

1. Course Number and Title

ORE 653 Ocean Instrumentation and Technology

2. Credits and Contact Hours

3 credit hours, two 1.25-hour sessions per week

3. Instructor

Michael Krieg

4. Class Textbook

Textbooks: None

Reference books:

- a. M.L. Menn, *Instrumentation and Metrology in Oceanography*, Wiley-ISTE, 2013
- b. J.E.C. Garcia, *Coastal Ocean Observing: Platforms, Sensors and Systems*, Springer, 2018.
- c. R. Venkatesan, A. Tandon, E. D'Asaro, & M.A. Atmanand *Observing the Oceans in Real Time*, Springer International Publishing, 2018

5. Course Information

- a. Course Content: The course introduces students to modern oceanographic instrumentation. Students are exposed to this information through a series of lectures, and homework assignments, culminating in a class project tailored to the interest of the enrolled students that may include, but is not limited to, building and deploying simple sensors, running diagnostics on an existing instrument, 3D printing to improve/modify existing design, developing software to communicate with sensors/instruments, running through calibration procedures.
- b. Prerequisites: Instructor consent
- c. Designations: Elective

6. Specific Goals for the Course

- a. Learning Outcomes: This class is meant to provide an overview of past, present, and emerging technologies and instrumentation that support oceanographic and marine operations. Will cover the design, operation, and maintenance of the mechanical, electrical, and computing components of these systems.
- b. Student Outcomes: (2) Core Program. (3) Option Area. (4) Problem Formulation. (6) Communication. (9) Research and Experimentation.

7. Brief List of Topics to be Covered

- a. Historical overview of past, present and emerging marine technologies
- b. Marine technological needs
- c. Global hydrographic programs, cabled networks, sensor arrays
- d. Remote sensing and platforms
- e. Sampling strategies and requirements
- f. Metrology
- g. Sensors and transducers: marine physical, chemical, biological properties
- h. Mechanical design considerations for oceanographic elements: biofouling, turbulence, instrument recovery, payload limitations, high pressure, etc.

- i. Electronics: simple MCUs, reading schematics, op-amps, design considerations (cables/ connectors, noise, temperature, pressure, power)
- j. Programming languages overview
- k. Data storage and transmission
- l. Signal Processing
- m. Troubleshooting, diagnostics
- n. Calibration
- o. Prototype technologies and TRL designation