

Advanced Oceanographic Field Methods

XAS NS 324 (4 credits)

Course Catalog Description (max. 40 words):

Tools and techniques of the oceanographer. Participate in shipboard laboratory operations to gain experience with deployment of modern oceanographic equipment and collection of scientific data at sea. Emphasis on sampling plan design, advanced laboratory sample processing methods, and robust data analysis.

Instructor(s): Sea Education Association Oceanography Faculty

Location: At sea aboard SEA sailing school vessel.

Prerequisites: Admission to SEA Semester. Three lab science courses (one at the 300-level or higher) or permission of instructor.

Course Philosophy and Approach:

Advanced Oceanographic Field Methods is an at-sea practical skills course in shipboard laboratory management. Students will learn sample plan design, standard operating procedures for safe deployment/retrieval of modern oceanographic sampling equipment, accurate recording of metadata associated with each sampling station, advanced laboratory sample analysis methods, and robust data analysis. Direct operation of the onboard instruments will help students appreciate the limitations of various sensing technologies and to critically evaluate the data they collect. During the research cruise, students gradually assume greater responsibility for deployment and data management.

This course consists of 10 lecture/discussion sessions (1.5 hours each), 1 practical exam (2 hours), and a minimum of 45 hours of supervised laboratory watch participation (active learning/laboratory) across ~30 underway days at sea.

Learning Outcomes:

1. Familiarity with safe operation, underlying operating principles, and inherent limitations of standard oceanographic equipment: hydrographic winch, Conductivity Temperature and Depth (CTD) probes, 12-Niskin bottle rosette water sampler, *in situ* Seapoint fluorometers to measure chlorophyll-*a* concentration in seawater, RD Instruments OceanSurveyor 75 KHz hull-mounted Acoustic Doppler Current Profiler (ADCP) to measure upper-ocean currents, Knudsen 326 full ocean depth profiler for acoustic seafloor mapping, surface and subsurface nets for zooplankton sampling.
2. Recognize the importance of and practice accurate data recording.
3. Familiarity with fluorometric and spectrometric methods for seawater sample analysis.
4. Ability to interpret and evaluate data in real-time.
5. Participate and contribute as an essential member of a working research laboratory.

Evaluation:

Daily Reports	10%
Deployment Descriptions	20%
Instrument Design and Function Report	20%
Practical Exam	20%
On-Watch Evaluation	30%

Assignments:

Daily Reports: Each underway day at sea, the student team assigned to laboratory watch from 0300-0700 will prepare an oral report to be presented at class time. The report will summarize deployment activity and oceanographic trends during the past 24 hours. The report will also include a description of a topical oceanographic concept, recently collected organism, or instrument function.

Deployment Descriptions: In order to demonstrate proficiency, each student will complete a detailed description of deployment procedures for two pieces of oceanographic equipment.

Instrument Design and Function Report: Each student will research and present on the critical design features, function, and limitations of a particular piece of oceanographic instrumentation in use aboard SEA's research vessels.

Practical Exam: One practical exam, during the second week of the research cruise, will review deployment and analytical methods, materials, equipment, daily class content and the oceanography experienced on the cruise track.

On-Watch Evaluation: Much of your learning will occur at all hours of the day and night as you carry out all scientific operations. The Assistant Scientists are best able to evaluate your overall progress, including performance in and knowledge of lab routines as well as the *attitude* you bring to each and every watch; all three Assistant Scientists will contribute to your individual assessment for this course.

Expectations and Requirements:

- Punctual attendance is required at every class meeting.
- Active participation on watch and in class discussion is expected.
- Late assignment submissions are not accepted.
- The policy on academic accuracy, quoted below, will be strictly followed in this class.

The papers that you submit in this course are expected to be ***your original work***. You must take care to distinguish your own ideas and knowledge from wording or substantive information that you derive from one of your sources. The term "sources" includes not only published primary and secondary material, but also information and opinions gained directly from other people and text that you cut and paste from any site on the Internet.

The responsibility for learning the proper forms of citation lies with you.

Quotations must be placed properly within quotation marks and must be cited fully. In addition, all paraphrased material must be acknowledged completely. Whenever

ideas or facts are derived from your reading and research, the sources must be indicated. (Harvard *Handbook for Students*, 305)

Course Calendar:

Topic	Readings/Assignments Due
<i>Weeks 1 and 2 (21 hours) – at sea</i>	
Phase I: <ul style="list-style-type: none"> • Introduction to the Shipboard Laboratory • Oceanographic Equipment Capabilities • Safe Deployment of Oceanographic Equipment Class Topics: <ul style="list-style-type: none"> • Sample Plan Design • Hydrowire Deployment Demonstration • Neuston Tow Deployment Demonstration • ADCP – Currents and Vertical Migration 	<i>Daily Reports</i> <i>Deployment Descriptions</i> <i>On-Watch Evaluation</i>
<i>Weeks 3 and 4 (21.5 hours) – at sea</i>	
Phase II: <ul style="list-style-type: none"> • Increased Responsibility for Lab Routines • Practice Deployments <i>Practical Exam</i> Class Topics: <ul style="list-style-type: none"> • Biological Sample Processing • Fluorometry – Chlorophyll Analysis • Spectroscopy – Nutrient Analysis 	<i>Daily Reports</i> <i>On-Watch Evaluation</i>
<i>Weeks 5 and 6 (19.5 hours) – at sea</i>	
Phase III: <ul style="list-style-type: none"> • Apprentice Lab Manager <i>Instrument Design and Function Report Presentations</i> Class Topics: <ul style="list-style-type: none"> • Argo Float Program Summary and Deployment • Sub-Bottom Profiler - Regional Geology – Island Formation 	<i>Daily Reports</i> <i>On-Watch Evaluation</i>