EK307 – Electric Circuits
Fall 2021, Section A1

Lecture: Tues/Thurs 3:30-5:15, PHO 203
Instructor: Joshua Semeter (office: PHO 537, email: jls@bu.edu)
Office hours: Posted on Blackboard and on my office door, or by appointment

Lab instructor: Aleks Zosuls azosuls@bu.edu

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Course Website: **https://learn.bu.edu**

Course Description:

Introduction to electric circuit analysis and design; voltage, current, and power, circuit laws and theorems; element I-V curves, linear and nonlinear circuit concepts; operational amplifier circuits; transient response of capacitor and inductor circuits, sinusoidal-steady-state response, frequency response, transfer functions; includes design-oriented laboratory. 4 cr. Coreq: CAS MA 226.

Course Methodology:

EK307 includes a coordinated set of lectures, labs, homework, and exams. Lab sessions meet in PHO105 where students will perform circuit experiments using components and a breadboard. Students will have weekly discussion times with TAs to discuss course material and ask questions on the homework.

Textbook:

Alexander and Sadiku, *Fundamentals of Electric Circuits, 7th Edition,* McGraw Hill, 2021. 2021. The text is available for rent at the publisher's website at a reasonable price. Earlier editions are okay, but you may have to map Section #'s from Edition 7 to your Edition.

Grading:

Labs	20%
Homework and Participation	10%
Mid-term Exam I	20%
Mid-term Exam II	20%
Final Exam	30%

Exams: The exams will be closed book, closed notes. There will be two midterm exams and a Final. **The midterm exams will be given during lecture on Thursday, October 7 and Tuesday November 16.** Do not make any plans to be away from BU on these dates!

Missed Exam Policy:

Absence from an exam can be excused only for reasons as stipulated by BU's academic policies, such as illness, or unavoidable travel. Permission of the instructor in advance is required. A written note of authorization by a physician (in case of illness) or other appropriate authorized signature is required.

Homework: Problem Sets will be distributed approximately weekly, and submitted via scan and upload to gradescope.com. Please see the Homework link on Blackboard for details. Late homework will not be accepted. Additional practice problems from previous semesters are available online at edge.edx.org.

Collaboration on Homeworks:

Learning takes place in many ways and is different for all students. You are permitted to collaborate on homework, however each of you needs to submit your own original work. You are not allowed to copy someone else's answers. All students must comply with the University's Universal Academic Conduct Code: http://www.bu.edu/academics/resources/academic-conduct-code/.

Lecture: In-person attendance at lecture is expected. Lectures will focus on problem solving, participatory learning, and will include material not covered in the textbook but important for exams and homework.

Discussion Sections:

Discussion sessions are held every day of the week. You are permitted to attend any session that fits your schedule. The TA staff will be available for **the first hour of each session,** and will stay longer if you arrive beforehand or notify the TA ahead of time. The discussions sections are problem solving sessions, where you will have the opportunity to work with the TAs and your classmates on homework and lecture problems, and course concepts.

Labs: Lab information will be posted on blackboard as well (learn.bu.edu): Please note that this is a different website than the class website. Everyone should have ordered their individual lab kits online and is expected to bring those to each lab session.
As the labs are a vital part for you to apply the learned material, you need to **complete all labs by the assigned deadlines in order to pass the course**. The lab grade consist of the labs assignments and any worksheets.
Further details about lab procedures and lab grading will be discussed at your first lab session. Be sure to attend!

Covid 19 & BU Health Community Expectations:

Masks are required and face coverings must be worn over the mouth and nose at all times in the classroom. All students are expected to follow all university guidelines with respect to daily symptom checks, testing, social distancing, mask wearing and isolation/quarantine when necessary (see bu.edu/back2bu). In case of a positive test, if you reach out to the instructor, the instructor will work with you to make arrangements for missed classes and other requirements.

Lecture Schedule, EK 307 (A1), Fall 2021 (tentative)

Lec#	Date	Topic	Reading
1	R 9/2	Course Introduction, System of Units Charge, Current and Voltage; Power and Energy Basic Circuit Elements	Chapter 1
2	T 9/7	Ohm's law; KVL, KCL, Dependent sources	1.6, 2.1–2.4
3	R 9/9	Resistors in Series and voltage division Resistors in parallel and current division	2.5-2.6, 2.8-2.9
4	T 9/14	Node-Voltage Method Solving circuits with linear algebra	3.1–3.3
5	R 9/16	Mesh-current method Transistor model and dependent sources	3.4–3.5, 3.9–3.10
6	T 9/21	Linearity, superposition, source transformation Thevenin & Norton circuits, Part I	4.1–4.5
7	R 9/23	Thevenin & Norton circuits, Part II Maximum Power Transfer	4.6, 4.8, 4.10, 4.11
8	T 9/28	Introduction to operational amplifiers Inverting and non-inverting amplifiers	5.1-5.5
9	R 9/30	Op-amp analysis techniques Basic op-amp circuits: Voltage follower, Summing Amplifier, Difference Amplifier.	5.6 – 5.8
10	T 10/5	Op-amp circuit design D/A conversion, Instrumentation systems. Exam review	5.10, 5.11
11	R 10/7	**EXAM 1 (Lectures 1-8)**	
12	R 10/14	Introduction to Capacitors, Inductors Op-amp examples	Chapter 6
13	T 10/19	Intro to first order circuits: source free RL and RC circuits	7.1-7.3
14	R 10/21	Singularity Functions Step response of RL and RC circuits	7.4–7.6
15	T 10/26	First order op-amp circuits	7.7, 7.9–7.10
16	R 10/28	Intro to second order circuits Series/parallel RLC circuits	8.1-8.4
17	T 11/2	RLC circuits, step response	8.5-8.7, 8.12
18	R 11/4	Sinusoidal steady state and phasors Phasor relations for circuit elements	9.1 – 9.4
19	T 11/9	Impedance and admittance.	9.5-9.8, 9.9
20	R 11/11	Circuit analysis with phasors: KVL, KCL, Thevenin, Norton, Exam review.	10.1-10.2, 10.4 – 10.7, 10.10
21	T 11/16	**EXAM 2 (Lectures 8-18)**	
22	R 11/18	AC Power Analysis: instantaneous vs. average, RMS	11.1–11.4
23	T 11/23	Intro to frequency analysis. Transfer Functions, Decibel and Bode plots	14.1-14.4
24	T 11/30	Passive filters (high pass, low pass, band pass), Resonance	14.7
25	R 12/2	Active Filters: Analysis	14.8
26	T 12/7	Active Filters: Design and Applications	14.12
27	R 12/9	Final Exam Review	
	TBD	**FINAL EXAM (Entire course, emphasis on lectures 18-26)**	