Final ISIM project

To date in ISIM, you've learned about sensors, instrumentation, and measurement through a series of structured one-week labs. Through the semester you've grown from following recipes to designing your own circuits. When we had you design your own circuits, we still provided some overall goals and specifications to shoot for. In the final few weeks of the class, you'll apply what you've learned to a new activity with less guidance and more freedom on the overall specifications. In this final activity you will have to set all the specifications for your measurement system.

For the end of the semester, rather than another lab report, your final deliverable will be a live demo or pre-recorded video demo. You will present your demo (or video) to us in person at the final event on Wednesday, December 12th . This final event will be informal discussion and not a formal presentation. It will be a chance for you to show us and your peers your final results working in real-time. At that time, you will also hand in a very short summary describing your overall goal, functional block diagram, circuit, and summarized data (2-page max). This final summary is NOT a lab report. Really, we mean no more than 2 pages is needed.

Just like every lab we've done this year, your project must have some aspect of measurement and calibration. It should not rely on circuits that are radically different than what we have studied – we want you to design your circuit, not just copy some complex design that you found online. There are numerous resources where you can gain some inspiration, but the final circuit should be yours.

So what is the project?

You may either invent your own project, of you can use one of the ideas below.

- **Color sensor**. Distinguish or identify different colors.
- **Salinity sensor**. Measure the salt concentration of water.
- **Pulse oximeter**. Determine the oxygen content of your blood by shining light through your finger, a common device in hospital settings.
- **Glucose meter**. Measure glucose concentration using off the shelf test strips, emulating how devices for diabetes monitoring work.
- **Auditory localization**. Determine the direction a sound is coming from.
- **Lie detector**. Are we lying to you? You tell me.
- **EEG**. Brainwaves. This is a hard one to do and know if it is working or not.
- **Spy window**. Pickup what is being said inside a room by monitoring minute vibrations in the window glass. This is a challenging one to do.

We are also open to ideas that you may have. If you suggest an idea, we will need to approve your proposal so that we believe the project is appropriate for the course and manageable in the time you have to work. You will need to leave class on Week 1 with one of the instructors giving the OK on your idea. If you want to propose your own idea, it must follow these general guidelines:

1. The idea must fit within the spirit of the course (instrumentation, sensors, and measurement). No robots. No control projects. No input devices for video games. No radios. No software projects.

2. While you can use projects you find online for inspiration, you should not just be copying someone else's work.
3. The project must be manageable with given time and resources.
4. The project can't rely on specialty sensors that we don't have, are expensive, or have long shipping times.
5. If you will need anything beyond standard R, C, and op-amps that we have in-house– you will need to provide us an exact part number from DigiKey by the close of business on Friday, November 16.

Teams

You will work in pairs on the final project. You must work with someone else from your section.

Weekly schedule

There is not much time left in the semester, so this project will be fairly short. We will try to help you keep your project properly scoped so you are not taking on too much work. The basic schedule and deliverables are:

Week 1: Nov 12-16. In the first week you should figure out what you are doing, what your overall goal is, how you will generally go about tackling the problem and creating a simple block diagram of your system. A short ~1 page report is due by the end of the week (ideally you will finish this in class). The short report should have a description of what you are doing, a sketch of a functional block diagram of your system, and a list of any parts you will need beyond our standard stock (specific DigiKey part numbers).

Week 2: Nov 26-30. This week you should conduct your first tests and try out your basic ideas. You will need to spend the time you would usually devote to writing your lab, to coming back to the lab and conducting some experiments.

Week 3: Dec 3-7. This week you will want to refine your design and start working on your final testing. You will turn in at the beginning of your lab day (as if it were a usual lab) a very brief lab report. This will count as a normal lab. This report should be 1-2 pages at most. This report should have a circuit diagram, the current functional block diagram, and one decent looking plot of some kind of preliminary result.

Schedule

Week – date	In-class activity	What's due?	When is it due?
1 – Nov. 12-16	Preliminary design and testing	Short proposal and block diagram	Friday, Nov. 16
Nov. 19-23	Thanksgiving	Eating	All week
2 – Nov. 26 – 30.	Build circuit, test ideas	Nothing	
3 – Dec. 3-7	Finalize data and testing	One good plot, circuit diagram	Your lab day
4 - Dec 12		Demo and short report	