

Course number and title: Physics 6314 EN-9098 - Field Oceanography

A course proposed by:

Ralf Bachmayer (Faculty of Engineering and Applied Science)

Brad deYoung (Department of Physics and Physical Oceanography)

Rationale: Oceanography is a multidisciplinary field of research that brings together applied mathematics, biology, chemistry, engineering, geology, and physics. In that regard, MUN offers graduate studies in oceanography through many departments (e.g. Biology, Earth Sciences, Engineering and Applied Science, Ocean Sciences Centre, Physics and Physical Oceanography). However, there are currently little opportunities for MUN graduate students to be exposed to the multidisciplinary nature of field oceanography. This course is intended to integrate MUN oceanographic graduate students across disciplines.

Description: This course is intended for graduate students in all fields of oceanography (biology, chemistry, geology, physics) and ocean engineering. Mechanical, electrical and computer engineering students are also encouraged to participate. The student goals of the course are: 1) to develop a general understanding of the operating principles of a variety of oceanographic instruments, 2) to learn how to design an oceanographic field sampling program, 3) to provide hands-on learning experiences at sea, 4) to learn how to analyze and interpret oceanographic measurements in a interdisciplinary context.

Prerequisites: Instructors' approval

Format and topics

This course is divided into three parts:

1. Theory (3-4 weeks, lectures 3 hours / week, co-taught by instructors)
 - Theory of sensors
 - Sampling platforms
 - Sampling techniques
 - New concepts in sampling
 - Adaptive sampling
 - Multi-platform approach
 - Design of a sampling campaign to answer a scientific question using the available platforms and their constraints (availability included)
 - Security at sea
2. Field course aboard the Marine Institute's training and research vessel (~ includes overnight stay onboard)
 - Obtain experience in handling the available sensors and associated data acquisition-systems.
 - Executing and adapting the previously planned campaign in the field.
 - Prior to work at sea, safety training will be provided to every participant by a qualified mariner. Safety training generally includes a tour of the ship, review of procedures in case of fire and other emergencies, and a practice to put on survival suits.

3. Data-analysis (7-8 weeks, directed teaching in a workshop environment, 3 hours / week)

- Turning data into information
- Data-fusion
- Data analysis techniques (filters, spectra, plotting, etc.)

Evaluation:

Scientific poster (co-authored): 20%

Term paper (individual): 60%

Oral presentation (individual): 20%

Scientific poster: Students work in teams of 3-4. During Week 9, each team has to present a co-authored scientific poster showing the preliminary results of their field sampling campaign. This will be done in a conference-like setting where instructors and other students will discuss with the authors in front of their posters.

Term paper: Each student has to write a concise, journal-quality paper synthesizing the results of their research.

Oral presentation: Each student has to give a short, 15-min (including questions) conference-like oral presentation.

Instructors

This course will normally be co-taught by 4 instructors from different disciplines. The authors of this document are potential instructors and many other faculty members from various departments would be qualified to teach this course. Teaching credits for this course will be discussed individually between each instructor and the Head of their respective Academic Unit.

Instrumentation available

Biology

- Small box corer or multicorer (also for *geology*)
- Ring nets
- Tucker trawls with flowmeters
- Flume (lab tool) and Acoustic Doppler Velocimeter
- CHN analyzer
- Image analysis
- Plankton pump
- Video plankton recorder
- High volume plankton pump
- Tanks with flowing seawater at OSC possible

Geology

- Edgetech XS3200 subbottom profiling system
- Edgetech 4100P sidescan sonar

- Horiba laser-diffraction particle analyzer
- Digital X-ray imaging system for core samples
- Ovens for drying samples and determining water content

Physics

- Gliders
- Oxygen sensor (Aanderaa)
- RDI and Nortek ADCP (300, 400, 600, 1200 kHz)
- BioSonics echo-sounder (150, 200, 400 kHz)
- Towed body
- TowYo
- Seabird CTD
- Niskin water bottles
- Turbulence profiler
- Attitude/heading/GPS