SIO 179 – Ocean Instruments and Sensors

Fall qtr. 2023

Instructor: Todd Martz, MESOM 337, x47466, trmartz@ucsd.edu
Location: MESOM 330
Lab Location/Time: Fri 10a-12p Makerspace
                            Tu 1pm-4pm Makerspace
                            Thu 1pm-4pm Makerspace
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Theme
Apply modern and classic techniques for analysis of seawater, introducing concepts of signal transduction, calibration, and measurement quality control. Emphasis will be placed on sensor metrology. Computer automation will be used to perform basic functions including instrument control, data storage, and on-the-fly calculations. Students will apply techniques from several branches of engineering to the marine sciences.

Requirements
This is a hands-on laboratory course. During the first half of the quarter, students will complete a series of assignments designed to calibrate an oceanographic CTD sensor. Students will then conduct a 4-week project and presents the results during finals week. Class meets once per week for up to 2 hours to cover theoretical overview and open discussion of the experiment or data analysis. Homework will be in the form of laboratory preparation and completion of reports.

Laboratory time will be scheduled by the instructor based on availability of equipment and individual teams' schedules and is expected to require ~6-8 hours per week. Grades will be based on participation in lab, quality of the reports. Grading considerations will include comprehension of the material, presentation of data (i.e. quality of graphs, figures, and tables), data interpretation, report organization & overall clarity. All lab reports undergo a single revision cycle and the grade is based on the revised report.

Prerequisite Knowledge
No prerequisite courses are required, but the advanced nature of projects is intended for those with some background knowledge in at least one area of engineering, physics, or chemistry. Advanced concepts related to marine chemistry and engineering will be introduced and reviewed as needed.

Course Materials
- Computers will be available in the lab. Several exercises use LabView and Matlab. Although not required, it may be convenient to load the student versions (free through UCSD) of these software packages onto your computer.
- Instrument product manuals and datasheets will be added to Google Drive.

- A variety of research quality instruments and sensors will be available through the instructor's laboratory.
- Any additional materials will be discussed during the first class period.

Approximate Schedule for FA23

Week	Topic	Lab Activity
1	Serial communication	Communicate with serial device, record data
2	Signal transduction	frequency counter or analog PT100 cal
3	PID control	Assemble and program thermostat bath
4	PID control	Assess performance of thermostat bath
5	Temperature	Calibrate SeaBird thermistor
6	Salinity	Calibrate SeaBird conductivity sensor
7	Group projects	Group projects
8	Group projects	Group projects
9	Group projects	Group projects
10	Group projects	Group projects

Group projects must be approved by week 5.
Suggestions for 4-week group projects:
- Assemble SeapHOx, test/validate in tank
- O_2 Saturation test with sensors + Winkler titrations
- Assessment of benchtop UV nitrate with Genesys spectrophotometer
- Advance the UDA-based salinometer design started in FA22
- Examine GO-BGC profiling float data
- Examine pier SeapHOx data