

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY

Kurnool – 518002

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Semester–II (2016-17)

COURSE DESCRIPTION

Course Code	:	15A02201
Course Title	:	ELECTRICAL CIRCUITS - I
Course Structure	:	Lectures Tutorials Practical's Credits 3 1 - 3
Course Coordinator	:	Dr. M. RAM PRASAD REDDY Professor and Head
Team of Instructors	:	Mr. A.suresh kumar

I. Course Overview:

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.

By the end of the course, the successful student will be able to:

- The fundamental principles in electric circuit theory and are able to extend these principles into a way of thinking for problem solving in mathematics, science and engineering
- To analyze analog circuits that includes energy storage elements in the time and frequency domains, both theoretically and experimentally.
- Ways in which electrical engineering shapes and benefits society.
- To improve the oral, graphical and written communication skills.
- How to learn and work effectively both individually and in groups.
- To evaluate the personal learning process and understanding of the concepts and skills from class

II. Prerequisite(s)

Level	Credits	Periods/ Week	Prerequisites
UG	3	3	Basics of vector analysis, Basic Mathematics

III. Marks Distribution:

Sessional Marks	University End Exam Marks	Total Marks
There shall be 2 midterm examinations. Each midterm examination consists of subjective and objective tests. The subjective test is for 20 marks, with duration of 90 minutes and objective test is for 10 marks with duration of 20 minutes. Subjective paper shall contain 5 questions of which student has answer 3 questions evaluated for 20 marks. The objective paper is set for 20 bits for 10 marks. First midterm examination shall be conducted for the first four units of syllabus and second midterm examination shall be conducted for the remaining four units. The better of the two midterm examination will be taken as the final sessional marks secured by the candidate in the subject.	70	100

IV. Evaluation Scheme:

S.No	Component	Duration (hours)	Marks
1	I Mid Examination	1 hour 50 min	30
2	II Mid Examination	1 hour 50 min	30
3	External Examination	3	70

V. Course Educational Objectives:

- I. To know about the fundamentals Electrical engineering basics.
- II. To analyze analog circuits that includes energy storage elements in the time and frequency domains, both theoretically and experimentally.
- III. Ways in which electrical engineering shapes and benefits society.
- IV. To improve the oral, graphical and written communication skills.
- V. How to learn and work effectively both individually and in groups.
- VI. Investigate several graphical and mathematical methods to solve typical Electrical circuits.
- VII. Basic laws of Electrical and magnetic circuits and their correlation.

VI. Course Outcomes:

1. An understanding of basic EE abstractions on which analysis and design of electrical and Magnetic circuits are based, including lumped circuit abstractions.
2. Analyze different electrical networks & determine various parameters using different techniques in time domain and frequency domain
3. Formulate and solve the differential equations describing time and frequency behavior of circuits containing energy storage elements.
4. Interpret the concepts of Fourier theorem and transforms for analyzing the behavior of electrical circuits for different inputs
5. Demonstrate knowledge of recent research in the area and exhibit technical writing and presentation skills.
6. Engage in independent and lifelong learning in the context of technological changes.

VII. How Course Outcomes are assessed:

	Outcome	Level	Proficiency assessed by
A	An ability to apply knowledge of mathematics, science and engineering,	S	--
B	An ability to design and conduct experiments, as well as to analyze and interpret data,	H	--
C	An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability,	H	Tests and assignments
D	An ability to function on multidisciplinary teams,	S	--
E	An ability to identify, formulate, and solve engineering problems,	S	Tests and assignments
F	An understanding of professional and ethical responsibility,		--
G	An ability to communicate effectively,	N	
H	The broad education necessary to understand the impact of engineering solutions	S	--

	in a global, economic, environmental and societal context,		
I	A recognition of the need for, and an ability to engage in life-long learning	S	--
J	A knowledge of contemporary issues, and	S	--
K	An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.	S	Tests and assignments

N = None

S = Supportive

H = Highly Related

VIII. Syllabus:

UNIT- I INTRODUCTION TO ELECTRICAL & MAGNETIC CIRCUITS

Electrical Circuits: Circuit Concept, R, L and C Parameters - Independent and Dependent Voltage and Current Sources -Source Transformation, Voltage - Current Relationship for Passive Elements (For Different Input Signals: Square, Ramp, Saw Tooth, Triangular. Kirchoff's Laws, Network Reduction Techniques: Series, Parallel, Series Parallel, Star-to-Delta or Delta-to-Star Transformation. Examples

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, MMF Calculations.

UNIT- II SINGLE PHASE A.C CIRCUITS

R.M.S, Average Values and Form Factor for Different Periodic Wave Forms: Sinusoidal Alternating Quantities. Phase and Phase Difference, Complex and Polar Forms Of Representations, j-Notation, Steady State Analysis of R, L and C (In Series, Parallel and Series Parallel Combinations) With Sinusoidal Excitation, Concept of Power Factor, Concept of Reactance, Impedance, Susceptance and Admittance-Real and Reactive Power and Complex Power. Examples.

UNIT- III LOCUS DIAGRAMS & RESONANCE

Series R-L, R-C, R-L-C and Parallel Combination with Variation of Parameters. Resonance: Series, Parallel Circuits, Concept of Bandwidth and Q Factor.

UNIT- IV NETWORK THEOREMS

Thevenin's, Norton's, Maximum Power Transfer, Millman's Theorems, Tellegen's, Superposition, Reciprocity and Compensation Theorems for D.C And Sinusoidal Excitations.

UNIT- V TWO PORT NETWORKS

Two Port Network Parameters: Impedance, Admittance, Transmission and Hybrid Parameters and their Relations. Concept of Transformed Network, Two Port Network Parameters Using Transformed Variables.

TEXT BOOKS:

1. Electrical Circuit Theory and Technology 4th Edition, John Bird, Routledge/T&F, 2011.
2. Network Analysis 3rd Edition, M.E Van Valkenberg, PHI.

REFERENCES:

1. Circuit Theory (Analysis & Synthesis) 6th Edition, A. Chakrabarti, Dhanpat Rai & Sons, 2008.
2. Electric Circuits by N.Sreenivasulu, REEM Publications
3. Engineering Circuit Analysis, William Hayt and Jack E. Kemmerly, Mc Graw Hill Company, 6th edition.
4. Circuits & Networks by A. Sudhakar and Shyammoohan S Palli, Tata McGraw- Hill

VIII Course Plan:

The course plan is meant as a guideline. There may probably be changes.

Lecture No.	Learning Objective	Topics to be covered	Reference
UNIT-I			
1-9	Learn the fundamentals of electrical circuits	R, L and C Parameters Independent and Dependent Sources Voltage - Current Relationship for Passive Elements	T1,R1
10-15	Learn the basic laws and reduction techniques in electrical circuits. Implement the mesh and node analysis techniques.	Kirchhoff's Laws Mesh and nodal analysis Network Reduction Techniques	T1,T2,R1
16-22	Analyze the self and mutual inductances in magnetic coupled circuits	Concept of Self and Mutual Inductance Analysis of Series and Parallel Magnetic Circuits	T1,T2,R1
UNIT-II			
23-27	Learn the basic fundamentals and representations of sinusoidal circuits.	R.M.S, Average Values and Form Factor for Different Periodic Wave Forms: Phase and Phase Difference, Complex and Polar Forms Of Representations, j-Notation	T1,R1,T2
28-30	Analyze the behavior of R,L and C with A.C supply.	Steady State Analysis of R, L and C (In Series, Parallel and Series Parallel Combinations) With Sinusoidal Excitation,	T1,T2,R1
31-35	Learn the concepts of impedance, admittance.	Concept of Reactance, Impedance, Susceptance and Admittance Real, Reactive Power and Power Factor .	T1,R1
UNIT-III			
35-40	Learn the locus diagrams with variation of parameters	Series R-L, R-C, R-L-C and Parallel Combination with Variation of Parameters.	T1,R1
41-48	Analyze the series and parallel resonance circuits	Series, Parallel Resonance Circuits Concept of Bandwidth and Q Factor.	T1,R1
UNIT-IV			
49-62	Analyze the circuits by using theorems for AC and DC excitations	Thevenin's ,Norton's,Maximum Power Transfer Millman's Theorems,Tellegen's Superposition ,Reciprocity Compensation Theorems for D.C And Sinusoidal Excitations.	T1,T2,R1
UNIT-V			
63-69	Analyze the different two port parameters k.	Two Port Network Parameters: Impedance ,Admittance ,Transmission and Hybrid Parameters	T1,T2,R1
70-72	Learn the internal relations in two port parameters	Internal Relations in twoport network primeters Concept of Transformed Network	T1,T2,R1

IX. Mapping of course objectives to the achievements of course outcomes:

Course Objectives	Program Outcomes										
	a	b	c	d	e	f	g	h	i	j	k
I	S	S	-	-	S	-	-	H	S	S	S
II	-	H	S	S	S	-	-	S	S	S	
III	S	S	-	-	H	-	-	S	-	S	S
IV	S	S	H	S	H	S	S	S	-	-	S
V	-	-	H	S	H	-	-	H	-	S	-
VI	-	S	-	--	H	-	-	-	-	--	S

X. Mapping of course outcomes leading to the achievement of the program outcomes:

Course Outcomes	Program Outcomes										
	a	b	c	d	e	f	g	h	i	j	k
1	H	-	S	-	S	-	-	S	-	-	S
2	S	-	H	-	H	-	-	-	S	-	-
3	S	-	-	-	H	-	S	S	-	-	S
4	S	S	-	-	H	-		-	-	S	-
5	-	-	H	-	S	-	S	-	-		-
6	S	-		-		-		-	-	H	-
7	-	S	S	-	H	-	--	-	-	---	-
8	-	--	-	S				S			-

Prepared By :Mr. A.suresh kumar, Asst.Professor

Date :26-12-2016