E C E 548, Integrated Circuit Design

1. **Credits**: 3  
   **Contact Hours**: 2.5

2. **Textbook and Materials**: Device electronics for integrated circuits; Muller, Kamins, Chan; 3; 2003

   a. **Other Supplemental Materials**: None

   b. **Specific Course Information**:

   a. **Brief description of the content of the course (Course Catalog Description)**: Bipolar and MOS devices in monolithic circuits. Device physics, fabrication technology. IC-design for linear and nonlinear circuitry.

   b. **Pre-requisites or Co-requisites**: ECE 335

   c. **This is a Selected Elective course**.

   c. **Specific Goals for the Course**:

   a. **Course Outcomes**:

   1. Students will be able to draw semiconductor band diagrams and apply these drawings to explain effects that appear at interfaces between materials (differently doped semiconductors, semiconductor-metal interface etc.)

   2. Students will understand operation and fabrication of semiconductor devices (diodes, BJTs, MOSFETs) and solve problems related to operation of these devices.

   3. Students will be able to understand advanced effects that appear in MOSFETs when their size is reduced to nanometer scale.

   b. **ABET Student Learning Outcomes**:
(a) Ability to apply mathematics, science and engineering principles.
(e) Ability to identify, formulate and solve engineering problems.
(g) Ability to communicate effectively.
(j) Knowledge of contemporary issues.
(k) Ability to use the techniques, skills and modern engineering tools necessary for engineering practice.

• **Brief List of Topics to be Covered :**
  1. Semiconductor Electronics
  2. Silicon Technology
  3. Metal-Semiconductor Contacts
  4. pn Junctions
  5. Currents in pn Junctions
  6. Bipolar Transistors
  7. Properties of the MOS System
  8. MOS Field-Effect Transistors Advanced Topics