

SRM UNIVERSITY
FACULTY OF ENGINEERING AND TECHNOLOGY
SCHOOL OF ELECTRONICS AND ELECTRICAL ENGINEERING
DEPARTMENT OF ECE
COURSE PLAN

Course Code : EC0102
Course Title : ELECTRIC CIRCUITS
Semester : II
Course Time : Jan – April 2012
Location : SRMIST

Faculty Details

Sec.	Name	Office	Office hour	Mail id
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C	Mrs.V.Sarada	TP1006A	Day1-6,7 Day4-1 Day5-2	sarada.v@ktr.srmuniv.ac.in
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F	Mr. K. Ramesh	TP1106A	Day1-1,6 Day2-1 Day4-1,2	ramesh.kr@ ktr.srmuniv.ac.in
G	Mrs.N.Saraswathi	TP10S1	Day1-2 Day2-6,7 Day5-3	saraswathy.n@ ktr.srmuniv.ac.in
H	Mrs.R.Manohari	TP09S5	Day1-1 Day3-6 Day4-1 Day5-2	manohari.r@ ktr.srmuniv.ac.in

Required Text Books:

1. A. Sudhakaar & Shyanmugam S.Palli “Circuits & Network Analysis & Synthesis”, 2nd Edition, Tata McGraw Hill, 1994.
2. M. Arumugam & N. PremKumar, “Electric Circuit Theory”, Khanna Publishers, New Delhi, 1991.
3. William H.Hyte, Jr, j.e.kemmerly & Steven M. Durban, “Engineering Circuit Analysis” 6th Edition, McGraw Hill, 2002.
4. Joseph Edminister, “Electric Circuits” Schaum’s Outline Series, McGraw Hill 2nd Edition.
5. M.L. Soni & J.C. Gupta, “Electric Circuit Analysis”, Dhanat Rai & Sons, New Delhi, 1981.

Web Resources :

www.circuit-magic.com
<http://ocw.mit.edu>
www.allaboutcircuits.com
www.analyzethat.net

Prerequisite : Nil

Instructional Objectives

1. To understand the concept of circuit elements lumped circuits, waveforms, circuit laws and network reduction.
2. To solve the electrical network using mesh and nodal analysis by applying network theorems.
3. To understand the concept of active, reactive and apparent powers, power factor and resonance in series and parallel circuits.
4. To know the basic concepts of coupled circuits, three phase loads and power measurement.
5. To analyze the transient response of series and parallel A.C. circuits and to solve problems in time domain using Laplace Transform.

Assessment Details

Cycle Test – I : 10 Marks
 Surprise Test : 05 Marks
 Cycle Test – II : 10 Marks
 Model Exam : 20 Marks
 Attendance : 05 Marks

Test Schedule

S.No.	DATE	TEST	TOPICS	DURATION
1	30.1.2012 (tentative)	Cycle Test - I	Upto session 1-15	100 Mins
2	25.03.2012 (tentative)	Cycle Test - II	Upto session 16-36	100 Mins
3	09.04.2012 (tentative)	Model Exam	All sessions	3 Hrs

Outcomes

Student who have successfully completed this course,

Instruction Objective	Program outcome
<ol style="list-style-type: none"> 1. To understand the concept of circuit elements lumped circuits, waveforms, circuit laws and network reduction. 2. To solve the electrical network using mesh and nodal analysis by applying network theorems. 3. To understand the concept of active, reactive and apparent powers, power factor and resonance in series and parallel circuits. 4. To know the basic concepts of coupled circuits, three phase loads and power measurement. 5. To analyze the transient response of series and parallel A.C. circuits and to solve problems in time domain using Laplace Transform. 	<ol style="list-style-type: none"> a) Graduates will demonstrate knowledge of mathematics, science and engineering. b) Graduates will demonstrate the ability to identify, formulate and solve engineering problems c) Graduates will demonstrate the ability to design and conduct experiments, analyze and interpret data. k) Graduates will show the ability to participate and try to succeed in competitive examinations.

Detailed Session Plan

BASIC CIRCUIT CONCEPTS & LAWS				
Lumped Circuit elements, Ideal Sources (Dependent & Independent), Linear Passive elements -VI relationship of Circuit elements- Definitions: Node, Loop, Path & Branch. - Examples - Kirchoff's Laws and Application (Both AC & DC).				
Session No.	Topics to be covered	Text Books	Instruction Objective	Program Outcome
1	Introduction to Basic circuit elements, Lumped circuit elements, Dependent & Independent Ideal Sources Linear Passive elements	A. Sudhakaar & Shyanmugam S.Palli "Circuits & Network Analysis & Synthesis" – Chapter 1	1. To understand the concept of circuit elements lumped circuits, waveforms, circuit laws and network reduction.	a) Graduates will demonstrate knowledge of mathematics, science and engineering.
2	VI relationship of Circuit elements, Series and Parallel circuits of R, L and C	A. Sudhakaar & Shyanmugam S.Palli "Circuits & Network Analysis & Synthesis" – Chapter 1		a) Graduates will demonstrate knowledge of mathematics, science and engineering.
3	Definitions of Node, Loop, Path & Brach with examples	A. Sudhakaar & Shyanmugam S.Palli "Circuits & Network Analysis & Synthesis" – Chapter 1		a) Graduates will demonstrate knowledge of mathematics, science and engineering.
4	Kirchoff's Current Law and Kirchoff's Voltage Law With Numerical Examples	A. Sudhakaar & Shyanmugam S.Palli "Circuits & Network Analysis & Synthesis" – Chapter 1		b) Graduates will demonstrate the ability to identify, formulate and solve engineering problems
5.	Mesh Analysis , Super mesh Analysis and also by Inspection Method	A. Sudhakaar & Shyanmugam S.Palli "Circuits & Network Analysis & Synthesis" – Chapter 1		c) Graduate will demonstrate the ability to design and conduct experiments, analyze and interpret data.
6.	Nodal Analysis & Super node Analysis	A. Sudhakaar & Shyanmugam S.Palli "Circuits & Network Analysis & Synthesis" – Chapter 1		c) Graduate will demonstrate the ability to design and conduct experiments, analyze and interpret data.
7	Tutorials	Joseph Edminister, "Electric Circuits" Schaum's Outline Series – Chapter 2 & 3		k) Graduates will show the ability to participate and try to succeed in competitive examinations.

NETWORK THEOREMS

Voltage & Current source transformations, Star & Delta transformations, Superposition theorem, Thevenin's & Norton's theorems, Maximum Power Transfer theorem, Reciprocity theorem, Compensation theorem, Millman's theorem, Tellegen's theorem- statement & Applications.

Session No.	Topics to be covered	Text Books	Instruction Objective	Program Outcome
8	Source Transformation Theorem, Star delta theorem	A. Sudhakaar & Shyanmugam S.Palli "Circuits & Network Analysis & Synthesis" – Chapter 3	2. To solve the electrical network using mesh and nodal analysis by applying network theorems.	b) Graduates will demonstrate the ability to identify, formulate and solve engineering problems
9	Superposition Theorem	A. Sudhakaar & Shyanmugam S.Palli "Circuits & Network Analysis & Synthesis"- Chapter 3		b) Graduates will demonstrate the ability to identify, formulate and solve engineering problems
10	Working Examples of Superposition theorem	A. Sudhakaar & Shyanmugam S.Palli "Circuits & Network Analysis & Synthesis" - Chapter 3		b) Graduates will demonstrate the ability to identify, formulate and solve engineering problems
11	Thevenin's Theorem	A. Sudhakaar & Shyanmugam S.Palli "Circuits & Network Analysis & Synthesis" - Chapter 3		b) Graduates will demonstrate the ability to identify, formulate and solve engineering problems
12	Working Examples of Thevenin's Theorem	A. Sudhakaar & Shyanmugam S.Palli "Circuits & Network Analysis & Synthesis"- Chapter 3		b) Graduates will demonstrate the ability to identify, formulate and solve engineering problems
13	Nortons theorem with working Example	A. Sudhakaar & Shyanmugam S.Palli "Circuits & Network Analysis & Synthesis" - Chapter 3		c) Graduate will demonstrate the ability to design and conduct experiments, analyze and interpret data.
14	Maximum Power Transfer Theorem	A. Sudhakaar & Shyanmugam S.Palli "Circuits & Network Analysis & Synthesis" - Chapter 3		c) Graduate will demonstrate the ability to design and conduct experiments, analyze and interpret data.
15	Working Example of Maximum Power Transfer theorem	A. Sudhakaar & Shyanmugam S.Palli "Circuits & Network		k) Graduates will show the ability to participate and try to succeed in competitive examinations.

		Analysis & Synthesis"- Chapter 3		
16	Tellegen's & Millman's Duality and Substitution Theorem	A. Sudhakaar & Shyanmugam S.Palli "Circuits & Network Analysis & Synthesis"- Chapter 3		b) Graduates will demonstrate the ability to identify, formulate and solve engineering problems
17	Reciprocity Theorem Compensation Theorem	A. Sudhakaar & Shyanmugam S.Palli "Circuits & Network Analysis & Synthesis"- Chapter 3		b) Graduates will demonstrate the ability to identify, formulate and solve engineering problems
18	Working examples	A. Sudhakaar & Shyanmugam S.Palli "Circuits & Network Analysis & Synthesis"- Chapter 3		b) Graduates will demonstrate the ability to identify, formulate and solve engineering problems
19-22	Tutorials	Joseph Edminister, "Electric Circuits" Schaum's Outline Series- Chapter 3		k) Graduates will show the ability to participate and try to succeed in competitive examinations.

BASIC CONCEPTS OF AC & RESONANCE

AC Analysis: Concepts of phasor & complex impedance/Admittance – Analysis of Simple series and parallel circuits – Active power, Reactive power, Apparent power(Volt Amperes), Power Factor and Energy Associated with these circuits – concepts of complex power – phasor diagram, impedance triangle & power triangle associated with these circuits.

Resonance: Introduction – series resonance – parallel resonance – Definition: Q factor – half power frequency – resonant frequency – Bandwidth – Mathematical Expression for Different types of Resonant circuit.

Session No.	Topics to be covered	Text Books	Instruction Objective	Program Outcome
23	Basic concepts of AC circuits, Concepts of phasor, complex impedance/ admittance	A. Sudhakaar & Shyanmugam S.Palli "Circuits & Network Analysis & Synthesis"- Chapter 4 & 5	3. To understand the concept of active, reactive and apparent powers, power factor and resonance in series and parallel circuits.	b) Graduates will demonstrate the ability to identify, formulate and solve engineering problems
24	Analysis of simple series AC Circuits	A. Sudhakaar & Shyanmugam S.Palli "Circuits & Network Analysis & Synthesis" - Chapter 5		b) Graduates will demonstrate the ability to identify, formulate and solve engineering problems
25	Analysis of parallel circuits AC Circuits	A. Sudhakaar & Shyanmugam S.Palli "Circuits & Network Analysis & Synthesis" - Chapter		b) Graduates will demonstrate the ability to identify, formulate and solve engineering problems

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26	Power factor & Energy associated with these circuits - Active, Reactive & Apparent power of AC Circuits	A. Sudhakaar & Shyanmugam S.Palli "Circuits & Network Analysis & Synthesis"- Chapter 6		b) Graduates will demonstrate the ability to identify, formulate and solve engineering problems
27	Concepts of Complex power (phasor diagram, impedance and power triangle)	A. Sudhakaar & Shyanmugam S.Palli "Circuits & Network Analysis & Synthesis" - Chapter 5		b) Graduates will demonstrate the ability to identify, formulate and solve engineering problems
28	Working examples of AC circuits	Joseph Edminister, "Electric Circuits" Schaum's Outline Series- Chapter 6,7 & 9		k) Graduates will show the ability to participate and try to succeed in competitive examinations.
29	Resonance: Definition, Resonant frequency, half power frequency	A. Sudhakaar & Shyanmugam S.Palli "Circuits & Network Analysis & Synthesis" – Chapter 8		c) Graduate will demonstrate the ability to design and conduct experiments, analyze and interpret data.
30	Q factor & Bandwidth for series resonant circuit	A. Sudhakaar & Shyanmugam S.Palli "Circuits & Network Analysis & Synthesis" - Chapter 8		c) Graduate will demonstrate the ability to design and conduct experiments, analyze and interpret data.
31	Parallel Resonance: Definition, Resonant freq, half power frequency	A. Sudhakaar & Shyanmugam S.Palli "Circuits & Network Analysis & Synthesis" - Chapter 8		c) Graduate will demonstrate the ability to design and conduct experiments, analyze and interpret data.
32	Q factor & Bandwidth for parallel resonant circuit	A. Sudhakaar & Shyanmugam S.Palli "Circuits & Network Analysis & Synthesis" - Chapter 8		c) Graduate will demonstrate the ability to design and conduct experiments, analyze and interpret data.
33	Mathematical Expression for different types of Resonant circuit	A. Sudhakaar & Shyanmugam S.Palli "Circuits & Network Analysis & Synthesis" - Chapter 8		c) Graduate will demonstrate the ability to design and conduct experiments, analyze and interpret data.
34-36	Tutorials	Joseph Edminister, "Electric Circuits" Schaum's Outline Series - Chapter 11		k) Graduates will show the ability to participate and try to succeed in competitive examinations.

MAGNETICALLY COUPLED & 3-PHASE CIRCUITS

Coupled circuits: Mutual inductance – Co-efficient of coupling – Dot convention – Energy consideration – Analysis of Coupled

circuits

3-phase circuits: Poly phase system – phase sequence – Analysis of 3 phase Balanced/Unbalanced circuits – power and power factor measurement

Session No.	Topics to be covered	Text Books	Instruction Objective	Program Outcome
37	Introduction to coupled circuits	A. Sudhakaar & Shyanmugam S.Palli “Circuits & Network Analysis & Synthesis”- Chapter 10	4. To know the basic concepts of coupled circuits, three phase loads and power measurement.	b) Graduates will demonstrate the ability to identify, formulate and solve engineering problems
38	Mutual Inductance, Co-efficient of coupling, Dot convention	A. Sudhakaar & Shyanmugam S.Palli “Circuits & Network Analysis & Synthesis”- Chapter 10		b) Graduates will demonstrate the ability to identify, formulate and solve engineering problems
39	Energy consideration	A. Sudhakaar & Shyanmugam S.Palli “Circuits & Network Analysis & Synthesis”- Chapter 10		b) Graduates will demonstrate the ability to identify, formulate and solve engineering problems
40	Analysis of coupled circuits	A. Sudhakaar & Shyanmugam S.Palli “Circuits & Network Analysis & Synthesis”- Chapter 10		c) Graduate will demonstrate the ability to design and conduct experiments, analyze and interpret data.
41	Introduction to 3 phase system	A. Sudhakaar & Shyanmugam S.Palli “Circuits & Network Analysis & Synthesis”- Chapter 9		a) Graduates will demonstrate knowledge of mathematics, science and engineering.
42	Poly phase system	A. Sudhakaar & Shyanmugam S.Palli “Circuits & Network Analysis & Synthesis” - Chapter 9		a) Graduates will demonstrate knowledge of mathematics, science and engineering.
43	Analysis of 3 phase balanced circuits	A. Sudhakaar & Shyanmugam S.Palli “Circuits & Network Analysis & Synthesis”- Chapter 9		b) Graduates will demonstrate the ability to identify, formulate and solve engineering problems

44	Analysis of 3 phase unbalanced circuits	A. Sudhakaar & Shyanmugam S.Palli "Circuits & Network Analysis & Synthesis" - Chapter 9		b) Graduates will demonstrate the ability to identify, formulate and solve engineering problems
45	Power & power factor measurement	A. Sudhakaar & Shyanmugam S.Palli "Circuits & Network Analysis & Synthesis" - Chapter 9		b) Graduates will demonstrate the ability to identify, formulate and solve engineering problems
46-48	Tutorials	Joseph Edminister, "Electric Circuits" Schaum's Outline Series - Chapter 10		k) Graduates will show the ability to participate and try to succeed in competitive examinations.

TRANSIENT ANALYSIS

Basics – Source free and forced response of RL, RC and RLC series circuits – Forced response of RL, RC and RLC series circuits with sinusoidal excitation – time constant & Natural frequency of oscillation – Laplace transform application to the solution of RL, RC & RLC transient circuits

Session No.	Topics to be covered	Text Books	Instruction Objective	Program Outcome
49	Basics of transients	M. Arumugam & N. PremKumar, "Electric Circuit Theory" - Chapter 13	5. To analyze the transient response of series and parallel A.C. circuits and to solve problems in time domain using Laplace Transform.	a) Graduates will demonstrate knowledge of mathematics, science and engineering.
50	Source free and forced response of RL series circuit	M. Arumugam & N. PremKumar, "Electric Circuit Theory" - Chapter 13		c) Graduate will demonstrate the ability to design and conduct experiments, analyze and interpret data.
51	Source free and forced response of RC series circuit	M. Arumugam & N. PremKumar, "Electric Circuit Theory" - Chapter 13		c) Graduate will demonstrate the ability to design and conduct experiments, analyze and interpret data.
52	Source free and forced response of RLC series circuit	M. Arumugam & N. PremKumar, "Electric Circuit Theory" - Chapter 13		b) Graduates will demonstrate the ability to identify, formulate and solve engineering problems
53	Forced response of RL series circuit with sinusoidal excitation	M. Arumugam & N. PremKumar,		b) Graduates will demonstrate the ability to identify, formulate and solve engineering problems

		“Electric Circuit Theory” - Chapter 13		
54	Forced response of RC series circuit with sinusoidal excitation	M. Arumugam & N. PremKumar, “Electric Circuit Theory” - Chapter 13		b) Graduates will demonstrate the ability to identify, formulate and solve engineering problems
55	Forced response of RLC series circuit with sinusoidal excitation	M. Arumugam & N. PremKumar, “Electric Circuit Theory” - Chapter 13		b) Graduates will demonstrate the ability to identify, formulate and solve engineering problems
56	Time constant and natural frequency of oscillation	M. Arumugam & N. PremKumar, “Electric Circuit Theory” - Chapter 13		b) Graduates will demonstrate the ability to identify, formulate and solve engineering problems
57	Revision of transients	M. Arumugam & N. PremKumar, “Electric Circuit Theory” - Chapter 13		b) Graduates will demonstrate the ability to identify, formulate and solve engineering problems
58-60	Tutorials	Joseph Edminister, “Electric Circuits” Schaum’s Outline Series - Chapter 5		k) Graduates will show the ability to participate and try to succeed in competitive examinations.