American University of Beirut

Department of Electrical and Computer Engineering

EECE 311 Electronic Circuits

Spring 2012

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

Class:	M, W, F 8:00 – 8:50 am in 541	(section 1)
	T, R 9:30 – 10:45 am in 545	(section 2)
	M, W, F 10:00 – 10:50 am in 539	(section 3)

Instructors:

Sections 1 and 3

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Section 2

Name:	Ayman Kayssi
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Prerequisite: EECE 310 Electronics

Prerequisites by topic:

Mathematics: Calculus, differential equations, Fourier series, Laplace transform.
Circuits: Circuit analysis techniqnes: 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*, sixth edition

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 LC oscillators
21. understand the operation of static CMOS circuits
22. are familiar with pseudo-NMOS CMOS circuits
23. are familiar with CMOS pass-transistor circuits
24. are familiar with dynamic CMOS circuits

Sections that will be covered from textbook: (not necessarily in the order shown)
Chapter 1: *Section* 1.6
Chapter 2: *Sections* 2.1 – 2.8
Chapter 4: *Section* 4.6
Chapter 5: *Section* 5.6
Chapter 6: *Sections* 6.1 – 6.6
Chapter 7: *Sections* 7.1 – 7.6
Chapter 8: *Sections* 8.2 – 8.10
Chapter 9: *Sections* 9.1 – 9.7, 9.10 – 9.13
Chapter 10: *Section* 10.1
Chapter 12: *Sections* 12.1 – 12.3
Chapter 14: *Sections* 14.1 – 14.4
Chapter 15: *Sections* 15.1 – 15.3

Assessment:

Midterm	30%
Final Exam	40%
Project	12%
Assignments	10%
Short quizzes	5%
Class participation and attendance	3%

Course Policy:

The midterm will be on Thursday April 12, 2012.
The final exam will be scheduled by the Registrar's Office.
The exams are 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 $(3/N)$ points, for a maximum of 3 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.