Academic Course Description

BHARATH University
Faculty of Engineering and Technology
Department of Electronics and Communication Engineering

BEE301 Circuit Theory

Third Semester, 2015-16 (Odd Semester)

Course (catalog) description

This course introduces to the concepts and definitions of charges, currents, voltages, power, and energy. The voltage- current relationship of basic circuit elements – resistors, inductors, capacitors, dependent and independent voltage and current sources; apply Kirchhoff's current and voltage laws to circuits in order to determine voltage, current and power in branches of any circuits excited by DC voltages and current sources. Apply simplifying techniques to solve DC circuit problems using basic circuit theorems and structured methods like node voltage and mesh current analysis.

Compulsory/Elective course : Compulsory for ECE students

Credit hours : 3 credits

Course Coordinator : Ms. RAJI PANDURANGAN Asst. Professor

Instructors :

Name of the instructor	Class handling	Office location	Office phone	Email (domain:@ bharathuniv.ac.in	Consultation
Ms.RAJI PANDURANGAN	Second year ECE	SA006		Raji.ece @bharathuniv.ac.in	12.30-1.00 PM
Mr.V.SRINIVASAN	Second year ECE	SA006		Srinivasan.etc @bharathuniv.ac.in	12.30-1.00 PM

Relationship to other courses:

Pre –requisites **:** BPH101 Engineering Physics –I, BMA101 Mathematics –I

Assumed knowledge **:** The students will have a physics and mathematics background obtained at a high school (or equivalent) level. In particular, working knowledge of basic mathematics including differentiation, integration and probability theories are assumed.

Following courses **:** BEC402 Electronic Circuits,BEC405 Linear Integrated Circuits

Syllabus Contents

UNIT I BASIC CIRCUIT CONCEPTS 9 HOURS

Circuit elements – Kirchhoff's Law – V-I Relationship of R,L and C – Independent Sources – Dependent sources – Simple Resistive circuits – Networks reduction – Voltage division – current source transformation.- Analysis of circuit using mesh current and nodal voltage methods.

UNIT II SINUSOIDAL STEADY STATE ANALYSIS **9 HOURS**

Phasor – Sinusoidal steady state response concepts of impedance and admittance – Analysis of simple circuits – Power and power factors — Solution of three phase balanced circuits and three phase unbalanced circuits —-Power measurement in three phase circuits.

UNIT III NETWORK THEOREMS (BOTH AC AND DC CIRCUITS) **9 HOURS**

Superposition theorem – The venin's theorem - Norton's theorem-Reciprocity theorem- Maximum power transfer theorem.

UNIT IV TRANSIENT RESPONSE FOR DC CIRCUITS **9 HOURS**

Transient response of RL, RC and RLC Circuits using Laplace transform for DC input with sinusoidal input.

UNIT V RESONANCE AND COUPLED CIRCUITS **9 HOURS**

Series and parallel resonance – their frequency response – Quality factor and Bandwidth - Self and mutual inductance – Coefficient of coupling – Tuned circuits – Single tuned circuits.

TOTAL 45 HOURS

Text book(s) and/or required materials :

1. T1 Sudhaker A. and Shyam Mohan S.p., "Circuits and Network Analysis and Synthesis" Tata McGrew Hill Co. Ltd., New Delhi, 1994.
2. T2 U.A Bakshi. "Electric Circuit Analysis ", Technical Publication, Pune.

Reference Books :

1. R1 Edminister J.A. "Theory and Problems of Electric Circuits " Schaum's outline series, McGrew hill Book Company 2nd edition, 1983.
2. R2 Hyatt W.H. and Kemmerlay J.E. „Engineering Circuits Analysis", McGrew Hill international Editions,1993.
3. R3 http://nptel.ac.in/courses/108102042/

Computer usage: Nil

Professional component

General	-	0%
Basic Sciences	-	0%
Engineering sciences & Technical arts	-	0%
Professional subject	-	100%

Broad area : Circuit Theory | Electronics | Transmission Lines and Networks | Linear Integrated Circuits

Test Schedule

S. No.	Test	Tentative Date	Portions	Duration
1	Cycle Test-1	August 1st week	Session 1 to 14	2 Periods
2	Cycle Test-2	September 2nd week	Session 15 to 28	2 Periods
3	Model Test	October 2nd week	Session 1 to 45	3 Hrs
4	University Examination	TBA	All sessions / Units	3 Hrs.

Mapping of Instructional Objectives with Program Outcome

To develop problem solving skills and understanding of circuit theory through the application of techniques and principles of electrical circuit analysis to common circuit problems. This course emphasizes:	Correlates to program outcome		
	H	M	L
1. To develop an understanding of the fundamental laws and elements of electric circuits.	b,c,d,j	a,f,k	e,g
2. To develop the ability to apply circuit analysis to DC and AC circuits	b,c,f	a,d,g,h	j
3. To understand advanced mathematical methods such as Laplace and Fourier transforms along with linear algebra and differential equations techniques for solving circuits problem	a,d,e	b,g	j,k
4. To learn the "alphabet" of circuits, including wires, resistors, capacitors, inductors, voltage and current sources	a,d,e	b,g,h,k	f,j
5. Introduce students to different methods involves in analysis both linear and non-linear network.	e	a,b,c,d,g	j,k

H: high correlation, M: medium correlation, L: low correlation

Draft Lecture Schedule

Session	Topics	Problem solving (Yes/No)	Text / Chapter
UNIT I	**BASIC CIRCUIT CONCEPTS**		
1.	Circuit elements	No	[T1] Chapter -1, [R1]Chapter-2,3
2.	Kirchhoff's Law – V-I Relationship of R,L and C	Yes	
3.	Independent Sources – Dependent sources	No	
4.	Simple Resistive circuits -Networks reduction	Yes	
5.	Networks reduction	Yes	
6.	Voltage division	Yes	
7.	Current source transformation	Yes	
8.	Analysis of circuit using mesh current	Yes	
9.	Analysis of circuit using nodal voltage methods	Yes	
UNIT II	**SINUSOIDAL STEADY STATE ANALYSIS**		
10.	Introduction to Phasor	No	[T1] Chapter -6,7,9 [R1]Chapter-9,11
11.	Sinusoidal steady state response concepts of impedance	No	
12.	Sinusoidal steady state response concepts of admittance	Yes	
13.	Analysis of simple circuits	Yes	
14.	Analysis of simple circuits	Yes	
15.	Power and power factors	Yes	
16.	Solution of three phase balanced circuits	Yes	
17.	Solution of three phase Unbalanced circuits	Yes	
18.	Power measurement in three phase circuits	Yes	

UNIT III NETWORK THEOREMS (BOTH AC AND DC CIRCUITS)			
19.	Superposition theorem	Yes	[T1] Chapter -3 [R1]Chapter-4
20.	Superposition theorem	Yes	
21.	The venin's theorem	Yes	
22.	The venin's theorem	Yes	
23.	Norton's theorem	Yes	
24.	Norton's theorem	Yes	
25.	Reciprocity theorem	Yes	
26.	Maximum power transfer theorem	Yes	
27.	Maximum power transfer theorem	Yes	
UNIT IV TRANSIENT RESPONSE FOR DC CIRCUITS			
28.	Transient response of RL	Yes	[T1] Chapter -12,13 [R1]Chapter-7
29.	Transient response of RL	Yes	
30.	Transient response of RC	Yes	
31.	Transient response of RCL	Yes	
32.	Transient response using Laplace transform	Yes	
33.	Transient response RCL Circuits using Laplace transform for DC input	Yes	
34.	Transient response RCL Circuits using Laplace transform for DC input	Yes	
35.	Transient response RCL Circuits using Laplace transform for sinusoidal input	Yes	
36.	Transient response RCL Circuits using Laplace transform for sinusoidal input	Yes	
UNIT V RESONANCE AND COUPLED CIRCUITS			
37.	Series resonance	No	[T1] Chapter -8,10 [R1]Chapter-12,14
38.	Series resonance – their frequency response	Yes	
39.	Parallel resonance	No	
40.	Parallel resonance – their frequency response	Yes	
41.	Quality factor and Bandwidth	Yes	
42.	Self and mutual inductance	No	
43.	Coefficient of coupling	Yes	
44.	Tuned circuits	Yes	
45.	Single tuned circuits	Yes	

Teaching Strategies

The teaching in this course aims at establishing a good fundamental understanding of the areas covered using:

- Formal face-to-face lectures
- Tutorials, which allow for exercises in problem solving and allow time for students to resolve problems in understanding of lecture material.
- Laboratory sessions, which support the formal lecture material and also provide the student with practical construction, measurement and debugging skills.
- Small periodic quizzes, to enable you to assess your understanding of the concepts.

Evaluation Strategies

Cycle Test – I	-	10%
Cycle Test – II	-	10%
Model Test	-	25%
Attendance	-	5%
Final exam	-	50%

Prepared by: Raji Pandurangan Assistant professor , Department of ECE **Dated : 10 -5-2016**

Addendum

ABET Outcomes expected of graduates of B.Tech / ECE / program by the time that they graduate:

(a) an ability to apply knowledge of mathematics, science, and engineering fundamentals.
(b) an ability to identify, formulate, and solve engineering problems
(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
(d) an ability to design and conduct experiments, as well as to analyze and interpret data
(e) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice
(f) an ability to apply reasoning informed by a knowledge of contemporary issues
(g) an ability to broaden the education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
(h) an ability in understanding of professional and ethical responsibility and apply them in engineering practices
(i) an ability to function on multidisciplinary teams
(j) an ability to communicate effectively with the engineering community and with society at large
(k) an ability in understanding of the engineering and management principles and apply them in Project and finance management as a leader and a member in a team.

Program Educational Objectives

PEO1: To provide strong foundation in mathematical, scientific and engineering fundamentals necessary to analyze, formulate and solve engineering problems in the field of Electronics And Communication Engineering.

PEO2: To enhance the skills and experience in defining problems in Electronics And Communication Engineering design and implement, analyzing the experimental evaluations, and finally making appropriate decisions.

PEO3: To enhance their skills and embrace new Electronics And Communication Engineering Technologies through self-directed professional development and post-graduate training or education.

PEO4: To provide training for developing soft skills such as proficiency in many languages, technical communication, verbal, logical, analytical, comprehension, team building, inter personal relationship, group discussion and leadership skill to become a better professional.

PEO5: Apply the ethical and social aspects of modern communication technologies to the design, development, and usage of electronics engineering.

Course Teacher	Signature
Ms. RAJI PANDURANGAN	
Mr.V.SRINIVASAN	

Course Coordinator	**Academic Coordinator**	**Professor In-Charge**	**HOD/ECE**
(Ms.Raji Pandurangan)	( )	(Dr.)	(Dr.M.Sundararajan)