



Appledore Island, Isle of Shoals, Kittery, Maine
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Shoals Marine Laboratory
Underwater Research (BIOSM 3650/MEFB 730)
July 11 - 25 2022

Course Syllabus and Schedule

Faculty: Dr. Jarrett Byrnes (jarrett.byrnes@umb.edu)
Dr. Becca Selden (bselden@wellsley.edu)
Becca Toppin (DSO) (Becca.Toppin@unh.edu)
Breckie McCollum (TA) (breck.mccollum001@umb.edu)

Prerequisites: One semester of college level biology or equivalent and recognized SCUBA certification. Additionally, accepted students must apply for approval to SCUBA dive at Shoals Marine Lab.

Class enrollment limit: 12

Credit hours: 3

Course Objectives/Goals:

- To recognize and conduct good research by:
 - o Developing skills in critical and constructive thinking via reading and orally critiquing several papers reporting current subtidal research
 - o Designing an original research proposal requiring the development of hypotheses and their subsequent evaluation through
 - Design of sampling protocol and experiments
 - Appropriate statistical analysis of preliminary data
 - Formal written proposal (incorporating preliminary data)
 - o To recognize and identify common species of subtidal invertebrates, vertebrates, and algae associated with the Isles of Shoals and in the Gulf of Maine
- To understand key marine ecological concepts, both general and specific to the Gulf of Maine
- To recognize and understand how anthropomorphic activities (pollution, climate change, etc.) are changing the marine environment, both globally and within the Gulf of Maine
- To understand the physiological limitations of working underwater and learn how to collect data underwater in an efficient and safe manner
- To complete necessary training (100 classroom hours and 12 dives) leading to AAUS (American Association of Underwater Scientists) Scientific Diver Status

Course Materials:

First aid instruction books



Cornell University



University of
New Hampshire

Assignments & Grading:

Grades:

- a. Research Proposal: 38%
- b. Final Exam: 38%
- c. Paper Discussions: 12%
- d. Underwater Organism Exam: 8%
- e. Paper Summary: 4%

Research Proposal:

During the second week of the course, students will design a Research Proposal and conduct original research on a subject of their choice. Students work closely with the instructors to formulate research questions (based on observations made during the first week and/or lectures) and the appropriate sampling and experimental design to answer the questions. Due to time constraints and the nature of collecting data underwater, the research proposal will utilize preliminary data that can be collected within the time frame of the course. The proposal offers students the opportunity to observe patterns, design their own project, test specific hypotheses, analyze preliminary data and interpret results, and design sampling regimes and experiments that would be done if sufficient time was available. Accordingly, it represents the culmination of everything learned in UWR. Proposals will be evaluated based on scientific soundness.

Final Exam:

The final exam consists of 14-17 essay questions covering all aspects of lectures. Questions will not deal with minute specifics, but will emphasize broad concepts. Some questions may present new information related to subtidal ecology and will require synthesis of lecture and field material along with formulating hypotheses for the best answer.

Paper Discussions:

Pairs of students will read and critically evaluate current papers assigned from the primary literature. Results of their analysis will be presented to the class in the form of an organized discussion. Additionally, all students are expected to have read and comprehended the papers in preparation for the group discussions. Grades will be assigned to both the discussion leaders and student participation.

Underwater Organism Exam:

Groups of four students will be lead by one of the instructors on an underwater "tour". The instructor will point to various organisms *in situ* and students will be asked to identify the organism by scientific name on their underwater slate. Slates will be collected at the dives' conclusion and graded.

Paper Summary:

Students will prepare a written summary and evaluation of a philosophical paper of their choice. This paper is in addition to the papers presented and evaluated by students during evening discussion sessions.

Expectations and Conduct:

Students are responsible for fully understanding all of the information presented in this syllabus. If there are any questions regarding this information, it is the student's responsibility to bring it to the instructor's attention. In addition, students are responsible for attending all activities associated with this course and completing all assignments. Students are responsible for asking questions any time they need clarification (remember, there is no such thing as a bad question).

Every student is responsible for their own behavior- specifically in being respectful and collegial to other students and with instructors. Students are responsible for fully understanding and adhering all of the information presented in the SML Appledore Handbook (http://www.sml.cornell.edu/sml_forms.html)

1. *Personal Technology.* Do not use cell phones, smart phones, iPads, mp3 players, headphones, or similar devices in the classroom or during course activities. If you take notes with your computer, disable wireless access during lecture

2. The lab has a modest computer facility in Loughton Library; please treat this shared facility with respect. Printers are available, but please limit printing to your FINAL document (if required).
3. *Transmission of Course Materials.* Students are not authorized to replicate, reproduce, copy or transmit lectures and course materials presented, or derivative materials including class notes, for sale or free distribution to others without written consent of the instructors who are the original source of the materials.
4. *Academic Integrity.* Any work submitted must be your own. Uncredited use of another person's words, data or images is considered plagiarism, a serious violation of the Code, whether the material comes from another student, a web site, or a published paper. Students must adhere to Cornell's and UNH's Policy for Academic Honesty/Plagiarism and Discrimination
 - a. Cornell: <http://cuinfo.cornell.edu/aic/cfm>
 - b. UNH: <http://www.unh.edu/vpsas/handbook/welcom-university-new-hampshire>
5. *Disabilities & ADA Accommodation:* Students with a disability must contact Cornell's (420 CCC building; 607-254-4545) or UNH's Student Disability Services (<http://www.unh.edu/disabilityservices>) four weeks prior to start of class for confidential discussion of needs and for registration to verify eligibility for academic accommodations. No retroactive accommodations can be made.
6. *Mental Health:* Shoals Marine Laboratory cares about you and your well-being. If you experience unusual personal or academic stress during the course or need to talk with someone about a personal problem, seek support from your instructors as soon as possible. In addition, any SML staff is available for consultation 24/7. Find staff in the office in the Hamilton House between 8am – 7pm or knock on the door of Bartell House after hours

Underwater Research

Shoals Marine Laboratory

See https://bit.ly/sml_uwr_2022 for most up to date schedule

July 2022

Monday, July 11	Afternoon	Arrive at Shoals
	Evening	Introduction to the course, instructors Organisms (flora and fauna) of the Gulf of Maine (Jarrett)
Tuesday, July 12	Morning	Swim test and snorkel skills evaluation - dock Search for patterns from snorkeling Dive planning & "chore wheel" at the dive locker (Becca T)
		Afternoon
		The Gulf of Maine Diving environment (Becca T) Subtidal Patterns and Processes (Becca S) The Gulf of Maine Subtidal (Jarrett) Diving equipment and tanks/tank handling and filling at the dive locker
	Evening	(Becca T) ROCK TALK
Wednesday, July 13	Morning	SCUBA evaluation & checkout dive from dock (1), followed by touring Underwater navigation lecture (compass and natural) (Becca T)
		Afternoon
		Diving physiology and dive tables/computers (Becca T) Receive dive table problems (due 7/15) Elements of a scientific study: Lamb et al 2019 (Jarrett/Becca S) FOOD RUN
	Evening	Land navigation practice (Becca T) Organisms II (Lecture – Byrnes) Receive physics and SAC rates problems (due 7/15)
Thursday, July 14	Morning	Philosophy of research discussion (Jarrett) Statistical analysis and sampling design (Becca S) Lab 1 Intro (Jarrett) How to work off the dive float (Becca T/Jarrett)
		Afternoon
		Kick cycles (2) Lab 1: Crustacean Counts on Belt Transects (3)
	Evening	AAUS, UNH and SML diving protocols (Becca) McGuyver for the Diver (Breckie)
Friday, July 15	Morning	Introduction to Analysis/ Lab 1 Analysis (Jarrett) Flora review
		Afternoon
	Evening	Navigation (4) Rescue Skills (5) Artist-in-Residence Demo Fishing and the Subtidal (Becca S)

Fauna Review; Dive table problems due

Saturday, July 16	Morning	Organism exam (underwater exam)(6) Search for patterns (7)
		Receive scientific diver exam (due 7/23)
	Afternoon	Dive physics and SAC rates (Becca T), Receive DFA Pro links for CPR/First Aid/Oxygen/AED **or before class begins? Invertebrate Rock Wall Ecology (Breckie)
	Evening	Lab 2 analysis (Jarrett) Kelp forests and climate change (Jarrett) Discuss papers: Smale et al. 2022
	After	
Sunday, July 17	brunch	Intro to Lab 2: Algal Quadrat Lab Lab 2: Quadrat Lab (8) & Lift Bags (9)
	Evening	Quad Lab Analysis (Jarrett) Dive Accident Management (DFA Pro) (Becca T)
Monday, July 18	Morning	DFA Pro continues (Becca T)
	Afternoon	DFA Pro finished (Becca T) Catch up dive topics (Becca T)
	Evening	Discuss papers: Feehan et al. 2019
Tuesday, July 19	Morning	KEEN Survey Training; PHILOSOPHICAL DISCUSSION
	Afternoon	KEEN Survey Dives off JBH (10-11)
	Evening	Proposal discussion (oral and individual) (Jarrett/Breckie) ROCK TALK
Wednesday, July 20	Morning	KEEN Survey Dive off JBH (12,13)
	Afternoon	Float Proposal Dive (14)
	Evening	Diving Careers (Breckie / Becca T)
Thursday, July 21	Morning	Float Proposal dive (15,16)
	Afternoon	Proposal Work
	Evening	Night dive from float (17), night diving lecture (Becca T)
Friday, July 22	Morning	Proposal Format and Writing Work with Artist in Residence (10am)
	Afternoon	Float Proposal Dive (18,19) if needed
	Evening	Discuss proposals Deeper diving lecture (Becca T/Liz)
Saturday, July 23	Morning	SCIENTIFIC DIVER EXAM DUE Discuss rough draft of proposal
	Afternoon	Deeper dive off of JBH, 2nd dive at Smuttynose Island (20,21)
	Evening	Open
Sunday, July 24	Morning	Open
	Afternoon	Open (student art show)
	Evening	Proposals due

Monday, July 25 Morning Pack up and depart