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 2013

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.

Prerequisites are: Calculus 1 and 2, Physics with Calculus 1 and 2.

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. Text Book (optional)

J.R. Cogdell, "Foundations of Electronics", Prentice Hall 1999. [The book is needed as an optional reference for personal use]

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 are expected to print the latest versions of lab and computer lab manuals ahead of time and bring to class at the appropriate dates shown in this syllabus.

b) Electronic parts and tools kit, Orcad Lite 9.2 (free demo CD for the PSPICE simulation software) 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.

c) Orcad Lite 9.2 runs on Windows XP. It may or may not run on Vista and it does not run on Windows 7 and MAC. In such cases students should run PSPICE on one of the FAU College of Engineering servers – Genie (Citrix) or VMware. Students can access these servers from campus and/or from home.

6. Grading Scheme

6 Computer Lab Reports	24%
3 equally weighted Quizzes	21%
9 Electronics Lab Reports	36%
Instructors' assessment of Lab Participation and Work Quality	9%
Instructors' assessment of the Final Project	10%
	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

Mentor/TA: TBA

8. Class Dates, Time and Location

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

Lab: Engineering East Building Room 210
Computer Lab: Engineering East Building Room, TBA
Lecture: New Engineering Building (#92)

9. Course Schedule Details

Monday, June 10

9:30 – 9:45	Orientation	Engineering East – The Cube (Suite 101)
10:00-11:25	Lecture	Complex numbers & applications to RC circuits
11:30-12:30	Computer Lab	Circuits analysis using PSPICE
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

Wednesday, June 12

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

Friday, June 14

9:30-11:25	Lecture	Review of RC circuits and op-amp circuits; **Quiz #1**
11:30-12:30	Computer Lab	Level Shifting; Differential Amplifiers
12:30-1:30	Lunch	
1:30-4:30	Lab	Level Shifting and Band-Pass Filter analysis

Monday, June 17

9:30-11:25	Lecture	Diodes and Transistors
11:30-12:30	Computer Lab	Diode and Transistor circuits
12:30-1:30	Lunch	
1:30-4:30	Lab	Diode characteristics; Transistor characteristics

Wednesday, June 19

9:30-11:25	Lecture	More transistor circuits
11:30-12:30	Computer Lab	Power Amplifiers
12:30-1:30	Lunch	
1:30-4:30	Lab	LED with Current Amplifier

Friday, June 21

9:30-11:25	Lecture	Review of diodes and transistors; **Quiz #2**
11:30-12:30	Computer Lab	AM Communication
12:30-1:30	Lunch	
1:30-4:30	Lab	Power Amplifiers

Monday, June 24

9:30-10:25	Lecture	Power Amplifiers; Timer 555;
10:35-12:30	Lecture	AM Communication
12:30-1:30	Lunch	
1:30-4:30	Lab.	AM Optical Transmitter

Wednesday, June 26

9:30 -11:00	Lab.	The 555 Timer
11:00-12:30	Lecture	Review of AM and Project and **Quiz #3**
12:30-1:30	Lunch	
1 :30 - 4:30	Lab.	Amplitude Modulation Detection and AM Optical Receiver using synthetic AM input

Friday, June 28

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

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 report per experiment in a standard Technical Report format (see PowerPoint presentation included in Course Documents). Teams must include the measured data; however answers to questions posed in the lab instructions are optional.

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) 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 9% 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