E151/3 Syllabus

Spring 2021

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Welcome to E151! I am very excited about this material and very excited to have you in the class. A wide array of logistics is found below. I hope the learning goals are especially helpful, please review them and watch for opportunities to reinforce those goals in the course.

Electronic Communication

Mailing List: eng-151-1-2020-sp@hmc.edu
Class Site: http://pages.hmc.edu/mspencer/e151/sp21

Text and Supplies

Optional reference texts:
Analysis and Design of Analog Integrated Circuits. Grey, Hurst, Lewis and Meyer (called Grey and Meyer)
Microelectronic Circuits, Sedra/Smith

Supplies:
We are performing simulations for labs this semester because of remote work. You will need to install the ltSpice simulator to complete the labs. Link below.
https://www.analog.com/en/design-center/design-tools-and-calculators/ltspice-simulator.html

Course Description

Design and analysis of linear, analog systems, particularly multi-stage amplifiers with an emphasis on laboratory realization as a teaching tool for debugging practical analog systems.

At the end of this course you will be able to design and build an operational amplifier. To do this, you will need to use several skills. You will be able to:

- Find design parameters of single stage amplifiers
- Analyze multi-stage amplifiers by reducing stages to two-port representations
- Apply small signal models, open circuit time constants and half circuit analysis
- Use analog building blocks like references, current mirrors and output stages
- Reason about stability and compensation of amplifiers in feedback
- Take a systematic and rational approach to debugging analog circuits in a lab

Schedule

- The most up to date class schedule, including descriptions of lectures, is on the website
- Class meetings in a standard week take place M/W 2:30-3:45 on Discord
- Structured lab hours are Friday 9:00-12:00 in the Analog Lab
- Support will be available in the form of office hours and student proctor hours
- There will be a lab on Friday 3/5, the day before spring break
- The final for the class will take place during the standard time during finals week

Assignments and Grading

Labs:

- Labs are assigned each week on Thursday, they are due next Monday at midnight.
- The deliverable for each lab is a completed lab notebook entry. As will be discussed in class, these are less formal than reports. You are encouraged to try Evernote for your notebook. Export your completed notes and upload them to Sakai.
- Labs will be completed in self-selected pairs. You will be in the same pair all semester.
- You may not collaborate with other pairs other than by discussing your work; you may not share designs and your circuit must be the work of your own hands.

Warm Up Problems:

- Warm-up problems will be assigned with each lab, they are due one day after the lab.
- You are responsible for grading your own warm up problems, and the self-graded problems are due the class period after the problems is due.
- Warm-up problems will be submitted on Sakai, so will self-graded problems. Both versions should be submitted as scans.
- I will randomly audit your self-graded and original submission to make sure there are no changed answers and you are grading yourself honestly.
- Warm-up problems should reflect your individual effort. You may consult with your peers if you make a good faith effort to solve the problem and attain individual mastery.

Videos & Quizzes

- Videos will be released shortly after each lecture period, watching them will prepare you for the next lecture. Watch them actively, completing activities and taking notes.
- Each lecture period will begin with a quiz on the videos assigned for the lecture
- The quiz will first be completed individually then as a small group.
- Your score on the quiz is the average of your score and your group's score.

Design Projects:

- You have two design projects, which are like larger, less structured labs
- Design projects are also completed with your lab partner.
- Instead of the lab notebook entry documenting the design and testing process, design projects should be submitted with a brief report. This report must be based on the template report on the website. In filling out this template you will describe the design process, explain the final design, describe the testing process for the circuits, compare calculated, simulated and measured performance of the design, and explain any discrepancies between these quantities.
- Design reports should be no longer than five pages, fewer is acceptable. Use IEEE citation format and ensure that every figure has a caption.
- The audience for the design report is another student of the class, you may use sophisticated technical language, and you don't need to introduce basic calculations.

Skill Mastery Problems

- In class, you may request to take exam-style questions on individual skills in the class in keeping with the skill mastery schedule on the website.
- You may request more questions on the same skill in future classes or office hours if the sunset date for a skill has not yet passed.

Grading:

- Warm-up Problems 5%
- Quizzes 5% Half credit assigned to individual quiz, half to group quiz
- Labs 40% 4% per lab for 10 labs
- Design Projects 20% 10% per design project, which comes to 5% per week
- Exams 10% Weighted avg of midterm & final, better score weighted 2/3
- Mastery 20% Based on number of skills mastered

Late Work

I am very flexible about extensions so long as I know about them in advance and they don't interfere with my graders. If an extension extends past the reveal of answers in class or online, I trust you not to refer to the published answers. All work still needs to be completed. Talk to me.

Lab Access

The projects for this class will require the use of power supplies, function generators and oscilloscopes. These tools are available in many labs at Mudd, but we will mostly use the Analog Lab. This lab will be in heavy use this semester, and we only have top billing during our 3 hour lab meeting. If you must use the lab at a different time, do so when there are no other classes in session. Never disturb equipment for other labs.

Academic Honesty

It goes without saying that I expect the honor code to be followed carefully during this class. Any instances of academic dishonesty will be handled through the honor board.

Specific academic honesty pitfalls for this class:

- Modifying your homework after solutions have been distributed
- Copying another student's design during lab
- Allowing students other than your partner to build or measure your circuits
- Unattributed schematics or reference designs (eg: from data sheets) in lab notebooks

Harassment

I am committed to making this class a safe space for people of all genders, sexual orientations, races, cultures, religions, disabilities, political affiliations and socioeconomic classes. Please be kind to one another and try to form an inclusive community. Please report any instances of harassment which might undermine or harm our community to me.

Academic Accomodations

If you would like to request academic accommodations due to temporary or permanent disability, contact the Office of Disability Resources at (909)-607-3148 or ability@hmc.edu . Appropriate accommodations are considered after you have conferred with the Office of Student Disability Resources and presented the required documentation of your disability.

Title IX

If I learn of any potential violation of our gender-based misconduct policy (rape, sexual assault, dating violence, domestic violence or stalking), I am required to notify the HMC Title IX Coordinator. Students can request confidentiality from the institution, which I will communicate to the Title IX Coordinator. If students want to speak to someone confidentially, they can contact the EmPOWER Center at (909) 607-2689, Monsour Couseling Center at (909) 621-8202 or the McAlister Chaplains at (909) 621-8685. Speaking with a confidential resource does not preclude students from making a formal report to the Title IX Coordinator at a later time.