The University of Jordan
School of Engineering
Electrical Engineering Department
1st Semester – A.Y. 2020/2021

Course: **Electrical Circuits (I) – 0903211 (3 Cr. – Required Course)**

Instructor: Dr. Raed Al-Zubi
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Office Hours: Will be posted soon

Course website: http://elearning.ju.edu.jo/

Catalog description: Units, definitions, and simple circuits. Circuit analysis techniques. Inductance and capacitance. Source-free RL and RC circuits. The application of unit-step forcing functions. The RLC circuits. The sinusoidal forcing function. The phasor concept. The phasor relationships for R, L, and C. Impedance/admittance. The sinusoidal steady state response. Circuit analysis using MATLAB and SPICE.

Prerequisites by course: **Py** **0302102** General Physics II (pre-requisite)

Prerequisites by topic: Students are assumed to have a background in the following topics:
- Columb's Law.
- Magnetic and electric fields.
- Dielectrics and capacitice.
- Resistance and electric curcuits.
- Electromagnetic induction.

Textbook: **Fundementals of Electric Circuits by Charles K. Alexander and Matthew Sadiku, McGraw-Hill Education, 6th edition, 2016.**

References:
1. Engineering Circuit Analysis by William H. Hayt, Jack E. Kemmerly and Steven M. Durbin, McGraw-Hill Education, 8th edition, 2011.
2. Electrical Circuits by James W. Nilsson and Susan Riedel, Pearson, 11th edition, 2018.
3. Electric Circuits Fundamentals by Thomas L. Floyd, Pearson, 8th edition, 2009.
4. Principles of Electric Circuits: Conventional Current Version by Thomas L. Floyd, Pearson, 9th edition, 2009.

5. Schaum's Outline of Basic Circuit Analysis by John O'Malley, McGraw-Hill Education, 2nd edition, 2011.
6. Schaum's Outline of Electric Circuits by Mahmood Nahvi and Joseph Edminister, McGraw-Hill Education, 7th edition, 2011.
7. Introductory Circuit Analysis by Robert L. Boylestad, Pearson, 13th edition, 2015.

Schedule: 16 Weeks, 42 lectures (50 minutes each) plus exams.

Course goals: The overall objective is to provide the student with the knowledge and proficiency to analyze R/L/C circuits by applying the proper technique with DC, unit-step or sinusoidal forcing functions.

Course learning outcomes (CLO) and relation to ABET student outcomes (SO):

Upon successful completion of this course, a student will:	[SO]
1. Understand the definitions of basic electrical quantities, Ohm's law and differences between practical and ideal sources.	[1]
2. Analyze simple series and parallel resitive circuits and simplify series/parallel connected sources and resistors.	[1]
3. Implement general nodal and mesh analysis and other circuit analysis techniques, and select between them to achieve an optimal solution.	[1]
4. Understand the natural response of unforced R/L/C circuits.	[1]
5. Apply unit-step forcing function and obtain the total response of different R/L/C circuits.	[1]
6. Understand the concept of the sinusoidal forcing function and anlayze R/L/C cirucits in the frequency domain and convert the solution to the time domain.	[1]

Course topics:	Hrs
1. Units, charge, current, voltage, and power. Dependent and independent voltage and current sources. Ohm's law.	3
2. Nodes, paths, loops, and branches. Kirchoff's current and voltage laws. Single node or loop circuits. Reduction of series or parallel circuits. Voltage and current division.	5
3. Nodal analysis and supernode. Mesh analysis and supermesh. Nodal versus mesh analysis. Computer aided circuit analysis.	5
4. Linearity and superposition. Source transformations. Thevenin and Norton theorems. Maximum power transfer. Delta–Wye conversion. Selecting an optimal solution technique.	7
5. The capacitor and inductor. Inductance and capacitance combinations. Consequences of linearity. Duality.	5
6. The source free RL circuits. Properties of the exponential response. The source free RC circuits. The unit step function. Driven RL and RC circuits. Natural and forced response.	5
7. The source-free parallel RLC circuit. Overdamped, critically damped, and underdamped circuits. The source-free series RLC circuits. The complete response of RLC circuits. The lossless LC circuit.	5

8. Characteristics of sinusoids. Forced response to sinusoidal functions. Relation between frequency and time domains. The phasor and relationships for R, L, and C elements. Impedance and admittance. Circuit analysis techniques. Phasor diagrams. **7**

Ground rules: Attendance is required and highly encouraged. To that end, attendance will be taken every lecture. Eating and drinking are not allowed during class, and cell phones must be set to silent mode. All exams (including the final exam) should be considered cumulative. Exams are closed book. No scratch paper is allowed. You will be held responsible for all reading material assigned, even if it is not explicitly covered in lecture notes.

Assessment & grading policy:

Assignments	5%	Quizzes	0%
First Exam	15%	Projects	0%
Midterm Exam	30%	Lab Reports	0%
Final Exam	50%	Presentation	0%
		Total	**100%**

Last Revised: March 2021