DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

COURSE PLAN – PART I			
Course Title	**BASICS OF ELECTRICAL CIRCUITS**		
Course Code	**EEMI10**	**No. of Credits**	**3**
Course Code of Pre-requisite subject(s)	**---**		
Session	**January 2018**	**Section**	**---**
Name of Faculty	**N. Kumaresan**	**Department**	**EEE**
Email	**nkumar@nitt.edu**	**Telephone No.**	**2503257**
Name of Course Coordinator(s) (if, applicable)			
E-mail		**Telephone No.**	
Course Type	☐ **Core course**	☑ **Elective course**	

Syllabus (approved in BoS)

EEMI10 / EEOE16 - BASICS OF ELECTRICAL CIRCUITS

Course Type: Minor (MI)/Open Elective (OE) ***Pre-requisites:*** --

No. of Credits: 3

Course Objectives:

The practical application of electricity involves the flow of electric current in a closed path under the influence of a driving force. A complete path, typically through conductors such as wires and through circuit elements, namely, resistor (R), inductor (L) and capacitor(C) is called an electrical circuit. In fact, electrical circuits are everywhere, from tiny ones in integrated circuits in mobile phones and music players, to giant ones that carry power to our homes. This course deals with analysis techniques that can be applied to all such circuits. After completion of this course, one should be able to analyze any linear circuit comprising of circuit elements, R, L and C along with the voltage and current sources.

Course Content :

Review of Electrical elements and circuits, Kirchhoff's laws, voltage and current sources, controlled sources, RMS and average values for typical waveforms, power and energy in electrical elements, phasor representation, series and parallel RLC circuits -simple examples.

Self and mutual inductance, coefficient of coupling, Capacitance, Series-parallel combination of inductance and capacitance, Series and parallel resonant circuits.

Circuit analysis using Node voltage and Mesh current methods, analysis with dependent source and special case.

Equivalent circuits, star-delta transformation, source transformation, Thevenin, Norton, Superposition and Maximum power transfer theorems.

Three-phase circuits, balanced three-phase voltages, analysis of three-phase star and delta connected circuits, balanced and unbalanced systems, power calculations, power measurement using two wattmeter method.

Reference Books:

1. *James W. Nilsson and Susan A. Riedel, "Electric Circuits", International Edition Adapted by Lalit Goel, Pearson Education, 8th Edition, Seventh Impression, 2012.*
2. *A. Sudhakar and Shyammohan S Pillai, "Circuits and Networks", Tata McGraw Hill, New Delhi, 4th Edition, 2010.*
3. *William H. Hayt, Jack Kemmerly, Steven Durbin, "Engineering Circuit Analysis", McGraw Hill, 8th Edition, 2012.*
4. *Mahmood Nahvi, Joseph Edminister, "Schaum's Outline of Electric Circuits", McGraw Hill Education, 6th Edition, 2014.*

COURSE OBJECTIVES

The practical application of electricity involves the flow of electric current in a closed path under the influence of a driving force. A complete path, typically through conductors such as wires and through circuit elements, namely, resistor (R), inductor (L) and capacitor(C) is called an electrical circuit. In fact, electrical circuits are everywhere, from tiny ones in integrated circuits in mobile phones and music players, to giant ones that carry power to our homes. This course deals with analysis techniques that can be applied to all such circuits. After completion of this course, one should be able to analyze any linear circuit comprising of circuit elements, R, L and C along with the voltage and current sources.

COURSE OUTCOMES (CO)

Course Outcomes	**Aligned Programme Outcomes (PO)**
Upon completion of the course, the students will be able to	
1. Understand the concept of phasors, waveforms and behaviour of basic circuit components	
2. Obtain the equivalent inductance and capacitance and understand the operation of resonant circuits	
3. Use node voltage and mesh current methods to solve electrical circuits	
4. Obtain the equivalent circuit and apply network theorems to circuits	
5. Analyze the three-phase system	

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.

COURSE TEACHING AND LEARNING ACTIVITIES

S.No.	**Week/Contact Hours**	**Topic**	**Mode of Delivery**
1.	3rd week of Jan. 18 (15 to 19) **(3 Contact Hours)**	Discussion on course plan - Review of Electrical elements and circuits, Kirchhoff's laws, voltage and current sources, controlled sources, RMS and average values for typical waveforms	Lecture / Tutorial C & T using Document viewer PPT wherever needed
2.	4th week of Jan. 18 (22 to 26) **(3 Contact Hours)**	power and energy in electrical elements, phasor representation, series and parallel RLC circuits - simple examples	
3.	29 Jan to 2 Feb 2018 **(3 Contact Hours)** **30.01.2018 : 30 minutes (01.30 pm – 02.00 pm)**	Self and mutual inductance, coefficient of coupling, Capacitance **(Assessment-3 : Quiz – written - Unit I – 5 marks)**	

S.No.	Week/Contact Hours	Topic	Mode of Delivery
4.	2nd week of Feb. 18 (5 to 9) **(3 Contact Hours)**	Series-parallel combination of inductance and capacitance, Series and parallel resonant circuits.	Lecture / Tutorial C & T using Document viewer PPT wherever needed
5.	3rd week of Feb. 18 (12 to 16) **(3 Contact Hours)** **13.02.2018 : 30 minutes (01.30 pm – 02.00 pm)**	Circuit analysis using Node voltage method – analysis with dependent source and special case. **(Assessment-3 : Quiz – written - Unit II -5 marks)**	
6.	4th week of Feb. 18 (19 to 23) **(3 Contact Hours)**	Circuit analysis using Mesh current method - analysis with dependent source and special case. **(Assessment - 1) - Written test**	
7.	Last week of February & 1st week of March 18 (26 Feb to 2 March) **(2 Contact Hours)**	Circuit analysis using Node voltage and Mesh current methods – contd.	
8.	2nd week of March 18 (5 to 9) **(3 Contact Hours)** **06.03.2018 : 30 minutes (01.30 pm – 02.00 pm)**	Equivalent circuits, star-delta transformation, source transformation **(Assessment-3 : Quiz – written- Unit III-5 marks)**	
9.	3rd week of March 18 (12 to 16) **(3 Contact Hours)**	Thevenin, Norton, Superposition and Maximum power transfer theorems.	
10.	4th week of March 18 (19 to 23) **(3 Contact Hours)** **22.03.2018 : 30 minutes (01.30 pm – 02.00 pm)**	Theorems – contd. Three-phase circuits, balanced three-phase voltages **(Assessment-3 : Quiz – written- Unit IV-5 marks)**	
11.	Last week of March 2018 (26 to 30) **(2 Contact Hours)**	analysis of three-phase star and delta connected circuits, balanced and unbalanced systems **(Assessment - 2) - Written test**	
12.	1st week of April 18 (2 to 6) **(3 Contact Hours)**	analysis of three-phase star and delta connected circuits, balanced and unbalanced systems – contd.	
13.	2nd week of April 18 (9 to 13) **(3 Contact Hours)**	power calculations, power measurement using two wattmeter method. Review / revision	
14.	3rd week of April 18 (16 to 20)	**Compensation Assessment** **(Written test)**	
15.	4th week of April to first week of May 2018 (23 April to 4 May)	**ASSESSMENT – 4 : Final Assessment** **(Written test)**	
	C & T : Chalk and Talk and PPT : Power Point		

COURSE ASSESSMENT METHODS

S.No.	Mode of Assessment	Week/Date	Duration	% Weightage
1	Assessment-1 : (First 2 Units) **(Written test)**	4th week of Feb. 18 (19 to 23)	60 Minutes	20
2	Assessment-2 : (3rd & 4th Units) **(Written test)**	Last week of March 18 (26 to 30)	60 Minutes	20
3	Assessment-3 : Quiz (4 Nos. each for 5 marks)	During the regular class hours – details will be informed later		20
CPA	Compensation Assessment (First 4 Units) - **(Written test)**	3rd week of April 18 (16 to 20)	60 Minutes	20
4	Assessment-4 Final Assessment - (All units) **(Written test)**	April / May 2018	120 Minutes	40

Note:

1. Exact date and time for the assessments (1,2, 4 and CPA) will be informed later.
2. Attending all the assessments (i.e., Assessment 1 to 4) are MANDATORY for every student.
3. Grading will be based on the clusters (range) of the total marks (all the assessments i.e., Assessment 1 to 4, 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.
4. The passing minimum shall be class mean by two or maximum by three, whichever is lower. Hence, every student is expected to score the minimum mark to pass the course. Otherwise the student would be declared fail and 'F' grade will be awarded.

COURSE EXIT SURVEY (mention the ways in which the feedback about the course shall be assessed)

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

COURSE POLICY (preferred mode of correspondence with students, policy on attendance, compensation assessment, academic honesty and plagiarism etc.)

MODE OF CORRESPONDENCE (email/ phone etc)

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.
2. Queries (if required) may be emailed to me / contact me during 03.00 pm to 04.00 pm on Tuesday with prior intimation for any clarifications.

ATTENDANCE

1. Attendance will be taken by the faculty in all the contact hours. Every student should maintain minimum 75 % physical attendance in these contact hours to attend the Assessment-4 i.e., last assessment.
2. Any student, who fails to maintain 75% attendance, however, having score more than 50 % marks (i.e., more than 30 marks) in first three assessments will be eligible for attending the last assessment (Assessment-4).
3. Students having less than 75% attendance at the end of the semester and also having the score less than 50 % marks (i.e., less than 30 marks) in first three assessments will have to REDO the course and hence they are not eligible for attending the last assessment (Assessment-4). 'V' Grade will be awarded for such students.

COMPENSATION ASSESSMENT

If any student is not able to attend Assessment-1 / Assessment-2 due to genuine reason, he/she is permitted to attend the Compensation Assessment (CPA) with 20% weightage (20 marks). At any case, CPA will not be considered as an improvement test.

ACADEMIC HONESTY & PLAGIARISM

1. All the students are expected to be genuine during the course work. 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.
2. Tendering of information such as giving one's program, simulation work, assignments to another student to use or copy is also considered dishonest.
3. Preventing or hampering other students from pursuing their academic activities is also considered as academic dishonesty.
4. Any evidence of such academic dishonesty will result in the loss of marks on that assessment. Additionally, the names of those students so penalized will be reported to the class committee chairperson and HoD for necessary action.
5. Students who honestly producing ORIGINAL and OUTSTANDING WORK will be REWARDED.

ADDITIONAL INFORMATION

Following NPTEL courses will form the supplementary materials:

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, Department of Electrical Engineering, Indian Institute of Technology Delhi, Hauz Khas, New Delhi -110 016. Web-site: http://nptel.ac.in/syllabus/108102042/

FOR APPROVAL

15/1/18

Course Faculty | **CC-Chairperson** | **HOD / EEE**