

**GODAVARI INSTITUTE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)**

**Approved by AICTE, Accredited by NBA & NAAC 'A' Grade, Recognized under 2(f) and 12(b) of UGC,
Permanently Affiliated to JNTUK, Kakinada**

NH-16, Chaitanya Knowledge City, Rajahmundry – 533296.E.G.Dt., - AP.



**DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING
4 YEARS B.TECH COURSE STRUCTURE
(2017-18)**

COURSE STRUCTURE

B. Tech. Electrical & Electronics Engineering

I 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.	17199101	English – I	4	1	-	3	40	60	100
2.	17199102	Mathematics-I	4	1	-	3	40	60	100
3.	17199105	Mathematics-II	4	1	-	3	40	60	100
4.	17130101	Engineering Mechanics	4	1	-	3	40	60	100
5.	17199103	Computer Programming	4	1	-	3	40	60	100
6.	17198106	Professional Ethics & Human Values	2	1	-	1	40	60	100
7.	17199111	English Communication Skills Lab I	-	-	3	2	50	50	100
8.	17199113	Computer Programming Lab	-	-	3	2	50	50	100
9.	17199181	Engineering Workshop & IT Workshop		-	3	2	50	50	100
Total			22	06	9	21	390	510	900

T- THEORY P – PRACTICAL D- DRAWING C – CREDITS Int. – INTERNAL Ext. - EXTERNAL

COURSE STRUCTURE

B. Tech. Electrical & Electronics Engineering

I 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.	17199201	English-II	4	-	-	3	40	60	100
2.	17199203	Engineering Chemistry	4	-	-	3	40	60	100
3.	17199202	Engineering Physics	4	-	-	3	40	60	100
4.	17130201	Engineering Drawing	3	-	-	3	40	60	100
5.	17199204	Data Structures Through C	4	-	-	3	40	60	100
6.	17199206	Environmental Studies	4	-	-	3	40	60	100
7.	17199211	English Communication Skills Lab II	-	-	3	2	50	50	100
8.	17199212	Engineering Physics Lab	-	-	3	2	50	50	100
9.	17199213	Data Structures Through C Lab	-	-	3	2	50	50	100
Total			23	-	09	24	390	510	900

T- THEORY P – PRACTICAL D- DRAWING C – CREDITS Int. – INTERNAL Ext. - EXTERNAL

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.	17120301	Electrical Circuits Analysis – I	4	-	-	3	40	60	100
2.	17120302	Electro Magnetic Field	4	-	-	3	40	60	100
3.	17120303	Electrical Machines – I	4	-	-	3	40	60	100
4.	17129304	Mathematics III	4	-	-	3	40	60	100
5.	17123305	Fluid Mechanics & Hydraulic Machines	4	-	-	3	40	60	100
6.	17124306	Electronic Devices & circuits	4	-	-	3	40	60	100
7.	17129397	Soft Skills – I	1	2	-	1	40	60	100
8.	17124311	Electronic Devices & Circuits Lab	-	-	3	2	50	50	100
9.	17123312	Fluid Mechanics & Hydraulic Machines Lab	-	-	3	2	50	50	100
Total			25	2	6	23	380	520	900

T- THEORY P – PRACTICAL D- DRAWING C – CREDITS Int. – INTERNAL Ext. - EXTERNAL

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.	17120401	Electrical Circuit analysis – II	4	-	-	3	40	60	100
2.	17124405	Switching Theory and Logic Design	4	-	-	3	40	60	100
3.	17120402	Power Systems – I	4	-	-	3	40	60	100
4.	17120403	Electrical Machines – II (Through Moocs)	4	-	-	3	40	60	100
5.	17120404	Electrical Measurements	4	-	-	3	40	60	100
6.	17124406	Pulse & Digital Circuits	4	-	-	3	40	60	100
7.	17120411	Electrical Machines – I Lab	-	-	3	2	50	50	100
8.	17120412	Electrical Circuits Lab	-	-	3	2	50	50	100
Total			24	0	6	22	340	460	800

T- THEORY P – PRACTICAL D- DRAWING C – CREDITS Int. – INTERNAL Ext. - EXTERNAL

COURSE STRUCTURE

B. Tech. Electrical & Electronics Engineering

III 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.	17129505	Managerial Economics and Financial Analysis	4	-	-	3	40	60	100
2.	17120501	Control Systems	4	-	-	3	40	60	100
3.	17120502	Power Systems-II	4	-	-	3	40	60	100
4.	17120503	Special Electrical Machines	4	-	-	3	40	60	100
5.	17120504	Power Electronics	4	-	-	3	40	60	100
6.	17124506	Linear & Digital IC Applications	4	-	-	3	40	60	100
7.	17129597	Soft Skills - II	1	2	-	1	40	60	100
8.	17120511	Electrical Machines-II Lab	-	-	3	2	50	50	100
9.	17120512	Electrical Measurements Lab	-	-	3	2	50	50	100
10.	17120543	Mini Project - I		-	3	2	100	-	100
Total			25	02	09	25	480	520	1000

Mini Project / Study Project - To be done during summer vacation after II-II semester

T- THEORY P – PRACTICAL D- DRAWING C – CREDITS Int. – INTERNAL Ext. - EXTERNAL

COURSE STRUCTURE

B. Tech. Electrical & Electronics Engineering

III 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.	17120601	Switchgear and Protection	4	-	-	3	40	60	100
2.	17124606	Microprocessors & Microcontrollers and its applications	4	-	-	3	40	60	100
3.	17120602	Power System Analysis	4	-	-	3	40	60	100
4.	17120603	Renewable energy sources and systems	4	-	-	3	40	60	100
5.	17120604	Power Semiconductor Drives	4	-	-	3	40	60	100
6.	17120605	Signals and systems	4	-	-	3	40	60	100
7.	17129611	Power Electronics Lab	-	-	3	2	50	50	100
8.	17120612	Control Systems Lab	-	-	3	2	50	50	100
9.	17129697	IPR & Patents	2	-	-	1	50	50	100
Total			26	0	06	23	390	510	900

T- THEORY P – PRACTICAL D- DRAWING C – CREDITS Int. – INTERNAL Ext. - EXTERNAL

COURSE STRUCTURE

B. Tech. Electrical & Electronics Engineering

IV 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.	17120701	Utilization of Electrical Energy*	4	-	-	3	40	60	100
2.	17124702	Principles of Signal Processing	4	-	-	3	40	60	100
3.	17120703	Power System Operation & Control	4	-	-	3	40	60	100
4.		Elective-I	4	-	-	3	40	60	100
	17120704a	High Voltage Engineering							
	17124704b	Electronic Instrumentation and Automation system							
	17120704c	HVDC Transmission							
		Electrical Distribution Systems							
5.		Elective – II	4	-	-	3	40	60	100
	17120705a	Electrical Machine Modeling & analysis							
	17120705b	Switching mode power converters							
	17123705c	Optimization Techniques							
		EHV Transmission							
6.		Elective – III	4	-	-	3	40	60	100
	17120706a	Advanced Control Systems.							
	17120706b	Flexible Alternating Current Transmission systems							
	17120706c	Power Quality							
		Smart Grid							
7.	17120711	Power Systems Lab	-	-	3	2	50	50	100
8.	17124713	Microprocessors & Microcontrollers and its applications Lab	-	-	3	2	50	50	100
9.	17120712	Electrical Simulation Lab	-	-	3	2	50	50	100
10.	17120754	Mini Project II	-	-	4	2	100	-	100
Total			24	0	13	26	490	510	1000

Summer Internship / Training - To be done during summer vacation after III-II semester

T- THEORY P – PRACTICAL D- DRAWING C – CREDITS Int. – INTERNAL Ext. - EXTERNAL

COURSE STRUCTURE

B. Tech. Electrical & Electronics Engineering

IV 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.	17120801	Energy Audit, Conservation & Management	4	-	-	3	40	60	100
2.	Elective – IV		4	-	-	3	40	60	100
	17124802a	VLSI Design							
	17124802b	Embedded systems							
	17120802c	Digital control systems							
	17120802d	PLC and its Applications							
	17125802e	OOPS through JAVA							
	17125802f	DBMS							
	17125802g	UNIX and Shell Programming							
17120802h	Neural Fuzzy systems								
3.	17120831	Project Work	-	-	-	9	60	140	200
Total			08			15	140	260	400

T- THEORY P – PRACTICAL D- DRAWING C – CREDITS Int. – INTERNAL Ext. – EXTERNAL

Description	Subject methodology	L	T	P	C
Course code	ELECTRICAL CIRCUIT ANALYSIS-I	3	1	0	3
Teaching	Total contact Hours-65				
Prerequisites	Mathematics-1				

Course Objective(s):

1. To study the basics of circuit analysis
2. To solve D.C. circuits by using KVL and KCL
3. To solve A.C. circuits by using KVL and KCL
4. To apply theorems for finding the solutions of network problems
5. To study the basic graph theory

UNIT-I

Objective: To solve D.C. circuits by using KVL and KCL (CO1)

Introduction to Electrical Circuits

Passive components and their V-I relations, Sources (Dependent and Independent)-Kirchoff's laws, Nodal analysis, mesh analysis-Numerical problems.

Network reduction techniques (Series, parallel, series-parallel, star-to-delta or delta-to-star transformation), Source transformation technique .,

UNIT-II

Objective: To solve A.C. circuits by using KVL and KCL (CO2)

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 magnetic circuits (CO3)

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

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-IV

Objective: To apply theorems for finding the solutions of network problems(CO4)

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.

UNIT-V

Objective: To study the basic graph theory (CO5)

Network topology:

Definitions – Graph – Tree, Basic cut-set and Basic tie-set matrices for planar networks.

Loop and Nodal methods of analysis of Networks with dependent & independent voltage and current sources – Duality & Dual networks.

Course Outcomes

After successful completion of the course, a successful student will be able to-

- CO1: Apply the basics of circuit analysis
- CO2: Solve D.C. circuits by using KVL and KCL
- CO3: Solve A.C. circuits by using KVL and KCL
- CO4: Apply theorems for finding the solutions of network problems
- CO5: Understand the basic graph theory

Text Books:

1. Engineering Circuit Analysis by William Hayt and Jack E. Kemmerley, McGraw 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, Springer 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. Chakrabarti, 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>

COURSE CODE: ELECTRICAL CIRCUIT ANALYSIS-I													
COURSE DESIGNED BY: Department of Electrical & Electronics Engineering													
	Program outcomes	Po 1	Po 2	Po 3	Po 4	Po 5	Po 6	Po 7	Po 8	Po 9	Po1 0	Po1 1	Po1 2
Course outcomes	Co1		√								√		
	Co2			√								√	
	Co3			√									
	Co4				√								
	Co5	√											
CATEGORY		General Humanities		Basic sciences		Engineering sciences and Technical			Professional subjects				
									√				
Mode of Evaluation		Quiz, Assignment, Seminar, Written Examination											

Description	Subject methodology	L	T	P	C
Course code	ELECTROMAGNETIC FIELDS	3	1	0	3
Teaching	Total contact Hours-65				
Pre-requisites	Mathematics-2,engineering physics				

Course Objective(s):

1. To study the basics of electrostatics
2. To study the capacitors
3. To study magneto statics and apply Ampere's law
4. To study the force in magnetic fields
5. To study time varying fields

UNIT – I

Objective: To study the basics of electrostatics (CO1)

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 Poisson's equations – Solution of Laplace's equation in one variable.

UNIT – II

Objective: To study the capacitors (CO2)

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 magneto statics and apply Ampere's law (CO3)

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 force in magnetic fields (CO4)

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

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 – V

Objective: To study time varying fields (CO5)

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.

Course Outcomes

After successful completion of the course, a successful student will be able to-

- CO1: Understand the basics of electrostatics
- CO2: Understand the capacitors
- CO3: Understand statics and apply Ampere's law
- CO4: Understand the force in magnetic fields
- CO5: Understand time varying fields

Text books:

1. "Engineering Electromagnetics" by William H. Hayt & John A. Buck Mc. Graw-Hill Companies, 7th Edition, 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 edition

Reference books :

1. "Electromagnetics" by J P Tewari.
2. "Electromagnetics" by J. D Kraus McGraw-Hill Inc. 4th edition 1992.
3. "Electromagnetic fields", by S. Kamakshiah, 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://freevidelectures.com/Course/2340/Electromagnetic-Fields>

COURSE CODE: ELECTROMAGNETIC FIELDS													
COURSE DESIGNED BY: Department of Electrical & Electronics Engineering													
	Program outcomes	Po 1	Po 2	Po 3	Po 4	Po 5	Po 6	Po 7	Po 8	Po 9	Po10	Po11	Po12
Course outcomes	Co1	√							√		√		
	Co2			√		√							
	Co3					√						√	
	Co4				√								
	Co5			√						√			
CATEGORY		General Humanities		Basic sciences		Engineering sciences and Technical			Professional subjects				
									√				
Mode of Evaluation		Quiz, Assignment, Seminar, Written Examination											

Description	Subject methodology	L	T	P	C
Course code	ELECTRICAL MACHINES-I	3	1	0	3
Teaching	Total contact Hours-65				
Pre-requisites	ECA-1, Mathematics-1				

Course Objective(s):

1. To study the principle and types of DC generators
2. To study the principle of operation of Dc motor
3. To control the speed of Dc motor and to Test the D.c. Machines
4. To study the construction and performance characteristics of Transformers

UNIT – I

Objective: To study the principle and types of DC generators (CO1)

D.C. Generators

Armature windings – lap and wave windings, Numerical problems, commutation Process – methods of improving commutation, Compensating windings – Interpoles

Types of DC generators: Types of DC generator: separately excited and self excited generators. Numerical problems, O.C.C– build-up of E.M.F - critical field resistance and critical speed - causes for failure of inducing E.M.F and remedial measures.

Internal & External characteristics of shunt, series and Compound generator- Applications, Losses and Efficiency. applications of dc generators.

UNIT – II

Objective: To study the principle of operation of Dc motor (CO2)

D.C. Motors

D.C Motors – Principle of operation – Back E.M.F. --characteristics of shunt, series and compound motors – Armature reaction and commutation,

Torque equation, Speed torque characteristics, Losses and Efficiency, 3- point and 4- point starters – Numerical problems, applications of dc motors.

UNIT – III

Objective: To control the speed of DC motor (CO3)

Speed Control and Testing of D.C. Machines

Speed control Methods: D.C. Shunt motor-Armature voltage and field flux control methods, speed control of D.C. Series motor.

Testing of D.C. machines: Brake test, Swinburne's test, Hopkinson's test(Regenerative method) - Retardation test and separation of losses. electrical braking methods: plugging, dynamic braking, regenerative braking.

UNIT – IV

Objective: To study 1-ph. Transformers (CO4)

Single Phase Transformers

Construction & Operation – Construction details — types of transformers, Principle of operation- emf equation - operation on no-load and on-load-phasor diagrams for lagging, leading and unity power factors

Equivalent circuit – Regulation – losses and efficiency - effect of variations of frequency & supply voltage on iron losses-- All day efficiency

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

UNIT – V

Objective: To study 3-ph. Transformers (CO4)

3-phase Transformers

Poly phase 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.

Course Outcomes

After successful completion of the course, a successful student will be able to-

- CO1: study the principle and types of DC generators
- CO2: study the principle of operation of Dc motor
- CO3: control the Speed of Dc motor and to Test the D.C. Machines
- CO4: study the construction and performance characteristics of Transformers

Text books:

1. Electric Machinery – A. E. Fitzgerald, C. Kingsley and S. Umans, McGraw-Hill Companies, 5th edition
2. Electrical Machines – P.S. Bimbhra., 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 McGraw – Hill Publishers, 3rd edition, 2004.
3. Electromechanics – I (D.C. Machines) S. Kamakshiah Hi-Tech Publishers.

Web Resources:

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

COURSE CODE:ELECTRICAL MACHINES-I													
COURSE DESIGNED BY: Department of Electrical & Electronics Engineering													
	Program outcomes	Po 1	Po 2	Po 3	Po 4	Po 5	Po 6	Po 7	Po 8	Po 9	Po1 0	Po1 1	Po1 2
Course outcomes	Co1		√							√			√
	Co2								√		√		
	Co3		√			√							
	Co4	√								√			
	Co5		√				√						
√CATEGORY	General Humanities	Basic sciences		Engineering sciences and Technical			Professional subjects						
										√			
Mode of Evaluation	Quiz, Assignment, Seminar, Written Examination												

Description	Subject Teaching Methodology	L	T	P	C
Course Code	COMPLEX VARIABLES & STATISTICAL METHODS	3	1	0	3
Teaching	Total contact hours - 65				
Prerequisite (s)	(10+2) with Mathematics, B.tech Ist Year MI,MM				

Course Objectives:

1. Integrate the elementary complex functions, and be competent in the evaluation of contour integrals and series expansions.
2. Experiment conformal mappings and harmonic function theory in the solution of problems in fluid flow.
3. Design further study in areas of mathematics, science and engineering where knowledge of complex function theory is required.
4. Implement the Probability theory and Sampling distributions learnt in the course to solve a variety of problems at an appropriate level of difficulty.
5. Retrieve the four steps of hypothesis testing and can Distinguish between a one-tailed and two-tailed test.

Unit-I

Objective: To make the student learn about the necessary and sufficient conditions of Cauchy-Riemann equations and application to Harmonic functions.(CO1)

Functions of a complex variable

Introduction- Continuity-Differentiability-Analyticity-Properties-Cauchy-Riemann equations in Cartesian and polar coordinates. Harmonic and Conjugate Harmonic Functions-Milne-Thompson method.

Unit-II

Objective: To train the student in aspects of complex integration and series expansions of complex functions.(CO2)

Integration and series Expansions

Complex integration: Line Integral-Cauchy's integral theorem, Cauchy's integral formula, Generalized integral Formula (without proof)-Radius of Convergence-Expansion in Taylor's series, Maclaurin's series and Laurent series.

Unit-III

Objective: To gain the ability to derive the integration using Residue theorem and of conformal mappings.(CO3)

Integration using Residues:

Types of singularities: Isolated, pole of order in Essential-Residue theorem (without proof)- Evaluation of integrals of type (a) (b) (c), Elementary mapping; Transformation by $Expz$, Lnz , Z^2 , Z^n (n positive integer), $SineZ$, $CosZ$, $Z+a/z$ - Translation, rotation, inversion and bilinear transformations.

Unit-IV

Objective: The student will develop knowledge on elementary concepts of probability, Random variable and Baye's theorem.(CO4)

Elementary Probability: Sample Space-Events-Independent -mutually exclusive events- probability axioms, conditional Probability-Random variable types-probability Mass function-probability density function-distribution function-Baye's theorem. Expected value-properties-mean and variance of Binomial, Poisson and Normal distributions.

Unit-V

Objective: The student analyses the Types of theoretical distributions and sampling distributions, point and interval estimations-can distinguish the Tests of hypothesis concerning means and proportions for small and large samples.(CO5)

Sampling Distributions & Tests of Hypothesis:

Population and samples-sampling distribution of mean (with known and unknown variance), proportion- variances-point and interval estimators for means, variances, proportions. Type I and Type II Errors-Maximum error-one tail, two tail Tests-Tests concerning one mean & proportion, Two means-proportions and their differences using z-test, Student's t-Test-F-test and chi-square test.

Text Books:

1. Advanced Engineering Mathematics: Erwin Kreyszig, Wiley India Edition.
2. Advanced Engineering Mathematics: Michael Greenberg, Pearson.
3. Advanced Engineering Mathematics: Grewal, Khanna Publishers (42nd Ed.).
4. Probability Statistics for Engineers: Miller and John E. Freund, Prentice Hall of India.
5. Probability and Statistics for Engineers & Scientists: Ronald E. Walpole, Sharon L. Mayers and Keying: Pearson
6. Complex variables by R.V. Churchill.

Description	Subject	L	T	P	C
Course/ Code	Fluid Mechanics & Hydraulic Machinery []	-	-	3	2
Teaching	Total contact hours -				
Prerequisite (s)					

UNIT I

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

UNIT II

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

Closed conduit flow : Reynold’s experiment- Darcy Weisbach equation- Minor losses in pipes- pipes in series and pipes in parallel- total energy line-hydraulic gradient line. Measurement of flow: pilot tube, venturimeter, and orifice meter, Flow nozzle, Turbine flow meter.

UNIT IV

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.

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.

Reciprocating Pumps: Working, Discharge, slip, indicator diagrams.

UNIT V

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.

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

Course outcomes:

1. Describe basic working of single and multi-stage centrifugal pumps and blowers.
2. Calculate performance and design of turbines
3. Generate mathematical models of fluid motion including steady, unsteady flow and boundary layer theory

4. State and visualize fluid kinematics. predict and design a fluid dynamical system based on inviscid theory.

TEXT BOOKS:

1. Fluid Mechanics and Hydraulic Machines by Rajput.
2. Hydraulics, fluid mechanics and Hydraulic machinery by Modi and Seth.

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.

Useful Web-links : <http://nptel.ac.in/courses.php>
<http://mit.espe.edu.ec/courses/mechanical-engineering/>

Description	Subject Teaching Methodology	L	T	P	C
Course Code	ELECTRONICS DEVICES & CIRCUITS	3	1	-	3
Teaching	Total contact hours - 65				
Prerequisite (s)	Knowledge of Engineering physics related to semiconductor, mathematics like trigonometry, integration etc.				

Course objective(s)

1. To impart knowledge on semiconductor physics to design the circuits of electronic devices.
2. To understand the basic construction details, operation, characteristics and applications of various semiconductor based diodes.
3. To familiarize with the compensation techniques, characteristics, biasing of BJT and FET.
4. To understand small signal low frequency circuits and their analysis using h-parameters.

UNIT-I

Objective: To introduce basic concepts of semiconductor physics. **(CO1, CO2)**

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 Introduce the concepts of construction, operation and characteristics of various semiconductor diodes. **(CO1, CO2, CO3)**

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: To enlighten importance of operation and analysis of rectifiers with and without filters. Further study the operation of series and shunt regulators using zener diodes. **(CO2, CO3,)**

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, biasing, stabilization and compensation techniques of different bipolar junction transistors (BJT) and field effect transistors (FET). **(CO2, CO4, CO5)**

Transistor Characteristics, Biasing and thermal stabilization

Bipolar 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, punch through/ reach through, Photo transistor. Need for biasing, operating point, load line analysis, BJT biasing- methods, Stability factors, (S, Si, S''), compensation, Thermal runaway, Thermal stability.

FET: FET types, construction, operation, characteristics, parameters, MOSFET-types, construction, operation, characteristics, FET biasing methods and stabilization.

UNIT-V

Objective: To provide knowledge in concepts of small signals low frequency circuits and their analysis of transistor amplifier using h-parameters. **(CO2, CO4, CO5)**

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.

Course Outcomes

After successful completion of the course, a successful student will be able to-

- CO1:** Apply the Knowledge of semiconductor physics for designing the circuits of electronic devices.
- CO2:** Obtain the characteristics of diode in forward and reverse bias and perform mathematical modeling of diode as a resistor and capacitor.
- CO3:** Perform analysis and design of a complete AC to DC converter (Eg: Mobile Charger) consisting of Rectifiers, Filters and regulators.
- CO4:** Describe the construction and working of a Transistor in various modes and design circuits for stabilization and compensation of both BJT and FET.
- CO5:** Gain Knowledge of Small Signal Low Frequency Transistor Amplifier Models.

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 Circuit Theory-R.L. Boylestad and Louis Nashelsky, Pearson Publications, Tenth Edition.

Web-Resources:

1. www.iitkgp.ac.in
2. www.electronic4u.com
3. www.nptel.com
4. <http://www.satishkashyap.com/>

Description	Subject Teaching Methodology	L	T	P	C
Course Code	Soft Skills-1	2	1	0	1
Teaching	Total contact hours - 48				
Prerequisite (s)	Learner should be equipped with Functional grammatical skills and interactive ability				

Title: Professional Communication-1

Course Objective:

To strengthen the four language skills of the learners and to prepare them for success in academics and the job market.

UNIT 1: PLACES	
Reading	Importance of reading skills. Scanning techniques
Writing	Punctuation marks, Writing descriptive sentences ,Writing positives and negatives about a place
Listening & Pronunciation	Video: Living in Alaska Predicting content through visuals, Listening for main ideas Distinguishing fact from opinion
Speaking	Organizing information for a presentation; Making a presentation about place
Grammar	Tense and aspect
Vocabulary	Vocabulary to describe places, suffixes and prefixes
UNIT 2: FESTIVALS AND CELEBRATIONS	
Reading	Recognizing text types, skimming and scanning
Writing	Organizing sentences into a paragraph; writing first draft; writing paragraph: descriptive ,narrative etc.
Listening & Pronunciation	Video: Chinese New Year Listening and taking notes; listening for examples;Stressed words and unstressed sounds
Speaking	Giving a poster presentation, understanding intonation
Grammar	Present tense question forms, Adjectives
Vocabulary	Vocabulary to describe festivals; Collocations
UNIT 3: SCHOOL AND EDUCATION	
Reading	Making inferences/Previewing techniques
Writing	Letter writing/Official letters
Listening & Pronunciation	Video: Education around the world following native accent and intonation
Speaking	Giving opinions in a debate: /agreeing and disagreeing, convincing
Grammar	Conjunctions, Subject pronouns
Vocabulary	Prepositional phrases, Basic verb patterns
UNIT 4: THE INTERNET AND TECHNOLOGY	

Reading	Understanding discourse
Writing	Essay writing
Listening & Pronunciation	Video: Virtual Reality Listening for reasons
Speaking	Presenting a new technology along with advantages and disadvantages
Grammar	Compound nouns, <i>prepositions</i>
Vocabulary	Vocabulary for Internet and technology
UNIT 5: LANGUAGE AND COMMUNICATION	
Reading	Scanning techniques, Observation of foreign languages
Writing	Information from flow charts
Listening & Pronunciation	Video: Languages in South America Listening for genre; Listening for instructions;
Speaking	Sequencing words to organize instructions; Planning and giving a set of instructions
Grammar	Quantifiers: <i>some, many, a lot of, a few, a little</i> ; Imperative clauses;
Vocabulary	Analogies and idiomatic distortions

Prescribed Text Books: UNLOCK SERIES from Cambridge University Press

Unlock Book-2: Reading and Writing

Listening and Speaking

Course Code : ELECTRONICS DEVICES & CIRCUITS													
Course Designed by		Department of Electronics & Communication Engineering											
	Program	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
	CO 1	✓	✓	✓									
	CO 2		✓	✓									
	CO 3	✓	✓	✓									
	CO 4		✓	✓		✓	✓						
	CO 5			✓	✓		✓						
Category		General		Basic		Engineering Sciences And Technical							
						✓							
Mode of Evaluation : Quiz, Assignment, Seminar, Written Examination													

Description	Subject Teaching Methodology	L	T	P	C
Course Code	ELECTRONIC DEVICES AND CIRCUITS LAB	-	-	3	2
Teaching	Total contact hours - 36				
Prerequisite (s)	Knowledge of Engineering physics related to semiconductor, mathematics like trigonometry, integration etc.				

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

PART C: Equipment required for Laboratory

1. Bread boards.
2. Ammeters (Analog or Digital)
3. Voltmeters (Analog or Digital)
4. Active & Passive Electronic Components
5. Regulated Power supplies
6. Analog/Digital Storage Oscilloscopes
7. Analog/Digital Function Generators
8. Digital Multimeters
9. Decade resistance Boxes/Rheostats
10. Decade Capacitance

Description	Subject	L	T	P	C
Course/ Code	Fluid Mechanics & Hydraulic Machinery Lab	-	-	3	2
Teaching	Total contact hours - 48				
Prerequisite (s)					

Course Objective: To impart hands-on practical exposure on study of fluid flow and working of hydraulic machinery.

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.

Description	Subject methodology	L	T	P	C
Course code	ELECTRICAL CIRCUIT ANALYSIS-II	3	1	0	3
Teaching	Total contact Hours-65				
Pre-requisites	ECA-1, Mathematics-3				

Course Objective(s):

1. To study balance and unbalanced 3- ϕ circuits
2. To solve problems in transient state
3. To study 2-port networks
4. To study synthesis of networks
5. To apply fourier analysis to electrical circuits

UNIT-I

Objective: To study 3- ϕ circuits

Balanced 3- ϕ circuits : Phase sequence- Star and delta connection-phasor diagrams-Relation between line and phase voltages and currents in balanced systems-Analysis of balanced three phase circuits.

Unbalanced 3- ϕ circuits: Analysis of Three Phase unbalanced circuits-Loop Method(KVL)-Application of Millman's Theorem- Star Delta Transformation Technique – Measurement of Active and Reactive power-2 wattmeter and 3 wattmeter methods. (CO1)

UNIT-II

Objective:To solve problems in transient state

Transient Analysis: Transient response - R-L, R-C, R-L-C series circuits-with D.C excitation- solution method using differential equation method-laplace transform method.

Transient response - R-L, R-C, R-L-C series circuits-with A.C excitation- solution method using differential equation method- Laplace transform method. (CO2)

UNIT-III

Objective: To study 2-port networks

Two Port Networks :Two port network parameters – Z, Y, ABCD, Inverse transmission parameters

'h'- parameters and 'g 'and- their relations- Cascaded networks-Poles and zeros of Network functions. (CO3)

UNIT-IV

Objective: To study synthesis of networks

Network synthesis: Positive real function-basic synthesis procedure-LC immitance functions - Foster-I, Foster-II forms and Cauer-I, Cauer-II forms

RC impedance functions and RL admittance function- RL impedance function and RC admittance function-Foster-I, Foster-II forms and Cauer-I, Cauer-II forms. (CO4)

UNIT-V

Objective: To apply fourier analysis to 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.(CO5)

Course Outcomes

After successful completion of the course, a successful student will be able to-

CO1: Understand balance and unbalanced 3- ϕ circuits

CO2: Solve problems in transient state

CO3: Understand 2-port networks

CO4: Understand synthesis of networks

CO5: Apply fourier analysis to electrical circuits

Text Books:

- 1.Engineering Circuit Analysis by William Hayt and Jack E.Kemmerley,McGraw Hill Company,6 th edition
- 2.Networksynthesis:VanValkenburg; Prentice-Hall of India Pvt. Ltd.
3. Circuit Theory(Analysis and Synthesis)- A. Chakrabarti, DhanpatRai& 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.LakshmiNarayana,BS Publications,2nd edition
- Network Analysis: Van Valkenburg; Prentice-Hall of India Private Ltd.

Web Resources:

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

2. <http://www.electrical4u.com>

COURSE CODE: ELECTRICAL CIRCUIT ANALYSIS-II													
COURSE DESIGNED BY: Department of Electrical & Electronics Engineering													
	Program outcomes	Po 1	Po 2	Po 3	Po 4	Po 5	Po 6	Po 7	Po 8	Po 9	Po1 0	Po1 1	Po1 2
Course outcomes	Co1		√				√						
	Co2										√		
	Co3			√							√		
	Co4	√				√							
	Co5			√		√					√		
CATEGORY		General Humanities		Basic sciences		Engineering sciences and Technical			Professional subjects				
									√				
Mode of Evaluation		Quiz, Assignment, Seminar, Written Examination											

Description	Subject Teaching Methodology	L	T	P	C
Course Code	SWITCHING THEORY AND LOGIC DESIGN	3	1	0	3
Teaching	Total contact hours – 60				
Prerequisite (s)	Knowledge of Engineering and Network circuits.				

Course Objectives:

This course provides in-depth knowledge of switching theory and the design techniques of digital circuits, which is the basis for design of any digital circuit. The main objectives are:

1. To learn basics for the design of digital circuits and fundamental concepts used in the design of digital systems.
2. To understand different forms of number representation in digital electronics and to be able to convert between different representations.
3. To implement simple logical operations using combinational logic circuits
4. To design combinational logic circuits, sequential logic circuits.
5. To impart to student the concepts of sequential circuits, enabling them to analyze sequential systems in terms of state machines.
6. To implement synchronous state machines using flip-flops.

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 complement of signed numbers, problem solving. 4-bit codes, BCD, excess-3, alphanumeric code, self complement codes, Weighted and Non-weighted codes. (CO1,CO2)

Logic operations

Basic Logic gates- NOT, OR, AND, Universal building blocks, EX-OR, EX-NOR gates, Canonical and Standard form. 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 and realization of logic circuits -Adder and Subtrator circuits.(CO2)

MINIMIZATION OF SWITCHING FUNCTIONS

Minimization of logic functions using 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 using K –map, Tabular minimization (Quine McCluskey method).

Design of half adder, full adder, half sub tractor, full subtractor, applications of full adders, 4-bit binary adder, 4-bit binary subtractor, 4-bit Adder/ Subtractor Circuit, BCD adder, carry look – a – head adder, Binary Multiplier.

UNIT-III

COMBINATIONAL LOGIC CIRCUITS

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 and To study the basic structure and realization of Boolean functions with PLD, PROM, PLA, PAL.(CO3,CO4)

Design of decoder, encoder, multiplexer, de-multiplexer, priority encoder, comparators and seven segment display Decoder. Realization of Boolean functions using decoders and Multiplexers. Implementing multiplexers 32 to 1, 16 to 1 using other multiplexers. Implementing Decoders 5 x 32, 4 x 16 using other Decoders.

PLDS,ROM,PROM structures, merits & demerits and comparison of PROM, PAL, PLA and Implementation of circuits like Full Adder, Subtractor, Decoders, Multiplexers using PROM, PAL, PLA. Realization of Boolean functions with the help of Programming tables of PROM, PAL, PLA.

UNIT-IV

SEQUENTIAL LOGIC CIRCUITS

Objective: To understand the concepts of sequential circuits.(CO5)

Difference between combinational and sequential circuits, RS-Latch, Difference between Latch and Flip-flop, Classification of sequential circuits, flip-flops with truth tables, excitation tables, state diagram and state equation and Conversion of flip-flops.

Design of ripple counters, Decade counter, Synchronous counters, Modulo N-counter, Johnson and Ring counters. Shift register, bi-directional shift register and universal shift register. Realization of circuits using various flip-flops.

UNIT-V

Objective: To understand the concepts of state machines and finite state machines (FSM).(CO5,CO6)

Introduction to state machines, state diagrams, state tables and state equations, Finite state machines: Analysis of clocked sequential circuits, reduction of state tables state diagrams, and state assignments, design procedure, Melay and Moore models, Mealy to Moore conversion and vice-versa, Vending machine Example on state machines.

Text Books:

1. Digital design – Moris Mano PHI.
2. Switching and Finite automata theory – Zvi Kohavi, Tata Mcgraw – Hill, 1978, 2/e.

Reference Books:

1. Fundamentals of Logic Design – Charles H.Roth Jr, Jaico Publishers.
2. Anand kumar. A 8th printing (second edition) – January 2015.

Course Outcomes:

Upon completion of the course, students should possess the following skills:

1. Be able to manipulate numeric information in different forms, e.g. different bases, signed integers, various codes such as ASCII, Gray, and BCD.
2. Be able to manipulate simple Boolean expressions using the theorems and postulates of Boolean algebra and to minimize combinational functions.
3. Be able to design and analyze small combinational circuits and to use standard combinational functions/building blocks to build larger more complex circuits.
4. Be able to design and analyze small sequential circuits and devices and to use standard sequential functions/building blocks to build larger more complex circuits.

Web-Resources:

1. <http://www.ni.com/example/14493/en/>
2. <http://nptel.ac.in/courses/117106086/2>

Course Code :		ELECTROMAGNETIC WAVES AND TRANSMISSION LINES											
Course Designed by		Department of electronics and communication Engineering											
	Program Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
Course Outcomes	CO 1	✓							✓	✓	✓		✓
	CO 2		✓		✓	✓						✓	✓
	CO 3	✓			✓	✓				✓			✓
	CO 4					✓	✓	✓			✓		
Category		General Humanities	Basic Sciences	Engineering Sciences And Technical			Professional Subjects						
				✓									
Mode of Evaluation : Quiz, Assignment, Seminar, Written Examination													

Description	Subject methodology	L	T	P	C
Course code	POWER SYSTEMS-1	3	1	0	3
Teaching	Total contact Hours-65				
Pre-requisites	Mathematics-1				

Course Objective(s):

1. To study about power plants
2. To study distribution system
3. To study substations
4. To study underground cables
5. To study economic aspects and tariff

UNIT-I

Objective: To study about power plants (CO1)

Thermal Power Stations

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

Nuclear Power Stations

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

Unit-II

Objective: To study distribution system (CO2)

D.C.distribution :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, with inter connector- stepped distributor

AC distribution:- voltage drop calculations: AC distributor- fed at one end -fed at both ends (equal / unequal voltages)- ring main distributor- with inter connector. Comparison of DC and AC distribution.

Unit-III

Objective: To study substations (CO3)

Classification of substations: **Air insulated substations** - Indoor & Outdoor substations: Substations layout of 33/11KV -Bus bar arrangements in the Sub-Stations - single bus bar-sectionalized single bus bar- double bus bar with one and two circuit breakers- main and transfer bus bar system.

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-IV

Objective: To study underground cables (CO4)

Underground Cables: Types of Cables- Construction- Types of insulating materials- Calculations of insulation resistance and stress in insulation,- power factor of cable- Numerical Problems.

Capacitance of single core and 3-Core belted Cables- Numerical Problems -Grading of Cables- Capacitance grading, Numerical Problems, Inter sheath Grading

UNIT-V

Objective: To study economic aspects and tariff (CO5)

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

Course Outcomes

After successful completion of the course, a successful student will be able to-

CO1: Understand power plants

CO2: Understand distribution system

CO3: Understand substations

CO4: Understand underground cables

CO5: Understand economic aspects and tariff

Text Books:

1. A Text Book on Power System Engineering by M.L.Soni, P.V.Gupta, U.S.Bhatnagar and A.Chakraborti, DhanpatRai& 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/>

COURSE CODE: POWER SYSTEMS-I													
COURSE DESIGNED BY: Department of Electrical & Electronics Engineering													
	Program outcomes	Po 1	Po 2	Po 3	Po 4	Po 5	Po 6	Po 7	Po 8	Po 9	Po1 0	Po1 1	Po1 2
Course outcomes	Co1	√			√					√			
	Co2			√			√						
	Co3			√							√		
	Co4			√					√				
	Co5		√						√				
CATEGORY		General Humanities		Basic sciences		Engineering sciences and Technical			Professional subjects				
									√				
Mode of Evaluation		Quiz, Assignment, Seminar, Written Examination											

Description	Subject methodology	L	T	P	C
Course code	ELECTRICAL MACHINES – II	3	1	0	3
Teaching	Total contact Hours-65				
Pre-requisites	EM-1				

Course Objective(s):

1. To understand operation and working of 3-ph Induction motor
2. To understand performance of Induction motor
3. To understand working and performance of synchronous generator
4. To understand performance & Parallel operation of synchronous Generators

To Understand operation and performance of synchronous motor.

UNIT-I

Objective: To study induction motors (CO1)

3-phase Induction Motors

construction details: squirrel cage and wound rotors-skewing-production of rotating magnetic field - principle of operation - slip- rotor induced e.m.f and rotor frequency - rotor current and p.f. at standstill and running conditions, Numerical problems.

Rotor input power, rotor copper loss, mechanical power developed - equivalent circuit - Numerical problems, Torque equation- expressions for maximum torque and starting torque – slip-torque characteristics.

UNIT-II

Objective: To study performance of Induction motor (CO2)

No load and blocked rotor tests- Circle diagram for predetermination of efficiency-

Starting methods-from stator side and rotor side- Induction generator- double cage rotor - crawling and cogging.

UNIT-III

Construction and operation of Synchronous generator (CO3)

Constructional features of non-salient and salient pole type – Armature windings – Distributed and concentrated windings – Distribution– Pitch and winding factors –E.M.F equation–Improvements of waveform and armature reaction– Numerical problems.

UNIT – IV

Voltage regulation of synchronous generator (CO4)

Voltage regulation by synchronous impedance method– MMF method and Potier triangle method–Phasor diagrams– Two reaction analysis of salient pole machines and phasor diagram– Numerical problems.

Parallel operation of synchronous generators

Parallel operation with infinite bus and other alternators – Synchronizing power – Load sharing – Transfer of real and reactive power – Numerical problems.

UNIT–V (CO5)

Synchronous motor – operation

Synchronous Motor principle and theory of operation– Phasor diagram – Starting torque– Variation of current and power factor with excitation – Synchronous condenser – Mathematical analysis for power developed– Numerical problems.

Starting methods and performance of Synchronous motor

Excitation and power circles – Hunting and its suppression – Methods of starting – Synchronous induction motor.

Text Books:

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

Course Outcomes

After successful completion of the course, a successful student will be able to-

CO1: Understand operation and working of 3-Ph Induction motor

CO2: understand performance of Induction motor

CO3: understand working and performance of synchronous generator

CO4: understand performance & Parallel operation of synchronous Generators

CO5: understand operation and performance of synchronous motor.

Reference Books:

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

COURSE CODE: ELECTRICAL MACHINES-II													
COURSE DESIGNED BY: Department of Electrical & Electronics Engineering													
	Program outcomes	Po 1	Po 2	Po 3	Po 4	Po 5	Po 6	Po 7	Po 8	Po 9	Po1 0	Po1 1	Po1 2
Course outcomes	Co1		√					√				√	
	Co2			√									
	Co3	√	√						√				
	Co4				√			√					
	Co5			√							√		
CATEGORY		General Humanities		Basic sciences		Engineering sciences and Technical			Professional subjects				
							√						
Mode of Evaluation		Quiz, Assignment, Seminar, Written Examination											

Description	Subject methodology	L	T	P	C
Course code	ELECTRICAL MEASUREMENTS	3	1	0	3
Teaching	Total contact Hours-65				
Pre-requisites	Mathematics-1				

Course Objective(s):

1. To study fundamentals of measuring instruments
2. To measure power
3. To study potentiometers
4. To study magnetic measuring devices
5. To study digital meters

UNIT-I

Objective: To study fundamentals of measuring instruments (CO1)

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 measure power (CO2)

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 study potentiometers (CO3)

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

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 – IV

Objective: To study magnetic measuring devices (CO4)

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-V

Objective: To study digital meters (CO5)

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

Course Outcomes

After successful completion of the course, a successful student will be able to-

- CO1: Understand fundamentals of measuring instruments
- CO2: Understand measure power
- CO3: Understand potentiometers
- CO4: Understand magnetic measuring devices
- CO5: Understand digital meters

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.SawhneyDhanpatRai& 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>

COURSE CODE: ELECTRICAL MEASUREMENTS													
COURSE DESIGNED BY: Department of Electrical & Electronics Engineering													
	Program outcomes	Po 1	Po 2	Po 3	Po 4	Po 5	Po 6	Po 7	Po 8	Po 9	Po1 0	Po1 1	Po1 2
Course outcomes	Co1		√				√					√	
	Co2			√			√				√		
	Co3			√						√			
	Co4				√							√	
	Co5		√				√				√		
CATEGORY		General Humanities		Basic sciences		Engineering sciences and Technical			Professional subjects				
									√				
Mode of Evaluation		Quiz, Assignment, Seminar, Written Examination											

Description	Subject Teaching Methodology	L	T	P	C
Course Code	PULSE AND DIGITAL CIRCUITS				
Teaching	Total contact hours - 65				
Prerequisite (s)	Knowledge of Electronic devices and circuits.				

Course Objective(s):

1. To construct different linear networks and non linear networks
2. To learn the design of multivibrators and analyze their outputs
3. To determine the time base generator waveforms and To know the basic operating principles of blocking oscillators
4. To understand how to use synchronization and frequency division and To know the basic operating principles of sampling gates.

Unit I

Objective: To understand the response of sinusoidal waves and also study how to convert signals from one form to another (CO1)

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.

Unit II

Objective: To understand the response of non-sinusoidal waves and also study how to convert signals from one form to another (CO1)

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 III

Objective: To understand various multivibrators using BJT (CO2)

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 & To learn basic concepts of blocking oscillators using diodes and RC components. (CO3)

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.

Blocking oscillators

Basic operating principles of blocking oscillators, Applications.

Unit V

Objective: To understand the basic sampling gates using BJT & To understand synchronization and frequency division techniques (CO4)

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.

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

COURSE OUTCOMES

After successful completion of the course, a successful student will be able to

CO1: Design linear wave shaping circuits for various input signals and Design non linear wave shaping circuits using diodes and transistors.

CO2: Generate various non sinusoidal signals using multivibrators for various electronic application.

CO3: Design time base generators which are used in different applications and also Understand the principles of blocking oscillators.

CO4: Apply the operating principles of sampling gates for their applications and Understand the principles of synchronization and frequency division in systems operating at different frequencies

Web-Resources:

1. <http://www.iinet2.org/>
2. <http://www.ilo.org/global/publications/lang--en/index.htm>
3. [http://nptel.ac.in/courses/Webcourse-contents/IIT-ROORKEE/pulse and digital circuits/](http://nptel.ac.in/courses/Webcourse-contents/IIT-ROORKEE/pulse%20and%20digital%20circuits/)

Course Code : PULSE AND DIGITAL CIRCUITS													
Course Designed by		Department of electronics and communication Engineering											
	Program Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
Course Outcomes	CO 1	✓					✓						
	CO 2			✓		✓							
	CO 3		✓			✓							
	CO 4			✓			✓						
Category		General Humanities		Basic Sciences		Engineering Sciences And Technical		Professional Subjects					
						✓							
Mode of Evaluation : Quiz, Assignment, Seminar, Written Examination													

Description	Subject methodology	L	T	P	C
Course code	ELECTRICAL MACHINES – I LAB	0	0	3	2
Teaching	Total lab hours-33				
Pre-requisites	EM-1, ECA-1				

Course Objective(s):

1. To determine the performance of DC shunt machine
2. To determine the performance of DC series machine
3. To determine the performance of DC compound machine

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 shunt 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

Course Outcomes

After successful completion of the course, a successful student will be able to-

- CO1: Determine the performance of DC shunt machine
- CO2: Determine the performance of DC series machine
- CO3: Determine the performance of DC compound machine
- CO5:

COURSE CODE: ELECTRICAL MACHINES-I LAB													
COURSE DESIGNED BY: Department of Electrical & Electronics Engineering													
	Program outcomes	Po 1	Po 2	Po 3	Po 4	Po 5	Po 6	Po 7	Po 8	Po 9	Po1 0	Po1 1	Po1 2
Course outcomes	Co1			√			√				√		
	Co2					√				√			
	co3	√					√						
CATEGORY		General Humanities		Basic sciences		Engineering sciences and Technical			Professional subjects				
									√				
Mode of Evaluation		Quiz, Assignment, Seminar, Written Examination											

Description	Subject methodology	L	T	P	C
Course code	ELECTRICAL CIRCUITS LAB	0	0	3	2
Teaching	Total lab hours-33				
Pre-requisites	ECA-1, ECA-2				

Course Objective(s):

1. To verify the network theorems.
2. To study resonance characteristics
3. To determine 2-port network parameters

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

Course Outcomes

After successful completion of the course, a successful student will be able to-

- CO1: To verify the network theorems.
- CO2: To study resonance characteristics
- CO3: To determine 2-port network parameters

COURSE CODE:ELECTRICAL CIRCUITS LAB													
COURSE DESIGNED BY: Department of Electrical & Electronics Engineering													
	Program outcomes	Po 1	Po 2	Po 3	Po 4	Po 5	Po 6	Po 7	Po 8	Po 9	Po1 0	Po1 1	Po1 2
Course outcomes	Co1	√					√				√		
	Co2		√		√					√			
	co3		√			√					√		
CATEGORY		General Humanities		Basic sciences		Engineering sciences and Technical			Professional subjects				
									√				
Mode of Evaluation		Quiz, Assignment, Seminar, Written Examination											

