ENEE 312 Semiconductor Devices and Analog Electronics, Sections 0201-0202
SPRING 2005 SYLLABUS

Class Schedule: All Lectures EGR 2107 / ITV TuTh 12:30-1:45 PM
0201 Recitation EGR 1102 Th 9:30-10:20 AM
0202 Recitation EGR 2107 / ITV Tu 2:00-2:50 PM
Additional ITV (Remote) Recitations – To Be Announced

Instructor: Allen J. Goldberg, Ph. D.
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Office: AVW 1419 (rear, left of main entrance corridor)
Hours: College Park & Remote Site ITV – To Be Announced
        Also by appointment, via e-mail

Teaching Assistant: Smitha Kalappurakkal
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Hours: 

Course Websites: http://www.enee.umd.edu/class/enee312-2/
                http://umd.blackboard.com/

Course Objectives: The objectives of the class are to develop an understanding of the physical mechanisms governing the operation of electronic devices such as the diode and the transistor, and to then use this understanding to analyze and design analog electronic circuits.

Topics Covered:

1. Semiconductors materials, doping, electrons and holes;
2. Analytical description of drift and diffusion of carriers and continuity equation;
3. PN junction operation described through the analytical solution of the drift-diffusion model;
4. Bipolar junction transistors (BJTs) physical operation;
5. Physical basis of MOS field-effect transistor operation including threshold voltage and I-V characteristics;
6. DC bias of Bipolar and FET fundamental analog circuits;
7. Small signal analysis and design of fundamental transistor circuits;
8. Difference amplifiers, current mirrors and active loads;
9. Frequency response, including the Miller effect.
Course Prerequisites:

ENEE 302 (Digital Electronics), ENEE 204 (Basic Circuit Theory) and completion of all lower-division technical courses in the EE curriculum.

The prerequisites are absolutely essential, and students who have not taken these courses (or their equivalents subject to the approval of the instructor) will not be permitted to take this class. Students with weak prerequisite skills will find ENEE 312 difficult and good grades hard to attain.

Text (Required):

• Adel S. Sedra and Kenneth C Smith, Microelectronic Circuits, Fifth Edition
  Oxford University Press, 2004

Course Credits: 3

Basis for Grades:

• 2 Regular Exams 40% (20% each)
• Final Exam 40%
• Homework Submission 10%
• Class Participation 10%

Homework Policies:

• Homework is essential for learning the material in this class. Homework consists of assigned reading and accompanying problems. Students must make the effort to keep up with the reading, to work all problems assigned (however difficult), and to submit their work in class by the assigned due date to receive credit. Students may work with one another on the homework. Students can also access the instructor after class or via e-mail for help. However, copying of pre-existing or published homework solutions is unacceptable. Copying weakens the fundamental ability of homework to make you think. It also represents a breach of academic integrity that is easily detected.

• Students are responsible for all assigned reading and homework. Students are expected to work through and absorb basic material on their own. The lectures often cover only the more difficult material and compliment rather than duplicate the reading and homework.

• ENEE 312 is a demanding course covering timely and worthwhile topics. Over 500 pages of reading is assigned, and the accompanying homework is rewarding but very challenging. Students who are not prepared to devote the necessary time to perform this outside work will find ENEE 312 very difficult and good grades hard to attain.

• Details for collection, grading and return of homework will be discussed in class.
Exam Policies:

• Exams are closed book without notes or calculators. Students are not allowed to leave and return to the exam room once the exams are distributed in class. University policies on academic honesty are strictly enforced. Violations are reported immediately to the Department and Honor Council for further action. THERE IS ZERO TOLERANCE FOR VIOLATIONS.

• Make-up exams are simply not given. You are expected to attend all of the exams, which are given during regularly assigned class hours and with ample notice.

• Students are strongly encouraged to check their final exam schedules for conflicts before registering for classes. A working class schedule does NOT guarantee a final exam schedule free from conflicts.

• Details for grading and return of exams will be discussed in class.

ENEE 312 PREREQUISITES SUMMARY

ENEE 302: Digital Electronics

Prerequisite: ENEE 204 and completion of all lower-division technical courses in the EE curriculum. Large signal terminal characteristics of PN junction diodes, Bipolar and MOSFET transistors. Digital electronics at transistor level: inverter; nand; nor; and; or gates. CMOS and TTL logic. Combinatorial and sequential digital circuits, memory design. Circuit simulation with SPICE.

ENEE 204: Basic Circuit Theory

Prerequisite: MATH 246 (Differential Equations for Scientists and Engineers). Basic circuit elements: resistors, capacitors, inductors, sources, mutual inductance and transformers; their I-V relationships. Kirchoff's Laws. DC and AC steady state analysis. Phasors, node and mesh analysis, superposition, theorems of Thevenin and Norton. Transient analysis for first- and second-order circuits.