EEE-2101: Mathematics – IV

No. of Credits	**: 4**
No. of Periods/ Week	**: 4**
Internal Examination - Max. Marks	**: 30**
External Examination - Max. Marks	**: 70**
Total Marks	: **100**
Time	**: 3 Hours**

OBJECTIVES:

In general , the students are introduced with a knowledge on - Vector Calculus, Partial differential equations, their applications and Integral Transforms(Fourier transforms, FST, FCT) to facilitate them to use these concepts in their core subjects.

The objectives, in particular are to learn:

- The basic knowledge and applications of Vector Calculus used in engineering problems.
- about the gradient, divergence and curl under the differentiation of scalar and vector point functions, also on Line-, Surface- and Volume integrals under the integration of point functions; their applications in Engineering problems.
- the transformation theorems such as **Green's** theorem in the plane, **Stoke's** theorem, **Gauss Divergence** theorem and their applications
- how to formulate the Partial Differential Equations from the relations between the dependent and independent variables, and understand the methods of solving first order first degree linear, non-linear P**artial Differential Equations**, Homogeneous and Non homogeneous linear partial differential equations with constant coefficients .
- the procedure to find out the solutions of Partial Differential Equations by using the method of separation of variables (product method)
- About the formulation of one dimensional wave (string equation), one-and two-dimensional **Heat flow equations**, **Laplace's equation** in Cartesian and polar coordinates; also to solve these equations by the method of separation of variables.
- on the concept of integral transforms, namely, **Fourier transforms**, **Fourier Sine, Cosine and related inverse transforms;** their applications in solving several Physical and Engineering problems

OUTCOMES: After going through this course , the students would be able to:

- operate the differential operator 'del' to the scalar and vector point functions, Calculate the Gradient, Divergence and Curl, Vector normal to a surface, maximum rate of change of a scalar field, test whether two surfaces are to cut orthogonally or not .
- find the rate per unit volume at which the physical quantity is issuing from a point, the rate of inflow minus out flow using the Divergence and the angular velocity of rotation at any point of the vector field using the Curl.
- **test** whether the given motion is irrotational or rotational, whether a vector force acting on a particle is conservative or not
- Find out the potential function from a given vector field.

- obtain the well known Laplace and poisson equations from an irrotational field
- understand to determine the work done by a force field and circulation using a Line integral
- find out the Line, Surface and Volume integrals - find the flux using surface integral and volumes using the volume integral
- Apply the vector integral theorems (Green's theorem in the plane, Stoke's and Divergence theorems) for evaluating the double and triple integrals as these are used to find areas and volumes.
- know the methods of solving Linear and Non linear first order and first degree partial differential equations.
- solve the Linear Partial Differential Equations with constant coefficients (homogeneous and non homogeneous) and know the procedure for finding the complementary function and particular integrals
- apply the method of separation of variables to obtain solutions of most of the boundary value problems involving Linear partial differential equations occurred in engineering studies
- Solve, in particular the wave equations, heat equations and Laplace's equations in Cartesian and polar coordinates using the method of separation of variables.
- apply and extend the knowledge of Fourier transform techniques in solving several Initial and Boundary value problems of Engineering, such as in Conduction of heat / Thermodynamics, Hydraulics transverse vibrations of a string, oscillations of an elastic beam, bending of beams, electrical circuits, free and forced vibrations of a membrane and transmission lines , etc.

VECTOR CALCULUS-1: Differentiation of vectors, curves in space, velocity and acceleration, relative velocity and relative acceleration, scalar and vector point functions, vector operator ∇ applied to scalar point functions- gradient, ∇ applied to vector point functions- divergence and curl. Physical interpretation of ∇f, $\nabla.\overline{F}$, $\nabla\times\overline{F}$, ∇ applied twice to point functions, ∇ applied to products of two functions; Irrotational and Solenoidal fields.

VECTOR CALCULUS-2: Integration of vectors, line integral, circulation, work done, surface integral-flux, Green's theorem in the plane, Stoke's theorem, volume integral, Gauss Divergence theorem.
Introduction of orthogonal curvilinear coordinates, cylindrical and spherical polar coordinates

INTRODUCTION OF PARTIAL DIFFERENTIAL EQUATIONS: Formation of partial differential equations, solutions of partial differential equations- equations solvable by direct integration, linear equations of first order: Lagrange's Linear equation, non-linear equations of first order, Charpit's method.
Homogeneous linear equations with constant coefficients- rules for finding the complementary function, rules for finding the particular integral (working procedure), non- homogeneous linear equations.

APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS: Method of separation of variables, One dimensional wave equation-vibrations of a stretched string, one dimensional Heat equation, Two dimensional heat flow in steady state - solution of Laplace's equation in Cartesian and polar coordinates (two dimensional).

INTEGRAL TRANSFORMS: Introduction, definition, Fourier integral, Sine and Cosine integrals, Complex form of Fourier integral, Fourier transform, Fourier Sine and Cosine transforms, Finite Fourier Sine and Cosine transforms, properties of Fourier transforms, Convolution theorem for Fourier transforms, Parseval's identity for Fourier transforms, Fourier transforms of the derivatives of a function, simple applications to Boundary value problems.

TEXT BOOKS:

1. Scope and treatment as in "Higher Engineering Mathematics", by Dr. B.S.Grewal, **43rd Edition**, Khanna Publishers.

REFERENCE BOOKS:

1. A text book of Engineering Mathematics by N.P. Bali and Dr. Manish Goyal, Lakshmi Publications.
2. Mathematical Methods of Science & Engineering aided with MATLAB by Kanti B.Dutta, Cengage Learning India Pvt. Ltd.
3. Advanced Engineering Mathematics by Erwin Kreyszig.
4. Higher Engineering Mathematics by B. V. Ramana, Tata McGraw Hill Company.
5. Advanced Engineering Mathematics by H.K.Dass. S.Chand Company.
6. Higher Engineering Mathematics by Dr. M.K.Venkataraman.

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EEE-2102: NETWORK THEORY

No. of Credits	**: 4**
No. of Periods/ Week	**: 4**
Internal Examination - Max. Marks	**: 30**
External Examination - Max. Marks	**: 70**
Total Marks	: **100**

Network Elements: Charge, Voltage, Current, Power, Energy, Circuit concept, Active and Passive circuit elements, Ideal, Practical and dependent sources and their V-I characteristics, Energy stored in Inductors and Capacitors , Kirchoffs Laws, Voltage and Current division, Nodal Analysis, Mesh Analysis, Star-Delta transformation and Source Transformation.

Network Theorems: Linearity and superposition, Thevinen's and Norton's, Reciprocity, Compensation, Maximum power transfer theorems, Tellegan's and Millman's theorems, Application of theorems to DC circuits.

DC Transients: Inductor, Capacitor, Source free RL, RC and RLC Response, Evaluation of Initial conditions, application of Unit-step Function to RL, RC and RLC Circuits, Concepts of Natural, Forced and Complete Response.

Alternating Circuits: The Sinusoidal Forcing Function Instantaneous, Peak, Average and RMS values of Voltage and Current, Crest factor, Form factor, Concept of phase and phase difference in sinusoidal waveform, Phase relation in pure resistor, Inductor and capacitor, Impedance diagram, phasor diagram, series and parallel circuits, compound Circuits, Instantaneous and Average Power, Complex Power Computation of active, reactive and complex powers, power triangle, power factor.

Sinusoidal Steady State Analysis: Steady State Analysis Using Mesh and Nodal Analysis, Application of Network Theorems to AC Circuits, Series resonance, Impedance and phase angle, voltages and currents, bandwidth and Q factor and its effect on bandwidth, parallel resonance, resonant frequency, variation of impedance with frequency, Q factor and its effect on bandwidth, Balanced 3-phase circuits, Resonance, Concept of Duality. Magnetically Coupled Circuits, Dot Convention, Y, Z, H, T – Parameters of Two – Port Networks.

Laplace Transform Techniques: Transforms of Typical Signals, Response of Simple Circuits to Unit – Step, Ramp and Impulse Functions, Initial and Final Value Theorem, Convolution Integral, Time Shift and Periodic Functions, Transfer Function.

Text Books

1. Engineering Circuit Analysis, Willam H. Hayt Jr., and Jack E. Kemmerly, 5th Edition, McGraw Hill.
2. Electric circuits by J.A Edminister (Schaum outline series)

Reference Books:

1. Franklin F.Kuo, Network Analysis and Synthesis, 2nd Edition, John Wiley & Sons
2. Network Analysis, M. E. Vanvalkenburg, 3rd Edition, PHI.

EEE-2103 : ELECTRO MAGNETIC FIEDS

No. of Credits	**: 4**
No. of Periods/ Week	**: 4**
Internal Examination - Max. Marks	**: 30**
External Examination - Max. Marks	**: 70**
Total Marks	: **100**

Objectives:
All the electrical equipment are developed by using the magnetic material, conductors, and insulators. It is very much essential to know the behaviour of these materials in the presence of electric and magnetic fields. The main objective of this course is to provide the basic concepts about the effects of electric and magnetic fields on conductors, magnetic materials, and insulators under various operating conditions.

Outcomes:
At the end of the course, the student could able to

- Understand the concepts of electric and magnetic fields.
- Understand the electromagnetic wave behaviour.
- Estimate the effect of electric and magnetic fields on the materials used in electrical equipments.
- Understand the various principles used to estimate the effects of electric and magnetic fields.

Introduction: Rectangular, Cylindrical and Spherical Coordinate Systems.

Electrostatics: Superposition, Coulomb's Law, Electric Field of Different Charge Configurations using Coulomb's Law and Superposition, Flux of a Vector, Field Lines, Gauss's Law interms of E (Integral Form and Point Form), Applications of Gauss's Law, Curl of the Electric Field, Electric Potential, Calculation of Electric Field Through Electric Potential for given Charge Configuration, Electrostatic Energy.

Method of Images, Electric Dipoles, Polarization of Dielectrics, Bound Charges and Their Physical Interpretation, the Displacement Vector D, Comments about the Curl of D in Electrostatics, Linear Dielectrics, Determination of Electric fields in the Presence of Linear Dielectrics by finding D, Electrostatic Boundary Conditions at a Charged Surface(Assuming no Dielectric Polarization), Continuity Equation, Basic Properties of Conductors in Electrostatic Fields, Capacitance, Poisson's and Laplace's Equations, Properties of the Solutions of Laplace's Equations, Uniqueness Theorem, Examples on Laplace's and Poisson's equations.

Magnetic Fields and Lorentz force Law: Magnetic field intensity H, Magnetic flux Φ, flux density B, Biot-Savart's law, Determination of Magnetic Field using Biot-Savart's Law, Divergence and Curl of B, Ampere's Law in Integral and Differential Form, Applications, The Scalar and Vector Magnetic Potential, Calculation of Magnetic Field through the Vector Magnetic Potential for given Steady Current Configurations, Comparison of Electrostatics and Magnetostatics, Magnetostatic Boundary Conditions(assuming no magnetic polarizations)

The Magnetic Dipole: Diamagnetism, Paramagnetism & Ferro Magnetism, Torques and Forces on Magnetic dipoles, Magnetization, Bound current, Physical Interpretation of Bound Currents, the H Vector, the Divergence and Curl of H , Linear Magnetic Materials, Determination of Magnetic Fields in the Presence of Magnetic Materials by Finding H, EMF, Ohm's Law, Motional EMF, Faraday's Laws, Lenz's law, Quasistatic Fields, Inductance and Energy in Magnetic Fields.

Time Varying fields and Maxwell's Equations: Maxwell's modification of Ampere's Law, Maxwell's Equations in any medium in terms of E & B and in terms of D,E,B & H, General Boundary Conditions, The Uniform Plane Wave, Maxwell's Equations in Free Space, Plane Wave Propogation, Phase Velocity and Wave length, Intrinsic Impedance, Perfect Dielectrics, Attenuation, Phase and Propagation Constants, the Poyinting Vector and Power Considerations.

Text Books:

1. Introduction to Electrodynamics by David J. Griffiths, 3rd Edition, Prentice Hall, New Jersey, 1999.
2. Engineering Electromagnetics by William H. Hayt Jr. and John A. Buck, Sixth Edition, Mc Graw Hill, New Delhi, 2001.

Reference Books:

1. Principles of Electromagnetics by Mathew N.O. Sadiku, Oxford International Student edition, 2009.
2. Electromagnetics by John D Kraus, Mc Graw-Hill International Edition, 1999.
3. Engineering Electromagentics by J. P. Tewari, Khanna Publishers, 2nd edition.

EEE-2104: ELECTRONIC DEVICES AND CIRCUITS

No. of Credits	**: 4**
No. of Periods/ Week	**: 4**
Internal Examination - Max. Marks	**: 30**
External Examination - Max. Marks	**: 70**
Total Marks	: **100**

Energy Band Theory of Solids: Intrinsic and Extrinsic Semiconductors Doping, Doping Materials, Carrier Mobility, Conductivity, Diffusion and continuity equation, Hall – Effect and its Application.

Semiconductor Diodes: Band structure of PN Junction, Quantitative Theory of PN Diode, Volt – Amp. Characteristics, Temperature Dependence, Transition and Diffusion Capacitance of PN

Junction, Zener and Avalanche Breakdowns, Tunnel Diode, LED, Schottky Barrier Diode, Varactor Diode, Photo Diode, PIN Diode, Point Contact Diode.

Diode Rectifiers: Half-wave, Full-wave and Bridge Rectifiers with and without Filters, Ripple Factor and Regulation Characteristics.

Bipolar Junction Transistor: NPN and PNP junction Transistor, Characteristics of Current Flow across the Base Regions, Minority and Majority Carrier Profiles, CB, CE and CC Configurations and their Input and Output Characteristics. Comparison of CE, CB and CC Configurations. Junction Biasing for Saturation, Cutoff and Active Region, α and β Parameters and the relation between them.

JFET: JFET and its characteristics, Pinch off Voltage, Drain Saturation Current, JFET biasing, MOSFET – Enhancement and Depletion Modes, Small signal models of FET.

Small Signal – Low Frequency Transistor Amplifier Circuits: Transistor as an Amplifier, h – parameter model, Analysis of Transistor Amplifier Circuits using h – parameters. CB, CE and CC Amplifier configurations and performance factors. Analysis of Single Stage Amplifier, RC Coupled Amplifiers. Effects of Bypass and Coupling Capacitors. Frequency Response of CE Amplifier, Emitter – Follower, Cascaded Amplifier.

Text Books:

1. Integrated Electronics, Analog Digital Circuits and systems, Jacob Millman and D. Halkias, McGraw Hill.
2. Electronic Devices and Circuits, Nashalky.

References:

1. Electronic Devices and Circuits 2nd Edition, B. V. Rao and K. Raja Rajeswari, Pearson Education

Electronic Devices and Circuits Theory, Boylsted and Nashelsky, Prentice Hall Publication

EEE-2105: FLUID MECHANICS & HYDRAULIC MACHINERY

No. of Credits	**: 4**
No. of Periods/ Week	**: 4**
Internal Examination - Max. Marks	**: 30**
External Examination - Max. Marks	**: 70**
Total Marks	: **100**

Course Objectives:

- To familiarize the students with fluid statics and dynamics
- To introduce the concepts of working and design aspects of hydraulic machines like turbines and pumps and their application.

Course Outcomes:

- Students will be able to develop to gain knowledge on fluid statics, fluid dynamics, and closed conduit flow and hydro electric power stations.

- Students will be able to design various components of pumps and turbines and study their characteristics.

Introduction To Fluid Mechanics, Principle Of Continuum–Fluid Properties–Mass Density, Specific Weight, Specific Gravity, Viscosity, Surface Tension, Capillarity, Compressibility & Bulk Modulus Of Electricity, Vapour Pressure.

Fluid Statics – Fluid Pressure And Its Measurement, Pascal's Law, Hydrostatic Pressure Distribution, Manometers-Micromanometers-Mechanical Gauges, Hydrostatic Forces On Plane Surfaces.

Fluid Kinematics-Definition Of Steady and Unsteady, Uniform and Non Uniform, Compressible and Incompressible, Rotational and Irrotational, 1-D, 2-D and 3-D, Laminar and Turbulent Flows, Stream Line, Path Line, Streak Line, Stream Function, Velocity Potential Function, Local And Convective Accelerations-Flow Nets, Principle Of Conservation Of Mass, 3-D Continuity Equation In Cartesian Coordinates, Continuity Equation For Stream Tube.

Fluid Dynamics-Derivation Of Bernoulli's Equation From The Concepts Of Work Done, Total Head, Limitations Of Bernoulli's Principle, Application Of Bernoulli's Equation, Venturi Meter, Orifice Meter, Flow Nozzle, Pitot Tube, Momentum Principle-Impulse Momentum Equation And Its Application To Pipe Bends And Reducers, Impact Of Jets On Single Stationary Plates.

Flow Through Pipes-Laws Of Friction, Reynolds Experiment, Darcy-Weichbach Equation, Major And Minor Losses, Pipes In Series, Pipes In Parallel, Pipes Connecting Two Reservoirs, Siphon, Power Transmission Through Pipes And Nozzles, Water Hammer (Concept only) .

Hydraulic Machines-Impact Of Jets On Series Of Stationary And Moving Vanes, Velocity Triangles, Work done-Turbines-Hydraulic, Mechanical And Overall Efficiency, Classification, Component Parts And Working Principles Of Pelton, Francis And Kaplan Turbines, Unit Quantities, Specific Speed, Characteristic Curves.

Pumps: Classification of Pumps, Positive Displacement and Rotodynamic Pumps, Centrifugal Pumps-Components Parts, Working Principles, Manometric, Static And Overall Efficiency, Work Done- Pumps In Parallel And Series, Specific Speed And Pump Characteristic Curves.

TEXT BOOKS:

1. Fluid Mechanics and Hydraulic Machinery by P.N. MODI & SM SETHI
2. Fluid Mechanics and Hydraulic Machinery by A.K.Jain.

EEE-2106: THERMAL PRIME MOVERS

No. of Credits	**: 4**
No. of Periods/ Week	**: 4**
Internal Examination - Max. Marks	**: 30**
External Examination - Max. Marks	**: 70**
Total Marks	: **100**

Objectives

- To make the students understand the various types of prime movers this can be connected to generators for power production.
- To obtain the skills of performing the necessary calculations with respect to the functioning of the prime movers.
- To impart the knowledge of various types of pumps.

Outcomes

Upon completion of this course the student will be able to:

- Describe the basic components of steam power plants and working principles of different types of steam turbines.
- Explain the working principle of different types of gas turbines.
- Identify the main components of diesel power plant and explain the working principle of diesel engines.
- Discuss the working principle of different types of hydraulic turbines.
- Illustrate the working principle of centrifugal and reciprocating pumps.

Laws Of Thermodynamics (Statements Only), Gas Laws, Relation between Gas Constant and Specific Heat at Constant Pressure And Constant Volume, Thermodynamics Processes of Perfect Gases and Entropy, Properties of Steam and Use of Steam Tables, Extent Work and Internal Energy, Thermodynamic Processes of Vapor and Entropy Of Steam.

Boilers: Classification, Simple Vertical, Cochron, Lancashire, and Babcock & Wilcox Boilers.

I C Engines: Classification, Otto Cycle, Diesel Cycle and Duel Combustion Cycle. Working Of 2-Stroke And 4-Stroke Engines, Petrol Engines and Diesel Engines, Power and Efficiency of IC Engines.

Steam Nozzles: Flow through Steam Nozzles Critical Pressure Ratio, Effect of Friction and Super Saturation.

Steam Turbines: Impulse And Reaction Turbines, And Velocity diagrams, Methods of Reduction of Rotor Speed.

Gas Turbines: Introduction, Classification Of Gas Turbines. Analysis Of Constant Pressure Closed Cycle Gas Turbines, Open Cycle Gas Turbines. Methods to Improve the Thermal Efficiency Of Gas Turbines.

Text Books:

1. Thermal Engineering By R.S. Khurmi And J.K. Gupta, S.Chand & Co Ltd.
2. Elements Of Heat Engines, Vols. I & Ii By R.C. Patel And C.J. Karam Chandani, Acharya Book Depot, Baroda.

EEE-2201: ELECTRICAL MACHINES –I

No. of Credits	**: 4**
No. of Periods/ Week	**: 4**
Internal Examination - Max. Marks	**: 30**
External Examination - Max. Marks	**: 70**
Total Marks	: **100**

Electro mechanical Energy Conversion: Principles, Forces and Torques in Magnetic Field Systems, Energy Balance, Energy and Force in Singly Excited Magnetic Field System, Coenergy, Multiply Excited Magnetig Field Systems.

D.C.Generators: Principle of Operation, Constructional Features, emf Equation of a D.C.Generator, Collection and Flow of Current from Armature, Armature Reaction, Methods to Reduce Effects of Armature Reaction and Commutation Process, Armature Winding Diagram (Lap and Wave), Methods of Excitation, Generator Characteristics, Parallel Operation, Losses occur in DC Generator, Efficiency and Applications.

D.C. Motors: Principle of operation, Types of DC Motors, Back emf of a DC Motors, Torque and Speed Equations, DC Motor characteristics, Speed Control Methods of a D.C. Motors, Starting and Starters, Efficiency and Applications.

Testing of D.C. Motors: Brake Test, Swinburne's Test, Hopkinson's Test, Retardation Test, Field's Test and Separation of Losses.

Transformers: Principle of operation, Constructional features, Types of Transformers, emf equation of a Transformer, Transformer on No-Load and Load and its vector diagrams, Equivalent Circuit of a Transformers, Losses in a Transformer, Voltage Regulation and Efficiency, OC and SC Tests of a Transformer, Three Winding Transformers, Three Phase Transformer Connections, Parallel Operation and Load Sharing, Three Phase to Two Phase Conversion and Vice-Versa.

TEXT BOOKS:

1. Electrical Machinery by DR.P.S.BIMBHRA, KHANNA PUBLISHER.

2. Electrical Machines by D P KOTHARI and I J NAGRATH, Mc Graw Hill Education (India) Private Limited.

Reference Books:

1 Electrical Machines, by J B Gupta, S K Kataria & Sons
2 Electrical Machines by U A Bakshi and M V Bakshi, Technical Publications

EEE-2202: ELECTRICAL MEASUREMENTS

No. of Credits	**: 4**
No. of Periods/ Week	**: 4**
Internal Examination - Max. Marks	**: 30**
External Examination - Max. Marks	**: 70**
Total Marks	: **100**

Instruments: Objectives of Measurements, Analog Versus Digital Measurements, Accuracy, Precision And Uncertainty, Sources Of Measurement Error, Standard Cell And Standard Resistance. Basic

Characteristics of measuring instruments with a moving element instruments: Ammeter, Voltmeter, Expression for Torque of Moving Coil, Moving Iron, Dynamometer, Induction and Electrostatic Instruments.

Extension of Range Of Instruments. Wattmeters, Torque Expression For Dynamometer Instruments. Reactive Power Measurement, Energy Meters Single Phase And Poly Phase, Driving Torque And Braking Torque Equations, Errors And Testing, Compensation, Maximum Demand Indicator, Power Factor Meters, Frequency Meters, Electrical Resonance And Weston Type Of Synchro Scope.

Bridge Methods: Measurement Of Inductance, Capacitance & Resistance Using Bridges. Maxwell's, Anderson's, Wein's Heave-Side & Campbell's, Desauty's, Schering's Bridges, Kelvin's Double Bridge, Price Guard Wire Bridge, Loss Of Charge Method, Megger, Wagner's Earthing Device.

Magnetic Measurements: Ballastic Galvanometer, Calibration Of Hibbert's Magnetic Standard Flux Meter, Lloydfischer Square For Measuring Iron Loss. Testing Of Ring And Bar Specimens, Determination Of B-H Curve And Hysteresis Loop Using Cro, Determination Of Leakage Factor.

Potentiometers & Instrument Transformers: Crompton's D.C. Potentio Meter, A.C. Polar And Co-Ordinate Type Potentio Meters.Applicationsmeasurement Of Impedance, Calibration Of Ammeters, Voltmeters And Wattmeters. Use Of Oscilloscope In Frequency, Phase And Amplitude Measurements, Indian Standard Specifications For Voltmeters, Ammeters, Energy Meters, Insturmnet Transformers –Ration And Phase Angle Errors And Their Reduction.

Text Book :

1. Electric And Electronic Instrumentation By A.K. Sawhney, Dhanpat Rai & Sons, Delhi, 11 Th Edition, 1995.

Reference Books :

1. Electrical & Electronic Instrumentation By Umesh Sinha, Satya Prakashan, Newdelhi,1998
2. Electrical Measurements By E.W.Golding. & Widdis, 5th Edition, Wheeler Publishing.

EEE-2203: DIGITAL LOGIC DESIGN

No. of Credits	**: 4**
No. of Periods/ Week	**: 4**
Internal Examination - Max. Marks	**: 30**
External Examination - Max. Marks	**: 70**
Total Marks	: **100**

Numbering Systems: Basic structure and brief description of Digital computers and Digital systems - Binary, Octal, Decimal and Hex numbering systems – Number base Conversions – (n-1)'s and n's complements of the various numbering systems – Binary arithmetic – Various methods to represent signed binary numbers.

Binary Codes: BCD, Excess-3 codes – Binary arithmetic using BCD and Excess-3 codes – Gray code – Error detecting codes : parity checking and Hamming code – Error correcting codes: Hamming code – Basic idea of 2421, 84-2-1, ASCII codes.

Boolean Algebra and Boolean Functions: Boolean theorems and postulates – Logic gates – Truth table - Boolean functions – Dual of a function – Complement of a function – Canonical and standard forms – Simplification of Boolean functions using Boolean theorems and postulated, Karnaugh map (K-map) with maximum of 5 variables – Quine-McCluskey Tabular method.

Combinational Logic Circuits- I: Boolean function implementation using AND-OR logic, multilevel NAND and multilevel NOR implementation – Transformation of multilevel NAND and NOR circuits to AND-OR diagram – Combinational logic design - Half adder – Full adder – Half subtractor – Full subtractor – Parallel adder – Parallel adder/subtractor –Carry look ahead adder – BCD adder – Magnitude comparator – Even an odd functions – Parity generator and checker – code converters.

Combinational Logic Circuits- II: Decoders – Encoders – Demultiplexer – Multiplexer – Read Only Memory (ROM) – PLA – PAL – implementation of the Boolean functions using decoders, multiplexers, ROMs, PLA, and PAL.

Sequential Logic Circuits: Differences between combinational logic and sequential logic – Flip-flops (R-S, J-K, D, T, Master-slave J-K flip) – Truth tables and excitation tables of the flip-flops, Conversions of flip-flops – state diagram – Mealy and Moore models – Design of sequential circuits with various flip-flops – Design of synchronous counters – Serial adder.

Micro Computer Components Design with Flip-flops: Register – Register with parallel load – Shift register – Bidirectional shift register with parallel load – Ripple counters (Binary and BCD) – Binary counters with parallel load.

Text Book:

1. M. Morris Mano, Digital Design, Prentice-Hall of India Pvt. Limited, New Delhi, 2nd Edition. 2000.

Reference Books:

1. Zvi Kohavi, Switching and Finite Automata Theory, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2nd Edition, 2008.
2. Frederick J. Hill and Gerald R. Peterson, Introduction to Switching Theory and Logic Design, John Wiley & sons, Inc. New York, 3rd edition, 1981.

EEE-2204: SIGNALS, SYSTEMS AND SYNTHESIS

No. of Credits	**: 4**
No. of Periods/ Week	**: 4**
Internal Examination - Max. Marks	**: 30**
External Examination - Max. Marks	**: 70**
Total Marks	: **100**

OBJECTIVES:

- To understand the basic properties of signal & systems and the various methods of classification
- To learn Fourier transform and their properties
- To know Z transform & DTFT and their properties
- To characterize LTI systems in the Time domain
- To Synthesize a given network

OUTCOMES:
Upon the completion of the course, students will be able to:

- Apply the convolution theorem for continuous time signals
- Evaluate the Fourier Series of periodic signals
- Determine the Fourier Transform of energy signals
- Make use of Fourier Transform Properties
- Analyze a discrete time LTI system using discrete linear convolution
- Use z-transform for analyzing discrete time signals and systems
- Convert a continuous time signal to the discrete time domain and reconstruct using the sampling theorem
- Synthesize a given network

Signals, Transformations of Independent Variables, Basic Continuous Time Signals, Basic Discrete Time Signals, Signal Energy and Power Systems, Properties of Systems, Linear Time – invariant Systems. Continuous Time and Discrete time.

Fourier series. Convergence of Fourier series, Fourier Transform. Periodic Signals and Continuous and discrete Fourier Transform. Z-transform of a Discrete Sequence, Region of Convergence for the Z-transform. Inverse Z-transform, Properties of Z-transform, Relation Between Z and Fourier Transform.

Linear Time – Invariant (LTI) Systems Representation of Signals in terms of Impulses, Discrete Time LTI Systems, the Convolution Sum, Continuous Time LTI Systems, the Convolution Integral. Properties of LTI Systems, Systems Described by Differential and Difference Equations. Block Diagram Representation of LTI Systems Described by Differential Equations and, Singularity Functions. Frequency Response Characterized by Linear Constant Coefficient Differential

Equations. First-order and Second-order Systems. Representation of DTFT, First-order and Second-order Systems

Sampling Theorem, Reconstruction of a Signal from Samples, the Effect of under sampling, Discrete Time Processing of Continuous Time Signals. Sampling in Frequency Domain, Sampling of Discrete Time Signals

Positive Real Function and Other Properties, Herwitz Polynomials, Computation of Residues, Even and Odd Functions, Test for Positive Real Functions. Network Synthesis Elementary Synthesis Operation, LC Network Synthesis, Properties of RC Network Functions, Foster and Cauer Forms of RC and RL Networks.

Text Books:

1. A.V. Oppenheim et al.,(1997) Signals & Systems (2nd Edition), Prentice Hall., ISBN 0-13-814757-4
2. P.Rama Krishna Rao, "Signals & Systems", 1st Edition, TMH, 2008..
3. Modern Network Synthesis, M. E. Van Valkenburg, Wiley Eastern

EEE-2205: ANALOG ELECTRONIC CIRCUITS

No. of Credits	**: 4**
No. of Periods/ Week	**: 4**
Internal Examination - Max. Marks	**: 30**
External Examination - Max. Marks	**: 70**
Total Marks	: **100**

Multistage Amplifiers: BJT and FET RC Coupled Amplifiers – Frequency Response. Cascaded Amplifiers. Calculation of Band Width of Single and Multistage Amplifiers. Concept of Gain Bandwidth Product.

Feedback Amplifiers: Concept of Feedback Amplifiers – Effect of Negative feedback on the amplifier Characteristics. Four Feedback Amplifier Topologies. Method of Analysis of Voltage Series, Current Series, Voltage Shunt and Current Shunt feedback Amplifiers.

Sinusoidal Oscillators: Condition for oscillations –LC Oscillators – Hartley, Colpitts, Clapp and Tuned Collector Oscillators – Frequency and amplitude Stability of Oscillators – Crystal Oscillators – RC Oscillators -- RC Phase Shift and Weinbridge Oscillators.

Power Amplifiers: Classification of Power Amplifiers – Class A, Class B and Class AB power Amplifiers. Series Fed, Single Ended Transformer Coupled and Push Pull Class A and Class B Power Amplifiers. Cross-over Distortion in Pure Class B Power Amplifier, Class AB Power Amplifier – Complementary Push Pull Amplifier, Derating Factor – Heat Sinks.

Tuned Voltage Amplifiers: Single Tuned and Stagger Tuned Amplifiers – Analysis – Double Tuned Amplifier – Bandwidth Calculation.

Operational Amplifiers: Concept of Direct coupled amplifiers, Ideal Characteristics, Differential amplifier, normalized transfer characteristics, Measurement of Op-Amp Parameters.

Applications of Op-Amps: Inverting and Non-inverting Amplifiers, Integrator, Differentiator, Comparator, Logarithmic Amplifiers, Instrumentation Amplifiers.

Text Books:

1. Integrated Electronics, Analog Digital Circuits and systems, **Jacob Millman** and **D. Halkias**, McGraw Hill, 1972
2. OP-Amps and Linear Integrated Circuits, Gayakwad, 4th ed. PHI publications, 1993.

References:

1. Linear Integrated Circuits, D Choudhury Roy, New Age International Pvt Ltd, publishers, New Delhi, 2004
2. Electronic Devices and Circuits – G.K.Mithal, Khanna Publishers, 23rd Edition, 2004.

EEE-2206: ENVIRONMENTAL STUDIES

No. of Credits	**: 4**
No. of Periods/ Week	**: 4**
Internal Examination - Max. Marks	**: 30**
External Examination - Max. Marks	**: 70**
Total Marks	: **100**

Unit-1 : Introduction To Environmental Sciences – Importance - Types Of Ecosystems – Lake – River – Marine – Forest – Desert – Bio-Deversity.

Unit-2: Resources Natural – Water – Mineral – Food – Forest – Energy – Land – Use And Exploitation - Environmental Degradation - Remedial Measures.

Unit-3: Environmental Pollution Causes, Effects, Standards And Control Of
(A) Air Pollution;
(B) Water Pollution;
(C) Soil Pollution;
(D) Marine Pollution;
(E) Noise Pollution.

Unit-4 : Legal Aspects Of Pollution
(A) Air (Prevention And Control Of Pllution) Act.
(B) Water (Prevention And Control Of Pollution) Act.
(C) Environmental Protection (19860 Act.
(D) Forest Conservation Act.

Unit-5: Role Of People To Protect Envvironment – Role Of Ngos.
A. Global Issues.
B. Green Houseeffect
C. Global Warming
D. Nuclear Accidents
A. Local Issues. Causes And Action
B. Air Pollution Due To Industries

C. Automobiles
C. Public Interest Litigation Case Studies – Success Stories
Leather Industries
Taaj & Mathura Refinery
Silent Valley

Recommended text Books:

1. Introduction To Environmental Sciences – Turk & Turk And Witties &Witties.
2. Environmental Sciences – P.D.Sarma

EEE 3101: POWER SYSTEMS I

No. of Credits	**: 4**
No. of Periods/ Week	**: 4**
Internal Examination - Max. Marks	**: 30**
External Examination - Max. Marks	**: 70**
Total Marks	**: 100**

Introduction: Power Generation, Comparison of different Sources of Energy.

Renewable Energy Sources

Hydro Electric Plants: Choice of Site, Hydrology, Classification of Plants, General Arrangement, Functions of Different Components of A Hydro Plant

To Understand the Importance, Working Principle, types, Site Selection, Plant Layout, Components, Merits and Demerits for **Solar Power Plant, Wind Mill Power Plant, Fuel Cells, Tidal Power Plant & Bio-Mass Power Plant**.

Non Renewable Energy Sources

Thermal Power Stations: Line Diagram, Location, Coal Handling, Draught, Condensers, Cooling Water Systems.

Nuclear Power Plants: Schematic Arrangement, Components of Nuclear Reactor, Classification of Reactors, Different Power Reactors.

Diesel Power Plant: Understand the Working Principle, Site Selection, Plant Layout, Components, Merits and Demerits

Gas Turbine Plants: Layout, Components of A Gas Turbine Plant, Open Cycle and Closed Cycle Plants.

Magneto Hydro Dynamic (MHD) Power Generation: Basic Concepts, Principle, Classification, Coal Burning MHD Steam Power Plant, Gas Cooled Nuclear MHD Power, Liquid Metal MHD Generator.

Operational Aspects of Generating Stations: Load Curves and Associated Definitions, Selection of Units, Load Duration Curves.

Economic Considerations: Capital and Running Costs of Generating Stations, Different Tariffs, Comparison of Costs.

Text Book:

1. A Text Book on Power System Engineering by Soni, Gupta, Bhatnagar & Chakrabarti, Dhanpat rai & Co.

Reference Books:

1. Generation & Utilization by C.L.Wadhwa
2. Electrical Power by S. L. Uppal, Khanna Publishers

EEE 3102: PULSE AND DIGITAL CIRCUITS

No. of Credits	**: 4**
No. of Periods/ Week	**: 4**
Internal Examination - Max. Marks	**: 30**
External Examination - Max. Marks	**: 70**
Total Marks	**: 100**

UNIT- I: LINEAR WAVE SHAPING: High pass and Low pass RC circuits, Response of High pass and Low pass RC circuits to sinusoidal, step, pulse, square, exponential and Ramp inputs, High pass RC circuit as a differentiator, Low pass RC circuit as an integrator. Attenuators and its application as CRO probe, RL and RLC Circuits and their response for step input, Ringing Circuit.

UNIT- II: NONLINEAR WAVE SHAPING: Diode clippers, Transistor Clippers, Clipping at two independent levels, Comparator, Applications of voltage Comparators, Diode Comparator, Clamping Operation, Clamping Circuits using Diode with Different Inputs, Clamping Circuit Theorem, Practical Clamping circuits, Effect of diode Characteristics on Clamping Voltage.

UNIT- III: BISTABLE MULTIVIBRATORS: Transistor as a switch, Switching times of a transistor, Design and Analysis of Fixed-bias and self-bias transistor binary, Commutating capacitors, Triggering schemes of Binary, Transistor Schmitt trigger and its applications.

UNIT- IV: MONOSTABLE AND ASTABLE MULTIVIBRATORS: Design and analysis of Collector coupled Monostable Multivibrator, Expression for the gate width and its waveforms. Design and analysis of Collector coupled Astable Multivibrator, expression for the Time period and its waveforms, The Astable Multivibrator as a voltage to frequency convertor.

UNIT- V: TIME BASE GENERATORS: General features of a time-base signal, Methods of Generating time base waveform, Exponential voltage sweep circuit, Basic principles of Miller and Bootstrap time base generators, transistor Miller sweep generator, transistor Bootstrap sweep generator, Current Sweep circuit, Linearity correction through adjustment of driving Waveform.

UNIT VI: LOGIC GATES: Realization of gates using diodes and Transistors, RTL, DTL.

Text Books:

1. Pulse Digital and Switching Waveforms, J. Millman and H. Taub, McGraw-Hill, 2nd Edition 1991.
2. Pulse switching and digital circuits – David A.Bell,PHI ,5th Edn., oxford university press.

Reference Books:

1. Pulse and Digital Circuits, K.VenkatRao, Pearson Education India, 2nd Edition, 2010.
2. Pulse and Digital Circuits, A. Anand Kumar, PHI, second edition, 2005.

EEE 3103: ELECTRICAL MACHINES – II

No. of Credits	**: 4**
No. of Periods/ Week	**: 4**
Internal Examination - Max. Marks	**: 30**
External Examination - Max. Marks	**: 70**
Total Marks	**: 100**

Induction Motors - I :

Principle of operation, Constructional details, Rotating Magnetic field, Types of rotors, Slip, Stator and Rotor current frequencies, Development of torque and torque calculations, Torque-Speed Characteristics, Power flow and performance calculations, Equivalent circuit, Calculation of equivalent circuit parameters from No-load and Rotor-blocked tests.

Induction Motors - II :

Predetermination of performance characteristics using circle diagram and load test, Starting of Induction motors using Rheostat/reactor starter, Auto-transformer starter, Star-Delta starter, and Rotor Resistance starter, Crawling and cogging, Brief description of the induction motor speed control using Voltage control, frequency control, pole changing, rotor resistance control, cascading, and rotor emf injection, Induction generator and principle of operation, Double-cage rotors.

Synchronous Generators:

Basic requirements, Constructional details, EMF equation, Effect of chording and distribution of winding, Armature reaction, Phasor diagram, Regulation of Synchronous Generators using EMF, MMF and ZPF method, Synchronization of alternators, Parallel operation of two-alternators, Parallel operation of Synchronous Generator to infinite bus, Sharing of real and reactive powers, Capability curve, Salient-pole synchronous machine, Two-reaction theory, Determination of direct axis and quadrature axis reactances of salient-pole machines, Power-Angle characteristics of cylindrical and salient-pole machines.

Synchronous Motors:
Principle of operation, starting methods, phasor diagram, effect of changing load and changing excitation on machine performance, V and Inverter 'V' curves, Hunting, Damper winding, power developed by synchronous motor.

Special Machines:
Single phase Induction motors: Double-field revolving theory, Principle of operation of Split-phase, capacitor start, capacitor start and run, shaded pole machines.
Principle of operation of hysteresis motor, Reluctance motor, BLDC motor and Doubly-fed Induction generator.

Text books:

1. M G Say, The performance and Design of Alternating Current Machines, 3rd edition, CBS Publishers & Distributors, New Delhi, 2002.
2. P S Bhimbhra, Electrical Machinery, 7th edition, Khanna Publishers, New Delhi, 2011.

Reference books:

1. A E Fitzferald, Chrles Kingsley, Jr., and Stephen D Umans, Electric Machinery, 6th edition, Mc. Graw-Hill, New Delhi, 2003.
2. B L Theraja, and A K Theraja, A textbook of Electrical Technology, Vol. 2, AC & DC Machines, S Chand Publications.
3. Gonzalo Abad, *et al*, Doubly Fed Induction Machine: Modelling and Control for Wind Energy Generation, John. Wiley & Sons, Inc., USA, 2011.

4. EEE 3105 (b): COMMUNICATION SYSTEMS

5. **No. of Credits : 4**
6. **No. of Periods/ Week : 4**
7. **Internal Examination - Max. Marks : 30**
8. **External Examination - Max. Marks : 70**
9. **Total Marks : 100**
10.
11. **Unit-I**
12. **Communication System:** Elements of communication System and its Fundamental limitations Need of Modulation.
13. **Random Processes**: Random Process, Stationary Processes, Ergodic Processes, Transmission through LTI, Power spectral density, Gaussian process.
14. **Noise:** External and internal sources of noise, Thermal noise, Calculation of thermal noise, Shot noise, Noise figure, Noise temperature, Equivalent noise bandwidth.
15.
16. **Unit-II**
17. **Amplitude (Linear Modulation):** Generation and detection of DSB, SSB, VSB, Carrier Acquisition, Concept of FDM, AM transmitter and Receiver.
18.
19. **Unit-III**

20. **Angle(Exponential Modulation)**: Types of Angle Modulation, Concepts of Instantaneous frequency, Wideband and Narrowband FM, Generation and detection of FM, Generation and detection of PM, FDM.
21.
22. **Unit-IV**
23. Noise performance of CW Modulation Systems Noise in DSB-SC, SSB-SC and AM system, Noise in FM and PM FM threshold and its extension, Pre-emphasis and De-emphasis in FM.
24.
25. **Unit-V**
26. Sampling theory & pulse modulation Sampling process, sampling theorem, signal reconstruction, flat top sampling of band pass signals, Analog Pulse Modulation: Types of analog pulse modulation, Method of generation and detection of PAM, PWM, PPM, Spectra of pulse modulation, concept of time division multiplexing.
27.
28. **Text books:**
29. 1. Communication Systems S. Haykin, John Willy & Sons.
30. 2. Communication Systems: A.B. Carlson, Mc-Graw-HW.
31. 3. Modem Analog & Digital Communication Systems: B.P. Lathi; Oxford Univ. Press.
32. 4. Analog Communication Systems: PchakrabartiDhanpatRai.
33. **Reference Books:**
34. 1. Carlson, A. Bruce, Crilly, Paul B. & Rutledge, Janet C. / "Communication Systems an Introduction to Signals & Noise in Electrical Communication"/ Tata McGraw-Hill.
35. 2. Kennedy, George & Davis, Bernard / "Electronic Communication Systems" / Tata McGraw-Hill / 4th Ed.

36.EEE 3105 (c): DATABASE MANAGEMENT SYSTEMS

37. **No. of Credits : 4**
38. **No. of Periods/ Week : 4**
39. **Internal Examination - Max. Marks : 30**
40. **External Examination - Max. Marks : 70**
41. **Total Marks** : **100**
42. **1. Introduction**: File system versus a DBMS , Advantages of a DBMS, Describing and Storing Data in a DBMS, The Relational model, Levels of abstraction, Data Independence, Transaction management, Structure of a DBMS.
43.
44. **2. Introduction to Database Design and The Relational Model**: Database Design and ER Diagrams, Entities, Attributes and Entity Sets, Relationships & Relationship Sets, Additional Features of the ER Model, Conceptual Design with ER Model, Introduction to the Relational Model, Integrity Constraints over Relations, Enforcing Integrity Constraints, Querying Relational Data, Logical Database Design: ER to Relational, Introduction to Views, Destroying/ Altering Tables and Views.
45.
46. **3. Relational Algebra and SQL**: Preliminaries, Relational Algebra, The form of a Basic SQL Query, UNION, INTERSECT and EXCEPT, Nested Queries, Aggregate Operators,

Null Values, Complex Integrity Constraints in SQL, Triggers and Active Databases, Embedded SQL, Dynamic SQL, JDBC.

4. Database Design: Schema Refinement and Normal Forms, Introduction to Schema Refinement, Functional Dependencies, Reasoning about FD's, Normal Forms, Properties of Decomposition, Normalization, Other kinds of Dependencies.

5. Transaction Management: The ACID Properties, Transactions & Schedules, Concurrent Execution of Transactions, Lock-Based Concurrency Control.

6. Concurrency Control: 2PL, Serializability and Recoverability, Introduction to Lock Management, Lock Conversions, Dealing with Deadlocks, Specialized Locking Techniques, Concurrency Control without Locking.

7. Crash Recovery: Introduction to ARIES, The Log, Other Recovery-Related Structures, The Write-Ahead Log Protocol, Check pointing, Recovering from a System Crash, Media Recovery.

Text Book:

1. Database Management Systems; Raghu Ramakrishnan, Johannes Gehrke 4 Edition, McGraw-Hill

Reference Book:

1. Database System Concepts; A. Silberschatz, H. Korth 5th Edition, Mc

EEE 3106 (a): COMPUTER ARCHITECTURE AND ORGANISATION

No. of Credits	**: 4**
No. of Periods/ Week	**: 4**
Internal Examination - Max. Marks	**: 30**
External Examination - Max. Marks	**: 70**
Total Marks	: **100**

1. **Register Transfer and Micro operations:** Register Transfer Language, Register Transfer, Bus and Memory Transfers, Arithmetic Micro operations, Logic Micro operations, Shift Micro operations, Arithmetic Logic Shift Unit.

2. **Basic Computer Organization and Design:** Instruction Codes, Computer Registers, Computer Instructions, Timing and Control, Instruction Cycle, Memory-Reference Instructions, Input- Output and Interrupt, Complete Computer Description, Design of Basic Computer, Design of Accumulator Logic.

3. **Micro programmed Control**: Control Memory, Address Sequencing, Micro program Example, Design of Control Unit.

4. **Central Processing Unit:** Introduction, General Register Organization, Stack Organization, Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Program Control, Reduced Instruction Set Computer(RISC)

5. **Pipeline and Vector Processing:** Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISK Pipeline, Vector Processing, Array Processors.

6. **Input/output Organization:** Peripheral Devices, I/O interface, Asynchronous data transfer, Modes of transfer, priority Interrupt, Direct memory access, Input-Output Processor (IOP), Serial Communication.

7. **Memory Organization**: Memory Hierarchy, Main memory, Auxiliary memory, Associate Memory, Cache Memory, and Virtual memory, Memory Management Hardware.

Text Book:

1. Computer System Architecture, M. Morris Mano, Prentice Hall of India Pvt. Ltd., Third Edition, Sept. 2008.

Reference Books:

1. Computer Architecture and Organization, William Stallings, PHI Pvt. Ltd., Eastern Economy Edition, Sixth Edition, 2003.
2. Computer Organization and Architecture, Linda Null, Julia Lobur, Narosa Publications ISBN 81- 7319-609-5
3. Computer System Architecture", John. P. Hayes.

EEE 3107: MOOCS – I

No. of Credits: 2
Total Marks: **100**

List of Courses:

1. **Digital Communication**
2. **Cloud Computing**
3. **Rural Technology And Community Development**
4. **Knowledge Management**
5. **Global Strategy And Technology**
6. **Microelectronic Devices and Circuits**

7. EEE 3108: ELECTRICAL MACHINES LAB – II

8. **No. of Credits : 2**
9. **No. of Periods/ Week : 3**

10. Internal Examination - Max. Marks : 50
11. External Examination - Max. Marks : 50
12. Total Marks : 100

13.EEE 3109: PULSE AND DIGITAL CIRCUITS LAB

14. No. of Credits : 2
15. No. of Periods/ Week : 3
16. Internal Examination - Max. Marks : 50
17. External Examination - Max. Marks : 50
18. Total Marks : 100

EEE 3110: ELECTRICAL MEASUREMENTS LAB

No. of Credits : 2
No. of Periods/ Week : 3
Internal Examination - Max. Marks : 50
External Examination - Max. Marks : 50
Total Marks : 100

List of Experiments

1. Calibration of voltmeter and ammeter.
2. Calibration of UPF wattmeter using phantom loading.
3. Calibration of Energy meter.
4. Measurement of power using 2 Wattmeter method.
5. Measurement of power and power factor using 3 Ammeter method and 3 voltmeter method.
6. Measurement of low resistance by Kelvin's double bridge.
7. Measurement of voltage, current and resistance using dc potentiometer.
8. Measurement of inductance by Anderson's bridge.
9. Measurement of capacitance by Schering's bridge.
10. Measurement of Capacitance by De-Sauty Bridge.
11. Measurement of the high resistance by using loss of charge method.
12. Measurement of active and reactive power by 1- wattmeter method.
13. Crompton D.C. Potentiometer – Calibration of PMMC ammeter and PMMC voltmeter.
14. Dielectric oil testing using H.T. testing Kit.
15. Measurement of frequency by Wien's Bridge.

EEE 3201: POWER SYSTES – II

No. of Credits : 4

No. of Periods/ Week : 4

Internal Examination - Max. Marks : 30

External Examination - Max. Marks : 70

Total Marks : 100

Power Supply Systems: Comparison between Various Systems and Copper Efficiencies, Effect of System Voltage on Transmission Efficiency, Choice of Transmission Voltage, Conductor Size and Kelvin's Law.

Power Distribution Systems: Radial and Ring Main Systems, Different types of AC Distributors with Concentrated and Distributed Loads.

Transmission Line Constants: Inductance and Capacitance of Single Phase and Three Phase Lines, Concept of Self GMDR Mutual GMD Double Circuit Line, Inductance of Composite Conductors, Transposition, Skin Effect and Proximity Effect.

Transmission Line Modeling: Generalized Network Constants, Modeling of Short, Medium and Long Transmission Lines, Rigorous Line Modeling, Circle Diagrams.

Mechanical Design of Transmission Lines: Sag and Tension Calculations, Line Supports, Conductor Materials, Overhead Lines Vs Underground Cables.

Over Head Line Insulators: Types of Insulators, Potential Distribution over a String of Insulators and Methods of Equalizing Potential.

Under-Ground Cables: Types of Cables, Insulation in Cables, Armonning & Covering of Cable, Insulation Resistance OFR Cables, Stress in Insulation, Sheathing in Cable, Use of Inter Sheaths, Capacitance Grading, Capacitance in 3-Core Cables.

EHV & HVDC Transmission:

Introduction, Need of EHV Transmission Lines, Advantages and Disadvantages of EHV Lines, HVDC Transmission System Introduction, Advantages, Disadvantages and Applications of HVDC Transmission System, Types of DC Links.

Corona: Phenomenon of Corona, Critical Voltages, Power Loss due to Corona, Factors Affecting Corona Loss, Radio Interference.

Text Books:

1. A Text Book on Power Systems Engineering by Sony, Gupta, Bhatnagar and Chakrabarti, Dhanapatrai & Co.
2. Electrical Power Systems by C. L. Wadhwa.

Reference Books:

1. Electrical Power by S. L. Uppal.
2. A Course in Power Systems by J. B. Gupta.
3. Electrical Power Transmission and Distribution by S. Siva Nagaraju and S. Satyanarayana.

EEE 3202: MICROPROCESSORS AND MICROCONTROLLERS

No. of Credits	**: 4**
No. of Periods/ Week	**: 4**
Internal Examination - Max. Marks	**: 30**
External Examination - Max. Marks	**: 70**
Total Marks	**: 100**

8085 Microprocessor:

Introduction to microprocessors, micro computers – Architecture of 8085 microprocessor – pin-out diagram of 8085 – Detailed description of the 8085 pins – addressing modes – Memory structure and its requirements – Basic concepts in memory interfacing – Address decoding –

Memory mapping – Machine cycles and bus timings for memory read, memory write, I/O read, I/O write operations – Memory mapped I/O and I/O mapped I/O.

8085 Instructions and programming:
Difference between Machine language, Assembly language and High level language – Brief description of the 8085 instruction set – 8085 programming using data transfer group, arithmetic group, logical group, branch transfer group, stack and subroutines – counters and delay - code conversions.

Interfacing peripherals to 8085:
Function of D/A and A/D converters – Interfacing D/A and A/D converters and necessary programming – Detailed description and interfacing of 8251 USART, 8253/8254 programmable timer, 8255 PPI, 8257 DMA controller, 8259 programmable interrupt controller, 8279 programmable keyboard/display interface

8051 Microcontroller:
Introduction to microcontrollers – Comparison between microprocessors and microcontrollers – Functional block diagram of 8051 microcontroller and its description – 8051 pin-out diagram and description of 8051 pins – Interfacing external memory to 8051 – implementing counters and timers in 8051 – Serial data transfer using 8051 – Various interrupts and its programming in 8051.

Advanced topics in Microprocessors:
Architecture of 8086 microprocessor – Addressing modes – RS232 communication standard – Interfacing Stepper motor, elevator, traffic controller to 8085 microprocessor.

Text books:
1. Ramesh S. Gaonkar, Microprocessor Architecture, Programming, and Applications, New Age International Publishers, New Delhi, 2nd edition, 1996.
2. Kenneth J. Ayala, The 8051 Microcontroller : Architecture, Programming, & Applications, Penram International Publishing (I) Pvt. Ltd., Mumbai, 2nd edition, 2006.
3. Douglas V. Hall, Microprocessor and Interfacing : Programming and hardware, Tata McGraw-Hill Publishing Company Limited, New Delhi, 1997.

Reference Books:
1. B. Ram, Fundamentals of Microprocessors and Microcomputers, Dhanpat Rai & sons, New Delhi, 4th edition, 1998.
2. Muhammad Ali Mazidi and Janice Gillispie Mazidi, The 8051 Microcontroller and Embedded Systems, Pearson Education (Singapore) Pte. Ltd., New Delhi, 2003.
3. A K Ray and K M Bhurchandi, Advanced Microprocessors and Peripherals : Architecture, Programming and Interfacing, Tata McGraw Hill Publishing Company Limited, New Delhi, 2002.

EEE 3203: POWER ELECTRONICS

No. of Credits	**: 4**
No. of Periods/ Week	**: 4**
Internal Examination - Max. Marks	**: 30**
External Examination - Max. Marks	**: 70**
Total Marks	: **100**

Thyristors: Introduction, Principle of Operation, Two Transistor Model, Gate Characteristics, Turn On Methods, Turn Off Methods, Thyristor Ratings, Measurement of Thyristor Parameters, Protection Circuits.

Gate Triggering Circuits: Firing of Thyristors, Pulse Transformers, Opto Isolators, Gate Triggering Circuits, Resistance Firing, Resistance-Capacitance Firing, UJT, Programmable UJT (PUT), UJT as an SCR Trigger, Synchronized UJT Triggering.

Series And Parallel Operation of Thyristors: Equalizing Networks, Triggering, String Efficiency, De-rating.

Phase Controlled Rectifiers: Single Phase-Half Wave, Full Wave & Bridge Controlled Rectifiers, Three-Phase Half Wave and Fully Controlled Rectifiers, Three-Phase Fully Controlled Bridge Rectifier.

Inverters: Classification, Series and Parallel Inverters, Self Commutated Inverters, The Mc Murray Inverter, The Mc Murray Bedford Inverter, Harmonic Reduction, Current Source Inverters.

Choppers: Principle of Operation, Step Up, Step Down Choppers, Jones Chopper, Morgan Chopper

Cyclo-converters: Principle of Operation, Single Phase To Single Phase Cyclo-converters, Cyclo-converter Circuits for Three-Phase Output, Control Circuits

Modern Power Semiconductor Devices: Basic Structure and Characteristics of Diode, Transistor, MOSFET, IGBT, GTO, DIAC, TRIAC

FACTS Devices: Introduction to SVC, TCSC, SSSC, STATCOM

Text Books:

3. Power Electronics by M.D.Singh, K.B.Khanchandani, Tata Mc Graw Hill Education (India) Private Limited.
4. FACTS controllers in Power Transmission and Distribution by K.R.Padiyar, New Age International.

Reference Books:

1. Power Electronic Circuits Devices and Applications by M.H.Rashid, Pearson India
2. Power Electronics by Dr. P S Bhimbra, Khanna Publishers.
3. **EEE 3205 (b) : UTILIZATION OF ELECTRICAL ENERGY (UEE)**
4.
5. **No. of Credits : 4**

6. No. of Periods/ Week : 4

7. Internal Examination - Max. Marks : 30
8. External Examination - Max. Marks : 70
9. **Total Marks** : **100**
10. **UNIT—I**
11. **Electric Heating & Welding:** Electric Heating: Advantages and methods of electric heating, resistance heating induction heating and dielectric heating. Electric welding: resistance and arc welding, electric welding equipment, comparison between A.C. and D.C. Welding.
12. **UNIT — II**
13. **Illumination:** Introduction, terms used in illumination, laws of illumination, polar curves, photometry, integrating sphere, sources of light. Discharge lamps, MV and SV lamps — comparison between tungsten filament lamps and fluorescent tubes, Basic principles of light control, Types and design of lighting and flood lighting.
14. UNIT-III
15. **Electrical Circuits used in Refrigeration** Air Conditioning and Water Coolers: Principle of air conditioning, vapour pressure, refrigeration cycle, eco-friendly refrigerants Description of Electrical circuit used in refrigerator, air conditioner, Lift wiring and Automobile wiring.
16. **UNIT-IV**
17. **Electrolytic Processes:**
18. Need of electro-deposition, Laws of electrolysis, process of electrodeposition – clearing, operation, deposition of metals, polishing, buffing, Equipment and accessories for electroplating, Factors affecting electrodeposition, Principle of galvanizing and its applications, Principle of anodising and its applications, Electroplating on non-conducting materials, Manufacture of chemicals by electrolytic process and electrolysis process
19.
20. UNIT V
21.
22. ELECTRICAL SAFETY, WIRING & INTRODUCTION TO POWER SYSTEM
23. Safety measures in electrical system- types of wiring- wiring accessories-
24. staircase, fluorescent lamps & corridor wiring- Basic principles of earthing-Types of earthing- Simple layout of generation, transmission & distribution of power.
25.
26.
27. **Text Books:**
28. 1. C.L. Wadhwa, 'Generation, Distribution and Utilization of Electrical Energy', New Age International Pvt. Ltd, 2003.
29. 2. B.R. Gupta, 'Generation of Electrical Energy', Eurasia Publishing House (P) Ltd, New Delhi, 2003.
30.
31.
32.
33.
34.

35. **Reference Books:**
36. 1. H. Partab, 'Art and Science of Utilisation of Electrical Energy', Dhanpat Rai and Co, New Delhi, 2004.
37. 2. E. Openshaw Taylor, 'Utilization of Electrical Energy in SI Units', Orient Longman Pvt. Ltd, 2003
38. 3. Dash.S.S, Subramani.C,Vijayakumar.K,"BasicElectrical Engineering", First
39. edition, Vijay Nicole Imprints Pvt.Ltd,2013

EEE 3205 (c): POWER STATION PRACTICE

No. of Credits	**: 4**
No. of Periods/ Week	**: 4**
Internal Examination - Max. Marks	**: 30**
External Examination - Max. Marks	**: 70**
Total Marks	: **100**

1. **Design of Power Station:** Introduction, selection of sizes and location of generating stations, interconnections issues with wind and Solar PV.

2. **Substation Design:** Determination of voltage regulation and losses in power system, shifting of distribution transformer centre, Substation layout, sizes and locations of sub stations, Substation equipments specifications ratings and its operation from design view point, Cathodic Protection, Gas Insulated Substation (GIS).

3. **Power System Earthing – Power Station and Sub Station Earthing** Objectives, definitions, tolerable limits of body currents, soil resistivity, measurement of soil resistivity, earth resistance, measurement of earth resistance, tolerable step and touch voltage, actual step and touch voltage, design of earthing grid, impulse behaviour of earthing system.

4. **Insulation Coordination and Location of Lightning Arrestor :** Introduction, definitions, insulation-co-ordination curves, determination of line insulation, Basic Insulation level (BIL), Insulation levels of substation equipments, Lightning arrestor selection and location, Selection of arrestor voltage rating, arrestor discharge voltage and arrestor discharge current, protective margin.

5. **HVDC Transmission:** Merits and demerits of HVDC transmission, one line diagram, types of DC link, necessary equipments, operation and control, applications, recent advances, HVDC in India.

Note: It is suggested that based on the above syllabus, visits for LT/HT Electrification and 220KV/ 400 KV substations should be carried out.

Text Books:

1. Electrical Power System Design – M. V. Deshpande, TMH publication
2. Electrical Power System Design – B. R. Gupta, S. CHAND
3. Electrical Power System Planning – A. S. Pabla, TMH publication
4. Substation Design – Satnam & Gupta, Dhanpat Rai and Co.
5. A course in Electrical Power- Soni, Gupta and Bhatnagar, Dhanpat Rai & Sons

EEE 3206 (a) : NON CONVENTIONAL ENERGY SOURCES

No. of Credits	**: 4**
No. of Periods/ Week	**: 4**
Internal Examination - Max. Marks	**: 30**
External Examination - Max. Marks	**: 70**
Total Marks	: **100**

Energy Sources: Classification, Indian energy scenario, prediction regarding fossil fuels, generation of non conventional and renewable energy resources, Description of renewable energy sources, Achievements of renewable energy in India, Use of renewable energy in agriculture in India.

Solar Energy: Environmental impact of solar power, principles of solar radiation, solar constant, extraterrestrial and terrestrial solar radiation, solar radiation on tilted surfaces, solar radiation data, instruments for measuring solar radiation, sun shine.

Solar Energy Collectors: Principles of solar energy conversion, Flat plate and Concentrating type collectors, energy balance and collector efficiency, solar thermal plants, thermal energy storage for solar heating and cooling, limitations and applications.

Photovoltaic Technology: Present status, solar cells, cell technology, characteristics of PV systems, equivalent circuit, array design, Integrated PV systems, components, sizing and economics, peak power operation, MPPT, Standalone and grid integrated systems.

Wind Energy: Wind power sources, wind characteristics, site selection, criterion, momentum theory, Components of wind energy systems, performance and limitations, classification of wind energy collectors, aerodynamic forces acting on blades, applications and environmental impacts.

Nonconventional Energy: Detailed description of nonconventional energy sources of bio energy, chemical energy, MHD, geothermal energy, ocean energy systems, General features, Basic principles of operation, classification, applications and environmental impacts.

Renewable Energy Generation in Power Systems: Distributed Generation, Renewable energy penetration, Point of common coupling (PCC), Connection voltage, Voltage Effects, Steady state voltage rise, Thermal Limits, Other Embedded Generation Issues, Islanding.

Text Books:

1. Non Conventional Energy Sources by GD Rai, Khanna Publishers.

2. Renewable Energy in Power Systems by Leon Freris and David Infield, John Wiley & Sons, Ltd.

Reference Books:

1. Advanced renewable energy systems; Part 1 by S. C. Bhatia, Woodhead Publishing India Pvt Ltd.

2. Renewable Energy Sources and Methods by Anne Maczulak, Green technology info print publication.

3. Internet

EEE 3207: MOOCS – II

No. of Credits: 2
Total Marks: **100**

List of Courses:

1. **Planning For Sustainable Development**
2. **Infrastructure Systems Planning**
3. **Materials In Electrical Systems**
4. **Mechatronics**
5. **Probability And Statistics**
6. **Computer Aided Analysis And Design**

resources

EEE 3208: CONTROL SYSTEMS LAB

No. of Credits	**: 2**
No. of Periods/ Week	**: 3**
Internal Examination - Max. Marks	**: 50**
External Examination - Max. Marks	**: 50**
Total Marks	**: 100**

List of Experiments

1. D C SERVO MOTOR SPEED TORUQE CHARACTERISTICS
2. P I D CONTROLLER
3. MAGNETIC AMPLIFIER
4. SYNCHRO TRANSMITTER – RECEIVER PAIR
5. STUDY OF POTENTIOMETER
6. MICROPROCESSOR BASED STEPPER – MOTOR CONTROLLER
7. ON/OFF TEMPERATURE CONTROLLER
8. LINEAR SYSTEM SIMULATOR
9. D C POSITION CONTROL SYSTEM
10. ANALOG AND DIGITAL SERVO MOTOR
11. A C SERVO MOTOR SPEED TORQUE CHARACTERISTICS
12. LEAD-LAG COMPENSATING NETWORK
13. ARMATURE CONTROL OF D C SERVO MOTOR
14. FIELD CONTROL DC SERVO MOTOR
15. CLOSED LOOP FEEDBACK CONTROL SYSTEM
16. LINEAR VOLTAGE DIFFERENTIAL TRANSFORMER
17. MOCROPROCESSOR BASED P I D CONTROLLER
18. TRANSDUCER TRAINER
19. MAGNETIC LEVITATION SYSTEM

20. TWIN ROTOR MIMO SYSTEM TRAINER
21. INVERTED PENDULUM CONTROL SYSTEM
22. GIMBAL STABILISATION SYSTEM TRAINER

EEE 3209: POWER ELECTRONICS LAB

No. of Credits : 2
No. of Periods/ Week : 3
Internal Examination - Max. Marks : 50
External Examination - Max. Marks : 50
Total Marks : 100

LIST OF EXPERIMENTS

1) STUDY AND DESIGN OF VALVE FIRING CIRCUITS
2) DESIGN OF R,RC FIRING CIRCUITS FOR SCR
3) SINGLE PHASE HALF CONTROLLED BRIDGE RECTIFIER WITH R, RL, RLE LOADS
4) SINGLE PHASE FULL CONTROLLED BRIDGE RECTIFIER WITH R, RL, RLE LOADS
5) SINGLE PHASE DUAL CONVERTER CIRCUIT
6) SINGLE PHASE CYCLOCONVERTER CIRCUIT
7) DC JONES CHOPPER
8) SINGLE PHASE SERIES INVERTER
9) SINGLE PHASE PARALLEL INVERTER
10) SINGLE PHASE AC CONTROLLER USING TRIAC
11) DESIGN OF COMMUTATION CIRCUITS FOR SCR'S

EEE 3210: MICROPROCESSORS AND MICROCONTROLLERS LAB

No. of Credits : 2
No. of Periods/ Week : 3
Internal Examination - Max. Marks : 50
External Examination - Max. Marks : 50
Total Marks : 100

NEW REGULATION SYLLABUS FOR 2015-16 ADMITTED BATCH.