SABANCI UNIVERSITY
Faculty of Engineering & Natural Sciences
EE 200 – Electronic Circuits Implementation Spring 2023/2024 Syllabus

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Weekly Schedule
Office Hours:
Wednesday 13:40-14:30 FENS 1033
Friday 13:40-14:30 FENS 1033

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

- 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.
- Use these engineering abstractions to analyze and design simple electronic circuits.
- Formulate and solve differential equations describing the time behavior of circuits containing energy storage elements.
- Use intuition to describe the approximate time and frequency behavior of circuits containing energy storage elements.
- Understand the concepts of employing simple models to represent non-linear and active elements such as Diodes, BJTs and MOSFETs in circuits.
- 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.
- 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 mathematical models and explain the discrepancies.
- Understand the relationship between the mathematical representation of circuit behavior and corresponding real-life effects.

Learning Outcomes:

- Use of the electronics laboratory equipment and devices (DC power supply, Waveform/Signal generator, multimeters, Oscilloscope, connectors, breadboard to apply and measure AC/DC signals.
- Analyze circuits made up of linear lumped elements. Specifically, analyze circuits containing resistors and independent sources using techniques such as the node voltage analysis, superposition, and the Thevenin/Norton equivalent circuit method.
- Calculate/determine/analyze the time and frequency behavior of first order and second order circuits containing resistors, capacitors, and inductors (RLC).
- Determine input/output (I-V, load-line, DC, and small-signal) characteristics and applications (rectifiers) of different diodes: pn–junction, Schottky and Zener.
- 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.
• 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

• 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/output DC/AC range, etc. specifications.

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

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

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

**Prerequisites:** ENS 203 (Electronic Circuits I)

**Co-requisites:** EE 202 (Electronic Circuits II)

**Labs**

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

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

**Important Rules for the LABS**

1. **No food or drinks** allowed during the lab sessions.
2. **No late entry** is 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. **Pre-lab assignments** should be completed prior to coming to lab and submitted through SuCourse. If you do not complete and submit your prelab assignment, you will get “0” from pre-lab assignment and in-lab assignment. So, it means if you do not do your pre-lab assignment, you can only get points from the post-lab assignment part of your lab.

8. **No late submissions will be accepted.**

9. **There will be random quizzes at the beginning of the labs.** So, it is also important to come on time not to miss the quizzes.

10. Written lab work for each lab must be completed in lab. Please **bring the printed version of in-lab assignment** part of the lab.

11. Labs will be conducted each week.

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

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

14. 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.

**Grading Policy:**

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<tbody>
<tr>
<td>Quizzes</td>
<td>10%</td>
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<tr>
<td>Lab Work (Pre-lab/In-lab/Post-lab)</td>
<td>50%</td>
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<td>Lab Exams (2 exams)</td>
<td>40%</td>
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**Lab Work Grading**

Pre-lab: 30%

In-lab: 40%

Post-lab: 30%

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

Lab 1 (Introduction to instruments and DC measurements): 2%

Lab 2 (Thevenin/Norton equivalent circuits, AC measurements, RC/RL networks): 3%

Lab 3 (Frequency response, series and parallel resonance): 4%

Lab 4 (Op-amp based amplifiers and filters): 3%

Lab 5 (Diodes and applications): 4%

Lab 6 (A.M. radio receiver): 7%

Lab 7 (Single stage BJT circuits): 5%
Lab 8 (Building a function generator): 8%
Lab 9 (Discrete multi-stage BJT amplifier): 9%
Lab 10 (MOSFET characterization and amplifiers): 5%