BOSTON UNIVERSITY COLLEGE OF ENGINEERING

Syllabus: EK307 – Electric Circuits – Fall 2022

Lecture:

Section	**A3**
Instructor	Abdoulaye Ndao (andao@bu.edu)
Time	Mond/Wed 4:30pm -6:15pm
Classroom	**PHO 203**
Office Hours	Monday/Thu:2:00 pm - 4:30pm, or by appointment
Office Location	PHO725

Lab instructor: Vladimir Kleptsyn vklep@bu.edu

Teaching assistants:

- Guo Chen guochen@bu.edu
- Mete Aslan maslan@bu.edu
- Xinchang Zhang zhangxc@bu.edu
- Howard Dao hdao@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 credits)

Coreq: CAS PY 212, MA 226.

Textbook: (strongly recommended but not required):
"Circuit Analysis and Design" Fawwaz T. Ulaby, Michel M. Maharbiz, Cynthia M. Furse, Michigan Publishing, 2018; ISBN 978-1-60785-483-8 (hardcover) ISBN 978-1-60785-484-5 (electronic)
Download FREE electronic copy or purchase a hardcopy for $75 at the following web site: (https://www.publishing.umich.edu/publications/ee/)

Alternate textbook references:
Alexander and Sadiku, *Fundamentals of Electric Circuits*, 6th Edition, McGraw Hill, 2016, ISBN 978-1307425215
Thomas/Rosa/Toussaint, *The Analysis and Design of Linear Circuits*, 8th edition, 2016, ISBN 978-1-119-23538-5.

Course Methodology:
EK307 involves the use of a coordinated set of lectures, labs, homework, and exams to provide students with an introduction to electric circuit analysis and design. Laboratory sessions are mandatory and meet weekly in PHO105 where students will perform a variety of introductory circuit experiments using components and a breadboard. Students are required to register for a laboratory section as well as a discussion section. The course will contain two mid-terms and a final exam.

Course announcement and communications:
Primary method for course announcement and information disseminations will be through a Blackboard site (Content section).

Schedule‡ of Lectures and Exams: **Ulaby, Mharbiz, and Furse**

Dates	***Topic Description***	***Text Material***
09/07/22	Course Introduction, Basic concepts and notations. System of Units, Voltage, Current, Power, Energy.	1.2 – 1.5
09/12/22	Basic Circuit Elements, Ohm's Law. Resistors in parallel and series.	1.6 - 2.1
09/14/22	Kirchhoff's Laws. KVL and KCL. Equivalent circuits.	2.2 – 2.3
09/19/22	Methods of Analysis: Node Voltage. Mesh Currents.	3.1 – 3.2
09/21/22	Circuit Theorems: Linearity, superposition, equivalency	3.5
09/26/22	Source transformations, Thevenin and Norton Equivalents	3.6 – 3.7
09/28/22	Maximum Power Transfer and Review of Chapter 4	
10/03/22	Introduction to Operational Amplifiers, Inverting and non-inverting amplifiers	3.8
10/05/22	Op-amp circuits and analysis, Voltage follower, Summing Amplifier. Midterm Exam #1 Review	4.1 – 4.3
10/11/22	**Mid-Term Exam I (up to the end of Chapter 3)**	
10/12/22	Op-amp circuits and analysis, Instrumentation amplifier	4.4 – 4.5
10/17/22	Non-periodic waveforms, Capacitors and Inductors	4.6 – 4.9
10/19/22	First-order Circuits: RC and RL circuits	5.1 – 5.3
10/24/22	Singularity Functions. Step response of RL and RC circuits	5.4
10/26/22	First-order Op-amp circuits and Applications	5.5
10/31/22	Second-order Circuits: series RLC circuits	5.4 – 5.6
11/02/22	Second-order Circuits: parallel RLC circuits	6.1 – 6.6
11/07/22	Complex numbers, sinusoids/phasors	6.7 – 6.8
11/09/22	Phasor relationships for circuit elements, impedance and admittance Midterm Exam #2 Review	7.1 – 7.3
11/14/22	**Mid-Term Exam II (up to the end of Chapter 5)**	
11/16/22	Phasors and Sinusoidal Steady-State Analysis	7.4
11/21/22	Thevenin/Norton and Examples of phasor analysis	7.5
11/28/22	AC Power Analysis: instantaneous vs average power, RMS	7.6 - 7.9
11/30/22	Intro to frequency analysis. Transfer Functions, Decibel and Bode plots	8.1 – 8.3
12/05/22	Passive filters (high pass, low pass, band pass), Resonance	9.1 – 9.3
12/07/22	Frequency Response – Active Filters	9.4
12/12/22	Final Exam Review	9.5 – 9.6
TBD	**Final Exam (all the course material during the semester)**	

Homeworks:
HWs are assigned on EdX and due dates will be posted. To sign up, visit: (this information will be added later)

‡ This schedule is for Section A3. The specifics may be subject to change.

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 Tuesday, Oct. 11 and Mon. November 14.** 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: Homework sets will be distributed approximately weekly, and submitted via scan and upload to Blackboard. Please see the Homework link on Blackboard for details. Late homework will not be accepted. Additional practice problems and supplemental course materials 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 offered throughout the week (see Blackboard for full schedule). You are welcome 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 within that time, 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 a separate dedicated Blackboard site(https://learn.bu.edu/webapps/blackboard/execute/courseMain?course_id=_83366_1). Everyone should have ordered their individual lab kits online. You are expected to bring those to each lab session. The labs are a required part of EK307. You mucty to **complete all labs by the assigned deadlines in order to receive a passing grade in EK307!** The lab grade is based on demonstrating your circuits to the lab TA staff, and completing lab worksheets. More information will be given at your first lab session.

Covid 19 & BU Health Community Expectations:

At this time there is not a mask mandate in place for other locations on campus, including classrooms, however we strongly encourage the use of high-quality masks (such as N95s, KN95s, KF94s, and FFP2s) to reduce the risk of transmission in crowded settings or for

individuals who are at increased risk of severe illness from COVID-19. 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.

Inclusion: I consider this classroom to be a place where you will be treated with respect, and I welcome individuals of all ages, backgrounds, beliefs, ethnicities, genders, gender identities, gender expressions, national origins, religious affiliations, sexual orientations, ability – and other visible and nonvisible differences. All members of this class are expected to contribute to a respectful, welcoming and inclusive environment for every other member of the class.

Accommodations for Students with Documented Disabilities: If you are a student with a disability or believe you might have a disability that requires accommodations, requests for accommodations must be made in a timely fashion to Disability & Access Services, 25 Buick St, Suite 300, Boston, MA 02215; 617-353-3658 (Voice/TTY). Students seeking academic accommodations must submit appropriate medical documentation and comply with the established policies and procedures