



## Lahore University of Management Sciences

### EE 240 – Circuits I Fall 2023-24

Instructors	Zartash Afzal Uzmi (Section-1); Naveed ul Hassan (Section-2)
Room No.	Zartash (SBASSE 9-219A, second floor, Maxwell wing); Naveed (SBASSE 9-250A, second floor, Tesla wing)
Class timings	4:30pm-5:45pm Tuesdays and Thursdays (both sections)
Class Venue	SBASSE 10-201 (Section-1, Zartash); SDSB-205 (Section-2, Naveed)
Email	<a href="mailto:zartash@lums.edu.pk">zartash@lums.edu.pk</a> ; <a href="mailto:nuhassan@lums.edu.pk">nuhassan@lums.edu.pk</a>
Office hours	Wed 4-5 pm or by appointment (both instructors)
TA	This information will be provided on class main page on LMS
TA Office Hours	On LMS (class main page)
Course URL (if any)	<a href="http://lms.lums.edu.pk">http://lms.lums.edu.pk</a>

#### Course Teaching Methodology

- Live in-person lectures twice a week during the scheduled class times.
- Attendance is not mandatory but is highly recommended to understand the subject material without losing continuity.
- We will use [Piazza](#) for course-related discussions; you can post questions related to lectures and assignments on Piazza.
- [Piazza](#) signup link for the <https://piazza.com/lums.edu.pk/fall2023/ee240>

#### Course Basics

Credit Hours	3			
Lecture(s)	Nbr of Lec(s) Per Week	2	Duration	75 minutes
Recitation/Lab (per week)	Nbr of Lec(s) Per Week		Duration	
Tutorial (per week)	Nbr of Lec(s) Per Week	1	Duration	1 hour (or as needed)

#### Course Distribution

Core	For EE Majors
Elective	
Open for Student Category	Undergraduates
Close for Student Category	None

#### COURSE DESCRIPTION

The course provides an introduction to circuit analysis. Topics covered include an 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.

#### COURSE PREREQUISITE(S)

	<ul style="list-style-type: none"><li>• Pre-requisite: MATH 101 (Calculus-1)</li><li>• Co-requisite: None</li></ul>
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#### COURSE OBJECTIVES

	<ul style="list-style-type: none"><li>• Equip the students with the fundamental knowledge of electric quantities (charge, current, voltage), basic passive components R, L, C, and their interactions</li><li>• Enable the students to understand and use network conventions and network topology, formulate network equations using Krichhoff's voltage and current laws</li><li>• Enable the students to analyze first and second-order switched circuits for their initial and final condition, transient response, etc.</li></ul>
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Learning Outcomes																															
	After the course, 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																														
Relationship to EE Program Outcomes																															
	<table><tr><th>EE 240 CLO</th><th>Related PLO(s) in EE</th><th>Levels of Learning</th><th>Teaching Methods</th><th>CLO Attainment checked in which instrument(s)?</th></tr><tr><td>CLO1</td><td>PLO1</td><td>Cog-3</td><td>Instruction, Tutorial, Assignments</td><td>Quizzes, Final</td></tr><tr><td>CLO2</td><td>PLO1</td><td>Cog-3</td><td>Instruction, Tutorial, Assignments</td><td>Quizzes, Final</td></tr><tr><td>CLO3</td><td>PLO1</td><td>Cog-3</td><td>Instruction, Tutorial, Assignments</td><td>Quizzes, Final</td></tr><tr><td>CLO4</td><td>PLO2</td><td>Cog-4</td><td>Instruction, Tutorial, Assignments</td><td>Quizzes, Final</td></tr><tr><td>CLO5</td><td>PLO2</td><td>Cog-4</td><td>Instruction, Tutorial, Assignments</td><td>Quizzes, Final</td></tr></table>	EE 240 CLO	Related PLO(s) in EE	Levels of Learning	Teaching Methods	CLO Attainment checked in which instrument(s)?	CLO1	PLO1	Cog-3	Instruction, Tutorial, Assignments	Quizzes, Final	CLO2	PLO1	Cog-3	Instruction, Tutorial, Assignments	Quizzes, Final	CLO3	PLO1	Cog-3	Instruction, Tutorial, Assignments	Quizzes, Final	CLO4	PLO2	Cog-4	Instruction, Tutorial, Assignments	Quizzes, Final	CLO5	PLO2	Cog-4	Instruction, Tutorial, Assignments	Quizzes, Final
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Grading Breakup and Policy
<p><b>Homeworks:</b> 18% (Total 7, consider 6 best using N-1 policy, no petition or late submission accepted)</p> <p><b>Quizzes:</b> 24% (Total 9, consider 8 best using N-1 policy) (in-class, announced, no make-up allowed)</p> <p><b>Attendance:</b> 8% (missing any part of lecture is not permitted)</p> <p><b>Final examination (comprehensive):</b> 50% (combined for both sections)</p> <p>Below, we describe how each type of assessment will be conducted.</p> <p><b>Quizzes</b></p> <ul style="list-style-type: none"> <li>Quizzes will be announced, in-class, and will follow N-1 policy. See the quiz schedule below for specific dates.</li> <li>We will have a total of 9 quizzes in the course, but only your best eight (8) quizzes will count towards the grade. An important purpose of having N-1 quizzes is to account for <u>all issues</u> (e.g., sickness, etc.) that may prevent you from taking the quiz. No request for assigning an average score or taking a makeup quiz will be entertained if you miss up to one quiz, irrespective of the reason. If you end up missing more than one quiz, we will consider accommodation <i>only if</i> you have an OSA-approved petition.</li> <li>All quizzes will take place during class times (usually at the start of class, but occasionally at the end as well).</li> <li>The syllabus for every quiz will include the <u>lecture</u> in which the quiz will be taken (if the quiz is at the end of the class).</li> <li>All quizzes will be announced.</li> </ul> <p><b>Exam</b></p> <ul style="list-style-type: none"> <li>There will be a comprehensive final exam, which will be conducted in-person. There will be no midterm exam in the course.</li> <li>The final exam will take place during the final exam week, on the date as specified on zambeel.</li> </ul>



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### Academic Honesty

The principles of truth and honesty are recognized as fundamental to a community of teachers and students. This means that all academic work will be done by the student to whom it is assigned without unauthorized aid of any kind. Plagiarism, cheating and other forms of academic dishonesty are prohibited. Any instances of academic dishonesty in this course (intentional or unintentional) will be dealt with swiftly and severely. Potential penalties include receiving a failing grade on the assignment in question or in the course overall. For further information, students should make themselves familiar with the relevant section of the LUMS student handbook.

### Harassment Policy

SSE, LUMS and particularly this class, is a harassment free zone. There is absolutely zero tolerance for any behaviour that is intended or has the expected result of making anyone uncomfortable and negatively impacts the class environment, or any individual's ability to work to the best of their potential. In case a differently-abled student requires accommodations for fully participating in the course, students are advised to contact the instructor so that they can be facilitated accordingly.

If you think that you may be a victim of harassment, or if you have observed any harassment occurring in the purview of this class, please reach out and speak to me. If you are a victim, I strongly encourage you to reach out to the Office of Accessibility and Inclusion at [oai@lums.edu.pk](mailto:oai@lums.edu.pk) or the sexual harassment inquiry committee at [harassment@lums.edu.pk](mailto:harassment@lums.edu.pk) for any queries, clarifications, or advice. You may choose to file an informal or a formal complaint to put an end of offending behavior. You can find more details regarding the LUMS sexual harassment policy here. To file a complaint, please write to [harassment@lums.edu.pk](mailto:harassment@lums.edu.pk)

### SSE Council on Equity and Belonging

In addition to LUMS resources, SSE's Council on Belonging and Equity is committed to devising ways to provide a safe, inclusive and respectful learning environment for students, faculty and staff. To seek counsel related to any issues, please feel free to approach either a member of the council or email at [cbe.sse@lums.edu.pk](mailto:cbe.sse@lums.edu.pk)

### Rights and Code of Conduct for Online Teaching

A misuse of online modes of communication is unacceptable. TAs and Faculty will seek consent before the recording of live online lectures or tutorials. Please ensure if you do not wish to be recorded during a session to inform the faculty member. Please also ensure that you prioritize formal means of communication (email, LMS) over informal means to communicate with course staff.

### Makeup Policy

- Please refer to Student Handbook 2019-20, page 37, article 25, titled "Makeup Policy for Graded Instruments".
- "In case N-X policy is implemented for an instrument having multiple sub instruments then petitions will not be accepted for that instrument".

### Examination Detail

Midterm Exam	Yes/No: No
Final Exam	Yes/No: Yes Combine/Separate: Combined (for both sections) Duration: 3 hours Exam Specifications: Details provided in-class



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## Schedule

Note: The quiz and assignment dates are **tentative** and can be subject to changes

Lecture	Topics	Recommended Readings	Assessments
1	Introduction, Charge and Energy, Relationship of field and circuit concepts	1-1, 1-2, 1-3	
2	The Capacitance parameter, The Inductance parameter, The Resistance parameter	1-4, 1-5, 1-6	
3	Units, scaling, and circuit interpretation of physical systems	1-7, 1-8	Quiz 01
4	Reference directions for current and voltage, Active element conventions	2-1, 2-2	
5	The dot convention for coupled circuits	2-3	
6	Topological description of networks	2-4	Quiz 02
7	Kirchhoff's laws, The number of network equations	3-1, 3-2	
8	Source transformations	3-3	
9	Examples of formulation of network equations	3-4	Quiz 03
10	Loop variable analysis	3-5	
11	Node variable analysis	3-6	
12	Determinants: Minors and the Gauss elimination method	3-7	Quiz 04
13	Duality, State variable analysis	3-8, 3-9	
14	General and particular solutions	4-1	
15	Time constants	4-2	Quiz 05
16	The integrating factor	4-3	
17	The integrating factor	4-3	
18	More complicated networks	4-4	Quiz 06
19	Thevenin and Norton equivalent of resistive circuits	4-4	
20	Why study initial conditions, Initial conditions in elements	5-1, 5-2	
21	Geometrical interpretation of derivatives	5-3	Quiz 07
22	Procedure for evaluating initial conditions	5-4	
23	Initial state of a network	5-5	
24	Second order equation: Internal Excitation	6-1	Quiz 08
25	Networks excited by external energy sources	6-3	
26	Response as related to the s-plane location of roots	6-4	
27	General solution	6-5	Quiz 09
28	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



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Please note the syllabus and schedule above is **tentative** and can be subject to some changes.