DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

COURSE OUTLINE TEMPLATE			
Course Title	**NETWORKS AND LINEAR SYSTEMS for IV Sem. EEE – A Section**		
Course Code	**EEPC19**	**No. of Credits**	**04**
Department	**EEE**	**Faculty**	**N. Kumaresan**
Pre-requisites Course Code	**MAIR32 & EEPC11**		
Course Coordinator(s)	**---**		
Other Course Teacher(s) / Tutor(s) E-mail	**---**	**Telephone No.**	**0431-2503257**
Course Type	√ **Core course** ☐ **Elective course**		

COURSE OVERVIEW

Networks, signals and systems form the basic foundations of electrical engineering. Any electrical engineering equipment/product which handles signals using electrical networks and circuits is called as system. Having a good understanding of signals and their time/frequency domain characterization is an absolute must for any electrical engineer. The aim of this course is to provide students with an understanding of the concepts of discrete and continuous-time signals, Fourier series, Fourier transforms, Laplace transforms and application of these concepts for analyzing the electrical systems.

COURSE OBJECTIVES

To emphasize the relationship between the conceptual understanding and problem-solving approach for (i) analyzing the electric circuit / system excited with non-sinusoidal and non-periodic source, (ii) one-port and two- port networks, (iii) system modeling and simplifications, (iv) transfer function, state- space analysis and z-transform analysis.

COURSE OUTCOMES (COs)

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

1. Understand the significance of Fourier series and Fourier Transform and apply them for typical electrical systems.
2. Apply Laplace Transform for the solution of typical electric circuits and determine the two-port network parameters for typical circuits.
3. Model the systems in transfer function and state-space domain and analyze the system using these models.
4. Apply Z-transforms for the analysis of discrete time system.

Aligned Programme Outcomes (POs)

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

COURSE TEACHING AND LEARNING ACTIVITIES			
S.No.	**Week**	**Topic**	**Mode of Delivery**
1.	1st week of January 17 (4 to 6) **(2 Contact Hours)**	Discussion on course plan Introduction to Fourier series - Fourier coefficients	Lecture / Tutorial C & T / PPT or any suitable mode
2.	2nd week of January 17 (9 to 13) **(4 Contact Hours)**	Effect of symmetry on the Fourier coefficients – Trigonometric form of Fourier series – Application to simple circuits – Average power – power factor and rms value calculations	
3.	3rd week of January 17 (16 to 20) **(4 Contact Hours)** **20.01.2017 : 50 minutes (2.20 pm – 3.10 pm)**	Exponential form of the Fourier series – Fourier transform – Fourier transforms for typical signals – application to simple circuits **(Assessment-3 : Solving numerical examples from Unit I – 5 marks)**	
4.	4th week of January 17 (23 to 27) **(4 Contact Hours)**	Review of Laplace transform – Laplace transform for typical signals – representation of signals in terms of elementary signals-complex frequency-time response of the circuits	
5.	Last week of January & 1st week of February 17 (30-31 Jan and 1 to 3 Feb) **(4 Contact Hours)**	circuit elements in s-domain-circuit analysis in s-domain-transfer function-poles and zeros-application of initial and final value theorems-frequency response from pole-zero plot-driving point impedances	
6.	2nd week of February 17 (6 to 10) **(4 Contact Hours)** **10.02.2017 : 50 minutes (2.20 pm – 3.10 pm)**	Two-port networks **(Assessment-3 : Solving numerical examples from Unit II – 5 marks)**	
7.	3rd week of February 17 (13 to 17) **(3 Contact Hours)**	Open-loop system-closed loop system - Transfer function modeling for the simple electrical systems-Differential equation of translational and rotational mechanical systems **(Assessment - 1)** **Written test**	
8.	4th week of February 17 (20 to 24) **(4 Contact Hours)**	force-voltage and force-current analogous systems-transfer function modeling of mechanical systems - Block diagram representation-Block diagram reduction technique	

S.No.	Week	Topic	Mode of Delivery
9.	Last week of Feb. 17 to 1st week of March 17 (27 Feb to 3 March) **(3 Contact Hours)** **01.03.2017 : 50 minutes (01.30 pm – 2.20 pm)**	signal flow graph-Mason's gain formula **(Assessment-3 : Solving numerical examples from Unit III – 5 marks)**	Lecture / Tutorial C & T / PPT or any suitable mode
10.	2nd week of March 17 (6 to 10) **(4 Contact Hours)**	Concepts of state and state variables-state space modeling for simple electrical and mechanical systems	
11.	3rd week of March 17 (13 to 17) **(4 Contact Hours)** **17.03.2017 : 50 minutes (2.20 pm – 3.10 pm)**	State transition matrix – solution of state equations - Solution of state equations-numerical examples **(Assessment-3 : Solving numerical examples from Unit IV – 5 marks)**	
12.	4th week of March 17 (20 to 24) **(3 Contact Hours)**	Introduction to discrete time systems – properties – z-transform for typical signals-region of convergence **(Assessment - 2) Written test**	
13.	5th week of March 17 (27 to 31) **(4 Contact Hours)**	Inverse z-transform – simple examples - Difference equation – solution of difference equations – stability analysis	
14.	1st week of April 17 (3 to 7) **(4 Contact Hours)**	Numerical examples from unit V. Review of all units	
15.	2nd week of April 17 (10 to 14)	**Compensation Assessment (Written test)**	
16.	3rd / 4th week of April 17 Date of examination will be intimated later	**ASSESSMENT – 4** **(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)**	3rd week of February 17 (13 to 17)	60 Minutes	20
2	Assessment-2 (3rd and 4th Units) **(Written test)**	4th week of March 17 (20 to 24)	60 Minutes	20
3	Assessment-3 Assignment (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)**	2nd week of April 17 (10 to 14)	60 Minutes	20
5	Assessment-4 (All units) **(Written test)**	3rd / 4th week of April 17	120 Minutes	40

Note:

1. Exact date and time for the assessments (1,2 & 4) will be informed later.
2. Attending all the assessments (i.e., Assessment 1 to 4) are MANDATORY for every student.
3. 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).
4. 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 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.
2. 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.

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

Text Books:

1. *D. Roy Choudhury, 'Networks and Systems', New Age International Publications, 1st Edition, 2013.*
2. *James W. Nilsson and Susan A. Riedel, 'Electric Circuits', Pearson Education Publications, 9th Edition, 2011.*
3. *F.F.Kuo, 'Network Analysis and Synthesis', John Wiley Inc Publications, 2nd Edition, 2010.*
4. *M.E. Van Valkenburg, 'Network Analysis', PHI Learning Publications, 3rd Edition, 2014.*

Reference Books:

1. *Cheng.D. K, 'Analysis of Linear System', Addison Wesley Publications, Revised Edition, 2009.*
2. *William D. Stanley, 'Network Analysis with Applications', Pearson Education Publication, 2009.*
3. *Hayt, W. H, Kemmerly J. E. & Durbin, 'Engineering Circuit Analysis', McGraw Hill Publications, 8th Edition, 2013.*

Following NPTEL course materials will form the additional references :

1. Networks and systems by Prof. V.G.K. Murti, IIT Madras. Web-site: http://nptel.ac.in/courses/108106075/#
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.)

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.
2. Queries (if required) may be emailed to me / contact me during 10.30 am to 11.30 am on Monday and Wednesday 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.

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 COURSE INFORMATION

FOR APPROVAL

Course Faculty _____ 2/01/17 **CC-Chairperson** _____ **HOD** _____