COURSE PLAN – PART I			
Course Title	CIRCUIT THEORY II Sem. EEE – A Section		
Course Code	EEPC10	No. of Credits	04
Course code of Pre-requisite subject(s)		NIL	
Session	January 2022	Section	A
Name of Faculty	N. Kumaresan	Department	EEE
e-mail	nkumar@nitt.edu	Telephone No.	0431-2503257
Name of Course Coordinator(s)		---	
Course Type	Core course		

Syllabus (approved in BoS)

EEPC10 - CIRCUIT THEORY

Course Type: Programme Core (PC) *Pre-requisites:* MAIR21
No. of Credits: 4

Course Objectives:

To provide the key concepts and tools in a logical sequence to analyze and understand electrical and electronic circuits.

Course Content:

Fundamental concepts of R, L and C elements, DC circuits, series and parallel circuits - loop and nodal analysis, AC circuits - complex impedance - phasor diagram, real and reactive power - loop and nodal analysis applied to AC circuits.

Voltage source –current source transformations. Various Network theorems and applications to dc and ac circuits, star-delta transformations.

Resonance in series and parallel circuits, self and mutual inductances, coefficient of coupling - dot convention - analysis of coupled circuits.

Three-phase star and delta circuits with balanced and unbalanced loads - power measurements - power factor calculations.

Time response of RL, RC and RLC circuits for step and sinusoidal inputs.

Text Books:

1. *Hayt, W. H, Kemmerly J. E. & Durbin, 'Engineering Circuit Analysis', McGraw Hill Publications, 8th Edition, 2013.*
2. *Charles K. Alexander, Matthew N.O.Sadiku, 'Fundamentals of Electric Circuits', McGraw-Hill Publications, 5th Edition, 2013.*

Reference Books:

1. *Joseph. A. Edminister, 'Electric Circuits - Schaum's Outline Series', McGraw-Hill Publications, 6th Edition, 2003.*
2. *Robins & Miller, 'Circuit Analysis Theory and Practice', Delmar Publishers, 5th Edition, 2012.*

COURSE OBJECTIVES

To provide the key concepts and tools in a logical sequence to analyze and understand electrical and electronic circuits.

COURSE OUTCOMES (COs)

Upon completion of the course, the student will be able to

1. Understand the technical representation of common electrical systems.
2. Analyze and compute the time domain behavior of linear (AC and DC) electric circuits with single or multiple power sources.
3. Compute the performance of AC Networks (1-port) which may be 1-Φ or 3-Φ using phasor analysis.
4. Understand the flow of real and reactive power components in AC systems.
5. Analyze simple electro-magnetic circuits.

Aligned Programme Outcomes (POs)

COs / POs		Course outcomes(COs)				
		1	2	3	4	5
Programme Outcomes (POs)	1	H	H	H	H	H
	2	H	H	H	H	H
	3	--	--	--	--	--
	4	--	--	--	--	--
	5	--	--	--	--	--
	6	--	--	--	--	--
	7	L	M	M	M	L
	8	H	H	H	H	H
	9	M	M	M	M	M
	10	M	M	M	M	M
	11	H	H	H	H	H
	12	M	M	M	M	M
	13	H	H	H	H	H
	14	--	--	--	--	--

COURSE PLAN – PART II

COURSE OVERVIEW

An electric circuit is a mathematical model that approximates the behaviour of an actual electrical system. Circuit analysis has long been a traditional introduction to the art of problem solving from an engineering perspective, even for those whose interests lie outside electrical engineering. There are many reasons for this, but one of the best is that in today's world it's extremely unlikely for any engineer to encounter a system that does not in some way include electrical circuitry. They are found in homes, schools, workplaces and transportation vehicles everywhere.

Since most engineering situations require a team effort at some stage, having a working knowledge of circuit analysis therefore helps to provide everyone on a project with the background needed for effective communication. The models, the mathematical technique, and the language of circuit theory will form the intellectual framework for our engineering endeavours. Hence, this course on Circuit Theory is about developing basic problem-solving skills as they apply to situations an engineer is likely to encounter.

The focus of this course is on linear circuit analysis. Linear problems are inherently more easily solved than their nonlinear counterparts. For this reason, we often seek reasonably accurate linear approximations (or models) to physical situations. Furthermore, the linear models are more easily manipulated and understood—making design a more straightforward process. When greater accuracy is required in practice, nonlinear models are employed, but with a considerable increase in solution complexity.

Linear circuit analysis can be separated into four broad categories: (1) dc analysis, where the energy sources do not change with time; (2) transient analysis, where things often change quickly; (3) sinusoidal analysis, which applies to both ac power and signals; and (4) frequency response, which is the most general of the four categories, but typically assumes something is changing with time.

This course begin with the topic of resistive circuits to learn a number of very powerful engineering circuit analysis techniques, such as nodal analysis, mesh analysis, superposition, source transformation, Thévenin's theorem, Norton's theorem, and several methods for simplifying networks of components connected in series or parallel. Then, the analysis of the circuits with ac source and related components are introduced. To study circuits which are suddenly energized or de-energized, transient analysis of simple RL, RC and RLC are also included in this course.

COURSE TEACHING AND LEARNING ACTIVITIES

Sl. No.	Week / Duration	Topic	Mode of Delivery
1.	4 – 9 April 2022 **(5 Contact Hours)**	Discussion on course plan. Fundamental concepts of R, L and C elements, DC circuits – series and parallel circuits	Lecture / Tutorial C & T using Document viewer in online / offline mode
2.	11 – 16 April 2022 **(4 Contact Hours)**	DC circuits – loop and nodal analysis, special cases - circuit with dependent sources	
3.	18 – 23 April 2022 **(5 Contact Hours)**	AC circuits – Complex Impedance, phasor diagram, real and reactive power - loop and nodal analysis applied to AC circuits.	
4.	25 – 30 April 2022 **(4 Contact Hours)**	Voltage source –current source transformations, Various Network theorems and applications to dc and ac circuits, star-delta transformations. **Assessment-1 (Quiz) on 06.05.2022 – 15 marks**	
5.	2 – 7 May 2022 **(4 Contact Hours)**		
6.	9 – 14 May 2022 **(4 Contact Hours)**	Resonance in series and parallel circuits **Assessment-2 (Written test) on 13.05.2022– 20 marks**	
7.	16 – 21 May 2022 **(5 Contact Hours)**	Self and mutual inductances - Coefficient of coupling – dot convention – Analysis of coupled circuits	
8.	23 – 28 May 2022 **(5 Contact Hours)**	Three-phase star and delta circuits with balanced and unbalanced loads - power measurements - power factor calculations. **Assessment-3 (Quiz) on 10.06.2022 – 15 marks**	
9.	30 May – 4 June 2022 **(5 Contact Hours)**		
10.	6 – 11 June 2022 **(4 Contact Hours)**		
11.	13 – 18 June 2022 **(5 Contact Hours)**	Time response of RL, RC, and RLC circuits for step and sinusoidal inputs . **Assessment-4 (Written test) on 17.06.2022 – 20 marks** **Compensation Assessment (Written test) – 20 marks**	
12.	20 – 25 June 2022 **(4 Contact Hours)**		
13.	27 June – 1 July 2022 **(1 Contact Hours)**		
14.	4 – 9 July 2022	**Assessment-5 (Written test) – 30 marks** Date of examination will be intimated later	

COURSE ASSESSMENT METHODS

S.No.	Mode of Assessment	Week/Date	Duration	% Weightage
1	Assessment-1 (Quiz)	07.05.2022	30 Minutes (11.45 am to 12.15 pm)	15
2	Assessment-2 (First 2 Units) : **(Written test)**	13.05.2022	60 Minutes	20
3	Assessment-3 (Quiz)	10.06.2022	30 Minutes (11.45 am to 12.15 pm)	15
4	Assessment-4 (3rd and 4th Units): **(Written test)**	17.06.2022	60 Minutes	20
CPA	Compensation Assessment **(Written test)**	27 June – 1 July 2022	60 Minutes	20
5	Assessment-5 (All units) : **(Written test)**	04 – 9 July 2022	120 Minutes	30

Note:

1. Attending all the assessments (i.e., Assessment 1 to 5) are MANDATORY for every student.
2. If any student is not able to attend Assessment-1 to Assessment-4 due to genuine reason, he/she is permitted to attend only one Compensation Assessment (CPA) with 20% weightage (20 marks). Appropriate weightage will be assigned according to the assessment missed by the student.
3. At any case, CPA will not be considered as an improvement test.

Grading the students

1. Grading will be based on the clusters (range) of the total marks (all the assessments i.e., Assessment 1 to 5, put together for each student) scored. For grading, Gap theory or Normalized curve method will be used to decide the clusters (range) of the total marks.
2. The passing minimum shall be as per the Office of the Dean (Academic) instructions. Hence, every student is expected to score the minimum mark to pass the course as prescribed by the Office of the Dean (Academic). Otherwise the student would be declared fail and 'F' grade will be awarded.

ESSENTIAL READINGS : Textbooks, reference books Website addresses, journals, etc

1. *Hayt, W. H, Kemmerly J. E. & Durbin, 'Engineering Circuit Analysis', McGraw Hill Publications, 8th Edition, 2013.*
2. *James W. Nilsson and Susan A. Riedel, 'Electric Circuits', Pearson Education Publications, 9th Edition, 2011.*
3. *Charles K. Alexander, Matthew N.O.Sadiku, 'Fundamentals of Electric Circuits', McGraw-Hill Publications, 5th Edition, 2013.*
4. *Joseph. A. Edminister, 'Electric Circuits - Schaum's Outline Series', McGraw-Hill Publications, 6th Edition, 2003.*
5. *Robins & Miller, 'Circuit Analysis Theory and Practice', Delmar Publishers, 5th Edition, 2012.*

Following NPTEL course materials will form the additional references :

1. Basic Electrical Circuits by Dr Nagendra Krishnapura, Department of Electrical Engineering, IIT Madras. Web-site: http://nptel.ac.in/courses/117106108/#
2. Circuit theory by Prof. S.C. Dutta Roy, IIT Delhi. Web-site : http://nptel.ac.in/courses/108102042/#

COURSE EXIT SURVEY (mention the ways in which the feedback about the course is assessed and indicate the attainment also)

Feedback from the students during class committee meetings
Anonymous feedback through questionnaire

COURSE POLICY (including plagiarism, academic honesty, attendance, etc.)

ATTENDANCE

As prescribed by the Office of the Dean (Academic).

ACADEMIC HONESTY & PLAGIARISM

1. Possessing a mobile phone, carrying bits of paper, talking to other students, copying from others during an assessment will be treated as punishable dishonesty.
2. All the students are expected to be genuine during the course work. Zero mark to be awarded for the offenders. For copying from another student, both students get the same penalty of zero mark.
3. The departmental disciplinary committee including the course faculty member, PAC chairperson and the HoD, as members shall verify the facts of the malpractice and award the punishment if the student is found guilty. The report shall be submitted to the Academic office.
4. Taking of information by means of copying simulations, assignments, looking or attempting to look at another student's paper or bringing and using study material in any form for copying during any assessments is considered dishonest.
5. Tendering of information such as giving one's program, simulation work, assignments to another student to use or copy is also considered dishonest.
6. Preventing or hampering other students from pursuing their academic activities is also considered as academic dishonesty.
7. Students who honestly producing ORIGINAL and OUTSTANDING WORK will be REWARDED.

ADDITIONAL COURSE INFORMATION

CORRESPONDENCE

1. All the students are advised to check their NITT WEBMAIL regularly. All the correspondence (schedule of classes/ schedule of assessment/ course material/ any other information regarding this course) will be done through their **webmail / MS Team**.
2. Queries (if required) may be emailed to me / contact me during 04.00 pm to 05.00 pm on Friday with prior intimation for any clarifications.

FOR APPROVAL

(N. Kumaresan)
Course Faculty

S. Magesh
CC- Chairperson
(S. MAGESHWARI)

HOD / EEE