SABANCI UNIVERSITY

Faculty of Engineering and Natural Sciences

Electronics Engineering (EE)

EE 200 - Electronic Circuits Implementation, Spring-2022-23

Course Instructor: Prof. Dr. Yaşar Gürbüz
e-mail: yasar@sabanciuniv.edu
Office: FENS 1044
Tel: ext. 9533

https://sabanciuniv.zoom.us/j/2554580251
https://sabanciuniv.zoom.us/my/yasar.gurbuz
Meeting ID: 255 458 0251

TAs:

Tahsin Alper Özkan	**(PhD)**	(**talper@sabanciuniv.edu**)
Serhan Özboz	**(MSc)**	(sserhan@sabanciuniv.edu)
Umut Barut	**(MSc)**	(umutbarut@sabanciuniv.edu)
Ekin Asım Özek	**(PhD)**	(**ekinozek@sabanciuniv.edu**)

Disclaimer:

"We may have to revise the course plan according to the countrywide reassessment to be made regarding higher education. This is expected to happen at the beginning of April. The content to be delivered is certain but the method of course delivery, the number and dates of exams, and some other details are subject to change."

We will start online and use Zoom until the next official announcement from the Higher Education Council (YÖK) regarding the way the course will be carried out, online / physical / hybrid, hopefully before April 10th, 2023.

I will talk in detail about how we plan to begin carrying out our lab course/sessions in the first week in each lab section. Make sure that you do not miss the first lab, yet alone, all the labs.

A few additional announcements/details regarding the online-LAB teaching at the beginning of the semester:

1. Please do let me know, send me an email, if you or someone you know are effected by the recent Earthquakes.

2. We will start implementing labs online in Zoom by using LTSpice, a circuit design and simulation platform. The instructions and tutorials for downloading, installation and using LTSpice will be provided in the first week of the semester. We will continue in this way of implementation until the next official announcement by YÖK, hopefully no later than the beginning of April 2023.

3. We hope to switch to physical labs in April by starting condensed/ revised version of the physical labs that already completed online. We will make sure that students will complete each lab physically until the end of the semester.

4. Online labs will be graded and will be part of grading of the corresponding physical labs.

5. There will be pre-lab, inlab and post lab, along with Quizzes, during the online implementations of the labs, also added as part of the physical lab grading scheme.

6. No Lab Exams will take place until we switch to physical lab implementations.

7. All rules and regulations that are stated below about the course are also applicable for the online part of the labs.

8. Attendance is required for the online lab sessions.

I will clarify any issues you might have about the announcement above or any other you might have about the course during the first week in each lab section.

Course/Lab Sessions

EE 200 – B Electronic Circuit Implementation **Electronic Circuit Implement. - 20704 - EE 200 - B**		
Wednesday	2:40-5:30	Zoom: 2554580251 FENS 1033 (in April)
EE 200 – C Electronic Circuit Implementation **Electronic Circuit Implement. - 20705 - EE 200 - C**		
Thursday	2:40pm-5:30pm	Zoom: 2554580251 FENS 1033 (in April)
EE 200 – D Electronic Circuit Implementation **Electronic Circuit Implement. - 20706 - EE 200 - D**		
Friday	10:40am-1:30pm	Zoom: 2554580251 FENS 1033 (in April)

EE 200 – E Electronic Circuit Implementation		
Electronic Circuit Implement. - 20707 - EE 200 - E		
Friday	2:40-5:30	Zoom: 2554580251 FENS 1033 (in April)

Office Hours:

Tuesday,   **15:40-16:30**   **@** FENS 1033

Wednesday,   **13:40-14:30**   **@** FENS 1033

Thursday,   **13:40-14:30**   **@** FENS 1033

Course Objectives

After successfully studying EE 200, students will be able to:

1. Understand the basic electrical engineering principles and abstractions on which the design of electronic systems is based. These include lumped circuit models, diodes, transistors and operational amplifiers.
2. Use these engineering abstractions to analyze and design simple electronic circuits.
3. Formulate and solve differential equations describing the time behavior of circuits containing energy storage elements.
4. Use intuition to describe the approximate time and frequency behavior of circuits containing energy storage elements.
5. Understand the concepts of employing simple models to represent non-linear and active elements-such as, Diodes, BJTs and MOSFETs-in circuits.
6. Understanding the basic active filter behaviors and Op-Amp fundamentals and learn how to design active filter circuits for a specific bandwidth and the inverting, non-inverting amplifier, and integrator principles.
7. Build circuits and take measurements of circuit variables using tools such as oscilloscopes, multimeters, and signal generators. Compare the measurements with the behavior predicted by mathematic models and explain the discrepancies.
8. Understand the relationship between the mathematical representation of circuit behavior and corresponding real-life effects.

Learning Outcomes

1. Use of the electronics laboratory equipments and devices (DC power supply, Wave-form/Signal generator, multimeters, Oscilascope, frequency counter, connectors, breadboard to aply and measure AC/DC signals.
2. Analyze circuits made up of linear lumped elements. Specifically, analyze circuits containing resistors and independent sources using techniques such as the node method, superposition and the Thevenin method.
3. Calculate/determine/analyze the time and frequency behavior of first order and second order circuits containing resistors, capacitors and inductors (RLC).

4. Determine input/output (I-V, load-line, DC and small-signal) characteristics and applications (rectifiers) of different diodes: pn–junction, Schottky and Zener.

5. Design, implement and characterize operational amplifiers: inverting, non-inverting, positive and negative feedback, single and multi-stage operational amplifiers, integrator, filters, input and output performance analysis and characterization.

6. Implement/Extract/measure DC operating points (desired quiescent operating point/region/mode), input/output characteristics, small-signal models/parameters and frequency responses of BJT and MOSFET

7. Design, implement and analyze common transistor amplifier configurations for BJTs (such as common emitter, common base, and emitter follower) and for FETs (such as common source, common gate, and source follower) with different gain, BW, power consumption, input/ouput DC/AC range, etc. specifications.

8. Design and Implement circuits using BJT/MOSFETs: multi-stage (3 or more) amplifier design and implementation from given system specifications

9. Design and implement an AM Receiver/Radio using electronic components, within the scope of this course, effectively/efficiently.

10. Use and implement Computer Aided Design (CAD) Tools, PSPICE, to design and / or verify the circuit performance, combined of use SPICE to analyze circuits that include passives (RLC), semiconductor devices such as diodes, BJTs, FETs and Op-Amps.

Prerequisites

ENS 203: Circuits I

Co-requisites

EE 202: Circuits II

Office Hours

Please attend one of the office hours assigned unless you have a scheduling conflict; if this is the case, please notify me or TAs by emailing.

Tutorials

Tutorials will be held within the Lab during the beginning of the week. Extra tutorials to address particularly challenging material will be scheduled throughout the term, depending on student demand; if you have interest in receiving extra help on a particular topic, please contact TAs.

Textbook

There is no textbook for this course. Each lab manual will be posted in advance of the corresponding lab session.

Homework

N/A

Labs

There will be 10 lab assignments/performances during the semester. They are:

1. **Introduction to instruments and DC measurements (Feb 28)**
2. **Thevenin/Norton equivalent circuits, AC measurements, RC and RL networks (March 7)**
3. **Frequency response, series and parallel resonance (March 14)**
4. **Op-amp based amplifiers and filters (March 21)**
5. **Diodes and applications (March 28)**
6. **A.M. radio receiver (April 4)**
7. *Single stage BJT circuits (Apr 11)*
8. *Building a function generator*
9. *Discrete multi-stage BJT amplifier*
10. *MOSFET characterization and amplifiers*

Important Attendance Rules for the LABS

1. No food or drinks allowed during the lab sessions

2. No late entry are acceptable.

3. Grace time/period is 10 minutes after the starting time of the lab and only applicable twice for the full semester with acceptable/written excuses.

4. Students will get "0" grade for the missing/unattended lab

5. Missing the labs twice during the semester will also get an automatic one letter grade down of the final letter grade

6. Missing 3 labs during will result an automatic failure of the course.

7. Labs will be conducted each week.

8. Each lab assignment involves one or more accomplishments which must be checked off by a TA in the lab.

9. TAs will be available for help and lab check-off during those weeks in which a lab is in progress.

10. Written lab work for each lab must be completed in lab and will be due in recitation//office hours on the day following the week of the lab.

11. You are welcome and encouraged to discuss the labs among your colleagues. You will also be asked to team up in pairs to execute some of the labs. However, the write up of your lab must be done on your own. Skipping the lab and submitting work copied from someone else is a serious breach of ethics, and will be handled by the Committee on Discipline.

12. During the lab sessions, there will be considerable amount of discussion about the lab material in between the entire teaching team (TAs and Professor) and the students. Your diligent participation in these discussions will be a factor in the lab performance/grading and can affect your letter grade for the course, particularly if your initial grade is on a letter-grade boundary.

13. This policy has been designed so that recitations, tutorials, homework/Quizzes and labs are integral and essential parts of the learning process. Although there is a specific reward for participation, there is also a clearly defined penalty for not participating.

Lab Reports

Written pre-lab, in-lab and post-lab exercises are to be completed in your lab reports or in a specified/announced format and must be turned in for grading before the due date/time. No grace period is there for late submissions.

You need to submit your Pre-Lab on SuCourse before you come to the lab.

Late submissions of any progress / part of the lab reports will receive 0 credit.

Quizzes

There will be a quiz at the beginning of each lab session, closed-book/notes.

Exam

2 X 2– hours exam will be given in this term.

Grading

ACTIVITIES	PERCENTAGES
Quiz Totals	% 10
Lab Reports (Prelab/InLab/PostLab) Progress	% 50
Lab Exams	% 40

Each Lab's Grade Distribution (out of the %50 of the Total 100):

Lab 1   1.25
Lab 2   2.50
Lab 3   3.50
Lab 4   3.00
Lab 5   3.00
Lab 6   6.25
Lab 7   5.00
Lab 8   10.50
Lab 9   11.25
Lab 10 3.75