Scheme of Studies Batch-2020 & Onward

	Course Code	Course Title	Credit Hrs		
			Th	Pr	Total
First Year Fall Semester	EE-125	Basic Electrical Engineering	3	1	4
	PH-122	Applied Physics	3	1	4
	HS-111	Functional English	2	0	2
	ME-116	Basic Mechaincal Engineering	3	0	3
	MT-114	Calculus	3	0	3
	CS-113	Introduction to Computing	1	1	2
	Total		**15**	**3**	**18**
First Year Spring Semester	**Course Code**	**Course Title**	**Credit Hrs**		
			Th	**Pr**	**Total**
	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	Pak. Studies/ Pak. Studies (For Foreigners)	2	0	2
	Total		**13**	**5**	**18**
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	Academic Writing	3	0	3
	HS-205/ HS-209	Islamic Studies / Ethical Behavior	2	0	2
	Total		**16**	**2**	**18**
Second Year Spring Semester	**Course Code**	**Course Title**	**Credit Hrs**		
			Th	**Pr**	**Total**
	EE-282	Electromagnetic Fields	3	0	3
	EE-223	Instrumentation and Measurement	2	1	3
	EE-232	Signals and Systems	3	1	4
	TC-201	Digital Logic Design	2	1	3
	MT-331	Probability and Statistics	3	0	3
	Total		**13**	**3**	**16**

	Course Code	Course Title	Credit Hrs		
			Th	Pr	Total
Third Year Fall Semester	EE-346	Electrical Machines I	2	1	3
	EE-395	Digital Signal Processing	2	1	3
	EE-359	Electrical Power Distribution and Utilization	3	1	4
	EE-313	Power Electronics	3	1	4
	MT-442	Numerical Methods	3	0	3
	Total		**13**	**4**	**17**
	Course Code	**Course Title**	**Credit Hrs**		
			Th	**Pr**	**Total**
Third Year Spring Semester	EE-362	Power System Analysis	3	1	4
	TC-306	Communication Systems	3	0	3
	HS-304	Business Communcation & Ethics	3	0	3
	EE-347	Electrical Machines II	2	1	3
	EE-354	Embedded Systems	2	1	3
	Total		**13**	**3**	**16**
	Course Code	**Course Title**	**Credit Hrs**		
			Th	**Pr**	**Total**
Final Year Fall Semester	EE-457	Electrical Power System Protection	3	1	4
	EF-304	Occupational Safety and Health	2	0	2
	EE-401	*Electrical Engineering Project	0	3	3
	EE-352	Electrical Power Transmission	3	0	3
	EE-375	Feedback Control Systems	3	1	4
	Total		**11**	**5**	**16**
	Course Code	**Course Title**	**Credit Hrs**		
			Th	**Pr**	**Total**
Final Year Spring Semester	MG-482	Organizational Behaviour	3	0	3
	MG-481	Entrepreneurship	3	0	3
	CS-439	Computer Communication Networks	2	0	2
	EE-401	Electrical Engineering Project	0	3	3
	EE-414	Power Generation	3	0	3
	EF-305	Engineering Economics and Management	3	0	3
	Total		**14**	**3**	**17**

DEPARTMENT OF ELECTRICAL ENGINEERING

SYLLABI OF COURSES FOR BE (ELECTRICAL ENGINEERING)

APPLICABLE FORM BATCH 2020 & ONWARDS

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.

CS-113 Introduction to Computing

Number Systems; Digital logic Gates, Classification of computer Systems, Structure and Organization of Computers and Computer system, Computer peripherals, Classification of software systems, Introduction, software Development Process, Levels of programming language

CE-109 ENGINEERING SURVEYING-I

Introduction: Introduction to land surveying, Definitions of basic surveying terms branches and their application, Instruments used

Survey Techniques Distance measurement techniques, Compass survey, Traversing and triangulation, Plane table surveying, Computation of areas and volumes by various methods, Tachometry, Theodolite survey

Modern Methods in Surveying: Principles of EDM operation, EDM characteristics, Total stations, field procedures in Surveying: for total stations in topographic surveys, Construction layouts using total station

Levelling and Contouring: Methods and types of levels, precise levelling, Methods and applications of contouring.

ME 116 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.

Thermodynamics: Work, heat, open, closed and steady flow systems, thermodynamics properties and processes, absolute & gauge pressure, pressure temperature and flow measurement, laws of thermodynamics, equation of continuity, two phase systems, ideal gas, conservation of mass & energy, basic heat engine & refrigeration cycles.

Heat Transfer: Fundamentals of heat transfer, conduction, convection, radiation, thermal conductivity, overall heat transfer coefficient

Heating, Ventilation and Air Conditioning (HVAC): Introduction to HVAC components, heating and cooling load, comfort charts, outline of A/C. systems, consideration for air-conditioning in building, natural ventilations, insulating materials.

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-111 FUNCTIONAL ENGLISH

Objectives of the Course

- The course aims at improving the four language skills –listening, speaking, reading and writing.
- The functional aspect of language will be stressed further through development of students' vocabulary and use of grammar.

Course Contents

Speaking and Listening

- Listening actively through the use of skills and sub skills, and in a variety of situations.
- Speaking: Fluency and confidence building through group discussions, role plays and public speaking.

Vocabulary development

- Tips / strategies in vocabulary enhancement
- Practice in vocabulary development

Reading

- Reading skills, Sub skills
- Reading strategies
- Reading practice through variety of reading texts and comprehension exercises
- Précis writing

Writing

- Note taking: Techniques for taking notes from lectures, from books (integrated with listening & reading) Process of Writing with practice in pre writing strategies, in revising, and in , editing for grammar. Writing well- structured and effective paragraphs, essays and letters(routine communication) using proper writing mechanics. Writing descriptions, narrations, cause and effect, compare and contrast etc.

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 from; 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 l/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.

Lap lace 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 tn 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.

ELECTROSTATICSAND 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 Principals 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 electrodynamometer 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-232 Signals and Systems

LTI Systems: Continuous time LTI Systems, modeling of different physical systems (Electrical, Mechanical and coupled systems), state-space representation of LTI systems, Type of inputs, Zero-input response, Convolution Integral, transient and forced/steady-state response, complete response of LTI systems using classical solution of differential equations, second order systems and their responses (underdamped, overdamped, critically damped)

Fourier Series: Fourier Series Representation of continuous time periodic signals, properties of continuous time Fourier series, exponential form of Fourier series (analysis and synthesis equations)

Fourier Transform: Fourier Transform Representation of continuous time aperiodic signals, properties of continuous time Fourier transform,

Laplace Transform: Definition, derivation of Laplace transforms of simple functions, inverse transformation techniques Properties, application of Laplace for

solution of differential equations of physical systems, analysis of LTI systems using Laplace transform

Magnitude-Phase: representation (for Frequency response) of LTI systems, transfer functions, Bode-plots, frequency responses of first and second order transfer functions. Design of passive and active 1st and 2nd order analog filters

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-282 ELECTROMAGNETIC FIELDS

Vector Analysis: scalars and vectors, vector algebra, the Cartesian coordinate system, vector components and Unit vectors, the vector field, 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 for electrostatics, the divergence theorem.

Energy and Potential: Energy expanded 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 boundary conditions, semiconductors, the nature of dielectric materials, capacitance, several capacitance examples, of a two wire lines, current analogies.

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 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 related potentials

TC-201 Digital Logic Design:

Computer Operations: Evaluation of the computer, basic organization 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, 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 network, Introduction to design of NAND and NOR Networks, Switching expressions for NAND and NOR Networks, Transient response of combination 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.

Introduction to Verilog HDL and VHDL

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, centoroid, 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 vectosr 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-346 Electrical Machines-I

Fundamentals of Electrical Machinery: A linear machine, Left hand rule, right hand rule, a simple single loop AC and DC. Magnetic flux, flux density, magneto motive force, permeability, hysteresis, Faraday's law, Lenz's law, induced force on wire, induction of voltage on a conductor.

DC Generators: Construction and working, types, emf equation, losses, efficiency, armature reaction, performance characteristics and their curves.

DC Motors: Types, Back EMF, torque, speed and speed regulation, performance characteristics and their curves, losses and efficiency.

Transformers: Types of transformer, single phase and three phase transformer, 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, vector groups, distribution and power transformer.

EE-347 Electrical Machines II

Synchronous Generators: Construction and working, speed control, Internal Generated Voltage, Equivalent Circuit, Phasor Diagram, Power and Torque relationship, Modes of an alternator operation (Standalone and Parallel), voltage regulation of alternators.

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

Single Phase Induction Motor: Single phase induction motors, construction and working, rotating field theory, 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, noise of induction motor, crawling and cogging, speed and power factor control of induction motors by injecting EMF in the circuit, phase advancers and phase compensated induction motor, induction generators and regulators, testing of induction motor, efficiency and losses, circle diagram, starter calculations

EE-354 Embedded System

Microprocessor and Microcontroller (latest) Architecture. Internal Registers, Machine code, addressing modes and Instruction Set, C and the Compiler, Debugging Software and Hardware, Threads, Tasks and Simple Scheduling, Branching, Interrupt handling, I/O and Communication Ports programming, Digital and Analog I/O Peripherals, Analog to Digital (A/D) and Digital to Analog (D/A) interfacing, Simulation design and debugging, Introduction and applications of Internet of Things (IoT).

EE-352 ELECTRICAL POWER TRANSMISSION

Power Systems Overview: Per Unit system,Phasor notation, complex power, power triangle, direction of power flow, current and power in balanced three- phase circuits, Power system infrastructure, transmission and sub-transmission system, AC/DC system, standard voltages for transmission and sub transmission.

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 unsymetricalspacings, transposition, inductance of Bundled conductors. Capacitance of two-wire and 3-phase line, effect of earth on capacitance; capacitance of bundled conductors, parallel circuit lines.

Current and Voltage Relationship on a Transmission Line: Representation of lines in terms of ABCD parameters for short, medium and long transmission lines, voltage and current waves, SIL loading, power flow through the line, power transmission capability, voltage regulation, series and shunt compensation for long transmission line.

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.

EE-359 Electrical Power Distribution & Utilization

Introduction to Distribution System: Distribution System Arrangement from Sub-transmission to Consumer Services, Types of Distribution system, DC& AC Distribution systems, Distribution transformer; earthingresistance and earthing practices, Power Factor &its improvement techniques.

Distribution Substation: Single Line Diagram, selection of site for a substation, Bus bar Schemes, Substation Equipment, Fuses, Relays, Contactors, Circuit Breakers, Isolators, Surge Arresters, Measuring Instruments: CTs & PTs and CCVTs.

Load Characteristics: Types of Load, Estimation of Load, Loadcurves, Maximum Demand, Demand Interval, Diversity Factor, Demand Factor, Utilization Factor, Load Management, Private Power Policy, Energy Tariff.

Power Cables: Cable Construction, Types of Cables, Insulating materials, Conducting materials, Capacitance of a Cable, Dielectric Power Loss, Thermal Characteristics of Cables, Cable Installation, Cable Selection Criteria, Calculation of Current Rating of Cables, Voltage drop calculation, Cable Fault Localization.

Illumination: Basic Definitions related to illuminations, Laws of Illumination, Polar Curve of Lamps, Factors involve in designing of lighting Scheme, Lighting standards, Different types of Lamps – construction and working.

Electric Heating, Welding and Traction: Advantages of Electric Heating, Resistance, Induction & Dielectric Heating, Microwave & Infrared Heating, Resistance Welding & its Type. Different types of traction, advantages and disadvantages.

EE-362 Power System Analysis

Introduction to Power System Analysis: Definition of power system, components of power system, 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 Analysis: Solution of non-linear algebraic equations e.g. Gauss Seidal Method, Newton Raphson Method, Power Flow Solution using different techniques.Power Flow Problem, Power Flow Solutions using Gauss Seidal and Newton Raphson.

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

Symmetrical Components and Unbalanced Fault calculations: Definition of symmetrical components, Sequence impedance of (1) loads (2) transmission lines (3) transformer, sequence networks of a loaded generator, Unbalanced fault calculations (1) Single line to ground fault (2) double line fault (3) double line to ground fault.

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

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 375 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 and terminology for a feedback control system. Response of second order systems with time-domain specifications. Closed Loop Transfer functions of physical systems.

Block Diagram Algebra: Canonical and unity feedback forms of control system block system block diagram, block diagram reduction techniques and theorems, signal flow graph algebra, block diagram reduction using signal flow graphs.

Control System Stability: Stability of control systems, Routh Hurwitz Criteria for Stability, Conditional Stability, and Classification of feedback systems by type, analysis of system types, Steady State error efficiency, coefficients, and constant

Root Locus: Introduction, rules for construction of root locus, qualitative analysis of root locus, analysis of performance characteristic of systems in time domain, dominant pole zero approximations, System design via root locus compensation, PID controller.

Control System Design: Introduction and review of control system design for closed loop systems via gain and phase margin adjustment in Bode/Nyquist/Polar plots.

Introduction to Digital Control: Computer control systems, Single-loop digital control system, Digital control vs Analog Control systems, Relation between S and z-domain and responses.

EE-395 Digital Signal Processing

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

Linear Constant Coefficient Difference Equations: Modeling discrete systems, conversion of differential equations into difference equations, solution of difference equations.

Discrete Time Fourier Series: Representation of discrete time periodic signals, signal analysis using discrete time Fourier series, properties of discrete time Fourier series.

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, Analysis of discrete system, 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

EE 313 POWER ELECTRONICS

Introduction: SSDs 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. Application of Uncontrolled and Controlled rectifiers in electrical drives and power system.

DC Chopper: Principle, Step-up and Step-down operation, Buck regulator, Boost regulator, Buckboost regulator, Cuck regulator, Choppers using thyristors. Application of DC Uncontrolled and Controlled rectifiers in electrical drives and power system.

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. Application of inverters in electrical drives and power system.

Electronic Power Supplies: Design and analysis of regulated power supplies, switch mode power supplies, Uninterrupted power supplies. Application of Electronic Power supplies in electrical drives and power system.

TC-306 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

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, Preemphasis 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 nonCoherent 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-414 Power Generation

Principles of Energy Conversion and Integration of energy sources– Introduction, types of conventional and non-conventional energy sources, efficiency and cost comparison, site selection, thermodynamic cycles, integration of different energy sources.

Conventional Energy Sources: Thermal Power Plants: Working of power plant, plant layout, types of boiler, types of steam and gas turbines and other station auxiliaries.

Hydroelectric Power Plants: Working, plant layouts, types of hydro-electric turbine and other station auxiliaries.

Nuclear Power Plants: Working, plant layout, fission and fusion reaction, critical mass chain reaction, moderators, reactor control and cooling, classification of reactors, radiation damages and shielding.

Non-Conventional Energy Sources: Solar Photovoltaic: PV system, types of solar cells, charge controllers, shading effect and its protection, power and efficiency calculations.

Wind Energy: Types of wind turbine, kinetic energy conversion, wind turbine generators, power and energy equations, wind speed characteristics of a site, air density, aerodynamics of wind turbine.

Bio Mass: Components and layout, agricultural residues, environmental benefits and impacts.

Fuel Cells: Thermodynamic principles of fuel cells, efficiency of fuel cell and limiting factors, design of fuel cells, fuel cells in electric vehicles.

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-439 Computer Communication Networks

Introduction to Computer Networks: OSI reference model, the TCP/IP reference model; Packet Switching and Architectures; Circuit Switching and Architectures;
Data Link Layer and issues; Error Correction and Congestion Control in Networks;
Network Layer and Issues (Protocols and Services); IPv4 and IPv6, IP addressing and subnetting; Network Routing; Wireless Network;
Transport Layer and Issues, Transmission Control Protocol, User Datagram Protocol.

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

MG-481 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

MG-482 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 an 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.