Lahore University of Management Sciences

EE240: Circuits-I

Fall 2018-2019

Course Catalog Description
The course provides an introduction to circuit analysis. Topics covered include introduction to passive components (R, L, C), independent and controlled energy sources, lumped parameter models, conventions for describing networks, analysis and solution of first order and second order circuits, determination of initial conditions in these circuits and their transient and steady state responses. Students also learn Laplace transform and its application in solving circuits.

Course Details	
Credit Hours	3
Core	Core Course for Electrical Engineering
Elective	
Open for Student Category	BS students
Closed for Student Category	

Course Prerequisite(s)/Co-Requisite(s)
Pre-requisites: MATH-101 Calculus-1 Co-requisites: None

Course Offering Details						
Lecture(s)	Nbr of Lec(s) Per Week	2	Duration	75 min	Timings and Venue	
Recitation (per week)	Nbr of Rec (s) Per Week	x	Duration			
Lab (if any) per week	Nbr of Session(s) Per Week	x	Duration			
Tutorial (per week)	Nbr of Tut(s) Per Week	2	Duration	75 min		

Instructor	Zubair Khalid
Room No.	9-213A, 9-251
Office Hours	Tu-Th 2:00 pm – 3:00 pm, 4:30 pm – 5:30 pm
Email	Zubair.khalid@lums.edu.pk
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TA	Hamza Ather, Muhammad Saad Atique, Maha Awan
TA Office Hours	TBA
Course URL (if any)	LMS

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Course Learning Outcomes	
EE240-	The students should be able to:
CLO1:	Derive and apply working principle of passive components R, L,C and independent and controlled energy sources for device and circuit modeling and analysis
CLO2:	Demonstrate the understanding and use of component and network conventions and network topology
CLO3:	Formulate network equations based on the understanding of Krichhoff's voltage and current laws
CLO4:	Analyze first and second order switched circuits for their initial and final condition, transient response etc.
CLO5:	Solve switched linear networks up to second order using initial conditions

Relation to EE Program Outcomes

EE-240 CLOs	Related PLOs	Levels of Learning	Teaching Methods	CLO Attainment checked in
CLO1	PLO1	Cog-3	Instruction, Tutorial, Assignments	Midterm, Final
CLO2	PLO1	Cog-3	Instruction, Tutorial, Assignments	Midterm, Final
CLO3	PLO1	Cog-3	Instruction, Tutorial, Assignments	Midterm, Final
CLO4	PLO2	Cog-4	Instruction, Tutorial, Assignments	Final
CLO5	PLO2	Cog-4	Instruction, Tutorial, Assignments	Final

Grading Breakup and Policy

Class quizzes: (8 announced & 2 un-announced quizzes): 20% - Best 8
Assignments: (5 nos.): 5%
Midterm exam: 35%
Final exam: 40%

Tutorials: (Ungraded sessions for problem solving): 1 x 60min sessions (will be planned as per the need of the students)

Course Overview

Week No.	Book Chapter	Topic	Book sections	Related CLOs & Additional Remarks
1	1 Development of the circuit concept	Course introduction Charge and Energy Relationship of field and circuit concepts	1-1 1-2 1-3	CLO1 3 lectures
		The Capacitance parameter	1-4	
		The Inductance parameter	1-5	
		The Resistance parameter	1-6	
2		Units, scaling, and circuit interpretation of physical systems	1-7 1-8	
3	2 Conventions for describing networks	Reference directions for current and voltage, Active element conventions, The dot convention for coupled circuits	2-1 2-2 2-3	CLO1, CLO2 3 lectures
		Topological description of networks	2-4	
	3 Network equations	Kirchhoff's laws, The number of network equations	3-1 3-2	CLO3 7 lectures
		Source transformations,	3-3	

4,5,6		Examples of formulation of network equations	3-4	
		Examples of formulation of network equations…cont., Loop variable analysis	3-4 3-5	
		Node variable analysis, Determinants: Minors and the Gauss elimination method	3-6 3-7	
		Additional examples of: Solving networks with active dependent sources Solving networks with super nodes Loop analysis with current loops	additional readings	
7		Duality, State variable analysis	3-8 3-9	
8,9	4 First-order differential equations	General and particular solutions, Time constants	4-1 4-2	CLO4, CLO5 6 lectures & Midterm
		The integrating factor	4-3	
10		Midterm exam (in class)	All covered	
		More complicated networks; Thevenin and Norton equivalent of resistive networks	4-4 and additional material	
11	5 Initial conditions in networks	Why study initial conditions, Initial conditions in elements	5-1 5-2	CLO4 4 lectures + Review of midterm exam in tutorial
		Geometrical interpretation of derivatives, Procedure for evaluating initial conditions	5-3 5-4	
12		Initial state of a network	5-5 and additional material	
13,14	6 Differential equations, continued	Second order equation: Internal Excitation	6-1	CLO5 5 lectures
		Networks excited by external energy sources	6-3	
		Response as related to the s-plane location of roots	6-4	
		General solution	6-5	

Textbook(s)/Supplementary Readings
Textbook: Network Analysis, 3rd edition, by M. E. Van Valkenburg, Pearson Education or PHI Additional/Supplementary Reading: The Analysis and Design of Linear Circuits by R E Thomas, A J Rosa and G J Toussaint, John Wiley, 6th Edition, 2000 Electric Circuits Fundamentals by S Franco, Oxford University Press, 2002 Basic Engineering Circuit Analysis by J D Irwin and R M Nelms, Wiley, 9th Edition, 2008 Photocopy of relevant sections of notes from Prof. Abidi's workshop and other material indicated in the class.

Examination Detail	
Midterm Exam	Yes/No: Yes Combine Separate: Combine Duration: 180 minutes Preferred Date: TBA

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	Exam Specifications: TBA
Final Exam	Yes/No: Yes Combine Separate: Combine Duration: 180 minutes Exam Specifications: TBA

Prepared and Revised by:	**Nadeem Ahmad Khan, Zubair Khalid**
Revision Date:	**24 January 2018**