Measurable Course Outcomes

A student completing this course will be able to:

1. Explain the underlying physics and principles of operation of p-n junction diodes, metaloxide-semiconductor (MOS) capacitors, bipolar junction transistors (BJTs), and MOS field effect transistors (MOSFETs), and describe and apply simple large signal circuit models for these devices which include charge storage elements;
2. Create an incremental (small signal) linear equivalent circuit (LEC) model for a multiterminal non-linear electronic device knowing its large signal characteristics, and understand and apply standard LEC models for p-n diodes, BJTs, and MOSFETs, including capacitances;
3. Determine parameter values for large signal and incremental LEC models for p-n diodes, BJTs, and MOSFETs based on knowledge of the device structure and dimensions, and of the bias condition;
4. Explain how devices and integrated circuits are fabricated and describe discuss modern trends in the microelectronics industry;
5. Explain, compare, and contrast the input, output, and gain characteristics of single-transistor, differential, and common two-transistor linear amplifier building block stages;
6. Use large signal and incremental LEC device models to analyze analog electronic circuits of moderate complexity, including circuits with multiple stages, nonlinear and active loads, and current source bias circuits;
7. Determine the frequency range of simple electronic circuits and understand the high frequency limitations of BJTs and MOSFETs;
8. Design simple devices and circuits to meet stated operating specifications; e.g. Operational Amplifier and Light sensor