**SIO 179 – Ocean Instruments and Sensors**

**Fall qtr. 2024**

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

TA: Pete Ahlers pahlers@ucsd.edu

Staff: Dalton Rust darust@ucsd.edu

**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. Students will complete a series of assignments designed to calibrate an oceanographic C-T sensor and autonomous instrument packages. 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 FA24

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| Week | Topic | Lab Activity |
| 1 | Signal transduction, Intro to LabView | RTD interface, LabView tutorial |
| 2 | Temperature standards/cal | Calibrate RTD |
| 3 | Serial communication | Log serial data |
| 4 | PID control | Assemble thermostat bath |
| 5 | PID control | Tune PID |
| 6 | PID control | Assess performance of thermostat bath |
| 7 | Temp/Cond calibration | Calibrate SeaBird C&T sensors |
| 8 | Temp/Cond calibration | Calibrate SeaBird C&T sensors |
| 9 | SeapHOx | Assist with calibration of SeapHOx units |
| 10 | SeapHOx | Assist with calibration of SeapHOx units |