



## EE 223-Fundamentals of Electronic Devices (Required Course)

**Code and Name:** EE 223 Fundamentals of Electronic Devices

**Credit Hours:** 3 (Lecture: 3, Tutorial: 1)

### Textbook:

- Microelectronics: Circuit Analysis and Design, D. A. Neamen, Fourth Edition, McGraw-Hill, 2010.

### Other References:

- T. L. Floyd, Electronic Devices: Electron Flow Version, 9<sup>th</sup> Ed., Prentice Hall, 2012.
- R. C. Jaeger and T. N. Blalock, Microelectronic Circuit Design, 4<sup>th</sup> Ed., Mc Graw Hill, 2011.
- S. Sedra and K. C. Smith, Microelectronic Circuits, 5th Ed., Oxford University, 2004.
- R. Boylestad and L. Nashelsky, Electronic Devices and Circuit Theory, 7<sup>th</sup> Ed., Prentice Hall.
- M. Tooley, Electronic Circuits: Fundamentals and Applications, 3<sup>rd</sup> Ed., Elsevier Ltd., 2006.
- Computer animations and online resources supplied by the instructor.

### Course Description:

Semiconductor: Different semiconductor materials. Impurity doping. Intrinsic and extrinsic semiconductors. Conductivity, Carrier concentration. Charge densities. Diodes: models and circuit analysis. Diode applications (rectifiers and others). Transistors: bipolar junction, junction field effect, and metal-oxide-semiconductor field effect (BJT, FET, AND MOSFET). DC and small signal AC analysis. Amplifier configurations.

**Pre-requisites:** EE 221.

**Co-requisites:** None

### Course Learning Outcomes:

With relation to ABET Student Outcomes (SOs: 1-7)

1. Explain the structure, operation, dc and small-signal models, and characteristics of diodes, bipolar junction transistors, and MOSFETs. (1)
2. Calculate correctly different parameters (inc. currents and voltages) for various semiconductor materials and electronic devices. (1)
3. Analyze (DC and AC) circuits that include diodes. (1)
4. Analyze (DC and AC) circuits that include BJTs and MOSFETs. (1)
5. Analyze and design diode circuits as well as common-emitter/source, common-collector/drain, and common-base/gate amplifiers. (2)
6. Illustrate using new technologies: submitted in Word and Power point in preparing their reports plus oral presentation. (3)

### Topics to be covered:

- Course description, objectives, and content – Textbook and extra useful resources – Marks distribution – Policy.
- Introduction to Electronics.
- Semiconductor: Different semiconductor materials. Impurity doping. Intrinsic and extrinsic semiconductors.
- Conductivity, Carrier concentration. Charge densities.
- Diodes: models and circuit analysis. Diode applications (rectifiers and others).
- Transistors: bipolar junction (BJT). DC and small signal AC analysis.
- Transistors: junction field effect, and metal-oxide-semiconductor field effect (FET AND MOSFET). DC and small signal AC analysis.

### Grading Policy:

The grading for the course are 60% coursework and 40% Final Exam. The coursework consists of two Midterm Exams, where each midterm exam is worth 20%. It also includes quizzes, homework, and projects for the remaining 20% that is modified by the course instructor.

