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 2020**	**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**	☑ **Open Elective & Minor 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.	2nd week of Jan. 20 (6 to 10) **(3 Contact Hours)**	Discussion on course plan - Review of Electrical elements and circuits, Kirchhoff's laws, voltage and current sources, controlled sources, power and energy in electrical elements	Lecture / Tutorial C & T using Document viewer PPT wherever needed
2.	3rd week of Jan. 20 (13 to 17) **(2 Contact Hours)**	RMS and average values for typical waveforms phasor representation,	
3.	4th week of Jan. 20 (20 to 24) **(3 Contact Hours)**	Series and parallel RLC circuits -simple examples	

S.No.	Week/Contact Hours	Topic	Mode of Delivery
4.	5th week of Jan. 20 (27 to 31) **(3 Contact Hours)**	Self and mutual inductance, coefficient of coupling, Capacitance	Lecture / Tutorial C & T using Document viewer PPT wherever needed
5.	1st week of Feb. 20 (3 to 7) **(3 Contact Hours)**	Series-parallel combination of inductance and capacitance, Series and parallel resonant circuits	
6.	2nd week of Feb. 20 (10 to 14) **(3 Contact Hours)** **13.02.2020 01.30 pm – 02.20 pm**	Circuit analysis using Node voltage method – analysis with dependent source and special case **(Assessment-3 : Assignment / Written test – Units I & II - 10 marks**)	
7.	3rd week of Feb. 20 (17 to 21) **(3 Contact Hours)**	Circuit analysis using Mesh current method - analysis with independent source and special case **(Assessment - 1) - Written test**	
8.	4th week of Feb. 20 (24 to 28) **(3 Contact Hours)**	Circuit analysis using Node voltage and Mesh current methods – contd.	
9.	1st week of March 20 (2 to 6) **(3 Contact Hours)**	Equivalent circuits, star-delta transformation, source transformation	
10.	2nd week of March 20 (9 to 13) **(2 Contact Hours)**	Thevenin, Norton, Superposition and Maximum power transfer theorems	
11.	3rd week of March 20 (16 to 20) **(3 Contact Hours)** **19.03.2020 (01.30 pm – 02.20 pm)**	Network Theorems – contd. **(Assessment-3 : Assignment / open book test - Units III & IV - 10 marks**)	
12.	4th week of March 20 (23 to 27) **(3 Contact Hours)**	Three-phase circuits, balanced three-phase voltages, Analysis of three-phase star and delta connected circuits, balanced and unbalanced systems **(Assessment - 2) - Written test**	
13.	5th week of March & 1st week of April 20 (30.3.20 to 3.4.20) **(3 Contact Hours)**	Analysis of three-phase star and delta connected circuits, balanced and unbalanced systems – contd.	
14.	2nd week of April 20 (6 to 10) **(3 Contact Hours)**	Power calculations, power measurement using two wattmeter method	
15.	3rd week of April 20 (13 to 17) **(3 Contact Hours)**	Review / revision / tutorial	
16.	4th week of April 20 (20 to 24) **(3 Contact Hours)**	Review / revision **Compensation Assessment** **(Written test)**	
17.	27.4.20 to 13.5.20	**ASSESSMENT – 4 : Final Assessment (Written test)** Exact date will be informed later	

COURSE ASSESSMENT METHODS

S.No.	Mode of Assessment	Week/Date	Duration	% Weightage
1	Assessment-1 : (Units I & II) **(Written test)**	3rd week of Feb. '20 (17 to 21)	60 Minutes	20
2	Assessment-2 : (Units III & IV) **(Written test)**	4th week of March '20 (23 to 27)	60 Minutes	20
3	Assessment-3 : Assignment / Open book test (2 Nos. each for 10 marks)	During the regular class hours		20
CPA	Compensation Assessment (First 4 Units) - **(Written test)**	4th week of April '20 (20 to 24)	60 Minutes	20
4	Assessment-4 Final Assessment - (All units) **(Written test)**	April / May 2020	120 minutes	40

Note: Exact date and time for the assessments (1, 2, 4 and CPA) will be informed later.

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

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

COURSE POLICY (including compensation assessment to be specified**)**

1. Attending all the assessments (i.e., Assessment 1 to 4) are MANDATORY for every student.
2. 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).
3. At any case, CPA will not be considered as an improvement test.
4. Grading will be based on the total marks (all the assessments i.e., Assessment 1 to 4, put together for each student) scored. Relative grading will be used to decide the clusters (range) for each grade.
5. The passing minimum shall be 35% or (Class average/2) whichever is greater. 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.

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 Monday with prior intimation for any clarifications.

ATTENDANCE POLICY (A uniform attendance policy as specified below shall be followed)

- At least 75% attendance in each course is mandatory.
- A maximum of 10% shall be allowed under On Duty (OD) category.
- Students with less than 65% of attendance shall be prevented from writing the final assessment and shall be awarded 'V' grade.

ACADEMIC DISHONESTY & PLAGIARISM

- Possessing a mobile phone, carrying bits of paper, talking to other students, copying from others during an assessment will be treated as punishable dishonesty.
- Zero mark to be awarded for the offenders. For copying from another student, both students get the same penalty of zero mark.
- 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.
- The above policy against academic dishonesty shall be applicable for all the programmes.

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

Course Faculty	~~CC-Chairperson~~	HOD/EEE

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