



**Basic Course Information:**

**Course Prefix/Number:** ELEG 220

**Course Title:** Electric Circuits

**Core/Elective Course:** Core Course

**Class Meeting Times:** MW, 15:30 – 16:45 p.m.

**Instructional Modality:** Onsite

**Class Location:** B210

**Instructor:** Dr. Ali Bostani

**Office Location:** B417

**Office Phone:** 3741

**Email:** [abostani@auk.edu.kw](mailto:abostani@auk.edu.kw)

**Office Hours:** MW: 12:30 – 15:30 a.m.

**AUK Mission Statement:**

The American University of Kuwait is a liberal arts institution dedicated to teaching, learning, and scholarship. The University offers programs that provide students with the knowledge and skills necessary for lifelong learning and professional success. AUK enriches society by fostering an environment that encourages critical thinking, effective communication, personal growth, service, and leadership.

**College of Engineering and Applied Sciences Mission Statement:**

The College of Engineering and Applied Sciences (CEAS) is committed to cultivating an inspiring and innovative learning environment that contributes to a culture of lifelong learning driven by the core values of liberal arts education. In its pursuit of excellence in teaching, research and community engagement, the College offers high quality programs in engineering and computing.

**Engineering Department Mission Statement:**

The Engineering Department strives to provide high-quality engineering education centered around the key principles of liberal arts, specifically, lifelong-learning, critical thinking, and effective communication. The department prepares students to become successful engineers, and be able to contribute effectively to their profession and community

**Catalog Course Description:**

Introduction to the basic laws and techniques for electric circuits analysis, response of circuits with resistors, independent sources, controlled sources, operational amplifiers; transient analysis of basic circuits with R, L, and C components. AC analysis and phasors; an introduction to MATLAB.

Prerequisites: PHYS 116 (Physics II)

Co-requisites: MATH 210 (Differential Equations) & ELEG 220L (Electric Circuits Lab)

**Course Learning Outcomes:**

Upon successful completion of the course, students will be able to:

1. Understand the behavior of different electric circuits' elements including current and voltage sources, resistors, inductors, capacitors and operational amplifiers.
2. Apply Kirchoff's laws to analyze electric circuits for DC inputs.
3. Apply resistive circuit simplification techniques and current/voltage division rules to solve electric circuits.
4. Apply different circuit analysis techniques to solve electric circuits, such as node voltages, mesh currents, Thevenin and Norton's techniques etc.
5. Determine the response of electric circuits to both ideal/independent and dependent DC sources.
6. Analyze electric circuits involving different types of operational amplifiers.
7. Obtain both the transient and steady state responses of RC and RL circuits.
8. Design and implement a simple electric circuit project.

**Course Delivery/Methodology:**

All course material will be posted on Moodle, which can be accessed at [<https://lms.auk.edu.kw/>]. The course project must be submitted through Moodle by the posted due dates and times.

**Required Textbook/Required Readings:**

Electric Circuits, Global Edition, 11th Edition, J. W. Nilsson and S. A. Riedel – Pearson, 2020.

**Recommended:**

1. Fundamentals of Electric Circuits, 5th Ed. Alexander and Sadiku – McGraw-Hill, 2013
2. Engineering Circuit Analysis, 6th Ed. William H. Hayt, Jack E. Kemmerly, and Steven M. Durbin – McGraw Hill, 2012
3. Principles of Electric Circuits, 9th Ed. Thomas L. Floyd – Prentice Hall, 2010

**Evaluations and Grading:**

<b>Evaluation Type</b>	<b>Weight</b>
Project - Practical Circuit Assembly	30%
First Exam (Chapters 1 to 3)	20%
Second Exam (Chapter 4)	20%
Second Exam (Chapters 5 to 9)	30%
<b>Total</b>	<b>100%</b>

**AUK Official Grading Scale:**

Letter Grade	Percentage	University Points
A	94-100	4.0
A-	90-93	3.7
B+	87-89	3.3
B	84-86	3.0
B-	80-83	2.7
C+	77-79	2.3
C	74-76	2.0
C-	70-73	1.7
D+	67-69	1.3
D	64-66	1.0
D-	60-63	0.7
F	0-59	0.0

**AUK Attendance Policy:**

The American University of Kuwait recognizes that class attendance is an important element of students' classroom success. Students are expected to attend all classes, laboratories, and/or required fieldwork. Because excessive absences prevent students from receiving full course benefits and disrupt orderly course progress, AUK has established the following policy on class attendance. Any student who misses more than 15% of class sessions of any course during a semester should expect to fail, unless s/he submits documented evidence to the course instructor of inpatient medical care, death of an immediate family member, academic instructional activities, or national athletic activities. If excused, students are required to satisfy all coursework due or assigned during their absence as determined by the course instructor. If a student does not submit documented evidence for her/his absence exceeding the limit, it is the student's responsibility to withdraw from the course by the specified deadline, as indicated on the academic calendar. Students who withdraw from a course receive a grade of "W". Students who do not withdraw from a course nor submit supporting documents for excessive absences will receive a grade of "FN" (failure for non-attendance).

**Code of Academic Honesty and Integrity:**

Upon admission to the American University of Kuwait, students agree to act responsibly in all areas of academic, personal and social conduct and to take full responsibility for their individual and collective action. Such regulations are found in the American University of Kuwait Catalogue, Student Handbook, and the AUK website at [www.auk.edu.kw](http://www.auk.edu.kw). Any question of interpretation regarding the code of academic honesty and Integrity shall be reported to the appropriate academic dean. The Code shall be reviewed annually at the discretion of the academic deans. Any student or student organization found to have committed the cited violations or misconduct, either on or off campus, is subject to the disciplinary sanctions outlined in adjudication procedures.

Any violation to the code of academic honesty and integrity will result in the student receiving a grade of 'F' in the course with the possibility of further action taken by the college/university if deemed necessary.

**Academic Support:**

The Writing and Tutoring Center (WTC) focuses on empowering students to become independent and successful learners by developing their literacy skills, enhancing their understanding, and helping them improve their academic and study skills. WTC offers tutoring and writing consultations to all AUK students, and collaborates with academic departments to continuously develop more effective learning support and classroom workshops. WTC also works with faculty

and other support units on campus to recognize and respect the rights and equality of all who seek assistance. Students can schedule appointments through the TutorTrac online appointment system, or they can drop in for assistance. The center also uses various digital platforms to conduct online operations.

### **Disability Accommodations:**

AUK provides equal and inclusive educational environment in order to enable all students to meet and perform requisite academic standards and to participate in the opportunities and activities of its community. If you believe you can benefit from accommodations for a learning, physical, or mental health disability, [click here to book a session through the Counseling Center/Disability Services Booking Page](#), to ask about disability services at AUK, initiate an accommodation plan, or receive disability services. You can also email [counseling@auk.edu.kw](mailto:counseling@auk.edu.kw) if you need assistance in booking a session.

### **Course Policies/Student Responsibilities:**

1. Class attendance is essential. Missing more than 15% of the classes, without a documented proof, will result in failure (a grade of “FN”).
2. Plagiarism will not be tolerated. Kindly adhere to AUK’s code of academic integrity and honesty as detailed in the university’s academic catalog.
3. Students are required to have an account on Moodle and to enroll in the course page to receive useful handouts and announcements for the course.
4. No make ups for any piece of assessment. In case of an unavoided emergency, the total weight of the remaining assessments might be adjusted. This policy is very strict, with no exceptions.
5. If the instructions written on the cover page of assessment components were not followed, marks will be deducted.
6. When the class is presented with any examination grade, all students have only **one week** to discuss their grades. After the week has passed, the grade will be final and will not be changed under any circumstances.

### **Communication Policy:**

Please be sure to use your official AUK email account, write your full name, and indicate which class and section you are taking (Class ###, DAY/TIME section) when you send me an email. If you have a question, please check the syllabus first and if your question is not answered there, then please feel free to send an email and I will be happy to clarify. I respond to questions via email within 24 hours of receiving them; if I do not respond within 24 hours, please re-send the email. Emails sent on weekends will be responded to on Sunday.

## Course Schedule:

<b>1. Reviewing Prerequisites:</b>	<b>2 hours</b>
a) PHYS 116 (chapter 28, 32, and 33 in Serway's textbook).	
b) Simulation tool (Multisim).	
c) Solving simultaneous equations (MATLAB & Appendix A).	
<b>2. Circuit Variables – Chapter (1):</b>	<b>3 hours</b>
a) An overview of basic circuit analysis.	
b) Voltage, current, power, energy, and ideal sources.	
<b>3. Circuit Elements – Chapter (2)</b>	<b>3 hours</b>
a) Dependent and independent sources.	
b) Resistors, Ohm's law, KCL, and KVL.	
<b>4. Simple Resistive Circuits – Chapter (3)</b>	<b>3 hours</b>
a) Resistors in series and parallel.	
b) Voltage and current dividers.	
c) Wheatstone bridge and Delta-to-Wye conversion.	
d) Using Multisim for complex circuits.	
<b>5. Techniques for Circuit Analysis – Chapter (4)</b>	<b>8 hours</b>
a) Nodal Analysis.	
b) Mesh Analysis.	
c) Source transformations.	
d) Thevenin's and Norton equivalents.	
e) Superposition.	
f) Applications using Multisim.	
<b>6. The Operational Amplifiers – Chapter (5)</b>	<b>4 hours</b>
a) Ideal and practical Op Amps.	
b) Inverting and non-inverting modes of operation.	
c) Applications, e.g. summer, differential, etc.	
d) Practical applications (Briefly).	
e) Op Amps in Multisim.	
<b>7. Inductance, Capacitance, and Mutual Inductance – Chapter (6)</b>	<b>3 hours</b>
a) Inductors and capacitors.	
b) Series and parallel connections.	
c) Mutual inductance.	
<b>8. Response of First Order <i>RL</i> and <i>RC</i> Circuits – Chapter (7)</b>	<b>5 hours</b>
a) Natural responses of <i>RL</i> and <i>RC</i> circuits.	
b) Step responses of <i>RL</i> and <i>RC</i> circuits.	
c) General solution of <i>RL</i> and <i>RC</i> circuits.	
d) Switch circuits & Op Amp Applications.	
<b>9. Sinusoidal Steady State Analysis – Chapters (9)</b>	<b>5 hours</b>
a) Introduction to phasors.	
b) Sinusoidal response using phasors.	
c) Circuit analysis using phasors.	
d) Transformers (if time permits!).	

### Tentative Course Schedule\*:

Week	Topic	Assignments and Readings
1	Introduction & syllabus discussion + Chapter (1)	
2	Chapter (2)	
3	Chapter (3)	
4	Chapter (3)	
5	Chapter (4)	
6	Chapter (4)	
7	Chapter (4)	
8	Chapter (4)	
9	Chapter (4)	First Exam
10	Chapter (5)	
11	Chapter (5)	
12	Chapter (6)	Project
13	Chapter (7)	
14	Chapter (7)	
15	Chapter (9)	
16	Chapter (9)	
17	Final Exam Week	Second Exam

\* Exact assessment dates may change according to the actual progress of the course.

### Mapping to ABET Student Outcomes:

	SO-1	SO-2	SO-3	SO-4	SO-5	SO-6	SO-7
1	H						
2	H						
3	H						
4	M						
5	H	M				H	
6	H	H				H	
7	H	L				L	
8	H	M				H	
9	H	H				H	L
10	H	M				M	M
11	H	L				L	

- SO-1. an ability to apply identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
- SO-2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
- SO-3. an ability to communicate effectively with a range of audience.
- SO-4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgements, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
- SO-5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
- SO-6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgement to draw conclusions.
- SO-7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.