American University of Beirut
Department of Electrical and Computer Engineering
EECE 311 Electronic Circuits
Spring 2008 – 2009

EECE 311 is the second course in the sequence of electronics courses offered in the ECE Department. This course covers analog and digital electronic circuits.

Class: T, R 11:00 am – 12:15 pm in Room 537 Bechtel.

Instructor: Ayman Kayssi
Office: 404 RGB
Office Hours: T, R 8:00 – 10:00 am
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Prerequisite: EECE 310 Electronics
Prerequisites by topic:
Circuits: Circuit analysis techniques: KCL, KVL, node equations, Thevenin’s/Norton’s theorem.
Electronics: Diodes, MOSFETs, BJTs – basic operation, models, and circuits.
CAD: SPICE

Catalog Description:
A course on BJT amplifiers; MOSFET amplifiers; differential amplifiers; frequency response of amplifiers; feedback; operational amplifiers; oscillators; digital CMOS circuits; SPICE simulations.

Textbook:
Sedra and Smith, Microelectronic Circuits, fifth edition

Sections covered from textbook:

- Chapter 1: 1.6
- Chapter 2: 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8
- Chapter 4: 4.8
- Chapter 5: 5.8
- Chapter 6: 6.1, 6.2, 6.3, 6.4, 6.5, 6.6, 6.7, 6.8, 6.9, 6.10, 6.11, 6.12
- Chapter 7: 7.1, 7.2, 7.3, 7.4, 7.5, 7.6, 7.7
- Chapter 8: 8.1, 8.2, 8.3, 8.4, 8.5, 8.6, 8.7, 8.8, 8.9, 8.10, 8.11
- Chapter 10: 10.1,10.2,10.3,10.4,10.5,10.6

Course Objectives:
The objectives of the course are to provide students with
1. The essential background on amplifiers that use bipolar junction transistors and MOS field-effect transistors.
2. An understanding of amplifier characteristics, limitations, and frequency response, and the integrated circuit implementation of amplifiers.
3. An overview of the effects of feedback on amplifier performance, and oscillator design.
4. The essential background on the operation and performance of various CMOS digital circuit families.
Course Outcomes:

By the end of the course, students
1. are familiar with IC biasing techniques
2. understand the operation of MOSFET and BJT current mirrors
3. understand the characteristics of, and can analyze the different transistor amplifier configurations
4. are able to analyze the high-frequency response of a transistor amplifier
5. understand the operation of the cascode amplifier
6. are familiar with the characteristics of the Wilson, cascode, and Widlar current mirrors
7. are aware of the effects of finite gain and finite bandwidth on op-amp characteristics
8. understand the large signal operation and DC imperfections of an op-amp
9. understand the operation of op-amp integrators and differentiators
10. can analyze the MOS and BJT differential pair circuits
11. can find the differential gain, common-mode gain, and CMRR of a differential amplifier
12. are aware of the nonideal characteristics of the differential pair
13. can analyze a differential amplifier with active load
14. are able to analyze the frequency response of a differential amplifier
15. are able to analyze CMOS multistage amplifiers
16. understand the general feedback structure and the properties of negative feedback
17. are familiar with the four basic feedback topologies: series/shunt, series/series, shunt/shunt and shunt/series
18. understand the effect of feedback on stability, and the need for frequency compensation
19. are familiar with op-amp RC oscillators
20. are familiar with bistable and astable multivibrators
21. are familiar with LC oscillators
22. understand the operation of static CMOS circuits
23. are familiar with pseudo-NMOS CMOS circuits
24. are familiar with CMOS pass-transistor circuits
25. are familiar with dynamic CMOS circuits

Assessment:

Midterm 30%
Final Exam 40%
Assignments 10%
Project 15%
PSpice test 2.5%
Class participation 2.5%

Course Policy:

The midterm will be on Wednesday April 8, 2009.
The final exam will be scheduled by the Registrar’s Office.
The final exam is objective (multiple-choice), comprehensive, and common to all sections of the course.
The midterm and final exam are open-book, open notes.
Late homework will not be accepted. You have to work individually on your homework.
The project will be done in teams of three students.
The class participation grade will be computed as follows: Class attendance will be taken $N$ times during the semester. Students who are in class will get (2.5/$N$) points, for a maximum of 2.5 points at the end of the term. Students who miss more than one fifth of the lectures in the first ten weeks of the semester will be dropped from the course.