The University of Jordan
School of Engineering
Electrical Engineering Department
2nd Semester – A.Y. 2023/2024

Course: **Electric Circuits Lab – 0913214 (1 Cr. – Required Course)**

Instructor: Prof. Mohammed Hawa + Eng. Ola Ananbeh
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Office Hours: Will be posted soon

Platform: http://www.hawa.work/214 and Moodle (https://elearning.ju.edu.jo/)

Catalog description: Electric measurement equipment. Ohm's law. Resistors and DC Circuits. Series and parallel connections. Voltage and current division. Nodal and mesh analysis. Superposition theorem. Thevenin's and Norton's theorems. Maximum power transfer. Inductance and capacitance. Transient Analysis. First-order RL and RC circuits. AC systems. Impedance concept and phase shift in RL and RC circuits. Measurement of power and power factor. Three-phase wye and delta connections. Series and parallel resonance. Quality factor. Filters, including LPF, HPF and BPF. Residential wiring and safety considerations.

Prerequisites by course: **EE 0913213** Electric Circuits (pre-requisite)

Prerequisites by topic: Students are assumed to have a background in the following topics:
• DC electric circuit analysis.
• AC electric circuit analysis.

Textbook:
Lab Manual which can be obtained from the course website.

References:
1. Fundementals of Electric Circuits by Charles K. Alexander and Matthew Sadiku, McGraw-Hill Education, 6th edition, 2016.
2. Engineering Circuit Analysis by W. H. Hayt, J. Kemmerly and S. M. Durbin, McGraw-Hill Education, 8th Edition, 2011.
3. Black & Decker The Complete Guide to Wiring by Editors of Cool Springs Press, 7th edition, Cool Springs Press, 2017.
4. Electrical Wiring Residential by Ray C. Mullin and Phil Simmons, 19th edition, Cengage Learning, 2017.
5. Basic Electrical Troubleshooting for Everyone by Darrel P. Kaiser, Darrel Kaiser Books, 1st edition, 2012.
6. Everything Electrical How To Test Circuits Like A Pro Part 1 by Vincent Keler, Independently published, 1st edition, 2018.
7. Beginner's Guide to Reading Schematics by Stan Gibilisco, 4th edition, McGraw-Hill Education, 2018.

Schedule: **On Campus** [16 Weeks, 10 lab sessions (3 hours each) plus exams.]

Course goals: The overall objective is to allow the student to perform a set of experiments to validate different circuit theorems and to utilize some basic measurement instruments such as multimeters and the oscilloscope.

Course learning outcomes (CLO) and relation to ABET student outcomes (SO):
Upon successful completion of this course, a student will: **[SO]**

1. Be able to conduct appropriate experimentation to measure fundamental electrical parameters (including voltage, current, power, frequency, etc) in electrical circuits, and validate the fundamental theories related to such circuits. **[6]**

2. Be able to analyze and interpret measured data, and use engineering judgment to draw **[6]**

conclusions.

3. Know the basics of electrical laboratory instruments (including multimeters, power supplies, function generators and oscilloscopes) and be able to properly use such instruments. **[6]**

4. Understand the requirements and pre-requisites for technical reporting, and be able to properly report experimental results. **[3]**

5. Be able to effectively function in a team in a collaborative and inclusive manner, to reach the lab goals and objectives. **[5]**

Course topics:

Hrs

1. Measurement Devices: Familiarization with the main devices and equipment used in the Lab, including: multimeters, oscilloscopes, power supplies, function generators and breadboards. A simple circuit is connected, and basic measurements are made. **3**

2. Resistors and DC Circuits: Identification of resistor values by color coding. Different resistor types. Testing different DC circuit analysis techniques, including parallel/series combinations, voltage/current division (using resistive networks), and nodal/mesh analysis. **3**

3. Network Theorems: Verify superposition theorem. Examine both the Thevenin and Norton theorems. Investigate the conditions for maximum power transfer in DC circuits. Learn about adjustable resistances, namely the potentiometer and rheostat. **3**

4. Transient Analysis: Learn how to read the values of capacitors and inductors from their number or color codes. Test the transient behavior when charging and discharging a capacitor, and the transient behavior when energizing and de-energizing an inductor. Learn how to use an oscilloscope to display and measure various waveforms. **3**

5. Inductive Reactance: Examine the relationship of inductive reactance to the AC source frequency. AC power and power factor calculations are introduced. **3**

6. Capacitive Reactance: Investigate the relationship of capactive reactance to the AC source frequency. AC power and power factor calculations are performed. **3**

7. Resonance: Investigate the voltage and current relationships in series and parallel resonant RLC circuits. Determine the resonant frequency and the quality factor of the circuit with relation to the values of the R, L, and C components. **3**

8. Delta-Wye Conversion: Investigate the Delta-Wye and Wye-Delta impedance conversion, and how this can be used to simplify the analysis of DC and AC circuits. **3**

9. Transfer Function of Two Port Networks: Investigate the transfer function of several two-port networks including: low-pass filter (LPF), high-pass filter (HPF) and bandpass filter (BPF). **3**

10. Home Wiring Basics: Introduce some basic principles that everyone should know about **3**

residential wiring, lighting, electrical installation and safety.

Ground rules: Attendance is required and highly encouraged. To that end, attendance will be taken every lab session. Eating and drinking are not allowed during the lab, 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. Academic integrity must be maintained.

Assessment & grading policy: First Exam 0% Assignments 0% Midterm Exam 30% Projects 0% Final Exam 40% Lab Reports 13%

Quizzes	13%	Teamwork	4%
		Total	**100%**

Last Revised: Feb 2024

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