

EE 5340/001 and 051 - Semiconductor Device Theory – Spring 2011 (*draft*)

(Click [syllabus](#) to download AdobeAcrobat file)

Instructor: Professor Ronald L. Carter, ronc@uta.edu, <http://www.uta.edu/ronc>, 532 Nedderman Hall, (office hours: 10 to 1050 Tu/W/Th or see [schedule](#) to request an appointment), 817/272-3466, fax 817/272-2253.

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Course Learning Goals and Objectives: Beginning with an introduction to solid state physics, the physics of semiconductor devices will be developed. Device physics will be applied to diodes, bipolar junction transistors and MOS transistors. Silicon and III-V device physics and technology will be considered.

Class Meetings: Tu/Th: Section 001 - 11:00 AM to 12:20 PM, 129 Engineering Research Building. Some class sessions will be devoted to demonstrations, problem solving tutorials or self-study.

Attendance Policy: Attendance at every class session for the entire 80-minute period is strongly advised. Lectures will be posted at <http://www.uta.edu/ronc/5340/lectures> by 8 AM the day of class. Bring a copy to class. In order to validate your attendance, Assignment 1 given in the first lecture must be submitted. If not, you will be dropped from class for non-attendance.

Text: ^R*Device Electronics for Integrated Circuits*, 3rd ed., by Richard S. Muller, Theodore I. Kamins, and Mansun Chan, John Wiley and Sons, New York, 2003. ISBN: 0-471-59398-2.

Reference Texts: (Books on reserve in the Science and Engineering Library are marked ^R.)

- ^R*Devices for Integrated Circuits: Silicon and III-V Compound Semiconductors*, by H. Craig Casey, Jr., John Wiley & Sons, New York, 1999.
- ^R*Semiconductor Physics and Devices*, by Donald A. Neamen, Irwin, Chicago, 1997.
- ^R*Device Electronics for Integrated Circuits*, 2nd ed., by Muller and Kamins, Wiley, New York, 1986.
- ^R*Fundamentals of Semiconductor Theory and Device Physics*, by Shyh Wang, Prentice Hall, 1989.
- ^R*Semiconductor Physical Electronics*, by Sheng S. Li, Plenum Press, New York, 1993.
- ^R*Physics of Semiconductor Devices*, by S. M. Sze, Wiley-Interscience, New York, 1981.

Spice References: (Books on reserve in the Science and Engineering Library are marked ^R.)

- ^R*MicroSim PSpice for Windows, 2nd ed*, by Goody, Prentice-Hall, Upper Saddle River, N.J., ©1998.
- ^R*Computer-Aided Circuit Analysis Using PSpice* by Walter Banzhaf, Regents/Prentice Hall, Englewood Cliffs, NJ, ©1992
- ^RSPICE: A Guide to Circuit Simulation and Analysis Using PSpice, 3rd ed., by Paul W. Tuinenga, Prentice Hall, Englewood Cliffs, NJ, ©1995.
- ^R*Schematic Capture with MicroSim Pspice: for Windows 3.1, 4th Ed.*, by Herniter, ©2000, Prentice-Hall
- PSpiceTM information to be determined

Use of e-mail: Updates of class information are sent by e-mail. For this reason e-mail addresses are collected through Assignment 1. Questions should be sent to ronc@uta.edu. Always include the course number, EE5340, in the Subject line of e-mail messages to me. Answers will be sent to the EE5340 list if they are of general interest to the class. EE students should also subscribe to EE_GRADS at [SUSCRIBE EE GRADS](#) to receive EE Department information.

Problems: The problem assignments to be given in the syllabus have been selected for your study, but will not be collected or graded. The study of the problems assigned will be helpful in preparing for the tests and final.

Tests: Sample tests are posted at <http://www.uta.edu/ronc/5340/tests/>. Tests will be on the following dates: 2/22, 4/5, and the Final Exam on 5/10.

Grade Calculation: Grade = (Test1 + Test2 + Project + Final)/4. Note that there are ONLY four components in the grade calculation.

Grading Scale:

- A = 90 and above
- B = 75 to 89
- C = 60 to 74
- D = 50 to 59
- F = 49 and below

Project Assignment: See <http://www.uta.edu/ronc/5340/project>. Click to download [Project Assignment](#)

Student Evaluation of Teaching: Students will complete evaluation forms at the end of the semester.

Lecture, Assignment, Quiz and Test Schedule

(Lectures at <http://www.uta.edu/ronc/5340/lectures> by 8 AM the day of class. Bring a copy to class.)

CL	DATE	DAY	ASSIGNMENTS	Important Dates
1	1/18	Tues	Ch. 1 - Semiconductor Electronics, P1:1,3,4,6,8,18	
2	1/20	Thur	Appendix 1A - Electric Fields ...	
3	1/25	Tues		
4	1/27	Thur	Ch. 2 - Silicon Technology, P2:15,18,19,20	
5	2/1	Tues		Census 2/2
6	2/3	Thur	Ch. 3 - Metal-Semiconductor Contacts, P3:2,3,4,5,7,16	
7	2/8	Tues	Project Assigned	
8	2/10	Thur	Ch. 4 - <i>pn</i> Junctions, P4:1,2,5,6,9,14	
9	2/15	Tues		
10	2/17	Thur		
11	2/22	Tues	Test 1	
12	2/24	Thur	Ch. 4 - <i>pn</i> Junctions, continued	
13	3/1	Tues	Ch. 5 Currents in <i>pn</i> Junctions - P5:1,2,3,6,9,11,19,21	
14	3/3	Thur		
15	3/8	Tues	Ch. 6 - Bipolar Transistors I, P6:1,5,8,9,12,13,16,17	
16	3/10	Thur		Spring Vacation 3/14 to 3/18
17	3/22	Tues		
18	3/24	Thur		
19	3/29	Tues		
20	3/31	Thur		Last day to drop class, April 1
21	4/5	Tues	Test 2	
22	4/7	Thur	Ch. 7 - Bipolar Transistors II, P7:1,2,7,9,11,23,29	
23	4/12	Tues	Ch. 8 - Properties of the MOS System, P8:1,2,4,7,12,15	
24	4/14	Thur		
25	4/19	Tues		
26	4/21	Thur	Ch. 9 - MOSFETs I, P9:1,3,5,7,14,21,	
27	4/26	Tues	Project Due	
28	4/28	Thur	Ch. 10 - MOSFETs II, P10:1,2,4,8	
29	5/3	Tues		
30	5/5	Thur		Last Class
31	5/10	Tues	Final 11:00 AM to 1:30 PM	

Notes:

1. This syllabus may be changed by the instructor as needed for good academic practice. Use the "refresh" or "reload" function on your browser.
2. Quizzes and tests are open book (must have a legally obtained copy-no Xerox copies) OR one handwritten page of notes. Calculator allowed.
3. There will be no make-up, or early exams given. Attendance is required for all tests.
4. Americans with Disabilities Act: The University of Texas at Arlington is on record as being committed to both the spirit and letter of federal equal opportunity legislation; reference Public Law 92-112 - The Rehabilitation Act of 1973 as amended. With the passage of federal legislation entitled Americans with Disabilities Act (ADA), pursuant to section 504 of the Rehabilitation Act, there is renewed focus on providing this population with the same opportunities enjoyed by all citizens. As a faculty member, I am required by law to provide "reasonable accommodations" to students with disabilities, so as not to discriminate on the basis of that disability. Student responsibility primarily rests with informing faculty of their need for accommodation and in providing authorized documentation through designated administrative channels. Information regarding specific diagnostic criteria and policies for obtaining academic accommodations can

be found at www.uta.edu/disability. Also, you may visit the Office for Students with Disabilities in room 102 of University Hall or call them at (817) 272-3364.

5. Academic Integrity: It is the philosophy of The University of Texas at Arlington that academic dishonesty is a completely unacceptable mode of conduct and will not be tolerated in any form. All persons involved in academic dishonesty will be disciplined in accordance with University regulations and procedures. Discipline may include suspension or expulsion from the University. "Scholastic dishonesty includes but is not limited to cheating, plagiarism, collusion, the submission for credit of any work or materials that are attributable in whole or in part to another person, taking an examination for another person, any act designed to give unfair advantage to a student or the attempt to commit such acts." (Regents' Rules and Regulations, Series 50101, Section 2.2). See <http://www.uta.edu/studentaffairs/conduct/>.
6. Submit a signed copy of <http://www.uta.edu/ee/COE%20Ethics%20Statement%20Fall%2007.pdf> (the COE Ethics policy). Review the contents of this page and the website referenced in 5 above.
7. If identical material is submitted for grade by different students, the grade earned will be divided among all identical submissions.
8. A paper submitted for regrading will be compared to a copy of the original paper. If the paper does not agree with the original, points will be deducted.
9. Student Support Services Available: The University of Texas at Arlington supports a variety of student success programs to help you connect with the University and achieve academic success. These programs include learning assistance, developmental education, advising and mentoring, admission and transition, and federally funded programs. Students requiring assistance academically, personally, or socially should contact the Office of Student Success Programs at 817-272-6107 for more information and appropriate referrals.
10. Final Review Week: A period of five class days prior to the first day of final examinations in the long sessions shall be designated as Final Review Week. The purpose of this week is to allow students sufficient time to prepare for final examinations. During this week, there shall be no scheduled activities such as required field trips or performances; and no instructor shall assign any themes, research problems or exercises of similar scope that have a completion date during or following this week unless specified in the class syllabus. During Final Review Week, an instructor shall not give any examinations constituting 10% or more of the final grade, except makeup tests and laboratory examinations. In addition, no instructor shall give any portion of the final examination during Final Review Week. Classes are held as scheduled during this week and lectures and presentations may be given.
11. Librarian to Contact: See <http://library.uta.edu/sel/> and <http://libguides.uta.edu/content.php?pid=3545>
12. Electronic Communication Policy: A UTA listserv is being established for EE 5340. All class communication will be conducted via this list. To sign up, go to <https://listserv.uta.edu/archives/EE5340.html>, click on the link "Join or Leave EE5340", or send e-mail to listserv@listserv.uta.edu with the command "subscribe EE5340 your_name" (without the quotes) in the body of the message. You may receive communication from this listserv at any email address you choose. If you have questions, send email to ronc@uta.edu. In addition, the University of Texas at Arlington has adopted the University "MavMail" address as the sole official means of communication with students. MavMail is used to remind students of important deadlines, advertise events and activities, and permit the University to conduct official transactions exclusively by electronic means. For example, important information concerning registration, financial aid, payment of bills, and graduation are now sent to students through the MavMail system. All students are assigned a MavMail account. Students are responsible for checking their MavMail regularly. Information about activating and using MavMail is available at <http://www.uta.edu/oit/email/>. There is no additional charge to students for using this account, and it remains active even after they graduate from UT Arlington.
13. Grade Grievance Policy: Forms to report a grade grievance are available in the EE Office.