

COURSE STRUCTURE

B. Tech. ELECTRICAL & ELECTRONICS ENGINEERING

II YEAR

I SEMESTER

S.No.	Subject Code	Subject Title	Periods per week			C	Scheme of Examination Maximum Marks		
			L	T	P		Int.	Ext.	Total
1	14120306	Electrical Circuits Analysis – I	3	1	-	3	30	70	100
2	14120302	Electro Magnetic Field	3	1	-	3	30	70	100
3	14120303	Electrical Machines – I	3	1	-	3	30	70	100
4	14129301	Complex Variable and Statistical Methods*	3	1	-	3	30	70	100
5	14123305	Fluid Mechanics & Hydraulic Machines	3	1	-	3	30	70	100
6	14124304	Electronic Devices & circuits	3	1	-	3	30	70	100
7	14139397	Soft Skills – I	3	-	-	-	-	-	-
8	14124311	Electronic Devices & Circuits	--	-	3	2	50	50	100
9	14123312	Fluid Mechanics & Hydraulic Machines Lab	--	-	3	2	50	50	100
Total			21	6	9	22	330	520	850

L- LECTURE T- TUTORIAL P – PRACTICAL Int. – INTERNAL Ext. – EXTERNAL C – CREDITS

COURSE STRUCTURE

B. Tech. ELECTRICAL & ELECTRONICS ENGINEERING

II YEAR

II SEMESTER

S.No.	Subject Code	Subject Title	Periods per week			C	Scheme of Examination Maximum Marks		
			L	T	P		Int.	Ext.	Total
1	14120401	Electrical Circuit analysis – II	3	1	-	3	30	70	100
2	14124402	Switching Theory and Logic Design*	3	1	-	3	30	70	100
3	14120403	Power Systems – I	3	1	-	3	30	70	100
4	14120404	Electrical Machines – II	3	1	-	3	30	70	100
5	14120405	Electrical Measurements*	3	1	-	3	30	70	100
6	14124406	Pulse & Digital Circuits	3	1	-	3	30	70	100
7	14120411	Electrical Machines – I Lab	3	-	3	2	50	50	100
8	14120412	Electrical Circuits Lab	--	-	3	2	50	50	100
Total			21	6	6	22	280	520	800

L- LECTURE T- TUTORIAL P – PRACTICAL Int. – INTERNAL Ext. – EXTERNAL C – CREDITS

II YEAR – I SEMESTER	T	P	C
	3+1	0	3
Sub Code: 14120306	ELECTRICAL CIRCUIT ANALYSIS-I		

Course Objective: This course introduces the basic concepts of circuit analysis which is the foundation for all subjects of the Electrical Engineering discipline. The emphasis of this course is laid on the basic analysis of circuits which includes single phase circuits, magnetic circuits, theorems, transient analysis and network topology.

UNIT-I

Objective: To study the concepts of positive elements type of sources and various network reduction techniques.

Introduction to Electrical Circuits

Passive components and their V-I relations, Sources (Dependent and Independent)- Kirchoff's laws, Network reduction techniques(Series, parallel, series-parallel, star-to-delta or delta-to-star transformation), Source transformation technique , Nodal analysis, mesh analysis.

UNIT-II

Objective: To understand the behaviour of RLC network for sinusoidal excitations.

Single Phase A.C Circuits

periodic wave forms (determination of RMS value, average value and form factor) , Concept of Phase angle and Phase difference , Complex and polar forms of representations , Steady state analysis of R,L and C circuits , Power factor and its significance –Real ,Reactive and apparent Power.

UNIT-III

Objective: To study the performance of R-L, R-C, and R-L-C circuits with verification of one of the parameters and to understand the concept of resonance.

Resonance

Locus diagrams for various combinations of R, L and C, Resonance, concept of band width and Q factor.

UNIT-IV

Objective: To study the concept of magnetic coupled circuit.

Magnetic Circuits

Basic definition of MMF , flux and reluctance , Analogy between electrical and magnetic circuits , Faraday's laws of electromagnetic induction-concept of self and mutual inductance-dot convention-coefficient of coupling-composite magnetic circuit-analysis of series and parallel magnetic circuits.

UNIT-V

Objective: To understand the applications of network topology to electrical circuits.

Network topology

Definitions – Graph – Tree, Basic cutset and Basic tieset matrices for planar networks – Loop and Nodal methods of analysis of Networks with dependent & independent voltage and current sources – Duality & Dual networks.

UNIT-VI

Objective: To understand the applications of network theorems for analysis of electrical networks.

Network theorems (DC & AC Excitations)

Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum Power Transfer theorem, Reciprocity theorem, Millman's theorem and compensation theorem.

Text Books:

1. Engineering Circuit Analysis by William Hayt and Jack E.Kemmerley,Mc Graw Hill Company,6th edition
2. Network Analysis: Van Valkenburg; Prentice-Hall of India Private Ltd.

Reference Books:

1. Introduction to circuit analysis and Design by Tildon Glisson Jr, Spinger Publications.
2. Electrical Circuits by K.S Suresh Kumar , Pearson Publications
3. Electrical Circuits by David A. Bell, Oxford Publications
4. Introductory circuit analysis by Robert L Boylestad , Pearson Publications
5. Circuit Theory (analysis and Synthesis) by A.Chakrabarhi, Dhanpat Rai &Co.

Web Resources:

- 1)<http://www.mathtutordvd.com/products/Engineering-Circuit-Analysis- Volume-1.cfm>
- 2)<http://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-002-circuits-and-electronics-spring-2007/video-lectures/lecture-2/>
- 3)<http://www.facstaff.bucknell.edu/mastascu/elessonsHTML/Circuit/Circuit1.html>

II YEAR – I SEMESTER	T	P	C
	3+1	0	3
Sub Code:14120302	ELECTRO MAGNETIC FIELDS		

Course Objective: Electromagnetic fields is the foremost pre-requisite course for most of the subjects in electrical engineering. Either in enunciation of basis of electrical elements R, L and C that are building blocks of any electrical device or in the illustration of energy transfer from mechanical to electrical and vice-versa its role is crucial. This course also includes the famous works of coulomb, ampere, faraday, maxwell etc. To the field of electrical engineering.

UNIT – I

Objective: To study the production of electric field and potentials ue to different configurations of static charges.

Electrostatics:

Electrostatic Fields – Coulomb’s Law – Electric Field Intensity (EFI) – EFI due to a line and a surface charge – Work done in moving a point charge in an electrostatic field – Electric Potential – Properties of potential function – Potential gradient – Guass’s law – Maxwell’s first law, $\text{div}(\mathbf{D}) = \frac{\rho}{\epsilon}$ Laplace’s and Poison’s equations – Solution of Laplace’s equation in one variable.

UNIT – II

Objective: To study the properties of conductors and dielectric, calculate the capacitance of different config-various and understand the concept of conduction and convection current densities.

Conductors - Dielectric & Capacitance:

Electric dipole – Dipole moment – potential and EFI due to an electric dipole – Torque on an Electric dipole in an electric field – Behavior of conductors in an electric field – Conductors and Insulators.

Polarization - Boundary conditions between conduction to dielectric and dielectric to dielectrics. Capacitance – Capacitance of parallel plate and spherical and co-axial cables with composite dielectrics – Energy stored and energy density in a static electric field – Current density – conduction and Convection current densities – Ohm’s law in point form – Equation of continuity

UNIT – III

Objective: To study the magnetic fields produced by currents in different configurations, application of amperes law and Maxwell’s second and third equations.

Magneto Statics & Ampere’s law:

Static magnetic fields – Biot-Savart’s law – Oesterd’s experiment - Magnetic field intensity (MFI) – MFI due to a straight current carrying filament – MFI due to circular, square and

solenoid current – Carrying wire – Relation between magnetic flux, magnetic flux density and MFI – Maxwell’s second Equation, $\text{div}(\mathbf{B})=0$.

Ampere’s circuital law and its applications viz. MFI due to an infinite sheet of current and a long filament current carrying conductor - Point form of Ampere’s circuital law – Maxwell’s third equation, $\text{Curl}(\mathbf{H})=\mathbf{J}$,

UNIT – IV

Objective: To study the magnetic force and torque through Lorentz force equation magnetic field environment like conductors and other current loops.

Force in Magnetic fields:

Magnetic force - Moving charges in a Magnetic field – Lorentz force equation – force on a current element in a magnetic field – Force on a straight and a long current carrying conductor in a magnetic field – Force between two straight long and parallel current carrying conductors – Magnetic dipole and dipole moment – a differential current loop as a magnetic dipole – Torque on a current loop placed in a magnetic field

UNIT – V

Objective: To develop the concept of self and mutual inductances and energy stored.

Self and Mutual inductance:

Self and Mutual inductance – determination of self-inductance of a solenoid and toroid and mutual inductance between a straight long wire and a square loop wire in the same plane – energy stored and density in a magnetic field.

UNIT – VI

Objective: To study time varying and Maxwell’s equations in different forms and maxwells fourth equation for the induced emf.

Time Varying Fields:

Time varying fields – Faraday’s laws of electromagnetic induction – Its integral and point forms – Maxwell’s fourth equation, $\text{Curl}(\mathbf{E})=-\partial\mathbf{B}/\partial t$ – Statically and Dynamically induced EMFs – Simple problems -Modification of Maxwell’s equations for time varying fields – Displacement current – Poynting Theorem and Poynting vector.

Text books:

1. “Engineering Electromagnetics” by William H. Hayt & John. A. Buck Mc. Graw-Hill Companies, 7th Editon.2006.
2. “Electro magnetic Fields” by Sadiku, Oxford Publications
3. “Introduction to Electro Dynamics” by D J Griffiths, Prentice-Hall of India Pvt.Ltd, 2nd editon

Reference books :

1. “Electromagnetics” by J P Tewari.

2. "Electromagnetics" by J. D Kraus Mc Graw-Hill Inc. 4th edition 1992.
3. "Electromagnetic fields", by S. Kamakshaiah, Right Publishers, 2007.

Web Resources:

- 1) <http://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-641-electromagnetic-fields-forces-and-motion-spring-2009/>
- 2) <http://www.electrical4u.com>
- 3) <http://freevideolectures.com/Course/2340/Electromagnetic-Fields>

II YEAR – I SEMESTER	T	P	C
	3+1	0	3
Sub Code: 14120303	ELECTRICAL MACHINES-I		

Course Objective: This is a basic course on rotating electrical machines. This course covers the topics related to principles, performance, applications and design considerations of dc machines.

UNIT – I

Objective: Appreciate the principles of electromagnetic energy conversion and understand the construction details of DC machine.

Electromechanical Energy Conversion

Introduction to S.I Units-principles of Electromechanical Energy conversion – forces and torque in magnetic field systems – energy balance- energy and force in a singly excited magnetic field system, determination of magnetic force - co-energy – multi excited magnetic field systems- construction features of conventional and modern DC machines.

UNIT – II

Objective: To understand the principle of operation and performance of DC generators.

D.C. Generators-I

D.C. Generators – Principle of operation –E.M.F Equation – armature windings – lap and wave windings. Armature reaction – Cross magnetizing and de-magnetizing AT/pole –commutation Process – methods of improving commutation – Compensating windings – Interpoles.

UNIT – III

Objective: To learn the characteristics and performance of DC generators.

D.C. Generators-II

Methods of Excitation-Types of DC generator: separately excited and self excited generators. O.C.C– build-up of E.M.F - critical field resistance and critical speed - causes for failure to self excite and remedial measures—Internal & External characteristics of shunt, series and Compound generator-Applications, Losses and Efficiency.

UNIT – IV

Objective: To learn the characteristics and performance of DC motors.

D.C. Motors

D.C Motors – Principle of operation – Back E.M.F. - Torque equation –characteristics of shunt, series and compound motors – Armature reaction and commutation, Losses and Efficiency. Speed torque characteristics – applications of dc motors. Starting by 3 point and 4 point starters – protective devices.

UNIT – V

Objective: To learn the speed control and testing methods of DC motors.

Speed Control and Testing of D.C. Machines

Speed control of d.c Motors: Armature voltage and field flux control methods. Testing of d.c. machines: methods of testing-:Brake test, Indirect testing: Swinburne’s method-- Regenerative or Hopkinson’s method - Retardation test-- separation of losses. methods of electrical braking: plugging, dynamic and regenerative.

UNIT – VI

Objective: To learn the basic ideas of design of DC machines.

Design of DC. Machines

Design concept- output equation- choice of specific electric and magnetic loadings – separation of D and L- estimation of number of conductors/ turns- coils-armature slots-conductor dimension – slot dimension – choice of number of poles- length of air gap.

Text books:

1. Electric Machinery – A. E. Fitzgerald, C. Kingsley and S. Umans, Mc Graw-Hill Companies, 5th edition
2. Electrical Machines – P.S. Bimbra., Khanna Publishers

Reference books:

1. Performance and Design of D.C Machines – by Clayton & Hancock, BPB Publishers

2. Electric Machines by I.J. Nagrath & D.P. Kothari, Tata Mc Graw – Hill Publishers, 3rd edition, 2004.
3. Electromechanics – I (D.C. Machines) S. Kamakshiah Hi-Tech Publishers.

Web Resources:

1. <http://freevideolectures.com/Course/3085/Electrical-Machines-I>
2. <http://www.electrical4u.com>
3. <http://www.onesmartclick.com/engineering/electrical-machines.html>

II YEAR – I SEMESTER	T	P	C
	3+1	0	3
Sub Code:14123305	FLUID MECHANICS AND HYDRAULIC MACHINERY		

Course Objective: The students completing this course are expected to understand the properties of fluids, its kinematic and dynamic behaviour through various laws of fluids like continuity, Euler’s Bernoulli’s equations, energy and momentum equations. Further, the student shall be able to understand the theory of boundary layer, working and performance characteristics of various hydraulic machines like pumps and turbines.

UNIT I

Objective: After studying this unit student will know the concept of fluid and its properties, manometry, hydrostatic forces acting on different surfaces and also problem solving techniques.

Fluid statics: Dimensions and units: physical properties of fluids- specific gravity, viscosity surface tension- vapour pressure and their influence on fluid motion- atmospheric gauge and vacuum pressure – measurement of pressure- Piezometer, U-tube and differential manometers.

UNIT II

Objective: In this unit student will be exposed to this basic law of fluids, flow patterns, viscous flow through ducts and their corresponding problems.

Fluid kinematics: stream line, path line and streak lines and stream tube, classification of flows- steady & unsteady, uniform, non uniform, laminar, turbulent, rotational, and irrotational flows- equation of continuity for one dimensional flow.

Fluid dynamics: surface and body forces –Euler’s and Bernoulli’s equations for flow along a stream line, momentum equation and its application on force on pipe bend.

UNIT III

Objective: After studying this unit student will know the pipes, hydrodynamic forces acting on vanes and their performance evaluation.

Closed conduit flow: Reynold’s experiment-Darcy weisbach equation-minor losses in pipes- pipes- pipes in series and parallel-total energy line- hydraulic gradient line.

Measurement of flow: Pilot tube, venturimeter, and orifice meter, flow nozzle, turbine flow meter.

Basics of turbo machinery: hydrodynamic force of jets on stationary and moving flat, inclined, and curved vanes, jet striking centrally and at tip, velocity diagrams, work done and efficiency, flow over radial vanes.

UNIT IV

Objective: After studying this unit student will know the storage plants and performance of turbines.

Hydroelectric power stations: Elements of hydro electric power station- types-concept of pumped storage plants - storage requirements, mass curve(explanation only) estimation of power developed from a given catchment area; heads and efficiencies.

Hydraulic Turbines: classification of turbines, impulse and reaction turbines, Pelton wheel, Francis turbine and Kaplan turbine-working proportions, work done, efficiencies, hydraulic design –draft tube- theory- functions and efficiency.

UNIT V

Objective: After studying this unit student will be in a position to evaluate the performance characteristics of hydraulic turbines.

Performance of hydraulic turbines: Geometric similarity, Unit and specific quantities, characteristic curves, governing of turbines, selection of type of turbine, cavitations, surge tank, water hammer

UNIT VI

Objective: At the end of this unit student will be aware of the importance, function and performance of hydro machinery.

Centrifugal pumps: classification, working, work done – manometric head- losses and efficiencies- specific speed- pumps in series and parallel-performance characteristic curves, NPSH.

Reciprocating pumps: Working, Discharge, slip, indicator diagrams

Text books:

1. Hydraulics, fluid mechanics and Hydraulic machinery MODI and SETH.
2. Fluid Mechanics and Hydraulic Machines by Rajput.

Reference books:

1. Fluid Mechanics and Fluid Power Engineering by D.S. Kumar, Kotaria & Sons.
2. Fluid Mechanics and Machinery by D. Rama Durgaiah, New Age International.
3. Hydraulic Machines by Banga & Sharma, Khanna Publishers.
4. Instrumentation for Engineering Measurements by James W. Dally, William E. Riley, John Wiley & Sons Inc. 2004 (Chapter 12 – Fluid Flow Measurements)

II YEAR – I SEMESTER	T	P	C
	3+1	0	3
Sub Code:14124304	ELECTRONIC DEVICES AND CIRCUITS		

Course Objective: The course intends to provide an overview of the principles, operation and applications of the basic electronic components like diodes, BJT, FET etc. for performing various functions as well as understanding the characteristics of active devices and the frequency response of different amplifiers. This course relies on elementary treatment and qualitative analysis and makes use of simple models and equation to illustrate the concepts involved.

UNIT-I

Objective: To learn the basic of semiconductor physics.

Semi Conductor Physics

Insulators, Semi conductors and Metals classification using energy band diagrams, mobility and conductivity, electrons and holes in intrinsic semi conductors, extrinsic semi conductors, drift and diffusion, charge densities in semiconductors, Hall effect, continuity equation, law of junction, Fermi Dirac function, Fermi level in intrinsic and extrinsic Semiconductors.

UNIT-II

Objective: To study the construction details, operation and characteristics of various semiconductor diodes.

Junction Diode Characteristics

Open circuited p-n junction, Biased p-n junction, p-n junction diode, current components in PN junction Diode, diode equation, V-I Characteristics, temperature dependence on V-I characteristics, Diode resistance, Diode capacitance, energy band diagram of PN junction Diode.

Special Semiconductor Devices

Zener Diode, Breakdown mechanisms, Zener diode applications, LED, LCD, Photo diode, optocoupler Varactor diode, Tunnel Diode, DIAC, TRIAC, SCR, UJT Construction, operation and characteristics of all the diodes is required to be considered.

UNIT-III

Objective: Understand the operation and analysis of rectifiers with and without filters. Further study the operation of series and shunt regulators using zener diodes

Rectifiers and Filters

Basic Rectifier setup, Half wave rectifier, full wave rectifier, bridge rectifier, derivations of characteristics of rectifiers, rectifier circuits-operation, input and output waveforms; Filters; Inductor filter, Capacitor filter, L- section filter, π - section filter, Multiple L - section and Multiple-section filter ,comparison of various filter circuits in terms of ripple factors, voltage regulators- series and shunt.

UNIT-IV

Objective: To study the characteristics of different bipolar junction transistors (BJT) and field effect transistors (FET)

Transistor Characteristics

BJT, Junction transistor, transistor current components, transistor equation, transistor configurations, transistor as an amplifier, and characteristics of transistor in Common Base, Common Emitter and Common Collector configurations, Ebers-Moll model of a transistor, punch through/ reach through, Photo transistor, typical transistor junction voltage values.

FET: FET types, construction, operation, characteristics, parameters, MOSFET-types, construction, operation, characteristics, comparison between JFET and MOSFET.

UNIT-V

Objective: To study different BJT biasing stabilization and compensation techniques.

Transistor Biasing and Thermal Stabilization

Need for biasing, operating point, load line analysis, BJT biasing- methods, basic stability, fixed bias, collector to base bias, self bias, Stabilization against variations in V_{BE} , I_C , and Stability factors, (S , S_i , S''), compensation, Thermal runaway, Thermal stability.FET biasing methods and stabilization.

UNIT-VI

Objective: To understand the concepts of small signals low frequency circuits and analyzes transistor amplifiers using h-parameters.

Small Signal Low Frequency Transistor Amplifier Models:

BJT: Two port network, Transistor hybrid model, determination of h- parameters, conversion of h-parameters, generalized analysis of transistor amplifier model using h- parameters, Analysis of CB, CE and CC amplifiers using exact and approximate analysis, Comparison of transistor amplifiers.

FET: Generalized analysis of small signal model, Analysis of CG, CS and CD amplifiers, comparison of FET amplifiers.

Text books:

1. Electronic Devices and Circuits- J. Millman, C. Halkias, Tata Mc-Graw Hill, Second Edition.
2. Electronic Devices and Circuits-B.P.Singh, Rekha Singh,Pearson Publications, Second Edition.

References:

1. Electronic Devices and Circuits-Salivahanan, Kumar, Vallavaraj, Tata Mc-Graw Hill, Second Edition.

2. Electronic Devices and Circuits -BV Rao, KBR Murty, K Raja Rajeswari, PCR Pantulu, Pearson, 2nd edition.
3. Electronic Devices and Circuit Theory-R.L. Boylestad and Louis Nashelsky, Pearson Publications, Tenth Edition.

II YEAR – I SEMESTER	T	P	C
	-	3	2
Sub Code:14124311	ELECTRONIC DEVICES AND CIRCUITS LAB		

PART A: Electronic Workshop Practice

1. Identification, Specifications, Testing of R, L, C Components (Colour Codes), Potentiometers, Coils, Gang Condensers, Relays, Bread Boards.
2. Identification, Specifications and Testing of active devices, Diodes, BJTs, JFETs, LEDs, LCDs, SCR, UJT.
3. Soldering Practice- Simple circuits using active and passive components.
4. Study and operation of Ammeters, Voltmeters, Transformers, Analog and Digital Multimeter, Function Generator, Regulated Power Supply and CRO.

PART B: List of Experiments

(For Laboratory Examination-Minimum of Ten Experiments)

1. P-N Junction Diode Characteristics
 - Part A: Germanium Diode (Forward bias& Reverse bias)
 - Part B: Silicon Diode (Forward Bias only)
2. Zener Diode Characteristics
 - Part A: V-I Characteristics
 - Part B: Zener Diode as Voltage Regulator
3. Rectifiers (without and with c-filter)
 - Part A: Half-wave Rectifier
 - Part B: Full-wave Rectifier
4. BJ T Characteristics (CE Configuration)
 - Part A: Input Characteristics
 - Part B: Output Characteristics
5. FET Characteristics (CS Configuration)
 - Part A: Drain Characteristics

Part B: Transfer Characteristics

6. SCR Characteristics

7. UJ T Characteristics

8. Transistor Biasing

9. CRO Operation and its Measurements

10. BJT-CE Amplifier

11. Emitter Follower-CC Amplifier

12. FET-CS Amplifier

II YEAR – I SEMESTER	T	P	C
	-	3	2
Sub Code:14123312	FLUID MECHANICS AND HYDRAULIC MACHINES LAB		

1. Impact of jets on Vanes

2. Performance Test on Pelton Wheel.

3. Performance Test on Francis Turbine

4. Performance Test on Kaplan Turbine

5. Performance Test on Single Stage Centrifugal Pump

6. Performance Test on Multi Stage Centrifugal Pump

7. Performance Test on Reciprocating Pump

8. Calibration of Venturimeter

9. Calibration of Orifice meter.

10. Determination of friction factor for a given pipe line.

11. Determination of loss of head due to sudden contraction in a pipeline.

12. Turbine flow meter.

Note: Any 10 of the above 12 experiments are to be conducted.

II YEAR – II SEMESTER	T	P	C
	3+1	0	3
Sub Code:14120401	ELECTRICAL CIRCUIT ANALYSIS-II		

Course Objective: This course aims at study of three phase systems, transient analysis, network synthesis and fourier analysis for the future study and analysis of power systems.

UNIT-I

Objective: To study the concepts of balanced three-phase circuits.

Balanced Three phase circuits

Three phase circuits: Phase sequence- Star and delta connection-Relation between line and phase voltages and currents in balanced systems-Analysis of balanced three phase circuits-Measurement of Active and Reactive power in balanced Three phase systems.

UNIT-II

Objective: To study the concepts of unbalanced three-phase circuits.

Unbalanced Three phase circuits

Analysis of Three Phase unbalanced circuits-Loop Method- Application of Millman's Theorem-Star Delta Transformation Technique – Two Wattmeter Method of measurement of three phase power.

UNIT-III

Objective: To study the transient behaviour of electrical networks with DC, pulse and AC excitations.

Transient Analysis in D.C and A.C Circuit

Transient response of R-L, R-C, R-L-C series circuits for D.C and A.C excitations, solution method using differential equation and laplace transforms.

UNIT-IV

Objective: To study the performance of a network based on input and output excitation/response.

Two Port Networks

Two port network parameters – Z, Y, ABCD and hybrid parameters and their relations, Cascaded networks-Poles and zeros of Network functions

UNIT-V

Objective: To understand the realization of electrical network function into electrical equivalent passive elements.

Network synthesis

Positive real function-basic synthesis procedure-LC immittance functions-RC impedance functions and RL admittance function- RL impedance function and RC admittance function-Foster and Cauer methods.

UNIT-VI

Objective: To understand the application of fourier series and fourier transform for analysis of electrical circuits.

Fourier analysis and Transforms

Fourier theorem- Trigonometric form and exponential form of Fourier series – conditions of symmetry- line spectra and phase angle spectra- Analysis of Electrical Circuits to Non sinusoidal periodic waveforms.

Fourier Integrals and Fourier Transforms – properties of Fourier Transforms and Application to Electrical Circuits.

Text Books:

- 1.Engineering Circuit Analysis by William Hayt and Jack E.Kemmerley,Mc Graw Hill Company,6 th edition
- 2.Network synthesis:Van Valkenburg; Prentice-Hall of India Pvt. Ltd.
3. Circuit Theory(Analysis and Synthesis)- A. Chakrabarti, Dhanpat Rai & Co.

Reference Books:

- 1.Network Theory by A. Sudhakar and Shyammohan S Palli, Tata McGraw- Hill Publications,first edition
- 2.Network Analysis by N.C.Jagan, C.Lakshmi Narayana,BS Publications,2nd edition Network Analysis: Van Valkenburg; Prentice-Hall of India Private Ltd.

Wed Resources:

- 1.<http://www.ece.ubc.ca/course/eece-253>
- 2.<http://www.electrical4u.com>

II YEAR – II SEMESTER	T 3+1	P 0	C 3
Sub Code:14120405	ELECTRICAL MEASUREMENTS		

Course Objective: This course introduces principle of operation of basic analog and digital measuring instruments for measurement of current, voltage, power, energy etc. Measurement of resistance, inductance and capacitance by using bridge circuits will be discussed in detail. It is expected students will be through with various measuring techniques that are required for an electrical engineer.

UNIT-I

Objective: To study the principle of operation and working of different types of instruments. measurement of voltage and current.

Measuring Instruments

Classification – deflecting, control and damping torques – Ammeters and Voltmeters – PMMC, moving iron type instruments – expression for the deflecting torque and control torque – Errors and compensations. Extension of range using shunts and series resistance -CT and PT: Ratio and phase angle errors – design considerations

UNIT –II

Objective: To study the working principle of operation and different types of instruments for measurement of power and energy.

Measurement of Power and Energy

Single phase and three phase dynamometer wattmeter, LPF and UPF, expression for deflecting and control torques – Extension of range of wattmeter using instrument transformers – Measurement of active and reactive powers in balanced and unbalanced systems. . Type of P.F. Meters – single phase and three phase dynamometer and moving iron type. Single phase induction type energy meter – driving and braking torques – errors and compensations –testing by phantom loading using R.S.S. meter. Three phase energy meter – trivector meter, maximum demand meters.

UNIT – III

Objective: To understand the principle of operation and working of dc and ac potentiometers.

Potentiometers

Principle and operation of D.C. Crompton’s potentiometer – standardization – Measurement of unknown resistance, current, voltage. A.C. Potentiometers: polar and coordinate types - standardization – applications

UNIT – IV

Objective: To understand the principle of operation and working of various types of bridges for measurement of parameters- resistance, inductance, capacitance and frequency.

Measurement of Parameters

Method of measuring low, medium and high resistance – sensitivity of Wheatstone's bridge – Carey Foster's bridge- Kelvin's double bridge for measuring low resistance– loss of charge method for measurement of high resistance. Measurement of inductance, Quality Factor - Maxwell's bridge, Hay's bridge, Anderson's bridge, Owen's bridge. Measurement of capacitance and loss angle - Desauty bridge-Wien's bridge – Schering Bridge- Wagner's erthing device.

UNIT – V

Objective: To study the principle of operation and working of various types of magnetic measuring instruments.

Magnetic Measurements:

Ballistic galvanometer – equation of motion – flux meter – constructional details. Determination of B-H Loop methods of reversals six point method – A.C. testing – Iron loss of bar samples– core loss measurements by bridges and potentiometers.

UNIT-VI

Objective: To study the principle of operation and working of various types of digital voltmeters.

Digital Meters: Digital Voltmeter-Successive approximation, ramp and integrating type-Digital frequency meter-Digital multimeter-Digital Tachometer

Text book:

1. Electrical Measurements and measuring Instruments – by E.W. Golding and F.C. Widdis, fifth Edition, Wheeler Publishing.
2. Electrical & Electronic Measurement & Instruments by A.K.Sawhney Dhanpat Rai & Co. Publications.
3. Electrical Measurements: Fundamentals, Concepts, Applications – by Reissland, M.U, New Age International (P) Limited, Publishers.

Reference books:

1. Electrical Measurements – by Buckingham and Price, Prentice – Hall
2. Electrical Measurements by Harris.
3. Electronic Instrumentation-by H S Kalsi, Tata McGraw-Hill Education

Web Resources:

1. <http://www.electrical4u.com/>
2. <http://www.facstaff.bucknell.edu/mastascu/elessonshtml/Measurements/MeasIntro.htm>

II YEAR – II SEMESTER	T 3+1	P 0	C 3
Sub Code:14120403	POWER SYSTEMS-I		

Course Objective: Electrical Power plays significant role in day to day life of entire mankind. The aim of this course is to allow the students to understand the concepts of the generation and distribution of power along with economic aspects.

UNIT-I

Objective: To study the principle of operation and function of different components of a thermal power station.

Thermal Power Stations

Selection of site, general layout of a thermal power plant showing path of coal, steam, water, air, ash and flue gasses, ash handling system- Brief description of components: Boilers, Super heaters, Economizers, electrostatic precipitators, steam Turbines: Impulse and reaction turbines, Condensers, feed water circuit, Cooling towers, and Chimney.

UNIT-II

Objective: To study the principle of operation and function of different components of a Nuclear power station.

Nuclear Power Stations

Location of nuclear power plant, Working principle, Nuclear fission, Nuclear fuels, nuclear chain reaction, Nuclear reactor Components: Moderators, Control rods, Reflectors and Coolants. Types of Nuclear reactors and brief description of PWR, BWR and FBR. Radiation: Radiation hazards and Shielding, nuclear waste disposal.

Unit-III

Objective: To study the concepts of DC and AC distribution systems along with voltage drop calculations.

Distribution Systems

Classification of distribution systems, design features of distribution systems, radial distribution, ring main distribution, voltage drop calculations: DC distributors for following cases: radial DC distributor fed at one end and at both ends (equal / unequal voltages), ring main distributor, stepped distributor and AC distribution. comparison of DC and AC distribution.

Unit-IV

Objective: To study the constructional details, principle of operation and function of different components of an Air and Gas insulated substations.

Substations

Classification of substations: **Air insulated substations** - Indoor & Outdoor substations: Substations layout of 33/11KV showing the location of all the substation equipment.

Bus bar arrangements in the Sub-Stations: Simple arrangements like single bus bar, sectionalized single bus bar, double bus bar with one and two circuit breakers main and transfer bus bar system with relevant diagrams.

Gas insulated substations (GIS) – Advantages of Gas insulated substations, different types of gas insulated substations, single line diagram of gas insulated substations, bus bar, construction aspects of GIS, Installation and maintenance of GIS, Comparison of Air insulated substations and Gas insulated substations.

Unit-V

Objective: To study the constructional details and classification of cables with necessary numerical calculations.

Underground Cables

Types of Cables, Construction, Types of insulating materials, Calculations of insulation resistance and stress in insulation, and power factor of cable, Numerical Problems Capacitance of single and 3-Core belted Cables, Numerical Problems Grading of Cables-Capacitance grading, Numerical Problems, Description of Intersheath –Grading

UNIT-VI

Objective: To study the concepts of different types of load curves and types of tariffs applicable and consumers.

Economic Aspects of Power Generation & Tariff

Economic Aspects : Load curve, load duration and integrated load duration curves, discussion on economic aspects: connected load, maximum demand, demand factor, load factor, diversity factor, power capacity factor, plant use factor, Base and peak load plants - Numerical Problems.

Tariff Methods : Costs of Generation and their division into Fixed, Semi-fixed and Running Costs, Desirable Characteristics of a Tariff Method, Tariff Methods: Simple rate, Flat Rate, Block-Rate, two-part, three –part, and power factor tariff methods, numerical problems

Text Books:

1. A Text Book on Power System Engineering by M.L.Soni, P.V.Gupta, U.S.Bhatnagar and A.Chakraborti, Dhanpat Rai & Co. Pvt. Ltd., 1999.

2. Principles of Power Systems by V.K Mehta and Rohit Mehta S.CHAND& COMPANY LTD., New Delhi 2004.

Reference Books:

1. Elements of Power Station design and practice by M.V. Deshpande, Wheeler Publishing.
2. Electrical Power Systems by C.L.Wadhawa New age International (P) Limited, Publishers 1997.
3. Electrical Power Generation, Transmission and Distribution by S.N.Singh., PHI, 2003.
4. Gas turbine performance, by PP Wals, P.Fletcher, Blackwell Publisher, 2004.

Wed Resources:

- 1.<http://www.electrical4u.com>
- 2.<http://www.mtu.edu/ece/department/faculty/>

II YEAR – II SEMESTER	T 3+1	P 0	C 3
Sub Code:14120404	ELECTRICAL MACHINES – II		

Course Objective: This course covers the topics on single-phase transformers, three-phase transformers and 3-phase induction motor which have wide application in powersystems. The main aim of the course is to provide detailed concepts, operation and performance of transformers and 3-phase induction motors. A complete design procedure for the design of transformers and 3-phase induction motors can be developed based on basic concepts discussed in unit-VI.

UNIT-I

Objectives: To appreciate the concept of operation and performance of single-phase transformers.

Single Phase Transformers

Construction & Operation – Principle of operation of Single phase transformers-Construction details — types - emf equation - operation on no load and on load-lagging, leading and UPF loads - phasor diagrams of transformers-Equivalent circuit –Regulation – losses and efficiency - effect of variations of frequency & supply voltage on iron losses-- All day efficiency.

UNIT-II

Objective: To understand the methods of testing of single-phase transformers.

Single Phase Transformers Testing

OC and SC tests - Sumpner's test -separation of losses -parallel operation with equal and unequal voltage ratios - auto transformers-equivalent circuit - comparison with two winding transformers.

UNIT-III

Objective: To distinguish between single-phase and three-phase transformers.

3-phase Transformers

Polyphase connections - Y/Y, Y/ Δ , Δ /Y, Δ / Δ and open Δ -- Third harmonics in phase voltages- three winding transformers : tertiary windings-determination of Z_p , Z_s and Z_t -- transients in switching - off load and on load tap changers -- Scott connection.

UNIT-IV

Objective: To understand the concept of operation and performance of 3-phase induction motor.

3-phase Induction Motors

construction details of cage and wound rotor machines-production of a rotating magnetic field - principle of operation - rotor emf and rotor frequency - rotor current and pf at standstill and during running conditions -Rotor power input, rotor copper loss and mechanical power developed and their inter relationship- equivalent circuit - phasor diagram.

UNIT-V

Objective: To appreciate the relation between torque and slip, performance of induction motor and induction generator.

Characteristics, Starting and Testing methods of Induction Motors

Torque equation- expressions for maximum torque and starting torque - torque slip characteristic - double cage and deep bar rotors - crawling and cogging- No load and blocked rotor tests- Circle diagram for predetermination of performance-methods of starting and starting current and torque calculations- induction generator-principle of operation.

UNIT-VI

Objective: To understand the basic concepts of design of transformers and 3-phase induction motors.

Design of transformer and 3-phase induction motor.

Transformer: Design concept – output equation – choice of windings- calculation of number of turns- length of mean turn of winding – calculation of resistance and leakage reactance.

Three phase induction motor: Design concept- choice of specific electric and magnetic loadings- output equation-stator design –number of slots – conductor dimensions-type of winding – number of rotor slots – conductor dimensions.

Text Books:

- 1.Electrical Machines – P.S. Bimbira., Khanna Publishers
2. Electric machinery - A.E. Fitzgerald, C.Kingsley and S.Umans, Mc Graw Hill Companies, 5th edition
- 3.Electrical Machines by R.K.Rajput, Lakshmi publications,Fifth edition

Reference Books:

1. Electrical Machines by D P.Kothari, I .J .Nagarth, Mc GrawHill Publications, 4th edition
2. Electrical Machines by J.B.Guptha. S.K.Kataria & Sons
3. Performance and Design of AC Machines by MG.Say, BPB Publishers

Wed Resources:

1. <http://freevideolectures.com/Course/3085/Electrical-Machines-I>
2. <http://www.electrical4u.com>
3. <http://www.onesmartclick.com/engineering/electrical-machines.html>

II YEAR – II SEMESTER	T 3+1	P 0	C 3
Sub Code:14124406	PULSE & DIGITAL CIRCUITS		

Course Objective: The main objective of this subject is to analyze, built and troubleshoot various pulse and digital circuits. This subject is used to understand the concepts of wave shaping, switching characteristics of diode and transistors to design various circuits for any applications and also to introduce time base generators, design of multivibrators, principles of synchronization & frequency division, operation of sampling gates and to design different gates using various logic families.

UNIT I

Objective: To understand the response of sinusoidal and non-sinusoidal waves and also study how to convert signals from one form to another

Linear wave shaping

High pass, low pass RC circuits, their response for sinusoidal, step, pulse, square and ramp inputs. RC network as differentiator and integrator, double differentiation, attenuators, RL and RLC circuits and their response for step input, Ringing circuit.

Non – Linear Wave Shaping

Diode clippers, Transistor clippers, clipping at two independent levels, Transfer characteristics of clippers, Emitter coupled clipper, Comparators, applications of voltage comparators, clamping operation, clamping circuits using diode with different inputs, Clamping circuit theorem, practical clamping circuits, effect of diode characteristics on clamping voltage, Transfer characteristics of clampers.

UNIT II

Objective: To study the characteristics of diode and transistor & To understand the realization of logic families

Switching Characteristics of Devices

Diode and Transistor as switches, Break down voltage consideration of transistor, saturation parameters of Transistor and their variation with temperature, Design of transistor switch, transistor-switching times.

Digital Logic gate circuits

Realization of Logic Gates using DTL, TTL, ECL and CMOS logic circuits, Comparison of logic families

UNIT III

Objective: To understand various multivibrators using BJT

Multivibrators

Analysis & Design of Bistable Multivibrators : Fixed bias& self biased transistor binary, Commutating capacitors, Triggering in binary, Schmitt trigger circuit, applications, Analysis & design of Monostable Multivibrator: Collector-coupled and Emitter-coupled Monostable multivibrators, Triggering in monostable multivibrator, Analysis & design of Astable multivibrator (Collector coupled and Emitter-coupled) using transistors.

UNIT IV

Objective: To generate the different signals using high frequency circuits with respect to time in voltage and current forms.

Time Base Generators

General features of a time base signal, methods of generating time base waveform, Miller and Bootstrap time base generators – basic principles, Transistor miller time base generator, Transistor Bootstrap time base generator, Current time base generators.

UNIT V

Objective: To understand synchronization and frequency division techniques

Synchronization and Frequency Division

Principles of Synchronization, Frequency division in sweep circuit, Astable relaxation circuits, Monostable relaxation circuits, Phase delay& phase jitters; Synchronization of a sweep circuit with symmetrical signals, Sine wave frequency division with a sweep circuit.

UNIT VI

Objective: To learn basic concepts of blocking oscillators using diodes and RC components & To under stand the basic sampling gates using BJT

Blocking oscillators

Monostable blocking oscillators (Basetiming & Emitter timing): Astable blocking oscillators (Diode-Controlled & RC controlled), Applications

Sampling gates

Basic operating principles of sampling gates, Unidirectional and Bi-directional sampling gates, Reduction of pedestal in gate circuits, Four-diode sampling gates; Applications of sampling gates.

Text Books :

1. J. Millman and H. Taub, "Pulse, Digital and Switching Waveforms", McGraw-Hill, 1991.
2. A. Anand Kumar, "Pulse and Digital Circuits", PHI, 2008. Second Edition

References :

1. Venkat Rao. K. Ramasudha K, Manmadha Rao G, "Pulse and Digital Circuits," Pearson Education, 2010
2. David J. Comer, "Digital Logic State Machine Design", Oxford University Press, 2008, Third Edition
3. MS Prakash Rao – "Pulse and Digital Circuits" Tata McGrawHill

II YEAR – II SEMESTER	T 3+1	P 0	C 3
Sub Code:14124402	SWITCHING THEORY AND LOGIC DESIGN		

Course Objective: Now a day the word 'DIGITAL' plays a major role. Digital implies 1 and 0. The main objective of this subject is design the digital circuits using logic gates and flip-flops which play the major role in the electronic gadgets.

UNIT – I

Objective: Students will learn different number systems- binary, octal, hexadecimal and BCD Number system and their applications, Boolean algebra, minimization of switching functions

REVIEW OF NUMBER SYSTEMS & CODES

Representation of different radix, Number systems base conversion methods, complements of numbers, r 's, $r - 1$'s compliment of signed numbers, problem solving. 4-bit codes, BCD, excess-3, alphanumeric code, self complement codes, 2421, 8421.

Logic operations

Basic Logic gates- NOT, OR, AND, Universal building blocks, EX-OR, EX-NOR gates, standard SOP and standard POS. Minimization of logic functions using theorems, gray code, error detection and correction codes, Parity checking codes, Hamming codes. Multi level NAND – NAND, NOR – NOR realizations.

UNIT-II

Objective: To study the various methods of Simplification of logic circuits this includes Boolean algebra and theorem, K-maps, Quine McCluskey method

MINIMIZATION OF SWITCHING FUNCTIONS

Boolean theorems, complements and duality of logic expressions, De-morgan theorems, Minimization of switching functions using Boolean theorem, K – map up to 6-variables, code converters and binary multiplier is using K –map, tabular minimization (Quine McCluskey method).

UNIT-III

Objective: To understand the design of Combinational Logic Circuits and to understand realization of Boolean functions using MSI and LSI components such as multiplexers, de-multiplexer, decoder, encoder.

COMBINATIONAL LOGIC CIRCUITS

Design of half adder, full adder, half sub tractor, full subtractor, applications of full adders, 4-bit binary adder, 4-bit binary subtractor, BCD adder, excess – 3 adder, carry look – a – head adder. Design of decoder, encoder, multiplexer, de-multiplexer, priority encoder, comparators and seven segment display, realization of Boolean functions using decoders and Multiplexers, Priority encoder, 4-bit digital comparator.

UNIT-IV

Objective: To study the basic structure and realization of Boolean functions with PLD, PROM, PLA, PAL.

INTRODUCTION OF PLD's

PROM, PAL, PLA- Basic structures, realization of Boolean functions with PLD's, programming tables of PLDs, merits & demerits of PROM, PAL,PLA, comparision, realization of Boolean functions using PROM, PAL, PLA, programming tables of PROM, PAL, PLA.

UNIT-V

Objective: To understand the concepts of sequential circuits

SEQUENTIAL LOGIC CIRCUITS I

Classification of sequential circuits, flip-flops with truth tables and excitation tables. Conversion of flip-flops. Design of ripple counters, synchronous counters, Johnson and ring counters. Design of buffer register, control buffer register, shift register, bi – directional shift register and universal shift register.

UNIT-VI

Objective: To understand the concepts of sequential circuits such as finite state machines

SEQUENTIAL LOGIC CIRCUITS II:

Finite state machines: analysis of clocked sequential circuits, state diagrams, state tables, reduction of state tables and state assignments, design procedure. Realization of circuits using various flipflops. Mealey to Moore conversion and vice-versa.

Text Books:

1. Anand kumar. A 8th printing (second edition) – January 2015.
2. Digital design – Moris Mano, PHI, 2/e.

Reference Books:

1. Switching and Finite automata theory – Zvi Kohavi, Tata Mcgraw – Hill, 1978, 2/e.
2. Fundamentals of Logic Design – Charles H. Roth Jr, Jaico Publishers.

II YEAR – II SEMESTER	T	P	C
	-	3	2
Sub Code:14120411	ELECTRICAL MACHINES – I LAB		

Any 10 of the following experiments are to be conducted

1. Magnetization characteristics of DC Shunt Generator. Determination of critical field resistance and critical speed
2. Load test on DC Shunt Generator. Determination of Characteristics
3. Load test on DC Series Generator. Determination of Characteristics
4. Load test on DC compound Generator. Determination of Characteristics
5. Hopkinson's test on DC shunts machines. Predetermination of efficiency.
6. Field's test on DC series machines. Determination of efficiency.
7. Swinburne's Test and Predetermination of efficiencies as Generator and Motor
8. Brake Test on DC compound motor. Determination of performance curves.
9. Brake Test on DC shunt motor. Determination of Performance curves
10. Separation of losses in DC shunt motor
11. Speed Control of DC shunt Motor by Field and Armature control

II YEAR – II SEMESTER	T	P	C
	-	3	2
Sub Code:14120412	ELECTRICAL CIRCUITS LAB		

Any **10** of the following experiments are to be conducted

1. Verification of Thevenin's and Norton's theorem
2. Verification of superposition theorem and Maximum power transfer theorem
3. Verification of Compensation theorem
4. Verification of Reciprocity, Milliman's theorem
5. Locus diagrams of RL and RC series circuits
6. Series and parallel resonance
7. Determination of self, mutual inductances and co-efficient f coupling
8. Z and Y parameters
9. Transmission and hybrid parameters
10. Measurement of active power for star & delta connected balanced loads
11. Measurement of reactive power for star & delta connected balanced loads
12. Measurement of 3-ph power by 2- wattmeter method for unbalanced loads