

## **EE313 Electronics II (4-0)**

2020 Fall, Tuesday: 8:45-10:30 / Thursday: 9:45-11:30

**Text Book:** **Microelectronics  
Circuit Analysis and Design**  
Donald A. NEAMEN  
McGraw Hill

**Supplementary Book:**  
**Microelectronic Circuits**  
Sedra Smith  
HRW

**Simulations:**  
<https://www.falstad.com/circuit/>

**Course Coordinator:** Dr. Kıvılcım Yüksel Aldoğan

### **Grading**

Quiz Score..... 50 %  
Final Exam..... 50 % (written + oral exam)

**Quiz-1:** BJT and FET Amplifiers

**Quiz-2:** Frequency response

**Quiz-3:** OPAMPs

**Quiz-4:** Feedback and stability

(Additional short pop-up exams that might be organized by the course coordinator are not indicated in the course plan)

During the semester, a total of 10 *Problem Sessions* will be held.

### **Content**

- 1) BJT and MOSFET
  - a. Review of BJT and MOSFET
  - b. DC Analysis of BJT and MOSFET
  - c. JFET
  - d. Basic transistor applications
  
- 2) BJT Amplifiers
  - a. Analog signals and linear amplifiers
  - b. The bipolar linear amplifier
  - c. Basic transistor amplifier configurations
  - d. AC load line analysis
  - e. The three basic amplifiers
  - f. Multistage amplifiers
  - g. Power considerations

- 3) FET Amplifiers
  - a. Review of MOSFET circuits
  - b. The MOSFET amplifier
  - c. The three basic amplifier configurations
  - d. Multistage amplifiers
  - e. Basic JFET amplifiers
  
- 4) Frequency Response
  - a. Amplifier frequency response
  - b. System transfer functions
  - c. Frequency response of transistor amplifiers with circuit capacitors
  - d. High-frequency response of transistor circuits
  - e. A two-stage amplifier with coupling capacitors
  
- 5) Ideal Operational Amplifiers and OP-amp circuits
  - a. The operational amplifier
  - b. Inverting amplifier
  - c. Summing amplifier
  - d. Noninverting amplifier
  - e. Op-Amp applications
  - f. Operational transconductance amplifiers
  
- 6) Differential and Multistage amplifiers
  - a. The differential amplifier
  - b. Basic BJT differential pair
  - c. Basic FET differential pair
  - d. Differential amplifier with active load
  
- 7) Feedback and stability
  - a. Introduction to feedback
  - b. Basic feedback concepts
  - c. Ideal feedback topologies
  - d. Voltage, Current, Transconductance, Transresistance amplifiers
  - e. Loop Gain
  - f. Stability of the feedback circuit
  - g. Frequency compensation
  
- 8) Applications and Design of Integrated Circuits
  - a. Active filters
  - b. Oscillators
  - c. Schmitt Trigger Circuits
  - d. Voltage, Current, Transconductance, Transresistance amplifiers
  - e. Voltage regulators

**Course plan:**

<b>Week</b>	<b>Subject</b>	<b>Instructor</b>
Week-1/1	Review: BJT Transistors. BJT Amplifiers	K. Yüksel
Week-1/2	BJT Amplifiers	K. Yüksel
Week-2/1	Problem Session-I (BJT amplifiers)	Assist-1
Week-2/2	Problem Session-II (Multistage Circuits)	Assist-1
Week-3/1	Review: Field-Effect transistor	K. Yüksel
Week-3/2	FET Amplifiers	K. Yüksel
Week-4/1	Problem Session-III (FET Amplifiers)	Assist-2
Week-4/2	Problem Session-IV (FET Amplifiers)	Assist-2
Week-5/1	QUIZ-1 & Review	BJT/MOSFET amplifiers
Week-5/2	Frequency Response	K. Yüksel
Week-6/1	Frequency Response	K. Yüksel
Week-6/2	Frequency Response	K. Yüksel
Week-7/1	Frequency Response	K. Yüksel
Week-7/2	Problem Session-V (Frequency Response)	Assist-3
Week-8/1	OPAMP Circuits and applications	K. Yüksel
Week-8/2	Problem Session-VI (OPAMP Circuits)	Assist-3
Week-9/1	QUIZ-2 & Review	Frequency Response
Week-9/2	Differential Amplifiers	K. Yüksel
Week-10/1	Multistage Amplifiers	K. Yüksel
Week-10/2	Problem session-VII (Diff. Amplifiers)	Assist-4
Week-11/1	Problem Session-VIII (Multistage Amplifiers)	Assist-4
Week-11/2	QUIZ-3 & Review	OPAMPs
Week-12/1	Applications and Design of Integrated Circuits (Bistable Multivibrators)	K. Yüksel

Week-12/2	Applications and Design of Integrated Circuits (Scmitt Trigger Oscillator, Monostable Multivibrator)	K. Yüksel
Week-13/1	Feedback and Stability	K. Yüksel
Week-13/2	Problem session-IX (Applications of Integrated circuits)	Assist-5
Week-14/1	Feedback and Stability	K. Yüksel
Week-14/1	Problem Session-X (Feedback and Stability)	Assist-5
Week-15/1	FINAL (26 January 2021)	Written exam
Week-16/1	FINAL (2 February 2021)	Oral exam

**Note**

The instructor reserves the right to make changes to this syllabus as necessary.