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)

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

<table>
<thead>
<tr>
<th>Component</th>
<th>Weight</th>
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</thead>
<tbody>
<tr>
<td>7 Computer Lab Reports</td>
<td>28%</td>
</tr>
<tr>
<td>3 equally weighted Quizzes</td>
<td>21%</td>
</tr>
<tr>
<td>9 Electronics Lab Reports</td>
<td>36%</td>
</tr>
<tr>
<td>Instructors’ assessment of Lab Participation and Work Quality</td>
<td>7%</td>
</tr>
<tr>
<td>Instructors’ assessment of the Final Project</td>
<td>8%</td>
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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
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 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)
1:30-4:30 Lab

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 Op-amps and Comparators (AZ)
1:30-4:30 Lab

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 Level Shifting and Band-Pass Filter analysis (ZR)
1:30-4:30 Lab

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 Diode characteristics; Transistor characteristics (AZ)
1:30-4:30 Lab

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