Course Syllabus

California State University, Bakersfield (CSUB)
Department of Electrical & Computer Engineering & Computer Science
ECE 3070: Analog Circuits

Instructor
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Office: Room 320, Science Building III
Office hours: Wednesday 1:00PM – 3:30PM

Lecture and Lab Sections
Lecture: Tu/Th 10:00AM - 11:15AM, Science III, Room 313
Laboratory: We 10:00AM - 12:30PM, Science III, Room 313

Prerequisite
MATH 2510, MATH2520, PHYS/ENGR 2070.

Required Textbook

Supplementary Textbook:

Course Description
Design, construction, and debugging of analog electronic circuits. Fundamental semiconductor device characteristics including diodes, MOSFETs and bipolar transistors; small and large signal characteristics and design of linear circuits. Diodes, filters, oscillators, transistors, op-amps, and basic analog circuit design. Broadband applications in networking and communications.

Course Objectives/Outcomes
1. A knowledge of semiconductor devices, including diodes, BJT transistors, and field-effect devices.
2. In depth understanding of semiconductor circuit design and modeling.
3. The ability to design and analyze transistor circuits, multi-stage amplifiers, operational amplifiers, current drivers, and interface circuits.
4. EDA software experience and practical skills in analog circuit design.
List of Topics

- Signal and Amplifiers (Week 1)
- Operational Amplifiers (Week 2-4)
- Semiconductors (Week 5)
- Diodes (Week 6-7)
- The MOS Field-Effect Transistor (MOSFET) (Week 8-10)
- The Bipolar Junction Transistor (BJT) (Week 11-13)
- Transistor Amplifiers (Week 14-16)

Homework
Homework will be assigned on a bi-weekly basis, covering the material discussed in class. It is due at the beginning of class on every other Tuesday. Problems in each homework will be graded on the following basis: a correct answer gets 100%, a reasonable attempt gets 50%, and no attempt or a very poor attempt gets 0%.

Late policy: No late submissions will be accepted, as solutions will be posted on the day after it is due.

Laboratory
The laboratory of this course consists of a set of experiments to complement the material covered in the lecture course. The experiments are based on the textbook introduced for this course. In each lab session, student will conduct two experiments from the list below.

Experiments list

CHAPTER 2 Operational Amplifiers
   Lab 2.1 Inverting Op-Amp Configuration
   Lab 2.2 Non-Inverting Op-Amp Configuration
   Lab 2.3 Difference Amplifier
   Lab 2.4 Instrumentation Amplifier
   Lab 2.5 Lossy Integrator
   Lab 2.6 Lossy Differentiator

CHAPTER 4 Diodes
   Lab 4.1 Diode I-V Transfer Curve
   Lab 4.2 Fun with Diodes I: Rectifiers
   Lab 4.3 Fun with Diodes II: Limiting and Clamping Circuits

CHAPTER 5 MOS Field-Effect Transistors (MOSFETs)
   Lab 5.1 NMOS I-V Characteristics
   Lab 5.2 PMOS I-V Characteristics
   Lab 5.3 NMOS at DC
   Lab 5.4 PMOS at DC
CHAPTER 6 Bipolar Junction Transistors (BJTs)
   Lab 6.1 NPN I-V Characteristics
   Lab 6.2 PNP I-V Characteristics
   Lab 6.3 NPN at DC
   Lab 6.4 PNP at DC

CHAPTER 7 Transistor Amplifiers
   Lab 7.1 NMOS Common-Source Amplifier
   Lab 7.2 PMOS Common-Source Amplifier
   Lab 7.3 NMOS Common-Source Amplifier with Source Degeneration
   Lab 7.4 PMOS Common-Source Amplifier with Source Degeneration
   Lab 7.5 NMOS Common-Gate Amplifier
   Lab 7.6 PMOS Common-Gate Amplifier
   Lab 7.7 NMOS Source Follower
   Lab 7.8 PMOS Source Follower
   Lab 7.9 NPN Common-Emitter Amplifier
   Lab 7.10 PNP Common-Emitter Amplifier
   Lab 7.11 NPN Common-Emitter Amplifier with Emitter Degeneration
   Lab 7.12 PNP Common-Emitter Amplifier with Emitter Degeneration
   Lab 7.13 NPN Common-Base Amplifier
   Lab 7.14 PNP Common-Base Amplifier
   Lab 7.15 NPN Emitter Follower
   Lab 7.16 PNP Emitter Follower
   Lab 7.17 NMOS vs. NPN: Common-Source/Common-Emitter Amplifier Comparison

Attendance in lab is mandatory.

Grading
Your final grade will be the weighted average of the homework, Lab, one midterm exam, and the final exam, as calculate from the formula below:

<table>
<thead>
<tr>
<th>Assignment</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>10%</td>
</tr>
<tr>
<td>Labs</td>
<td>20%</td>
</tr>
<tr>
<td>Midterm exam</td>
<td>30%</td>
</tr>
<tr>
<td>Final exam</td>
<td>40%</td>
</tr>
</tbody>
</table>

All students enrolled in this course must attend Final Exam. **An absence at final exam will result in an ‘F’ grade in the course.** If you have any conflict with the final exam date, you must notify me two weeks prior to the final exam.
Accessibility
California State University, Bakersfield attempts to guarantee access to all classes by all students. Students can find CSUB's accessibility policies and services by going to the website for the Office of Services for Students with Disabilities. In addition, E-Learning Services at CSUB has its own policy for guaranteeing access to students in online classes:
"California State University, Bakersfield is committed to providing equal access to Web-based information for people with disabilities. This is in accordance with Section 504 of the 1973 Rehabilitation Act, Section 508 of the Rehabilitation Act Amendment of 1998 and the 1990 Americans with Disabilities Act, and Executive Order 926 of California State University."
To achieve the goal of universal accessibility, CSUB uses Blackboard as its Learning Management System (LMS), the first LMS to receive the Nonvisual Accessibility Gold Certification by The National Federaion of the Blind. Students can read more about Blackboard's **guarantee of accessibility** and its accessibility programs at its website.

Technical Requirements and Support
All of the lectures in this class were given in PDF. Adobe Acrobat Reader is available on every computer on the CSUB campus. If students have difficulty with the content of the class, they need to contact the instructor. If students are having any technical problems with Blackboard, or loading the IPA fonts from Blackboard to their own computers, then students need to contact the Blackboard Help Desk, either by telephone (661) 654-2315 or by email lmssupport@csub.edu. Students may also go to the E-Learning Services Building on the east side of the Walter Stiern Library.