

## **ENEE303: Analog and Digital Electronics**

Credits: 3

### **Description**

**Prerequisite:** Minimum grade of C- in ENEE205; and permission of ENGR-Electrical & Computer Engineering department.

**Restriction:** Must be in one of the following programs (Engineering: Electrical; Engineering: Computer).

Conceptual operation of transistors and diodes. Large and small signal operation of BJTs and MOSFETs. Basic transistor configurations. Logic circuits and semiconductor memory. Multi-transistor circuits including differential amplifiers and current mirrors. Frequency response.

### **Semesters Offered**

Fall 2017, Spring 2018, Summer 2018, Fall 2018, Spring 2019, Summer 2019, Fall 2019, Spring 2020, Summer 2020, Fall 2020, Spring 2021

[Testudo](#)

### **Learning Objectives**

- Understand the basics of integrated semiconductor electronics
- Understand the basic function of active elements (MOS and bipolar transistors)
- Understand the basic functional elements of an integrated circuit (current sources, active loads)
- Develop an ability to design and to analyze single-stage analog amplifier circuits (common-emitter (source), followers, cascodes and differential pairs)
- Develop an ability to synthesize the single stage units into a multistage amplifier
- Develop an ability to perform basic time-domain and frequency-domain analysis of these circuits
- Develop an ability to design and build basic digital circuits: logic gates (NAND/NOR/Inverter, etc.)
- Understand the function and construction of basic memory circuits: DRAM, SRAM, non-volatiles

### **Topics Covered**

- Introduction to semiconductor electronic
- How to make an integrated resistor, diode, capacitor
- How MOS and bipolar transistors work
- Basic single-stage amplifier design: (common-emitter (source), followers, cascodes and differential pairs)
- Multi-stage design

- Time and frequency domain analysis
- Digital gates: NAND/NOR/Inverter
- Memory circuits: DRAM/SRAM and non-volatiles