The University of Jordan
School of Engineering
Electrical Engineering Department
2nd Semester – A.Y. 2019/2020

Course: **Electric Circuits – 0913213 (3 Cr. – Required Course)**

Instructor: Dr. Hani Jamleh
Office: E301, Telephone: 06/5355000 ext 22848, Email: h.jamleh@ju.edu.jo
Office Hours: Will be posted soon

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

Catalog description: Ohm's and Kirchhoff's laws. Series and parallel connections. Voltage and current division. Nodal and mesh analysis. Superposition theorem. Thevenin's and Norton's theorems. Source transformation. Maximum power transfer. Inductance and capacitance. Behavior of R, L and C under steady-state DC or AC conditions. Transient analysis. Unit-step forcing function. Natural, forced and complete response of first-order RL and RC circuits. Natural, forced and complete response of second-order RLC circuits. Characteristics of sinusoids. The phasor concept. Phasor relationships for R, L, and C elements. Impedance and admittance. Effective values of current and voltage. Instantaneous, average and apparent power. Power factor. Three-phase systems. Three-phase wye and delta connections. Resonance and filters. Safety considerations. Protective grounding.

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

Prerequisites by topic: Students are assumed to have a background in the following topics:
- Magnetic and electric fields.
- Electric charge.

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

References:
1. Principles and Applications of Electrical Engineering by Giorgio Rizzoni and James A. Kearns, McGraw-Hill Education, 6th edition, 2015.
2. Electrical Engineering: Principles & Applications by Allan R. Hambley, Pearson, 7th edition, 2017.
3. Electrical Circuits by James W. Nilsson and Susan Riedel, 11th edition, Pearson, 2018.
4. Schaum's Outline of Basic Circuit Analysis by John O'Malley, McGraw-Hill Education, 2nd Edition, 2011.
5. Schaum's Outline of Electric Circuits by Mahmood Nahvi and Joseph Edminister, McGraw-Hill Education, 7th Edition, 2011.
6. Microelectronic Circuits by Adel S. Sedra and Kenneth C. Smith, Oxford University Press, 7th Edition, 2014.
7. Microelectronics Circuit Analysis and Design by Donald A Neamen, McGraw-Hill Education, 4th edition, 2009.
8. Schaum's Outline of Electronic Devices and Circuits by Jimmie J. Cathey, McGraw-Hill Education, 2nd Edition, 2002.

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 DC circuits, R/L/C circuits with DC, unit-step or sinusoidal forcing functions, as well as steady-state AC circuits both single and multiphase. In addition the student is introduced to the concepts of frequency response and filters.

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]
7.	Understand and analyze steady-state three-phase AC circuits, and be able to perform power calculations.	[1]
8.	Design simple filter circuits.	[1, 2]

	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.	4
3.	Nodal analysis and supernode. Mesh analysis and supermesh. Nodal versus mesh analysis. Computer aided circuit analysis.	4
4.	Linearity and superposition. Source transformations. Thevenin and Norton theorems. Maximum power transfer. Delta–Wye conversion. Selecting an optimal solution technique.	5
5.	The capacitor and inductor. Inductance and capacitance combinations.	3
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.	4
7.	The source-free parallel RLC circuits. 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.	6
9.	Three-phase circuits, Wye and delta balanced loads. Power calculations for single- and three-phase circuits. Power factor and power triangle.	6
10.	Frequency Response: Parallel and series resonance,basic filters.	2

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	0%	Quizzes	0%
First Exam	15%	Homeworks	5%
Midterm Exam	30%	Lab Reports	0%
Final Exam	40%	Presentation	0%
		Total	**100%**

Last Revised: Febreuary 2020