# ECE 332 Electronics I: Microelectronic Circuits

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**Course level:** Undergraduate students

**Prerequisite**: ECE 225 or ECE320

**Lectures**: TR 12:30 pm - 2:25 pm, SERC, Room 2036

**Labs**: W 2:30 pm - 4:20 pm, SERC, Room 2010

**Office hours**: TR 2:30 pm - 3:00 pm, or per appointment

**Required textbook**

Donald A. Neamen, *Microelectronics: Circuit Analysis and Design*, 4th ed., McGraw-Hill, New York, 2010.

**Reference books**

- Muhammad H. Rashid, *Introduction to PSpice Using OrCAD for Circuits and Electronics*, 3rd ed., Pearson Prentice Hall, 2004
- Adel S. Sedra and Kenneth C. Smith, *Microelectronic Circuits*, Sixth Edition, Oxford University Press, 2009

**Course description**

As a core course for undergraduate students in Electrical and Computer Engineering (ECE), this microelectronic circuit course is intended to teach students the analysis and design of analog electronic circuits. Through the circuit analysis students will learn the operation, characteristics and limitations of various analog circuits. These fundamental studies will help students develop an intuition for circuit design and lay a foundation for advanced design and analysis of integrated

circuits. Topics to be covered include basic operational principles of electronic devices (focusing on diodes and BJTs), DC analysis of diode circuits, DC biasing and small-signal equivalent circuit of BJT transistors, and single stage BJT amplifiers. The hands-on experiments will allow students to "learn-by-doing" and to explore the realm of real-world microelectronics based on the lecture materials.

**Topics to be covered** (tentative, subject to change):

**Part I: Diode Circuits**

1. Operation of PN junction diodes
2. Piecewise linear model and load line analysis
3. Rectifier circuits
4. Zener diode voltage regulator circuits
5. Waveshaping circuits (clippers and clampers)
6. Multiple-diode circuits **(Midterm exam 1)**

**Part II: BJT Circuits and Amplifiers**

7. Operational principles of BJT transistors
8. DC analysis and biasing
9. Multistage BJT circuits **(Midterm exam 2)**
10. Bipolar linear amplifiers
11. Small-signal equivalent circuit
12. Analysis of three basic BJT transistor amplifiers, including common-emitter, emitter follower, common-base amplifiers **(Final exam)**

**Homework and exam policy**

*Discussion in small groups is encouraged* for homework. However, each student should *work through problems individually*. No late homework will be accepted. Exams will be completed individually during class time, and will be closed book. If an examination is missed due to a University approved activity or documented emergency/illness, the grade of comprehensive final exam will be used in place of the missing exam score. Missed examinations due to unexcused absences receive the grade of zero. *No makeup exams will be provided* for any circumstances.

**Laboratory and report policy**

- Safety is extremely important in each lab session. An introduction to safety is given as part of the first laboratory meeting. Failure to follow safety procedures or the Lab TA's directions will result in dismissal from the course.
- Any unprofessional behaviors, such as falsifying data/experimental results, copying another student's work, and/or using previous student's lab report will cause failure ("F" grade) of the whole class. No makeup lab session will be provided.
- Individual lab report must be turned in to Lab TA before next lab session. As a stand-alone document, each lab report includes following six components: (1) cover page, (2) introduction, (3) experiment procedure, (4) recorded data/results, (5) discussion, and (6) conclusion. No late lab report will be accepted. Missed lab or lab report will receive a zero grade.
- Two formal writing lab reports are required. In addition to technical grade, writing proficiency will be evaluated by an external instructor, who also provides a guideline for writing a professional lab report. A writing proficiency grade of at least 70% is required to pass the class. If the writing proficiency grade is less than 70%, one re-write will be allowed. The grade for writing proficiency will be averaged with technical grade of each lab report for overall lab score.

**Course grading**

Homework, weekly ……15%
Laboratory …….…… 20%
Midterm exam 1 ……20%
Midterm exam 2 ……20%
Final exam ……..... 25%