E157 Syllabus

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Welcome to E157! This class teaches design and analysis of circuits that operate at radio frequencies (RF), with an emphasis on microwave design, measurement techniques, and communication links. I am excited about this material and very excited to have you in the class!

At the end of this class, you should be able to complete a clinic project involving high speed board designs or antenna characterization. You'll learn these skills on the way to that goal:
- Identify when RF theory and techniques are important
- Understand common RF equipment, simulations and graphical tools
- Make a link budget for a communication system
- Design a printed circuit board with fast signals on it

Schedule and Electronic Communication
- The class website is http://pages.hmc.edu/e157
- The most up-to-date schedule and communication details are on the class website
- **There is class the Monday before Thanksgiving**
- There is no final exam for the class, but design project 2 is due during finals week

Optional Reference Text
Planar Microwave Engineering, Lee. RF Integrated Circuit Design, Razavi

Supplies
Physical supplies will be provided in the RF lab (PB159). You will need the ltSpice simulator:
https://www.analog.com/en/design-center/design-tools-and-calculators/ltspice-simulator.html

Lab Access
We will request swipe access to the RF lab (PB159) for students in the class. You should only access the lab after being RF lab certified, which we will discuss in class. The RF lab is small, so each student will have a designated "priority slot" where they have top priority to use the lab.

Academic Accommodations
If you would like to request academic accommodations due to temporary or permanent disability, contact ability@hmc.edu: the coordinator for student disability resources. Appropriate accommodations are considered after you have conferred with the Office of Student Disability Resources and presented the required documentation of your disability.

Late Work
I am very flexible about extensions, so please request them when you need them. I will approve an extension so long as (1) I know about it in advance, (2) it doesn't interfere with my graders, and (3) I don't perceive it as causing you to fall too far behind. If an extension extends past the reveal of answers in class or online, I trust you not to refer to the published answers. However, there are some hard deadlines in the class: all work for labs 1-3 and DP1 must be completed before fall break, for labs 4-5 before Thanksgiving break, for lab 6 before the last day of classes, and for DP2 by the end of finals week.

Assignments and Grading (and AI/LLM Use Policies)

Large-language models (LLMs), particularly those with easily accessible interfaces like ChatGPT, Gemini, CoPilot, Claude and many others, can answer many questions in this course. Because using language models in this way can compromise the course learning goals, some uses are banned, while others are acceptable. Policies governing LLM use for each type of assignment are embedded in this page. Beware that using LLMs may not be possible in your future work, especially in industry, because of legal considerations and copyright issues.

Quizzes and the Midterm:
- There will be an in-class quiz every lecture and one exam in the middle of the semester.
- The quiz will be carried out first individually and second as a team picked by me.
- The purpose of these quizzes is to enhance learning through frequent, low-stakes recall.
- LLM use is unavailable for quizzes and the test (closed book, no notes).

Labs and Design Projects:
- Labs are due about every two weeks. See the schedule for details. Each lab has two deliverables: a problem write-up (see Theory and Practice Problems, below) and a completed digital lab notebook. Lab notebooks will be discussed in our first class; they are less formal than reports and may include supplemental files that show your data. The problem writeup should be pre-pended to the lab notebook in one big PDF file. Submit your completed work on Canvas.
- Two design projects will be presented to you, these are less structured than labs and offer you considerable design freedom. The deliverable for design projects is a brief report. This report must introduce the design process; explain the final design; describe the testing process; compare calculated, simulated and measured performance of the design; and explain any discrepancies between these quantities. A template will be provided. Use IEEE citations. The audience for the design report is another student in the class, so you may use technical language and skip introducing basic calculations.
- In-lab and pre-lab design project work will be carried out in pairs, but deliverables will be submitted individually. Notably, you must plot data individually. Discussion between pairs is encouraged.
- Learning to organize and format your data is an important part of the course, but it's fine to use LLMs to help you generate graphs or code. You may use LLMs to edit your own original writing, but I think you will find them of little use generating lab text from scratch. You must include a section in any report describing how you used LLMs. This section may not be written or edited by an LLM.

Theory and Practice Problems:
- Each lab comes with a set of theory and practice problems that are due at the same time as the lab. Submission instructions will be discussed in class.
- Problems will be carried out individually, but discussion is encouraged consistent with standard Mudd collaboration policies.
- Theory problems are designed to give you practice with a mathematical procedure. LLMs prevent you from getting that practice, so they are banned for this type of problem.
- Practical problems are designed to familiarize you with specific RF terminology. LLMs can be a useful search tool, but you must paraphrase any LLM text that inspires your answers, and you must cite the LLM. Beware that LLMs are often wrong!

Grading:

- Quizzes   5%   Half credit assigned to individual quiz, half to group quiz
- Theory/Practice Qs 18%   6 assignments at 3% each
- Labs   42%   6 labs at 7% each
- Design Projects   24%   2 projects at 12% each
- Midterm   11%

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 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. I list specific academic honesty pitfalls for this class below:

- Copying text or figures from your lab partner's notebook. Sharing data is expected, but you should make your own submission, including plotting the data on your own.
- Unattributed schematics or reference designs (from data sheets or the internet) in lab notebooks, theory/practice questions or project reports.
- See the AI/large-language model policy above as well.

Title IX

If I learn of any potential violation of our gender-based misconduct policy (rape, sexual assault, dating violence, domestic violence or stalking) by any means, I am required to notify the HMC Title IX Coordinator, Deborah Kahn. Students can request confidentiality from the institution, which I will communicate to the Title IX Coordinator if I am reporting to her. If students want to speak to someone confidentially, the resources listed below are available. Speaking with a confidential resource does not preclude students from making a formal report to the Title IX Coordinator at a later time.

- EmPOWER Center (909) 607-2689
- Monsour Counseling Center (909) 621-8202
- McAlister Chaplains (909) 621-8685

Help Seeking

College students often experience issues that may interfere with academic success, including stress, sleep issues, juggling responsibilities, life events, relationship concerns, anxiety or depression. If you or a friend is struggling, I encourage you to seek support! Definitely take advantage of Academic Accommodations and my Late Work policy, but please also seek support in the following ways:

- Chat with me in class or office hours, or send me an email or chat message.
- Talk to the academic deans (academicdeans@g.hmc.edu)
- Talk to the Office of Health and Wellness (wellness@hmc.edu)
- Visit the Monsour Counseling Center, which is open 24/7/365 and at (909)-621-8202