: Brief history and development, Typical C/C++ development environment, structure of C/C++ programs, compilation process and debugging.

C/C++ Building Blocks: Data-types, Variables, representation of variables in memory, IEEE 754 Floating Point Standard, Input/output Functions, Operators, Comments.

Structured Programming: Loops (for() loop, while() loop and do-while() loop), Decision making constructs (if() and if()-else statements), nested loops and nested decision making constructs.

Arrays and Vectors: Array as linear data structure, Defining and manipulating 1D and 2D arrays, array memory allocation – Static vs. Automatic, C++ Standard Library Class Template Vector.

Functions: C++ Standard Library Header Functions, Function Prototype, Function Definition with multiple arguments, return multiple outputs with Global variables, Storage Classes and Scope rules, Array as argument to Function, Function Over-loading, and Recursion.

Pointers: Pointer Overview, Returning data from functions, Pointers and Arrays, Pointers and Strings, Double Indirection, Pointers to Pointers, Pointers to perform disk I/O operation.

Structures: Classical C Structure, Structure of Array, and Union.

Object Oriented Programming: Classes, Constructors and Destructors, Objects and Member Functions, Objects as Members of Classes, Operator Overloading, Inheritance, and Polymorphism.

CE-109 **Engineering Surveying-I**

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.

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.

HS-105 PAKISTAN STUDIES

Historical and ideological perspective of Pakistan Movement

Two Nation Theory

Definition: Claim of Muslims of being a separate nation from Hindus, based upon cultural diversity.

Significance: Cultural diversity and interests led to the demand of Pakistan – Lahore resolution.

Creation of Pakistan

Factors leading to the creation of Pakistan.

Quaid-e-Azam and the demand of Pakistan.

Land of Pakistan

Geo-physical conditions

Geo-political and strategic importance of Pakistan.

Natural resource, viz: mineral, water and power.

Constitutional Process

Early efforts to make a constitution (1947-1956) problems and issues.

Salient features of the constitution of 1956 and its abrogation.

Salient features of the constitution of 1962 and its abrogation.

Constitutional and political crisis of 1971.

Salient features of the constitution of 1973

Constitutional developments since 1973 to date with special reference to the amendments to the constitutions.

Contemporary issues in Pakistan

A brief survey of Pakistan Economy

An overview of current economic situation in Pakistan; problems, issues and future prospects.

Social Issues

Pakistani Society and Culture-Broad features

Citizenship: national and international

Literacy and education in Pakistan: problems and issues

State of Science and Technology in Pakistan: A comparison with other countries with special reference to the Muslim world

Environmental Issues

Environmental pollution and its hazards: causes, and solutions.

Environmental issues in Pakistan: government policies and measures and suggestions for improvement.

Pakistan's role in the preservation of nature through international conventions / treaties.

Pakistan's Foreign Policies

Evolution of Pakistan foreign policy-1947 to date

A brief survey of Relation with Neighbours, Super Powers & the Muslim World.

Human Rights

Conceptual foundations of Human Rights

What are Human Rights? Definition, origins & significance.

Comparative analysis of Islamic and Western Perspectives of Human rights.

UN System for protection Human Rights

UN Charter.

International Bill of Human Rights – an overview.

Implementation mechanism.

Other important international treaties and conventions

The convention on the elimination of all forms of discrimination against Women (CEDAW).

International convention on the rights of child (CRC)

Convention against torture (CAT).

Other treaties and Convention.

Pakistan's response to Human Rights at national and international levels

Constitutional Provisions.

Pakistan's Obligations to international treaties and documents.

Human Rights issues in Pakistan- a critical analysis

Pakistan's stand on violation of Human Rights in the international perspective.

HS-114 FUNCTIONAL ENGLISH

Listening

Types of Listening (content, critical, selective, active, reflective, empathic etc.)

Problems in listening and coping strategies

Listening skills and sub skills

Practice in Listening

Vocabulary Development

Words easily confused, compound words, prefixes and suffixes

Forming adjectives, descriptive adjectives (personalities)

Using synonyms and Antonyms, homophones

Use of idioms in current language

Exposure and practice to develop everyday vocabulary for formal and informal situations

Reading

Skimming, scanning, predicting, and anticipating

Guessing meanings of unfamiliar words from the context

Reading strategies

Reading practice through variety of reading texts and comprehension exercises

Beyond reading [speaking and writing outputs)

Writing

Making notes

Social formal letters (elements, style, formatting, organization and structure, types e.g. requests, invitation, thank you, condolence etc)

Short reports (structure, format, and types i.e. informational, event and analytical)

Grammar

Tenses

Frequency, time and quantity expressions

Punctuation

Conditional Sentences

Active and passive

Semantic markers

Phrasal Verbs

Speaking

Giving a presentation

Discussion

Beginning a discussion

Entering a discussion (at a subsequent stage)

Interrupting a discussion without giving offence

Changing your stance / point of view in the course of a discussion

Summing up a discussion

Role play / dialogue (e.g. interviewing: with respect to social interaction)

HS-127 PAKISTAN STUDIES (FOR FOREIGNERS)

Land of Pakistan

Land & People – Physical features and demography

Geographical and strategic importance of Pakistan

Natural resources – Mineral, water, and power

Natural Landscape

Environmental issues in Pakistan

Cultural heritage: important remnants of ancient civilizations in Pakistan

Creation of Pakistan

A brief Historical survey of Muslim community in the sub-continent

Two-Nation theory – its origin & development
Rationale for Pakistan – Factors leading to the demand of Pakistan
Emergence of Pakistan
Role of Quaid-e-Azam the struggle for Pakistan
Government & Politics in Pakistan
Political History of Pakistan – A brief account (1947 to date)
Constitution of Pakistan 1973 – Salient features
Governmental structure – Federal, Provincial and Local
Pakistan in the Community of Nations
An overview of Pakistan’s foreign policy
Relations of Pakistan with neighbors, Super Powers, and the Muslim World
Pakistan’s Stand Point on Human Rights
Constitutional provisions
Comparative analysis of Western and Islamic perspective of Human Rights
Pakistan’s Stand on national and international level

MT-114 CALCULUS

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, 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.

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, 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.

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

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).

MT-227 DIFFERENTIAL EQUATIONS

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 form; Linear differential equations of the order and equations reducible to the linear form; Bernoulli's equations . Application in relevant Engineering: orthogonal trajectories:

Numerical approximation to solutions ; Solution in series. Euler method, Euler modified method, Runge Kutta method of order 4.

2nd and Higher Orders Equations: Special types of II nd order differential equations with constant coefficients and their solutions; The operator D; Inverse operator $1/D$; 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.

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 using Laplace transform.

PH-122 APPLIED PHYSICS

INTRODUCTION: Types of Errors and Error Calculation, Graphical Techniques (Log, semi-log and other non-linear graphs).

VECTORS: Coordinate Systems, Review of vectors, Vector Differentiation (Ordinary and Partial Differentiation), Vector Integrations.

MECHANICS Motion under Constant Acceleration, Newton Laws and their Applications, Frictional Forces, Work-Energy Theorem, Law of Conservation of Mechanical Energy, Angular Momentum.

ELECTROSTATICS AND MAGNETISM : Coulombs Law, Continuous charge distribution, Electrostatic potential energy of discrete charges, Gauss's Law,

Electric field around conductors, Magnetic fields, Magnetic force on current, Hall effect, Biot-Savart Law, Ampere's Law, Field 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.

WAVES AND OSCILLATIONS: Simple Harmonic Oscillator, Damped Harmonic Oscillation, Forced Oscillation and Resonance, Type of Waves and Superposition Principle, Wave Speed on a stretched string.

OPTICS AND LASERS: Huygens Principle, Two-slit interference, Single-Slit Diffraction, Resolving power of Optical Instrument Principles for laser action, Types of laser, Applications of laser.

MODERN PHYSICS : Planck's explanations of Black Body Radiation Photoelectric Effect, Compton Effect, Bohr's Theory of Hydrogen Atom, Atomic Spectra, Reduced Mass, De-Broglie Hypothesis, Electron Microscope, Atomic Nucleus and Properties of Nucleus, Radioactive Decay and Radioactive Dating, Radiation Detection Instruments, Nuclear Reactions and Nuclear Reactor, Nuclear Fusion.

EE-223 Instrumentation and Measurement

General Theory-Classification of instruments, Block diagrams of various instrumentation schemes, Performance characteristics of instruments.

Measurement of Electrical Quantities -Basics of electromechanical instruments, moving coil and electro-dynamometer instruments as ammeter, voltmeter and ohmmeter, Extension of ranges

Instrument Transformers - their burden and accuracy, clamp meter, Active and Reactive power measurement, Max. Demand indicator, Classification of energy meter, Induction type KWH meter, p.f meter.

Measurement of resistance by bridge method and meggar, Measurement of Inductance and capacitance. Measurement of dielectric strength of insulators, high voltage surges.

Electronic Instruments: Data Acquisition, A/D conversion. Electronic and digital voltmeters, digital frequency meter, time interval measurement, Power and energy meter.

Transducers - Temperature transducers, Pressure transducers, Variable, resistance and inductance transducers, linear variable differential transformer (LVDT), capacitive, photoconductive, and piezo-electric transducers, thermo electric transducers.

Measurement of Nonelectrical Quantities- Measurement of temperature, pressure, flow, strains, thermal conductivity, motion, speed and vibrations.

EE-231 **Signals and Systems**

Signals and Systems – Elementary Signals, Basic System Properties;

Sampling – Types of Sampling, Sampling Theorem, Aliasing, Quantization, Reconstruction of Signal from its samples;

LTI Systems – Discrete time LTI Systems, Convolution Sum, Continuous time LTI Systems, Convolution Integral, Properties of LTI Systems, Linear Constant Coefficient Difference Equations, Linear Constant Coefficient Differential Equations, Block Diagram Representations;

Fourier Series – Fourier Series Representation of continuous time periodic signals, properties of continuous time Fourier series, Fourier Series Representation of discrete time periodic signals, properties of discrete time Fourier series;

Fourier Transform – Fourier Transform Representation of continuous time aperiodic signals, properties of continuous time Fourier transform, Fourier Transform Representation of discrete time aperiodic signals, properties of discrete time Fourier Transform;

Magnitude-Phase representation of Frequency response of LTI systems, Time and Frequency Analysis of Frequency Selective Filters, Time and Frequency characterization of 1st and 2nd order continuous and discrete time systems;

Laplace Transform – Properties, analysis of LTI systems using Laplace transform;

Z-Transform – Properties, analysis of LTI systems using Z- transform.

EE-264 **Data Structures and Algorithms**

Algorithm Fundamentals and Complexity Analysis: Algorithm as technology, Design Approach (Design Paradigms), Representation Techniques, Time and Space Complexity, Order of Growth, common Growth Functions, standard notations.

Data Structure Fundamentals: Revision of C/C++ Data-types and Structures, Abstract Data Type (ADT) concept, 1D Array as ADT, ADT for varying-length character Strings, 2D Array as ADT, Structures and Classes as ADT, Pointer Arrays and Records as ADT.

Recursion, Stacks and Queues: Program design with Recursion, Complexity of recurrence problem, Stack ADT, Stack implementation with Arrays, C++ Template as Stack, Stack applications, Recursion with Stacks, Queue as ADT and, Queue implementation.

String Processing: String Operations, Word Processing, Pattern Matching Algorithms.

Numeric and Number Theoretic Algorithms: Calculating Polynomial Equations, Matrix Multiplication, Linear Equations, Trapezoidal Integration, Root Finding of polynomial, Greatest Common Divisor, Primality Testing, Integer Factorization.

Divide and Conquer Approach: Sorting and Searching Algorithms.

Linked Lists: Linked List as Data Structure, List Operations, Implementation using Arrays and Dynamic Variables, Circular and Doubly Linked List, Linked List Implementation in C++, Linked List applications.

Trees: Binary Trees, Representation in memory, Binary Tree Traversals, Lists as Binary Trees, Finding and Deleting element in Tree, Tree Traversal Algorithms, Binary Search Trees, Heaps, Heap-Sort Algorithm.

Graphs: Representation in memory, Graph implementation, elementary Graph Algorithms, Traversal Algorithms, Shortest Path Algorithms.

EE-382 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 line charge, field of sheet charge, streamlines & 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's equation, product solution of Laplace's equation.

The Steady Magnetic Field : Biot Savart's Law, Amperes circuit law, curl, Stokes' 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 element, force and torque on a closed circuit, the nature of magnetic materials, Magnetization 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, 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 & power considerations, propagation in good conductors, skin effect, reflection of uniform plane waves, standing wave ratio.

CS-205 LOGIC DESIGN & SWITCHING THEORY

Computer Operations : Evaluation of the computer, basic organisation of digital computer, instruction formats, some different types of computers, special purpose and general purpose computers.

Number Systems : Conversion between bases, arithmetic with bases other than ten, negative numbers, binary coded decimal numbers, octal, and hexadecimal number systems.

Truth Function : Binary connectives, evaluation of truth functions, many statement compounds, physical realisations, sufficient sets of connectives, a digital computer examples.

Boolean Algebra : Truth functional calculus as Boolean algebra, duality, fundamental theorems of Boolean algebra, examples of Boolean simplifications, remarks on Switching functions.

Switching Devices : Switches and relays, logic circuits, speed and delays in logic circuits, integrated logic circuits.

Minimisation of Boolean Functions : Standard forms of Boolean functions, Minterm and maxterm, Designation of Boolean functions, Karnaugh map representation of Boolean functions, simplification of functions on Karnaugh maps, map minimisation of product of sums expressions, incompletely specified functions.

Tabular Minimisation : Cubical representation of Boolean functions, Determination of prime implicants, Selection of an optimum set of prime implicants, Design of Nand and Nor Networks and properties of combinational networks, Introduction to design and Nand and Nor Networks, Switching expressions for Nand and Nor Networks, Transient response of combinational Networks.

Introduction to Sequential Networks : Latches, Sequential Networks in fundamental mode, Introduction to the Synthesis of Sequential Networks, Minimisation of the number of states, Clocked Networks.

EL-240 ELECTRONIC DEVICES & CIRCUITS

Semiconductor Basics: Conduction, N and P Types;

Diode: Biasing, V-I Characteristics, Equivalent circuits, Diode as full and half Wave Rectifier, Limiting and Clamping Circuits, Zener and Optical Devices, and their applications;

BJTs: Structure, Operation, Characteristics and Parameters, BJTs as amplifier and switch, Biasing Circuits;

FETs: Basics, Characteristics and Parameters, Biasing, FET as amplifiers;

Power Amplifier: their classes and application

Operational Amplifier: Input modes and parameters, Negative feedback, Bias Current and offset voltage, Open and Closed Loop Response

Basic Op-Amp Applications: Comparators, Summing Amplifiers, Integrators and Differentiators, Instrumentation Amplifiers

HS-205 ISLAMIC STUDIES

Section-A: Quranic Verses

Chapter 01

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.

Chapter 02

Basic Islamic Practices: Al-Mu' minun-1-11, and two Ahadith

Chapter 03

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

Chapter 04

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

Chapter 05

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

Chapter 06

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

Chapter 07

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

Chapter 08

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

Section B:

Chapter 09

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

Section C:

Chapter 10

Islamic Civilization:

In the sub continent: pre- Islamic civilizations. The political, social & moral impacts of Islamic civilization.

In the world: academic, intellectual, social & cultural impact of Islam on the world.

HS-209 ETHICAL BEHAVIOUR

Introduction to Ethics:

Definition of Ethics

Definition between normative and positive science

Problem of freewill

Method of Ethics

Uses of Ethics

Ethical Theories:

History of Ethics: Greek Ethics, Medieval, Modern Ethics

Basic concept of right and wrong: good and evil

Utilitarianism, hedonism, self-realization: egoism, intuitionism, rationalism

Kant's moral philosophy

3. Ethics & Religion:

The relation of Ethics to religion

Basic ethical principles of major religions: Hinduism, Judaism, Buddhism, Zoroastrianism, Christianity, Islam

4. Ethics, Society, and moral theory:

Ethical foundation of Rights and Duties

Applied Ethics

Society as the background of moral life

Universalism and Altruism

Theories of punishment

HS-214 ACADEMIC WRITING

Writing Process

Identifying topic area, narrowing topic, planning, brainstorming, mind mapping, outlining, writing first draft, reviewing, revising, proofreading, writing final draft

Reading & Writing

Analyzing different texts: identifying point of views, claims, assumptions, differentiate facts from opinions

Practicing Academic Language: differentiate using language of opinion and fact

Synthesize information, developing critical write up with relevant factual information, personal views, academic evidence, examples, cause and effect etc.

Presenting and describing visuals (tables & graphs)

Avoiding plagiarism and ensuring originality: summarizing, paraphrasing and quoting sources, citing, documenting sources through a referencing system (MLA / APA / Harvard style, as suggested by the discipline)

Writing products

Writing a well-structured paragraph (topic sentence, supporting details, conclusion) Writing narrative, descriptive, expository, and argumentative essays

Developing an effective essay using thesis statement, adequate development and argument, supporting details, and conclusion

Writing short reports (technical reports)

MT-226 **MULTIVARIABLE CALCULUS**

Advanced 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, centroid, moment of inertia, surface area, and volume, use multiple integrals in solutions of engineering problems.

Vector Calculus: Dot and cross product, 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 Jacobean to transform a problem a new coordinate system, apply Gauss' divergence theorem to simple problems, apply Stokes theorem to simple examples.

Curvilinear Coordinates: Unit vectors in curvilinear system; Transformation of coordinates; Orthogonal coordinate system; Cylindrical coordinate system; Spherical coordinate system; Parabolic cylindrical coordinates; Elliptical cylindrical coordinate system.

MT-272 **LINEAR ALGEBRA & GEOMETRY**

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 tri-diagonal matrix), 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, transitions matrix.

Euclidean Spaces and Transformation: Geometric representation of vector, norm of vector, Euclidean inner product, projections and orthogonal projections, Euclidean n spaces n properties Cauchy-Schwarz inequality, Euclidean transformations, apply geometric transformations to plane figure, composition of transformations.

Application of linear Algebra: Leontief Economic models, Electrical Networks, Scaling, translation, rotation, and projection etc.

Eigen values & Eigen Spaces: Interpret eigenvectors and eigenvalues of a matrix in terms of transformation it represents, convert a transformation into a matrix eigen value problem, find the eigenvalues and eigenvectors of order not more than 3×3 matrices algebraically, determine the modal matrix for a given matrix, reduce

a matrix to diagonal (form and Jordan form, state the Cayley-Hamilton theorem and use it to find powers and the inverse of a matrix, understand a simple numerical method for finding the eigenvectors of a matrix, use appropriate software to compute the eigenvalues and eigenvectors of a matrix, Define quadratic form and determine its nature using eigenvalues.

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).

MT-331 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, ChiSquare 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 nile. 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.

EE-345 Electrical Machines

DC Machines - Construction, Simple lap and wave windings, equalizing connections and dummy coils, elementary concept of armature reaction and commutation. DC Generators, Types, emf equation, Losses, Efficiency, Performance curves, characteristics. Motors, Principle, Back EMF, Torque, speed and speed regulation. Types, characteristics performance curves, losses and efficiency.

Transformers - Construction, principle of working, emf equation, Transformation ratios, No load working and vector diagram, magnetizing current, Vector diagram on load, Equivalent circuit, Poly phase transformers, star delta and zig-zag connections for parallel operation, sharing of load, tertiary windings, harmonics and transients in transformers, on load tap changing transformers, auto transformers.

AC Induction Machines:- Induction Motors, Construction, Types, Rotating field theory, principle of working, slip and its effect on motor current quantities. Losses, efficiency and performance curves. Starting, full load and maximum torque relations, torque slip characteristics.

Three Phase Induction Motor - Equivalent circuit of induction motor, cage rotor, double cage and high torque motor, magnetizing current of an induction motor, speed and power factor control of induction motors by injecting EMF in the circuit, induction generators and regulators, testing of induction motor, efficiency and losses, circle diagram, starter calculations.

Synchronous Motors - Overexcited and under-excited motors, power factor and power factor control, starting of synchronous motors, circle diagram, V-curves and O-curves of synchronous motors.

Synchronous Generators - Approximate theory of synchronous generator with synchronous impedance, winding factors and their effect on the wave form of the machine, voltage regulation of alternators, MMF and EMF vector diagrams and their application in voltage regulation problems, cylindrical rotor machines and effect of saturation, parallel operation of alternators and sharing of loads, working of alternators on infinite bus bars.

EE-352 **ELECTRICAL POWER TRANSMISSION**

Systems of Transmission: Systems of DC and AC Transmission; Transmission and sub-transmission, standard voltages in and abroad for transmission and sub transmission, WAPDA & KESC practices.

Basic Concepts: Phasor notation, complex power, power triangle, direction of power flow, current and power in balanced three-phase circuits.

Representation of Power Systems: Percent and Per-Unit quantities, Selection of base and change in base of p.u. quantities, Node Equations, One-line diagram, impedance and reactance diagrams.

Series Impedance of Transmission Lines: Conductor types, Resistance, Skin effect, Line inductance based on flux considerations. Inductance of single phase 2-wire line, inductance of composite conductor line, use of tables,. Inductance of 3-ph line with equilateral and unsymmetrical spacings, transposition, inductance of Bundled conductors.

Capacitance of Transmission Lines: Review of Electric field on a long straight conductors, capacitance of two-wire, 3-ph line; Effect of Earth on capacitance; capacitance of bundled conductors, paralalled circuit lines.

Current and Voltage Relations on a Transmission Line: Representation of lines; The short, medium and long transmission lines, solution of equations and their interpretation travelling waves, Hyperbollic form of the equation, Equivalent circuits, power flow through the line, voltage regulation and power circuit diagram, line surges.

Mechanical Design of Overhead Lines: Line supports, sag and tension calculations, total length of conductor, supports at different levels, mechanical degree of safety, effect of wind pressure & ice loading, conductor vibration & use of dampers.

Insulators: Insulator material, types of insulators, voltage distribution over insulator string, string efficiency, methods of improving the string efficiency, testing of insulators.

Corona: The phenomenon of corona, disruptive critical voltage and visual critical voltage, conditions effecting corona loss, power loss due to corona, radio interference due to corona.

Power System Stability: stability problem, steady state and transient stability, rotor dynamics and swing equation, the power angle equation, equal area criterion of stability, solution of swing equation by graphical method.

EE-359 Electrical Power System Distribution

Distribution System Planning and Automation – Introduction and Factors affecting system planning, Present Planning Techniques and Modules, Upcoming Planning techniques, Futuristic Nature of Distribution Planning, Distribution System Automation.

Load Characteristics - Relationship between load and loss factors, Load Forecasting, Load Management, Rate Structure, and Electric Meter Types;

Applications of Distribution Transformers –Types, Regulation, Transformer Efficiency, Terminal or Lead markings, Transformer Polarity, Distribution Transformer loading guides, Three phase connections;

Substation Design - Schemes, Substation location, Rating, Comparison of four and six feeders, SCADA, Substation Cabling and Grounding;

Design Consideration of Primary System - Radial and Loop Type primary feeders, Primary Network, Tie Lines, Radial Feeders with uniformly and non-uniformly distributed loads;

Voltage Drop and Power Loss Calculations in different configurations, Power Factor Improvement Calculations.

EE-362 Power System Analysis

Fundamentals: Phasors, Instantaneous Power in single phase circuits, complex power, Network Equations, Balanced three Phase Circuits, Power In balanced three phase circuits, Advantages of Balanced three phase circuits' v/s singles circuits.

Power Transformers: Per Units System, Three phase transformer connections and phase shift, per unit equivalent circuits of balanced three phase two winding transformers, three winding transformers, Autotransformers.

The Admittance Model and Network Calculations : Branch and Node admittances; Mutually coupled Branches in Y-bus; Equivalent Admittance Network; Modification of Y-bus; Impedance matrix and Y-bus; the method of successive elimination; Node Elimination (Kron Reduction); Triangular Factorization;

Power Flow: Direct Solutions to Linear Algebraic Equations; Gaussian Elimination, Iterative Solutions to linear algebraic equations, Jacobian Gauss Seidel, Iterative Solutions to nonlinear algebraic equations; Newton Raphson Method, The Power Flow Problem, Power Flow Solutions,

Symmetrical Faults: Series RL circuits transients, three phase short circuit- Unloaded Synchronous Machine, Power System three phase short circuits, Bus Impedance Matrix.

Symmetrical Components: Definition of symmetrical components, Sequence networks of impedance loads, sequence networks of series impedances, sequence networks of three phase lines, sequence networks of rotating machines, Per unit sequence models of three two winding and three winding transformers., Power in Sequence Networks.

Unsymmetrical Components: System Representation, Single line to ground fault, Line to line fault, double line to ground fault, Sequence bus impedance matrix.

EE 374 FEEDBACK CONTROL SYSTEMS

Introduction: Introduction to control systems, examples and classifications, Feedback and its characteristics. Nature and representation of control 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 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.

Introduction to Digital Control: Computer as control device, Single-loop digital control system, Digital control: pros and cons, Data Converters.

Linear Difference Equations (LDE) and z-transform: Scalar difference equation, z-transform of simple sequences and inversion, solving LDE using partial fraction and z-transform, z-domain transfer function and impulse response, relation between S and z-domain.

Digital control system design techniques: Digital control strategies and implementation, closed-loop characteristic equation, z-domain design considerations, General PID digital control algorithm, Tuning procedure for PID controller.

EE-394 Digital Signal Processing

Overview of Discrete-time Signals and Systems – Sampling, Aliasing, Quantization, Convolution, Correlation, Properties of Discrete time Signals and Systems;

Discrete Fourier Transform – Frequency Domain Sampling, DFT Properties, Inverse DFT, Windowing and DFT Leakage, Direct Computation of DFT;

Fast Fourier Transform – Divide and Conquer, Radix algorithms; Inverse FFT, Applications of FFT

Discrete time systems implementation – Overview of z-transform, Structures of Discrete time systems, Fixed and Floating number types, Quantization effects.

Design of Digital Filters – General Considerations, FIR and IIR Filters, Techniques of FIR and IIR filter Design.

Multirate Signal Processing – Down sampling and Up sampling, Decimation and Interpolation.

EL-343 POWER ELECTRONICS

Introduction and scope of Power Electronics. Solid State Devices used as switches in power electronics, power diodes, power transistors, Power MOSFETS, Thyristors, Triacs, Diac. Characteristics of GTO, RCT, etc. Series and

parallel operation of SCR, LASCR. Thyristor turn on, integral cycle control and phase angle control, elementary and advanced firing schemes, sequence and close loop control.

Thyristor Commutation: Self commutation, impulse commutation, series capacitor commutation, parallel capacitor commutation.

Uncontrolled and Controlled rectifiers: Single phase, three phase, semi converter, full converter, dual converter, analysis and performance, parameters as harmonic factor, utilization factor, power factor, distortion factor, etc. rectifiers with purely resistive, highly inductive and RL loads.

DC Chopper: Principle, Step-up and Step-down operation, Buck regulator, Boost regulator, Buck-boost regulator, Cuck regulator, Choppers using thyristors

Protection Analysis: Over voltage, over current, di/dt & dv/dt protection, heat sinks

Inverters: Principles, half bridge, full bridge inverters, constant phase width modulation, variable PW modulation, sinusoidal PW modulation, modified SPWM.

Electronic Power Supplies: Design and analysis of regulated power supplies, switch mode power supplies, Uninterrupted power supplies.

TC-307 Communication Systems

Introduction: Introduction to Communication, elements of Communication system, Fundamental Limitations, Hartley Shannon law Needs and benefits of Modulation, electromagnetic spectrum, multiplexing and multiple access, Phasors and Line Spectra

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

Analog Communication:

Baseband and carrier communication, Linear CW (AM, SSB, DSB, VSB) Modulation and demodulation techniques, modulator and demodulator Circuits, AM and SSB Transmitters and Receivers, SSB Filters, Transmission Bandwidth for AM, Angle/ Exponential CW (FM, PM) Modulation and demodulation techniques, modulator and demodulator Circuits, FM/ PM Transmitter, FM Generation Methods, Transmission Bandwidth for FM/PM, Carson's rule, PLL Systems, Pre-emphasis and De-emphasis circuits, Narrowband and wideband FM, Demodulation of FM/PM and Receivers

Noise: Mathematical representation, Signal to Noise Ratio, Noise in AM, FM, and PM systems

Digital Communication systems: Digital transmitters and receivers, Pulse Modulation, Pulse Amplitude Modulation, Pulse Position and Pulse width Modulation, BER, Introduction to information theory , Digital CW modulation, Coherent and non Coherent systems, Digital modulation error-control coding.

HS-304 Business Communication & Ethics

Communication Skills (oral):

Definitions and Conditions,

Modes: verbal, non-verbal, vocal, non-vocal, sender, Receiver, en-coding, decoding, noise, context, emotional maturity, relationships, etc.

Language, perception,

Non-verbal, body language, physical appearance, cultural differences etc.

Personal and interpersonal skills / perceptions.

Communication dilemmas and problems

Public Speaking – speaking situation, persuasion,

Making presentations,

Interviews

Business Writing:

Formal / Business letters, e-mails: a) job applications and resumes/ cv, b) enquiries, c) complaints / adjustments, d) orders, e) quotations, f) banking etc.

Memos: layout, language, style

Meeting management: notice, agenda, conducting / participating, writing minutes.

Contracts and agreements (basic theoretical knowledge and comprehension),

Research / scientific reports : types, structure, layout / presentation, writing process etc.

Tenders (basic theoretical knowledge and comprehension)

Engineering / Business Ethics:

Need and objectives for code of ethics and its importance

Type of ethics, involvement and impact in daily life

Problems / conflicts / dilemmas in application (case studies)

Sexual Harassment / discrimination in the workplace

why it occurs,

myths regarding sexual harassment,

how to deal with it,

gender equality,

respect etc.

Codes of conduct:

Pakistan Engineering Council

Code for Gender Justice,

Brief study of other codes of conduct.

MT-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, 1/3th Simpson's rule, 3/8th 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.

EE-411 Power Generation

Power Stations - Introduction, Types of power Station, Choice of type of Generator, Cost of Electrical Energy,

Hydro Electric Stations - Introduction, Types of Hydro Electric Power Stations, Principle of working of a Hydro Electric Plant, Power Station Structure and Layout, Types of Turbine and their characteristics, Arrangements and location of Hydro Electric Stations, Types of Hydro Electric Plants and Dam, Characteristics of Generators, Costs of Hydro Electric Stations,

Steam Power Plants - Introduction, Main Parts and working of a steam Station, Plant Layout, Rankine Cycle and its types, Types of Boiler and their characteristics, characteristics of steam turbines, Design of a steam Power Station, Steam station auxiliaries, Cost of Steam Station

Gas Turbines - Introduction, Main Parts of Gas turbine plant, Plant Layout, Principle of Operation, Characteristics of Gas Turbine plants, Gas Turbine Power Plant operation and Control, Combined Cycles Cost of Gas Turbine Stations

Diesel Electric Station - Introduction of Diesel Engine, Principle of working, characteristics of diesel engines, sizes and dimensions of generator sets, Coordination of Engine and Generator Characteristics, Use of Diesel Sets as Alternative Power Plant, cost of diesel Plants.

Nuclear Power Stations - Introduction, Nuclear Reaction, Main Parts of Nuclear Power Stations, Plant Layouts, Principle of Nuclear Energy, Nuclear reactor and reactor control, Types of Power Reactor, Comparison of various types of reactor, Economics of Nuclear Power Stations.

EE-412 Alternate Energy Systems

Overview: Present Day fuel use, Energy Problems of modern societies, Renewable Energy Sources as a solution;

Solar Thermal Energy: Nature and availability of solar radiation, Low temperature solar energy applications, Active Solar Heating, Daylighting, Solar thermal engines and electricity generation, Economics Potential and environmental impact.

Solar Photovoltaic: Historical Background, PV in Silicon, Reducing the cost of crystalline PV cells, Thin film PV, Other innovative PV technologies, Electrical characteristics of Silicon PV cells and modules, PV systems for remote power, Grid-connected PV systems, Economics of PV Energy Systems, Environmental Impact and Safety, Integration of PV into future energy systems.

Fuel Cells : Thermodynamic principles, efficiency of fuel cell factors limiting the performance, design, new development in fuel cells, possibility of future use in Electric vehicles.

Bio Mass: Introduction, Past and present, Bio Mass as a fuel, Extracting the energy, Agricultural residues, Energy crops, Environmental benefits and impacts, Economics, New Technologies, Future Prospects.

Wind Energy: Introduction, wind turbine types and terms, Aerodynamics of wind turbines, Mechanical power, wind turbine generators, power and energy

from wind turbines, wind speed characteristics of a site, economics of wind turbine, Commercial development and wind energy potential.

Integration: Renewable supply availability, Changing patterns of energy use, Balancing economic options, Promoting renewables, Long term global renewable energy scenario.

EE-457 Electrical Power System Protection

Circuit Breakers and Switchgears: Introduction, Principle of circuit interruption, Short circuit studies in a power system, Faults at Generator Terminals, Faults in the system, Circuit breaker-Types and characteristics, Type of switchgear, Interrupting capacity of a circuit breakers and switchgears, Ratings of circuit breakers, Circuit Breaker operating mechanism, HVDC circuit breaking, Current Limiting Reactors; Use and location, Short circuit currents and size of reactor.

Modern Circuit Breakers: Construction and testing, Modern trend in HV circuit breakers, Vacuum Circuit breakers, SF6 Power Circuit breakers, Transients in power system, Switching Transients, Testing of circuit breaker, Test techniques for high rating circuit breaker, Selection of circuit breaker.

Protective Relays - Need for protective relaying in power systems, Basic requirements of protective relaying, Principles and characteristics of protective relaying, Theory and classification of relays, Theory of application of relays, Instrument Transformers, Types of relays, Auto reclosing, Under frequency/over frequency relays, Microprocessor based relays, Numerical relays, Protection Coordination.

Protection of Generators - Allocation of protective devices for stator, rotor, and prime mover of a generator, Faults in Generator windings, Generator Protection

Protection of Transformers - Busbars and Motors: Transformer Protection, Short circuit protection of Transformers by percentage differential relays, Differential Protection of a three winding transformer, Generator transformer Unit Protection, Gas accumulator and pressure relays, Protection of Motors, Protection of induction motors by static relays.

Protection of Transmission Lines - Busbar protection, Distance protection, Zones of protection.

CS 418 COMPUTER COMMUNICATION NETWORKS

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

Investigative practical laboratory work of research nature in the area of Electronic Engineering.

CS-430 Microprocessor Programming & Interfacing

Computer, Architecture, Instruction Cycle, Memory Organization, Address decoding, Memory Hierarehy, Interrupts, Bus Arbitration Schemes, Programmed I/O, Interrupt-Driven I/O, Direct Memory Access, General Purpose and Special Purpose Processors, Internal Registers, Internal Bus Architecture, Pin Functions, Addressing Modes, Instruction Set Architecture: (Data Transfer Instructions, Arithmetic & Logic Instruction, Branch (Instruction), Assembly programming and Testing Assemble Directives, Macros, Procedures, Instruction Encoding, Bus Cycles, Reset Circuit, Clock Generation Circuit, Wait States, Memory Interfacing, Memory Speed Requirements, I/O Interfacing, Programmable Peripheral Interface, Programmable Interval Timer, Programmable Interrupt Controller, Microprocessor System Design, Recent Microcontroller Architectures.

EF-304 Occupational Safety and Health

Introduction to Occupational Safety and Health, Historic development in the subject, Safety Legislations, Safety and Ethics;

Hazards – Mechanical and Machine, Falling, lifting and Vision related hazards, Temperature and Pressure, Electrical, Fire, Radiation, Chemical and Material, Noise and Vibration, Computers and Automation related Hazards, Industrial Hygiene and Confined Spaces; Case Studies

Hazard Analysis, Concepts of Risks, Incidents and Accidents, Accident Prevention and Control, Personal Protective Equipment, Management Responsibilities, Accident Causation, Reporting and Investigation; Case Studies

Developing and maintaining Safety Culture, OSH and Environment Codes, Standards and Regulations, ISO Standards 14001 and 45001/BS OHSAS 18001

EF-305 ENGINEERING ECONOMICS & MANAGEMENT

Introduction: Basic Concepts and principles of Economics, Micro- and Macro-economic theory, the problem of scarcity. Basic concepts of Engineering Economy, Financial effectiveness and non-monetary factors

Economic Environment: Consumers and producer goods, Goods and services, Demand & Supply concept. Market Equilibrium, Elasticity of demand, Elasticity of Supply, Measures of Economics worth, Price-supply-demand-relationship, Revenue, Cost and profit function.

Elementary Financial Analysis: Basic accounting equation. Development and interpretation of financial statements-Income Statement, Balance Sheet and Cash Flow, Working capital management, Financial Ratio Analysis .

Time Value of Money and Financial Returns: Concepts of simple, compound and effective interest rates, Less often than compounding period and more once a year; Present Value, Future Value and Annuities concepts, Uniform gradient and geometric sequence of cash flow.

Depreciation and Taxes: Depreciation concept, Economic life, Methods of depreciation, Gain (loss) on the disposal of an asset, Depreciation as a tax shield.

Basic cost concepts and Break Even Analysis: Types of costs and cost curves; Determination of Cost/Revenues. Numerical and graphical presentations. Practical applications, BEA as a management tools for achieving financial/operational efficiency

Linear Programming: Mathematical statement of linear programming problems, Graphical solutions, Simplex method, Duality Problems. Business Organizations and financial Institutions: Type of ownership, single ownership, partnerships, corporation, type of stocks and joint stock companies, Banking and specialized credit institutions.

Project Management: Integration of Organization Strategy with Projects, Defining the project, developing a network plan, managing risk, reducing project time, project selection and comparing alternatives techniques scheduling resources:

Introduction to Projection Management and Production Concepts: Basic production function, stages of production, returns to scales, Production lead time, Production rate, capacity, operations, planning and control, order processing, Scheduling, Material requisitions planning, line of balance

HS-403 Entrepreneurship

Entrepreneurship Mind-set

The revolution impact of Entrepreneurship
The individual Entrepreneurship Mind-set
Corporate Entrepreneurship Mind-set
The Social and Ethical perspectives of Entrepreneurship

Launching Entrepreneurship Ventures

Creativity and innovations
Methods to initiate ventures
Legal challenges in Entrepreneurship
The search for Entrepreneurship Capital

Formulation of Entrepreneurship Plan

The assessment of function with opportunities
The marketing aspects of new ventures
Financial statements in new ventures
Business plan preparation for new ventures

Strategic Perspectives in Entrepreneurship

Strategies growth in Entrepreneurship
Valuation challenges in Entrepreneurship
Final harvest of a new venture

HS-405 Organizational Behavior

Introduction to Organizational Behavior

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: Improving quality and productivity
Improving people skills
Managing work force diversity
Responding to globalization
Empowering people
Stimulating innovation and change
Coping with temporariness
Handling declining employee loyalty
Improving ethical behavior

Foundations of Individual Behaviour

Individuals & Organizations: Biographical traits and ability
Personality
Perceptions and individual decision making: Understanding perception and its significance, factors influencing perception
Linking perception and individual decision making

Optimizing decision making model
Alternative decision making models
Issues in decision making
Values, attitudes and job satisfaction: Importance, sources, types of values
Sources and types of attitude
Attitude and consistency
Measuring job satisfaction
Determinants of job satisfaction
Effect of job satisfaction on employee performance
Ways employees can express dissatisfaction
Motivation - basic concepts and applications

Foundations of Group Behaviour

Group in OB: Defining and classifying groups
Stages of group development, work group behaviour
Dynamics of groups
Understanding work teams: Team versus group; types of teams, creating high performance teams
Turning individuals into team players
Communication: communicating at interpersonal and organizational level
Leadership: basic approaches and contemporary issues
Conflict & negotiation: defining conflict; transition in conflict thought
Conflict process
Negotiation - strategies, process and issues

Foundations of Organizational Structure

Organizational structure and design
Work design
Work stress
Organizational culture: definition
Culture's functions, employees and organizational culture
Organization change and development: forces for change
Managing planned change, resistance to change
Approaches to managing organizational change

EE-401 Electrical 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. The student or group of students will be assigned the project by teaching by teacher concerned and will carry out the assignment as required and directed by the teacher. 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.