EEMN01	ELECTRICAL CIRCUITS AND NETWORKS	3L:1T:0P	4 Credits
Sessional Marks :**40**		End Semester Examination Marks: **60**	

Course Outcomes: At the end of this course, students will demonstrate the ability to

1. Understand pre requisites of Electric circuits
2. Apply network theorems for the analysis of electrical circuits.
3. Understand and Analyze AC Circuits

UNIT-1

Elementary Concepts: Prerequisite: Concept of Potential difference. Current and resistance. Ohm's law, effect of temperature on resistance, resistance temperature coefficient, insulation resistance. SI units of work Power and Energy. Conversion of energyfrom one form to another in electrical and thermal systems.

UNIT -2

D. C. Circuits: Kirchhoff's law, ideal and practical voltage and current sources. Mesh andNodal analysis (Super node and super Mesh excluded). Source transformation. Star delta transformation. Superposition theorem, Thevevnins's theorem Norton's theorem, maximum power transfer theorem (Source transformation not allowed for superposition theorem, Mesh and Nodal analysis.

UNIT- 3

A.C. Fundamentals: Sinusoidal voltage and currents, their mathematical and graphical representation, concept of cycle period, frequency, instantaneous, peak, average, r.m.s. values, peak factor, and form factor, phase difference, lagging, leading and in phase quantities and phasor representation. Rectangular and polar representation of phasors.

Study of A.C circuits of pure resistance, inductance and capacitance and corresponding voltage-current phasor diagrams, voltage – current and power waveforms.

UNIT- 4

Single phase AC Circuits: Study of series and parallel R-L, R-C, R-L-C circuits, conceptof impedance and admittance for different combinations, wave form and relevant voltage current phasor diagrams. Concept of active, reactive, apparent, complex power and power factor, resonance in series and parallel RLC circuit. Q- factor and bandwidth

UNIT- 5

Polyphase AC circuits: Concept of three phase supply and phase sequence. Balanced and unbalanced loads voltage current and power relations in three phase balance star and deltaloads and their phasor diagrams.

Text Books:

1. Engineering Circuit Analysis William H Hayt et al Mc Graw Hill 8th Edition, 2014
2. Network Analysis M.E.Vanvalkenburg Pearson 3rd Edition , 2014
3. Fundamentals of Electric Circuits Charles K Alexander Matthew N O Sadiku Mc Graw Hill 5thEdition,2013

Reference Books:

1. Engineering Circuit Analysis J David Irwin et al Wiley India 10th Edition, 2014
2. Electric Circuits Mahmood Nahvi Mc Graw Hill 5th Edition, 2009
3. Introduction to Electric Circuits Rich ard C Dorf and James A Svoboda Wiley 9th Edition, 2015
4. Circuit Analysis ; Theory and Practice Allan H Robbins Wilhelm C Miller Cengage 5th Edition,2013
5. Basic Electrical Engineering V K Mehta, Rohit Mehta S Chand 6th Edition 2015

EEMN02	ELECTRICAL MACHINES	3L:1T:0P	4 Credits
Sessional Marks :**40**		End Semester Examination Marks: **60**	

Course Outcomes: At the end of the course, students will be able to

1. Understand different types of DC generators, Motors
2. Analyze and understand performance aspects of various testing methods ofDC Machine
3. Understand Transformers, their construction, operation and applications.
4. Understand the operation of AC machine
5. Analyze performance characteristics of AC machines

UNIT- I

D.C. Generators – Principle of Operation – Constructional Features – E. M.F Equation– Numerical Problems – Methods of Excitation – Separately Excited and Self Excited Generators – Build-Up of E.M.F - Critical Field Resistance and CriticalSpeed - Load Characteristics of Shunt, Series and Compound Generators- Applications

UNIT – II

D.C Motors – Principle of Operation – Back E.M.F. –Torque Equation – Characteristics and Application of Shunt, Series and Compound Motors-Speed Control of D.C. Motors: Armature Voltage and Field Flux Control Methods. ThreePoint Starter-Losses – Constant & Variable Losses – Calculation of Efficiency - Swinburne's Test.

UNIT-III

Single Phase Transformers - Constructional Details- Emf Equation - Operation onNo Load and on Load - Phasor Diagrams-Equivalent Circuit - Losses and Efficiency-Regulation-OC and SC Tests – Sumpner's Test - Predetermination of Efficiency and Regulation.

UNIT-IV

Polyphase Induction Motors-Construction Details of Cage and Wound Rotor Machines- - Principle of Operation – Slip- Rotor Emf and Rotor Frequency - TorqueEquation- Torque Slip Characteristics.

UNIT – V

Principle And Constructional Features of Salient Pole and Round Rotor Machines – E.M.F Equation- Voltage Regulation by Synchronous Impedance Method- Theoryof Operation of Synchronous Motor.

TEXT BOOKS:

1. Electric Machines –by I.J.Nagrath & D.P.Kothari,Tata Mc Graw Hill, 7 th Edition.2005
2. Basic Electrical Engineering –By T.K.Nagasarkar and M.S. Sukhija Oxford UniversityPress.

REFERENCE BOOKS:

1. Electrical and Electronic Technology, Hughes, Pearson Education.
2. Electrical Machines, P. S. Bimbhra, Khanna Publishers, 2011.
3. Basic Electrical Engineering, 2 nd Edition, V.N. Mittle and Aravind Mittal, Mc Grawhill Education, 2006.

EEMN03	POWER SYSTEMS	3L:1T:0P	4 Credits
Sessional Marks :**40**		End Semester Examination Marks: **60**	

Course Outcomes: At the end of this course, students will be able to

1. Analyze Economic aspects of power stations
2. Understand the concepts of AC Distribution and Substations of power systems.
3. Study and analyze Overhead line insulators and Underground cables

UNIT–I

Fundamentals of Power Systems: Evolution of Power Systems-Present day Scenario-Structure of Power Systems-Conventional & Renewable Energy Sources

Power Stations: Hydro-electric, Thermal Stations, Gas Turbine and Nuclear Power stations-Selection of Site, Main parts, layout and working principle, Basics of Renewable Energy Sources

UNIT–II

Economic aspects of power stations- Types of loads-Load curve, load duration and integrated load duration curves-Load factor-Demand factor-Diversity factor-Capacity factor-Utilization and plant use factors. The effect of these factors on generation-Number and size of generating units-Base load and peak load plants-Costs of electrical energy-Types of tariff charges on consumers

UNIT–III

AC Distribution: Comparison of AC single phase, 3 phase 3 wire and 3 phase 4 wire systems with DC 2 wire-Types of primary distribution systems-Types of secondary Distribution systems-AC distributors fed at one end and at both ends-Kelvin's Law-Limitations of Kelvin's Law-Load Estimation-Selection voltage of primary distribution-Choice of scheme-Size of feeders, power factor correcting methods.

UNIT-IV

Substations: Number and size-Location and installation-The main equipment in substations-Busbar Arrangements-Key diagram of a typical primary substation.

Overhead line insulators: Introduction-Types of insulators-Potential distribution over a string of insulators-Methods ofequalizing the potential, string efficiency-Testing of insulators.

UNIT-V

Underground Cables: Introduction-The insulation types-Insulating materials for EHV voltage cables-Classification of cables - Parameters of single core cable-Grading of cables-Capacitance of three core belted cablebreak down of cables-Heating of cables –dielectric loss and Sheath losses-Current rating of cables.

Text Books:

1. C..L.Wadhwa, "Electrical Power systems" New age publications.
2. B.R.Gupta, "Power system analysis and design" third edition, Wheeler publishing.
3. William D.Stevenson "Elements of power system analysis" fourth edition, Mc Grawhill International editions.

Reference Books:

1. C.L.Wadhwa, "Generation Distribution and utilization of Electrical energy" , New Age International
2. AR Bergen and Vijay Vittal, "Power system analysis", Pearson education, 2001

EEMN04	CONTROL SYSTEMS	3L:1T:0P	4 Credits
Sessional Marks :**40**		End Semester Examination Marks: **60**	

Course Outcomes: At the end of this course, students will demonstrate the ability to

1. Understand the modeling of linear-time-invariant systems using transfer function.
2. Understand the concept of stability and its assessment for linear-time invariant systems.
3. Understand the applications of control systems in industries.

UNIT–I

Introduction to Control systems: Scope of Control System Engineer – Classification of Control System – Historical development of Control system – System representation – Control system technologies – Types of control Systems: open loop and closed loop systems - Advantages and disadvantages of control systems – Examples of open loop and closed loop control systems.

UNIT-II

Mathematical modeling of physical systems: Transfer function and limitations –Mathematical modeling and transfer functions of electrical, mechanical systems – Electrical analogues – Block diagram reduction techniques – signal flow graph and Mason's gain formulae.

UNIT-III

Time domain analysis: Standard test input signals – step response of first and second order systems – Time domain specifications – Problems.

Introduction to stability – Necessary conditions for stability – Characteristic equation and location of roots in s-plane for stability – R-H stability Criterion.

UNIT-IV

Frequency domain analysis: Introduction to frequency domain – Frequency Domain Specifications – Correlation between time domain and frequency domain responses – Frequency response plots – Polar plots – Bode plots.

Non linear systems – Introduction – Common physical non-linearities – Dead Zone, Jump Resonance, Friction, Hysteresis etc.

UNIT-V

Introduction to Compensators – Need for compensators – Types of Compensators – Transfer function of compensators – Comparison of compensators.

Controllers: Introduction to controllers – Need for controllers – Types of Controllers – Transfer function of controllers – Comparison of controllers.

Text Books:

1. I.J.Nagrath and M.Gopal, "Control system Engineering", Wiley Eastern Ltd.
2. Benjamin C. Kuo, "Automatic Control system", Prentice Hall, 1995.
3. Ch. Chengaiah and G.V Maruteswar, "Control Systems A comprehensive Lab Manual", B.S. Publications, 2017.
4. A Nagoor Khani, "Advanced Control Theory", CBS Publications, 2020.

EEMN05	POWER ELECTRONICS	3L:1T:0P	4 Credits
Sessional Marks :**40**		End Semester Examination Marks: **60**	

Course Outcomes: At the end of this course students will demonstrate the ability to

1. Understand the differences between signal level and power level devices.
2. Analyze controlled rectifier circuits.
3. Analyze the operation of DC-DC choppers.
4. Analyze the operation of voltage source inverters.

UNIT-I

Silicon controlled Rectifier – Static characteristics and ratings – turn-ON and turn-OFF mechanism – Gate characteristics – Series and parallel operation of SCR's static and dynamic equalization circuits – Protection circuits – Design of snubber circuit – Class A,B,C,D,E types of commutation circuits.

UNIT-II

Phase controlled Rectifiers - Principles of phase control – Half-wave and full- wave controlled rectifiers with resistive, inductive and RLC load – Freewheeling diode operation – Bridge rectifiers – Single phase and three phase Rectifiers with inductive load – Half and fully controlled rectifiers – freewheeling diode operation – Effect of source inductance –
Dual converter – circulation and non-circulating current mode of operation.

UNIT-III

Choppers – D.C.Choppers – Principles of operation – control strategies, constant and variable frequency system, current limit control – Types of chopper circuits – Type-A, Type B and Type E chopper circuits Morgan chopper Jone's chopper

UNIT-IV

Inverters – Classification – series and parallel inverters improved series inverters – Bridge inverters – Commutation circuits – current and voltage commutation circuits – single phase and three phase inverters – output waveform control – Mc Murray Inverter – Introduction to PWM techniques

UNIT-V

Cyclo-converters – Principle of operation – single phase step-up and step down cycloconverters – Three-phase half-wave cycloconverters – output voltage equation – circulation and non-circulating current mode of operation – Load commutated cycloconverter.
Speed control – Speed control of DC motors using controlled rectifiers and choppers – Speed control of induction motors using inverters

Text Books:

1. An introduction to Thyristors and their application – Dr.M.Ramamoorthy – East West press.
2. Power Electronics - Dr.P.S.Bimbhra 2nd edition – Khanna publishers.
3. Power Electronics – M.D.SINGH and K.B.KHANCHANDANI – Tata Mc.Graw Hill publishers.
4. Industrial and Power Electronics – RASHID(3rd Edition)

EEMN06	ELECTRONICS ENGINEERING	3L:1T:0P	4 Credits
Sessional Marks :**40**		End Semester Examination Marks: **60**	

Course Outcomes: At the end of this course students will demonstrate the ability to

1. Analyze the general – and special-Purpose diode circuits
2. Design biasing circuits for BJT
3. Analyze BJT Circuits in small-signal domain
4. Analyze basic FET Circuits
5. Verify the functionalities of basic digital gates and logic families

UNIT-1

DIODE THEORY AND APPLICATIONS Basic idea about forward bias, reversebias and VI characteristics, ideal diode, surface mount diodes, Zener diode, half wave rectifier, full wave rectifier, bridge rectifier, RC and LC filters, Design of un-regulated DC power supply, Clipping circuit, Clamping circuit, voltage multiplier circuit.

Light emitting diode (LED). Zener diode, Zener diode circuit for voltage regulation,Photo diode, Solar cell, PIN diode, Varactor, Schottky diode, Varistors, Tunnel diode

UNIT-2

BIPOLAR JUNCTION TRANSISTORS AND ITS BIASING BJT operation, BJT voltages and currents, CE, CB and CC characteristics, DC load line and bias point, base bias, emitter feedback bias, collector feedback bias, voltage divider bias, Thermal stability, biasing BJT switching circuits, transistor power dissipation and switching time

UNIT-3

AC ANALYSIS OF BJT CIRCUITS AND SMALL SIGNAL AMPLIFIER Coupling and bypass capacitors, AC load lines, Transistor models and parameters, Common emitter circuit analysis, common base circuit analysis, common collector circuit analysis, Comparison of CE, CB and CC circuits, Transistor as a switch

UNIT-4

Field effect transistors (FET) and its biasing Junction field effect transistors(JFET), Comparison of BJT and FET, JFET characteristics, FET, Biasing in ohmic region and active region, Trans-conductance, amplification and switching, MOSFETs (D-type and E-type MOSFET), CMOS introduction

UNIT-5

Digital Circuits Basic gates AND, OR, NOT, NAND, NOR, EX-OR, EX-NOR, Building AND, OR Gate with diodes, Digital logic families RTL, DTL, TTL, CMOS, Comparison of logic families

Text Books:

1. David A. Bell, "Electronic Devices and Circuits", Oxford University Press, Fifth edition
2. Albert Malvino & David, "Electronic Principles", Tata McGraw-Hill, Seventh edition
3. R. L. Boylestad and L. Nashelsky, "Electronic Devices and Circuit Theory", Pearson Education

Reference Books:

1. Jaccob Millman, Chritos Halkias, Chetan D Parikh, "Integrated Electronics", Tata McGraw-Hill, Second edition
2. Albert Malvino & David, "Problems and Solutions in Basic Electronics, McGraw Hill Education