Course Syllabus

ELCT 363 – Introduction to Microelectronics

Course Coordinator: Undergraduate Program Committee

Catalog Description: Properties and characteristics of semiconductor materials, p-n and semiconductor-metal junctions. Basic properties, characteristics and operation of diodes and transistors.

Credit Hours 3

Prerequisite(s) by course C or better in CHEM 111, C or better in PHYS 212 and C or better in MATH 241

Prerequisite by topics Current and voltage, resistance, capacitance, electricity and magnetism, Calculus


Other Materials
- Class notes posted on Blackboard

Learning Outcomes:
Students who successfully complete the course will be able to:

1. Analyze semiconductor devices, through numerical problems, using fundamental characteristics of semiconductor materials, such as carrier densities, transport, lifetime, generation and recombination.
2. Use basic governing equations to calculate carrier concentrations, position of Fermi energy level, carrier drift current in given field, built-in potential barrier at the space charge region, and current-voltage characteristics of p-n junctions
3. Analyze main characteristics of electronic and optoelectronic devices such as BJTs, MOSFETs and LEDs
4. Conduct literature search, review and report findings; demonstrate teamwork and develop communication skill through group report and presentation.
5. Demonstrate an understanding of professional and ethical responsibility through a report analyzing real or hypothetical ethic issues

Course Topics:
- Semiconductor crystal lattice and growth of high purity semiconductor materials
- Energy bands, Fermi-Dirac distribution function, and energy band diagrams
- Doping of semiconductors; carrier concentration in doped and intrinsic semiconductors
- Carrier transport phenomena - drift and diffusion current; device current equations
- Generation, recombination, carrier lifetime and mobility
- Semiconductor junctions
- p-n diodes: creation of space charge region in a p-n junction and current-voltage characteristics
- Metal-semiconductor contacts – Schottky and Ohmic contact
- LED – Application of p-n junction
- Basic operation principle of BJT and MOSFET transistors
- Engineering Ethics and professionalism

Course Contribution to Program Outcomes:
ELCT 363 contributes to an achievement of:
- Outcome 1 – an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
- Outcome 3 – an ability to communicate effectively with a range of audiences
- Outcome 4 – an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgements, which must consider the impact of engineering solutions in global, economic, environmental, and societal context.
• Outcome 7 – an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

General Course Policies

Academic Integrity
Unless otherwise stated, assignments and examination work are expected to be the sole effort of the student submitting the work. Students are expected to follow the University of South Carolina Honor Code and they should expect that every instance of a suspected violation will be reported. Students found responsible for violations of the Code will be subject to academic penalties under the Code in addition to whatever disciplinary sanctions are applied.

Accommodating Disabilities
Reasonable accommodations are available for students with a documented disability. If you have a disability and may need accommodations to fully participate in this class, contact the Office of Student Disability Services: 777-6142, TDD 777-6744, email sasds@mailbox.sc.edu, or stop by LeConte College Room 112A. All accommodations must be approved through the Office of Student Disability Services.

Diversity
When scheduling exams, I have attempted to avoid conflicts with major religious holidays. If, however, I have inadvertently scheduled an exam or major deadline that creates a conflict with your religious observances, please let me know as soon as possible so that we can make other arrangements.

Recommended Study Habits
• Read the assigned material before class.
• Bring thoughtful questions to class for discussion.
• Prepare for the exams in study groups.
• Take notes during class discussions and while completing reading assignments.

Deviations
Minor deviations from the syllabus are a normal part of any adaptive teaching and learning process.