

EE 5342, Spring 2011 [v.2.0]

Semiconductor Device Modeling and Characterization

(View at <http://www.uta.edu/ronc/5342/syllabus.htm>, download at <http://www.uta.edu/ronc/5342/syllabus.pdf>)
[best viewed in Internet Explorer]

Instructor: Professor R. 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), 817/273-3466, fax 817/272-2253.

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Course Learning Goals and Objectives: To model and characterize integrated circuit structures and devices using SPICE and SPICE-like descriptions of the devices.

Class Meetings: MWF, 11:00 to 11:50 PM, 108 Nedderman Hall. Some classes will meet longer.

Attendance Policy: Attendance at every class session for the entire 50-minute period is strongly advised. Lectures in *.ppt format will be posted by 8 AM the day of class at <http://www.uta.edu/ronc/5342/lectures>.

Use of e-mail: See Note 12 below.

Modeling Software: Agilent IC-CAP™ will be used extensively. It is accessible on gamma.uta.edu. The Friday class sessions will primarily be devoted to simulation and characterization demonstrations and exercises.

Text (On reserve in the Science and Engineering Library): *Semiconductor Device Modeling with SPICE, 2nd ed.*, by Paolo Antognetti and Giuseppe Massobrio, McGraw-Hill, New York, 1993, ISBN 0071349553 (paperback) or 007 0024693 (hardback). Listed as T in the assignments.

Device Characterization References: (On reserve in the Science and Engineering Library):

- *Introduction to Device Modeling and Circuit Simulation*, by Tor A. Fjeldly, Trond Ytterdal, and Michael Shur, John Wiley and Sons, New York, 1998.
- *Semiconductor Material and Device Characterization*, by Dieter K. Schroder, John Wiley and Sons, New York, 1990. Listed as S in the assignments. This text emphasizes primarily material characterization, so select device modeling topics primarily.

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.
- *Schematic Capture with MicroSim Pspice: for Windows 3.1, 4th Ed.*, by Herniter, ©2000, Prentice-Hall
- PSpice™ v8 or v9 are useful for some practice examples. A Google search will give sites for download.
- Prof. Dillon's excellent tutorial for PSpice™ is at www.uta.edu/ee/hw/pspice/

Device Electronics References: (On reserve in the Science and Engineering Library)

- *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. Listed as D in the assignments.
- *Devices for Integrated Circuits : Silicon and III-V Compound Semiconductors*, by H. Craig Casey, John Wiley, New York, 1999. Listed as DI in the assignments.

Projects, Tests and Grading Formula (Sample tests are posted at <http://www.uta.edu/ronc/5342/tests/>):

- 60% total for projects (see syllabus for due dates for each project – 30% each for P1 (3/11) and P2 (4/22). (Dates in () are when a test on the project will be given and the due dates for the project to be turned in.)
- 20% total, one mid-term (MT – February 18)
- 20% for final (FN (individually chosen project) – May 9 – required)
i.e., the grade will be computed from the formula, $Grade = (P1 + P2)*0.3 + (MT + FN)*0.2$

Grading Scale:

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

Project Assignments: Project assignments will be posted at <http://www.uta.edu/ronc/5342/projects>. A device of the student's choice will be used for P3 – by arrangement with the instructor. Project format and written content will be discussed and will be included in the grade.

(Lecture notes, when published, are at <http://www.uta.edu/ronc/5342/lectures>)

DATE	P/T	ASSIGNMENTS	Important Dates
Wednesday, January 19, 2011		Semiconductor Electronics Review	
Friday, January 21, 2011		T(Appendix A.1), D(Ch 1)	
Monday, January 24, 2011		DI(Chs 2&3), S(Chs 1 & 2)	
Wednesday, January 26, 2011			
Friday, January 28, 2011			
Monday, January 31, 2011		P-N and Schottky diodes, and contacts	
Monday, February 07, 2011			Census Date on Feb. 8
Friday, February 11, 2011		T(Appendix A.2, Ch 1 and Appendix C); D(Ch 3, 4 and 5)	
Monday, February 14, 2011		DI(Chs 4, 5 & 6), S(Chs 3 & 4.1-4.3)	
Wednesday, February 16, 2011			
Friday, February 18, 2011	MT	Project 1 assigned	
Monday, February 21, 2011			
Wednesday, February 23, 2011			
Friday, February 25, 2011			
Monday, February 28, 2011		Bipolar junction transistors	
Wednesday, March 02, 2011		T(Chs 2 & 5); D(Ch 6 & 7)	
Friday, March 04, 2011		DI(Ch 9), S(Chs 4 & 5)	
Monday, March 07, 2011			
Wednesday, March 09, 2011			
Friday, March 11, 2011	P1	Project due and in-class exam on project (Project 2 assigned)	
Monday, March 21, 2011			Spring Vacation 3/14 to 3/18
Wednesday, March 23, 2011			
Friday, March 25, 2011			
Monday, March 28, 2011		MOSFETs -T(Chs 4 & 6); D(Ch 8, 9 & 10)	
Wednesday, March 30, 2011		DI(Chs 7 & 8), S(Chs 4.6, 5.3 & 6)	
Friday, April 01, 2011			Last day to drop class, 4/1
Monday, April 04, 2011			
Wednesday, April 06, 2011			
Friday, April 08, 2011			
Monday, April 11, 2011		Project 3 device proposal due.	
Wednesday, April 13, 2011			
Friday, April 15, 2011			
Monday, April 18, 2011		Project 3 assigned	
Wednesday, April 20, 2011			
Friday, April 22, 2011	P2	Project due and take-home exam on project	
Monday, April 25, 2011			
Wednesday, April 27, 2011			
Friday, April 29, 2011		MESFETs, HEMTs and HBTs T(Ch 9.1); D(Ch 4.5)	
Monday, May 02, 2011		DI(Chs 5.6.4, 6.7, 6.8, and 9.9), S(Ch 4.7)	
Wednesday, May 04, 2011			
Friday, May 06, 2011			Last class
Wednesday, May 11, 2011		Proj. 3 due and in-class exam on proj. (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 5342. All class communication will be conducted via this list. To sign up, go to <https://listserv.uta.edu/archives/EE5342.html>, click on the link "Join or Leave EE5342", or send e-mail to listserv@listserv.uta.edu with the command "subscribe EE5342 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.