OCSC 2500 - *Introduction to Practical Ocean Sciences* (Spring 2019)

Course Coordinator:

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Course Format:

Two-week, team taught, field course: 20 to 31 May, 2019, from 09:00 to 16:00 (except on field days, see schedule below), with preparatory/recap evening work as required.

- Lectures, discussions, meetings: OS-3000 (Challenger Room, OSC)
- Field- and/or ship-based work and sampling: several sites in the St. John's area (to be announced)
- Lab-based work: OSC (rooms to be announced)

Course Description:

Introduction to Practical Ocean Sciences explores the instruments, techniques, and analytical methods commonly used to study marine life and processes, chiefly focusing on the interaction between living organisms and their chemical, physical and geological environment. The course combines ship-based or shore-based sampling and data collection with laboratory investigation in an intensive 2-week long format. It is primarily intended for mid-level undergraduate students majoring in Ocean Sciences and Marine Biology. This course will either be offered during a special session following the Winter semester, or in the Spring semester.

Learning Objectives:

In this course, students will learn to:

- Apply efficient and safe operating techniques to the use of modern field and laboratory instruments common in ocean studies;

- Record and organize accurate laboratory and field notes;
- Extract, synthesize, compare, and interpret oceanographic data;
- Report basic research results, including statistical and graphical exploration of data;
- Formulate the results of data analysis and interpretation in writing and orally;
- Appraise the advantages and limitations of various laboratory and field methods in ocean sciences.

Course Schedule (subject to change based on weather conditions):

This course is divided in five (5) thematic modules. Each instructor is responsible for one module based on her/his area of expertise. Each module typically addresses a collection of instruments and associated techniques and analytical methods belonging to a specific domain of ocean sciences. Each module is divided in three segments:

Segment 1 (S1-T) is largely theoretical / conceptual, addressing, in a lecture (classroom) format, the nature and importance of key ocean characteristics and the instruments commonly used to measure these characteristics. This segment provides the background knowledge necessary to undertake Segment 2.

Segment 2 (S2-P) is practical, addressing, in the field (shore- or ship-based work), how to configure, deploy, operate, and recover instruments. This segment is used to collect samples and/or generate new data from the instruments that will be analyzed in Segment 3.

Segment 3 (S3-A) is analytical, addressing, in the classroom and/or laboratory, how to extract, synthesize, compare, and interpret data acquired in Segment 2.

The course runs at the OSC from 9:00 to 16:00 on most days. Field days to address Segment 2 of the modules will be a little longer to optimize the learning experience, with the following tentative schedule:

Typical daily schedule:	08:30-09:00	Load bus with equipment (CIs + TA + students)
(SHIP- or SHORE-based	09:00-09:45	Travel to site (students, CIs, TA; on route briefings)
segments)	09:45-10:30	Preparation of equipment and assignment of teams + responsibilities
	10:30-12:00	Sampling (Module 1)
	12:00-12:30	Lunch **on your own*** + debriefing
	12:30-14:00	Sampling (Module 2)
	14:00-15:30	Sampling (Module 3)
	15:30-16:00	Load bus with equipment (CIs + TA + students)
	16:00-16:45	Travel to OSC (on route debriefing for each module)
	16:45-17:00	Offload bus + rinse equipment (CIs + TA + students)

* Lunch time will be relatively short (~30 minutes) to optimize field time. There will be little to no time to shop around for food. We recommend that you bring your own lunch not to miss the mandatory lunch debriefing and/or transportation to other sites.

Day	Date	Morning	Afternoon
1 (M)	May 20	- Course syllabus (PG; 9:00-9:30) - Overview of ocean sensors and sampling techniques (PG; 9:30-10:00) - Ocean Networks Canada (DR; 10:00- 12:00)	- Assessment rubrics (PG; 13:00-14:00) - Completion of Personal Review and Preparation (PRP)* (PG; 14:00-16:00)
2 (T)	May 21	- MUN lab and field safety aspects (MB; 9:00-9:45) - Lab/Field books (PG; 9:45-10:30) - Guided discussion (PG, DR; 10:30-12:00)	- Module 1: S1-T (RS; 13:00-16:00)
3 (W)	May 22	- Module 2: S1-T (JS; 09:00-12:00)	- Module 3: S1-T (PG; 13:00-16:00)
4 (T)	May 23	- Modules 1, 2, 3: S2-P (RS, JS, PG; 8:30-17:00)	
5 (F)	May 24	- Modules 1, 2, 3: S3-A (RS, JS, PG; 9:00-16:00)	
6 (M)	May 27	- Preparation and delivery of reports for Modules 1, 2, 3 (RS, JS, PG; 9:00-16:00)	
7 (T)	May 28	- Module 4: S1-T (IF; 09:00-12:00)	- Module 5: S1-T (AE; 13:00-16:00)
8 (W)	May 29	- Modules 4, 5: S2-P (IF, AE; 8:30-17:00)	
9 (T)	May 30	- Modules 4, 5: S3-A (IF, AE; 9:00-13:00)	- Preparation of reports for Modules 4, 5 (IF, AE; 14:00-16:00)
10 (F)	May 31	Preparation and delivery of reports for Modules 4, 5 (IF, AE; 9:00-12:00)	- Student oral presentations (All instructors; 13:00-15:30) - Debriefing + CEQs (PG; 15:30-16:00)

* PRP: Personal time provided to complete assigned readings in preparation for the course. Material to read will be communicated via the OCSC-2500 Brightspace shell the week before the course begins.

AE: Alexandra Eaves; MB: Mark Bailey; IF: Ian Fleming; PG: Patrick Gagnon; DR: Dave Riddell; JS: Javier Santander; RS: Rachel Sipler;

Overview of modules:

Module 1 - Water Column Characteristics and Plankton Dynamics (RS): Conductivity; Depth and temperature (CTD) profiles; Niskin sampling; Water filtration and sample collection; Nutrient dynamics; Zooplankton net tows; Basic plankton identification.

Module 2 - Marine Microbiology (JS): Importance of microbes in the ocean - sampling methods (e.g. water, sediments, and marine organisms tissues); Bacterial culture and selection; Bacterial shape and microscopy; Microbial diversity and molecular identification - PCR, DNA gel electrophoresis, and 16S analysis.

NOTE: This module includes techniques requiring preparatory familiarization with biosafety aspects. Students should read the following document in preparation for the course:

https://www.mun.ca/health_safety/OHSMS/BSMS/MUN_Biosafety_Manual_2016-01-27.pdf

Module 3 - Benthic Habitat Sampling and Mapping (PG): Scale, Scuba techniques; Photography, Videoing, Water motion sensors, Wave tanks; Drop and tow camera surveys; ROV; Geographic Information System (GIS).

Module 4 - Fish Population Ecology and Behaviour (IF): Fish population sampling (e.g. seine netting, baited traps, trawls, electrofishing); Species identification; Morphological measurement; Aging and growth; Tagging (mark recapture, passive integrated transponders); Biotelemetry, Genetics; Fish husbandry

Module 5 - Fish Health Surveillance (AE): Overview of challenges to fish health, conditions and indicators; Non-lethal and lethal surveying and sampling methods; Screening and assays used for characterization of fish health; Dissection, parasite identification and documentation of findings.

Recommended Textbooks:

None. Material for the course such as links to Oceans Network Canada (ONC)'s online modules and scientific articles from MUN-subscribed journals will be accessible via the Brightspace course shell. Material to consult will be communicated ahead of modules by each instructor.

Prerequisites:

Science 1807, OCSC 1000, at least three of OCSC 2000 (or BIOL 3710), 2001, 2100, 2200, 2300

Evaluation:

- Preparation (5 modules @ 3% each)	15%
- Participation (5 modules @ 3% each)	15%
- Lab/Field book (5 modules @ 4% each)	20%
- Reports (2 reports @ 15% each)	30%
- Oral presentation	20%

Preparation: Every student completes preparatory assignments before the first day of class. This may include assigned readings of scientific papers or book chapters. The goal is to equip all students with relevant background knowledge to undertake the various course modules.

Participation: Students are expected to participate actively in all aspects of the course. Every student is assessed continuously throughout the course on his/her level of involvement, from the sharing of ideas and opinions during discussions, to the manipulation and good care of the equipment, to the general attitude and level of preparation before and during class-, field-, and lab-based activities. Timely submission of Lab/Field books and Reports will also be considered in the participation grade.

Lab/Field book: Each student must purchase a notebook (Lab/Field book) to keep a permanent record of her/his work on all three aspects (S1-T, S2-P, S3-A) of the five modules. Each student is expected to maintain detailed, accurate, and legible notes that can be understood by any of the course instructors and teaching assistants. The notebook is assessed multiple times; the schedule of submissions will be communicated in the classroom. The content of the notebook is instrumental in preparing the two written reports (see below).

Reports: Students prepare, in teams, two reports outlining for each thematic module the methods and main results of data analysis with key interpretation. Delivery of the first report, which covers Modules 1, 2, and 3, is at the end of Day 6. Delivery of the second report, which covers Modules 4 and 5, is in the middle of Day 10. A detailed report template will be provided.

Oral presentation: Students prepare and deliver, in teams, a slideshow covering the methods, results, and interpretation of 3 modules of their choice. Advice to create efficient slideshows will be provided.

Plagiarism:

As outlined in Section 4.12.4 of MUN's Calendar, plagiarism (the act of presenting the ideas or works of another as one's own) is a form of academic offence. Plagiarism will not be tolerated in this course. Any student who plagiarizes another's work exposes himself/herself to the disciplinary measures outlined in section 4.12 of MUN's Calendar, which includes course expulsion. We will provide clear guidelines on how to avoid this problem.

Suggested strategy to do well in this course:

1) Think safety first. The foremost consideration for any course with a field component is **SAFETY**. Do not let the manipulation of instruments or collection of data override the safety aspect of your work. If you are concerned for your safety, do not hesitate to discuss it immediately with the course instructor(s).

2) Dress warm on field days. Bring a **raincoat and pair of rain boots** if available. Good footwear (rain boots or waterproof hiking boots) are a good idea no matter what the weather is like, as is something warm to cover up your head (e.g. a tuque) and hands (e.g. gloves) - even if sunny and 25°C. Bring a few (~10) sheets of paper (ideally waterproof, "Rite in the Rain" type of paper) and pencils to take notes during your bus trip and shore/ship excursion. You do not need to bring a PFD (Personal Floatation Device) as we will provide them. Bring a lunch, snacks, and plenty of fluids with you as we will return to the OSC only at the end of the day.

3) Show up on time and prepare. This course is loaded with hands-on activities, which require working collaboratively on tight schedules. If you are late, everyone will be. Follow all the instructions for preparation carefully.

4) Ask questions. If a question comes to mind, chances are that most classmates have the same question. Do not hesitate to ask for clarification.

5) Seek help outside of daily schedules. Do not hesitate to ask the instructor(s) or teaching assistant(s) to meet if you experience any difficulty that could not be addressed during normal daily schedules. We are flexible and certainly willing to help you do well in the course!

6) Use of personal laptop: Do not hesitate to bring your personal laptop to the classroom and use it to take notes, analyze data, and prepare your written reports and oral presentation slideshow. There will be a few computers available at the OSC with foreseeable delays depending on demand.

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