“Semiconductor Devices”

ECE 3080
Spring Semester 2009

School of Electrical and Computer Engineering
Georgia Institute of Technology

Dr. John D. Cressler

When and Where

Lecture Place: Van Leer C240
Lecture Time: M-W-F 9:05-9:55

Contact Information

dr: cressler@ece.gatech.edu
office: 538 Technology Square Research Building (TSRB)
(just over 5th street bridge, first building on the left)
phone: (404) 894-5161
(404) 351-0198 (emergencies only)

Office Hours:

Right after class is ideal…
… or M-W-F 11:00-12:00 in 538 TSRB
… or by appointment
… or if my door is open, stop in and say hi!
If you need me and cannot find me ... email me!

Course Policies and Procedures

Course Prerequisites

A Good Command of ECE 3040 (review it!)
Ordinary Differential Equations
Freshman Physics

Required Textbook


There are numerous other books on the subject which may be useful for consultation, extra problems, etc. See, for instance,


In addition, I will be using overhead material during each lecture. You need to put it in a binder and bring it to every lecture!

Web Site

The official course web site is located at:

http://users.ece.gatech.edu/~cressler/
Go to the “Courses” button on the left, and then click on our course. Overhead material used in lecture will be posted there, along with homeworks, supplemental material, etc. Other ECE 3080 professors also have lots of useful information on their websites (old exams, lots of practice problems, visualization tools, etc.). Students are encouraged to use all available resources.

**Lectures**

Lectures will consist of a mixture of on-the-board notes, hardcopy overheads, discussion about the technical material, problem solving, and digressions on life. Lecture will be considered by most to be reasonably fast-paced. Keeping up with the material will prove essential to your success. Solving all homework problems and reading your assigned readings will be key to making a good grade. **Based on past experience, class attendance should be viewed as mandatory for those desiring high grades in this class.** All students are responsible for all material covered in class (written or orally transmitted), and which can appear on exams.

**Homework**

For full-credit, homework must be turned-in on the assigned date! **(in my hands by 5:00 pm)**. Joint work is encouraged on homeworks, but each student **MUST** hand-in their own individual solution. HW will consist of qualitative, quantitative, and theoretical problems of varying difficulty and length. Computer solutions will at times be necessary. If you use a canned math package (e.g., MATLAB, MATHCAD), you must annotate your work. Good grammar and diction count.

**Exams**
Exams will be open book, open notes. Any and all calculators are allowed. Partial credit will be given, but only if you provide a clear, legible, and easy-to-follow exposition of your solution. **Box off your final answers.** Good grammar and diction count. Exams will consist of three main parts: *qualitative* (tell me about something), *quantitative* (calculate something for me), and *theoretical* (project your knowledge of the material into uncharted territory for me). An optional outside-of-class study session will be provided before each exam.

**Team Project**

A comprehensive team project (a competition actually!) will take place in the second half of the semester, and will serve as the final exam for the course. Details will be announced later.

**Teaching Assistant**

Your Graduate Teaching Assistant (and office hours) for the semester will be announced as soon as they are assigned. The TA will be responsible for homework grading. I will grade the exams. Please feel free to see me for any help needed with the course material (the TA is obviously also available if needed).

**Grading Policy**

Course grades will be calculated according to the following formula, based on a 100-point scale:

- Homework - 30%
- Exam 1 - 10%
- Exam 2 - 15%
- Exam 3 - 20%
Design Project - 25%

Academic Honesty

Students are expected to abide by Georgia Tech’s established Academic Honor Code (refer to the General Catalog). Academic misconduct is not acceptable in my class, and incidents will be reported to the Administration. While students are encouraged to work together on homeworks, individual solutions must be submitted for grading. No collaboration in any form is permitted on exams.

Course Objectives

ECE 3080 centers on developing a fundamental understanding of semiconductors and the many unique electronic and photonic devices that are built from semiconductors. A deeper discussion of semiconductor physics (based on introductory quantum mechanics), as well as semiconductor device operation, design, performance tradeoffs, and other “real world” device issues, will be emphasized. This material will build upon the introductory treatment given in ECE 3040. Thus, I will assume a 3040-level command of semiconductors and semiconductor devices. Successful completion of this course should provide you with sufficient background for graduate study in microelectronics.

Important Dates
Georgia Tech Calendar

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<thead>
<tr>
<th>Event</th>
<th>Day</th>
<th>Date</th>
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<tbody>
<tr>
<td>First Class</td>
<td>Monday</td>
<td>1/5</td>
</tr>
<tr>
<td>Holiday</td>
<td>Monday</td>
<td>1/19</td>
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<tr>
<td>Drop Day</td>
<td>Friday</td>
<td>2/27</td>
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<tr>
<td>Spring Break</td>
<td>Monday-Friday</td>
<td>3/16-20</td>
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<tr>
<td>Last Class</td>
<td>Friday</td>
<td>4/24</td>
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Tentative 3080 Calendar

<table>
<thead>
<tr>
<th>Event</th>
<th>Day</th>
<th>Date</th>
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</thead>
<tbody>
<tr>
<td>Exam 1</td>
<td>Friday</td>
<td>2/6</td>
</tr>
<tr>
<td>Exam 2</td>
<td>Friday</td>
<td>3/13</td>
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<tr>
<td>Exam 3</td>
<td>Friday</td>
<td>4/17</td>
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<tr>
<td>Final Exam</td>
<td>Thursday</td>
<td>4/30 (2:50-5:40pm)</td>
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Please mark all these dates on your calendar!

Tentative Travel Dates

- None at present (yippee!)

Please understand that travel is a fact of life for a professor. My travel schedule is reasonably well known at present, but in some cases it can be dynamic during the semester as meeting schedules change, etc. However, the show must go on! A guest lecturer will fill in for me during my required absences, as needed.

My Expectations of You

Class participation matters a great deal to me. In fact, it will be used to partially determine borderline grading cases. Meaningful
participation during lecture requires preparation for lecture (before class!) on your part. Read the course material. Come 5 minutes before lecture and review your previous notes. I expect all students to be respectful of their fellow students (and me). I expect you to be alive and kicking during lecture (bring coffee or Red Bull if necessary!), and responsive to my questions. Please be on time for lecture. We will start promptly at 9:05 am. Please turn your cell phones off. Please turn off wireless internet-connections! Smile, and relax … you are amongst friends!

**My Teaching Philosophy**

Simply stated, I am here for you. Period. I am concerned about *any* impediment to your learning and happiness, whatever that may be, and I will do whatever I can within my power to assist you. My goal in this class is to help facilitate your mastery of this material, but also to convince you of the beauty and majesty of the subject matter. And hopefully add some insight into life as well. It is my job to make the material clear to you. If I’m not succeeding in that, I am depending on you to make me aware of it. I conduct my classes informally. If you have a question, or comment, or need me to repeat something, or can’t read my writing, or you don’t follow what I’m saying - interrupt me (politely). There is no such thing as a dumb question. All questions are the potential source of deeper enlightenment for both you and me and the rest of the class. Ask! I would be happy to discuss any aspect of life with you, from career path, to graduate school, to the meaning of life. As you will see, I am fond of quotations, and offer them to you for your deeper reflection. They are also intended to remind you that there is more to life than ECE!