Florida Atlantic University
Department of Computer and Electrical Engineering and Computer Science
Engineering Scholars Program (ESP)

EEL 1007C Electronic Design with Operational Amplifiers (3 credits)

Summer 2017

1. Course Description and Prerequisites

This is a hands-on electronics circuit design course using standard electronic components and common electronic lab instruments. No prior background in electromagnetism is assumed. The theoretical material and the design methods are covered through interactive PSPICE software simulation sessions and lectures. The course lab experiments culminate in a design project competition of a wireless optical communication system.

2. Course Objectives

The course covers the fundamentals of electrical circuits and electronics via traditional-setting lectures coupled with computer lab simulations coupled with electronics lab experimentation. For enhanced breadth and depth of coverage every electronics principle and fact covered in this course will be presented from the above three angles (which do complement one another). Students spend half of their class time in the lab conducting guided experiments. The other half of class time is divided between lectures and computer lab activities. Due to the special time format constraints (9 full class days spread over three weeks) the course is fast paced and homework-intensive (team lab technical reports and individual computer lab assignments).

3. Course Outcomes

a) The students develop deep understanding of the operation principles and key properties of some of the most fundamental electrical and electronic building blocks – resistors, capacitors, op-amps, diodes and BJT transistors,

b) Students become familiar with basic electronics lab instruments – power supplies, signal generators and oscilloscopes,

c) Students learn how to use an industry-grade electronic circuits simulator and how to integrate this tool with the theory provided via lectures and experimentation done in the lab,

d) Students form lab teams and learn how to collect experimental data and how to process it and present it in technical reports,

e) Students become exposed to open-ended electronics design-oriented tasks.

4. Reference Book (optional)

J.R. Cogdell, "Foundations of Electronics", Prentice Hall 1999.

5. Resources

a) All notes (computer lab and electronics lab manuals) and class related announcements will be posted on the course's web page (http://blackboard.fau.edu). Students should download and bring to class either the electronic or printed latest versions of the lab and computer lab manuals at the appropriate dates shown in this syllabus.

b) Electronic parts and tools kit and textbook vouchers for the Book-Smart store (located in Oaks Plaza on Glades Road right across from the FAU campus) will be distributed on the first day of classes. Orcad Lite 16.6 may be downloaded from the Cadence web site.

6. Grading Scheme

7 Computer Lab Reports	28%
3 equally weighted Quizzes	21%
9 Electronics Lab Reports	36%
Instructors' assessment of Lab Participation and Work Quality	7%
Instructors' assessment of the Final Project	8%
	100%

1) Three equally weighted quizzes (each counts for 7%) will be given on the dates shown. Each quiz will be 10 minutes long. It will be based on the lecture as well as understanding of Electronics Lab Material.
2) Every lab report and computer lab report will be letter graded (A= 4, A- = 3.67, B+ = 3.33, B=3, etc).
3) Final project grade will be based on demonstrated understanding of circuit operation. Grades are individual.
4) The numerical overall grade is translated to the alphabetic FAU grade system, using the following key:
A 90-100%, A- 85-89%, B+ 80-84%, B 75-79%, B- 70-74%, C+ 65-69%, C 60-64% etc.
5) There will be no grade-curving of any sort. All final grades that will come within 1% of a grade threshold will be reviewed for possible special consideration based on the student's demonstrated consistent effort throughout the course.

7. Instructor and Contact Information

Dr. Ali Zilouchian Dean's Office 561-297-0432 zilouchi@fau.edu

Dr. Zvi Roth CEECS 561-297-3471 rothz@fau.edu

Teaching Assistants: TBA

8. Class Dates, Time and Location

Meeting Places and Times: See calendar (below).
Classroom Locations:

Lab: Engineering East Building, Room 210 (EE 210)
Computer Lab: TBA
Lecture: TBA

9. Course Schedule Details

Monday, June 12

9:30 – 9:45	Orientation	Engineering East (EE) Bldg. 96 – The Cube (101)
10:00-11:25	Lecture	Complex numbers & applications to RC circuits (AZ)
11:30-12:30	Computer Lab	Circuits analysis using PSPICE (ZR)
12:30-1:30	Lunch	
1:30-4:30	Lab	Orientation; Lab kits distribution; Instruments familiarization; DC electrical networks; AC and pulse signals; Capacitors and RC circuits – measurement of a RC network frequency response (ZR)

Wednesday, June 14

9:30-11:25	Lecture	Op-Amp basic circuits (AZ)
11:30-12:30	Computer Lab	Op-amp amplifiers and comparators (ZR)
12:30-1:30	Lunch	
1:30-4:30	Lab	Op-amps and Comparators (AZ)

Friday, June 16

9:30-11:25	Lecture	Op-Amp Applications (AZ)
11:30-12:30	Computer Lab	Level Shifting; Differential Amplifiers (ZR)
12:30-1:30	Lunch	
1:30-4:30	Lab	Level Shifting and Band-Pass Filter analysis (ZR)

Monday, June 19

9:30-11:25	Lecture	Review of RC circuits and op-amp circuits; **Quiz #1** Introduction to Diodes (AZ)
11:30-12:30	Computer Lab	Basic Diode and Transistor circuits (ZR)
12:30-1:30	Lunch	
1:30-4:30	Lab	Diode characteristics; Transistor characteristics (AZ)

Wednesday, June 21

9:30-11:25	Lecture	Transistor circuits (AZ)
11:30-12:30	Computer Lab	Power Amplifiers (ZR)
12:30-1:30	Lunch	
1:30-4:30	Lab	LED with Current Amplifier; Phototransistor Characterization (AZ)

Friday, June 23

9:30-11:25	Lecture	Review of diodes and transistors; **Quiz #2** , Power Amplifiers (AZ)
11:30-12:30	Computer Lab	555 Timer and Applications (ZR)
12:30-1:30	Lunch	
1:30-4:30	Lab	Power Amplifiers (AZ)

Monday, June 26

9:30-11:25	Lecture	AM Communication (AZ)
11:30-12:30	Computer Lab	AM Communication (ZR)
12:30-1:30	Lunch	
1:30-4:30	Lab	AM Optical Transmitter (ZR)

Wednesday, June 28

9:30-12:30	Lab	Amplitude Modulation Detection and AM Optical Receiver using synthetic AM input (ZR)
12:30-1:30	Lunch	
1:30-3:00	Lecture in Lab	Review of AM and Project and **Quiz #3** (AZ)
3:00-4:30	Lab	The 555 Timer Oscillator (ZR)

Friday, June 30

9:30 -12:30	Lab	Final Project – obtaining wireless connection between the transmitter and receiver (AZ,ZR)
12:30-1:30	Lunch	
1:30-3:30	Lab	Project (continued); Project Demonstration - Design Competition (AZ,ZR)
3:30-4:30	Lab	Course wrap-up (AZ,ZR)

10. Submission and Lab Usage Requirements

1) Lab reports, on whatever a team accomplishes in every lab session, are due the morning of the next class day. Each team submits one brief report per experiment. Teams must include the measured data and answers to those questions that are posed in bold letters in the lab instructions.
2) The computer homework assignments are also due the morning of the next class. Each student should submit individual report. Each report should be brief and include only answers to the questions posed, circuit diagrams and the relevant simulation results annotated.

3) Lab reports are no longer required to be submitted in a technical report format.
4) The Lab Participation and Work Quality grade will be based on the Instructors' impression of each team member's contribution to the lab experiments efforts. Students who consistently let their lab partners do most of the work may lose the entire 7% grade in this category. Students are expected to be active participants.

For further information: Registered students should use their FAU ID to access the course's Blackboard web page at http://blackboard.fau.edu