# Instructor Information

Jarrett Byrnes, Ph.D.

jarrett.byrnes@umb.edu

Phone (W): 617-867-3145

Office Location: ISC-3-3240

Office Hours: Tuesdays 2-3:30

# Course Information

**Course Title:** Marine Biology & Ecology Lab

**Credits: 1 lab**

**Time:** W 2-5

**Classroom:** M-1-318 or TBA

**Online?** [no]

**Course**

**Description:** This lab will introduce students to the basic concepts of sampling and conducting experiments in marine habitats to understand their biology and ecology. Students will spend time working in different habitats to gain a broad familiarity with the diversity of marine environments and challenges in discovering how they function. They will focus on salt marshes as a critical habitat at the epicenter of many New England marine environmental issues, partnering with the Massachusetts Bays Program. This community engaged partnership will aid in students both collecting data that is relevant to the MassBays Progam’s goals as well as showing students the direct connections between their work and environmental management. While initial investigations will be guided heavily by the instructor, the students will be given latitude as the lab progresses to design methodologies that best suit different ecological questions and ecosystems. Pre-planned work will be double-loaded into the first eight weeks of the fall semester to accommodate the need for good weather in accessing field sites. The students will then conduct additional investigations to answer a question posed by the class in a final group project over the ensuing weeks.

**Context:** This will serve as an upper level lab integrating concepts from ecology and environmental biology. It will give students a hands-on understanding of the ecology of marine ecosystems and how we build an understanding of how they work.

**Prerequisites:** I require that you are currently or have taken BIOL 3XX, the Marine Biology & Ecology lecture.

**Course**

**Objectives:** By fully participating in this course, you should be able to:

1) Understand the basic principles of conducting ecological research.

2) Learn how to experimental and observational data can and cannot be used to answer biological questions.

3) Gain an appreciation of how physical and biological forces interact to shape marine ecosystems.

4) Learn how data from biological systems can be used for management by government and non-government agencies.

**Core**

**Competencies:** The objectives for this course focus on the following core competencies:

1. Graduates should be able to evaluate primary scientific information about the structure and function of ocean ecosystems.
2. Graduates should be able to construct tests of hypotheses to answer questions about the ecology of marine ecosystems.
3. Graduated will be able to apply reason based on biological knowledge to make decisions as citizens about decisions impacting our oceans.
4. Graduates will be able to better communicate their interest and knowledge of how our oceans work to those around them.

**Required**

**Assignments:**

**Field Notebooks:** Each week, students will be asked to take careful notes on their methods, observations, and data. Students are encouraged to use notebooks both for maintaining consistent methods and brainstorming and hypothesis formation as they observe the natural history of the systems they work in. Notebooks will be assessed for completeness and detail at the end of the course. They will also be assessed for their utility in the group-experiment planning session during week 8.

**Weekly Write-ups:** After each lab, students will be asked to use their notes, data from the field, photos, or other media objects to discuss what they accomplished during the lab that week. Lab write-ups will consist of a standard format with a brief introduction, stating the problem or biological question posed, a definitive hypotheses with at least one alternative hypothesis, a statement of how the hypothesis was tested, a narrative of results that discusses the data and observations from the week, and finally a concluding statement regarding the weight of evidence for or against their hypothesis. This write-up is meant to provide a focuses space for students to unify field notes, observations, and data into a coherent narrative. It is not meant to recapitulate materials in the field notebook, but rather provide a space to explore the implications of the lab work for big-picture ecological ideas. Write-ups will be graded on 1) The precision and strength of hypotheses, 2) The ability to argue with the evidence for or against that hypothesis, and 3) The overall clarity and quality of writing.

**Final Project:**  Students will be asked to create 1-3 group projects that they will begin at the end of the week 8. These projects may use data already collected as a starting point and then add additional sampling and assays to answer a question of interest raised by students or the instructor during the course of the semester. The students will give a 15-20 minute final talk presenting their results and turn in a 10-12 page final paper in the style of a scientific paper. For students in the lecture portion of this class, the final project may be used for both.

**Course Rubric:**

|  |  |  |
| --- | --- | --- |
| **Assignment/Deliverable** | **Number** | **Grade %** |
| **1. Field Notebooks** |  | **10** |
| **2. Weekly Writeups** |  | **10** |
| **3.** |  |  |
| **4.** |  |  |
| **5.** |  |  |
| **6.** |  |  |
| **7.** |  |  |
| **Final Project/Presentation** |  | **30** |
| **Group Work** |  |  |
| **Participation** (as defined below) |  | **45** |
| **Attendance** (as defined below) |  | **5** |

**Course**

**Policies:**

* + Participation – Participation includes completing all required reading and writing assignments prior to class, participating in field work, and taking responsibility for helping create a positive learning environment by arriving promptly, listening respectfully, and participating constructively. In particular, students are expected to aid each other in work in the field. Participation will be noted as a part of your final grade.
  + Attendance - Students are expected to attend all classes. If you are not with us out in the field, you will not be able to learn. Note, class will often be held at nearby field sites in Quincy. Students are expected to make accommodations for transportation. Options with the professor or TA will be available. Two unexcused absences will reduce your maximum grade to a B. Three to a C. Four or more absences to an F.
  + Group Work – I encourage students to prepare before class in groups. Final projects are also allowed to be group projects, and collaboration is encouraged.
  + Late Work – Late work loses 3% point per day late. Exceptions can only be made in the case of a documented emergency.

# Grading

**Grading:** Grade type for the course is a whole or partial letter grade. (Please see table below)

Note: the lowest passing grade for a graduate student is a “C”. Grades lower than a “C” that are submitted by faculty will automatically be recorded as an “F”.

|  |  |  |  |
| --- | --- | --- | --- |
| **Grading Policy** | | | |
|  | **Letter Grade** | **Percentage** | **Quality Points** |
|  | A | 93-100% | 4.00 |
|  | A- | 90-92% | 3.75 |
|  | B+ | 87-89% | 3.25 |
|  | B | 83-86% | 3.00 |
|  | B- | 80-82% | 2.75 |
|  | C+ | 77-79% | 2.25 |
|  | C | 73-76% | 2.00 |
|  | F | 0-72% | 0.0 |
|  | **INC** | A grade of Incomplete (INC) is not automatically awarded when a student fails to complete a course. Incompletes are given at the discretion of the instructor. They are awarded when satisfactory work has been accomplished in the majority of the course work, but the student is unable to complete course requirements as a result of circumstances beyond his/her control. The student must negotiate with and receive the approval of the course instructor in order to receive a grade of incomplete | N/A |
|  | IF | Received for failure to comply with contracted completion terms. | N/A |
|  | W | Received if withdrawal occurs before the withdrawal deadline. | N/A |
|  | AU | Audit (only permitted on space-available basis) | N/A |
|  | NA | Not Attending (student appeared on roster, but never attended class. Student is still responsible for tuition and fee charges unless withdrawal form is submitted before deadline. NA has no effect on cumulative GPA.) | N/A |

**Readings:**

Altieri, A. H., M. D. Bertness, T. C. Coverdale, N. C. Herrmann, and C. Angelini. 2012. A trophic cascade triggers collapse of a salt-marsh ecosystem with intensive recreational fishing. Ecology 93:1402–1410.

Barbier, E. B., I. Y. Georgiou, B. Enchelmeyer, and D. J. Reed. 2013. The Value of Wetlands in Protecting Southeast Louisiana from Hurricane Storm Surges. PloS one 8:e58715.

Deegan, L. A., D. S. Johnson, R. S. Warren, B. J. Peterson, J. W. Fleeger, S. Fagherazzi, and W. M. Wollheim. 2012. Coastal eutrophication as a driver of salt marsh loss. Nature 490:388–392.

Hurlbert, S.H., 1984. Pseudoreplication and the Design of Ecological Field Experiments. Ecological Monographs. 54, 187.

Mcleod, E., G. L. Chmura, S. Bouillon, R. Salm, M. Björk, C. M. Duarte, C. E. Lovelock, W. H. Schlesinger, and B. R. Silliman. 2011. A blueprint for blue carbon: toward an improved understanding of the role of vegetated coastal habitats in sequestering CO2. Frontiers in Ecology and the Environment 9:552–560.

All papers will be provided via the course website.

**-----------------------------------------End of BHE section no more than 5 pages------------------------------------**

# Course Schedule

**Week 1:** Fouling Communities and Interactions between Biotic and Abiotic Conditions

**Description:** We will begin by going to the UMB campus docks, and examining how life takes root even on these man-made habitats. We will discuss the phylogenetic diversity of organisms we find on the docks, how to key out a species, and end by sampling to evaluate the distribution of different types of organisms around the docks. Discussion at the end of lab will focus on how to formulate hypotheses about organismal distributions.

**Week 2:** Diurnal Variation of Life in the Sea

**Description:** This 24-hour lab will begin with the class taking a plankton sample together. We will examine the sample, key out organisms, and discuss the basic life history of organisms found in the plankton. Students will be introduced to the concept of diel vertical migration of plankton, and begin a bi-hourly sampling program to assess how plankton changes over a diel cycle. Students will have the option of testing different hypotheses by placing sampling stations at different locations around campus. We will close by discussing observations and the relative pros and cons of their sampling methodology.

**Week 3:** Introduction to the Marshes of Quincy; Salt marsh sampling methodology

**Description:** An introduction to the natural history of the Quincy salt marshes from Dr. Lisa Engler of the Mass. Bays program. Dr. Engler will discuss their role as a provider of local ecosystem services, and the types of information government agencies require to keep tabs on marsh health for management. We will then introduce basic sampling techniques for different types of organisms. Students will perform simulated sampling exercises to learn the importance of random sampling, large sample sizes, and how to understand natural variability. They will also be introduced to the concept of keeping field notes, and given a notebook for observations in the field. Last, they will be introduced to how to record data, and the concept of good data recording for analysis using Google spreadsheets.

**Assignment**: Read Barbier et al. 2013, MacLeod et al. 2011

**Week 4:** In the grass: cordgrass abundance and marsh bank stability

**Description:** We will take students to the Squantum marshes and introduce them to the general layout of the marshes, including where permanent markers have been placed for sampling. Students will then be tasked with implementing a plan to measure cordgrass abundance in marked areas around the marshes and assess sediment stability in those same areas to examine the relationship between the two.

**Week 5:**  Marsh zonation

**Description:** At the Rock Island Marshes, we will introduce students to the zones of the marsh. Along marked transects students will be tasked with a) measuring the width of each zone and b) designing and implementing a simple sampling scheme for snails and crabs in each zone.

**Week 6:** Grazing and decomposition assays

**Description:** Students will be given a short introduction to how marsh grazing and decomposition are assessed in marshes. They will then deploy assays of grazing and decomposition using either live or dead cordgrass in locations they deem appropriate based on principles of good sampling design in the channels around Squantum.

**Week 7:** Nutrient sampling; Assay recovery.

**Description:** At the marsh, we will introduce the students to the basics of sampling for porewater nitrogen. Knowing the arrangement of plots throughout the marsh, students will have to design a sampling scheme to evaluate large-scale variation in nutrient concentrations across the marsh. Students will then be assigned to teams to either sample nutrients from porewater sippers in the marsh according to their design, or to recover their assays from the previous week.

**Assignment:** Read Deegan et al 2012.

**Week 8:** Making the leap to new science in the marsh

**Description:** Students will come to lab with all of the course data entered, and notebooks of field observations. During the lab, students will discuss and agree on a topic of further research in the Quincy marshes. The TA, instructor, and Dr. Engler will be available to guide conversation. They will also demonstrate data visualization and rough analyses from material gathered by the class previously.

Students will then implement the project they have designed over the next few weeks. They may continue sampling and writing as a group until the finals period as their course final project. TA and professor will be available for aid in transportation as needed throughout this time during normal course hours.

**Assignments:** Read Hurlbert et al. 1984.

**Week 13:** How to present scientific results

**Description:** We will hold an open discussion and tutorial on giving a scientific talk and writing a scientific paper. We will discuss both the general methodology behind talks as well as having the instructor demonstrate a model talk. We will discuss Altieri et al. 2012 as a model paper for a write-up.

**Assignments:** Read Altieri et al 2012.

**Week 15:** Presentations

**Description** Student groups will present their findings from their additional research in 20 minute talks. Students will also turn in their final papers.

# Methods of Instruction

**Methods:** The course will be almost entirely conducted at local marine environments. Students will discuss fundamental concepts about marine ecology with the professor and TA before going out to the field to conduct their work. Students will be allowed progressively more latitude in the design of their sampling, culminating in a student-led final project during the end of the course.

# Accommodations

The University of Massachusetts Boston is committed to providing reasonable academic accommodations for all students with disabilities. This syllabus is available in alternate format upon request. If you have a disability and feel you will need accommodations in this course, please contact the Ross Center for Disability Services, Campus Center, Upper Level, Room 211 at 617.287.7430. <http://www.umb.edu/academics/vpass/disability/> After registration with the Ross Center, a student should present and discuss the accommodations with the professor. Although a student can request accommodations at any time, we recommend that students inform the professor of the need for accommodations by the end of the Drop/Add period to ensure that accommodations are available for the entirety of the course.

# Academic Integrity and the Code of Student Conduct

***Code of Conduct and Academic Integrity***

It is the expressed policy of the University that every aspect of academic life--not only formal coursework situations, but all relationships and interactions connected to the educational process--shall be conducted in an absolutely and uncompromisingly honest manner. The University presupposes that any submission of work for academic credit is the student’s own and is in compliance with University policies, including its policies on appropriate citation and plagiarism. These policies are spelled out in the Code of Student Conduct. Students are required to adhere to the Code of Student Conduct, including requirements for academic honesty, as delineated in the University of Massachusetts Boston Graduate Catalogue and relevant program student handbook(s).[UMB Code of Student Conduct](http://www.umb.edu/life_on_campus/policies/code/)

You are encouraged to visit and review the UMass website on *Correct Citation and Avoiding Plagiarism:* http://umb.libguides.com/citations

Penalties for academic misconduct in the course, including plagiarism and cheating, are strictly enforced, and the penalties are very serious. Penalties include an F in the assignment or exam, an F in the course, or suspension from the University. If you have questions about what constitutes plagiarism or other forms of academic misconduct, see Prof. Byrnes **before** completing an assignment or exam.

**Ignorance of the rules does not excuse any academic conduct violation.**

**The University defines violations to include, but not be limited to, the following:**

* Submitting as one's own an author's published or unpublished work (e.g. material from a journal, Internet site, newspaper, encyclopedia), in whole, in part, or in paraphrase, without fully and properly crediting the author.
* Submitting as one's own work or materials obtained from another student, individual, or agency without full and proper attribution.
* Submitting as one's own work material that has been produced through unacknowledged or unauthorized collaboration with others.
* Submitting substantially the same work to more than one course (i.e., dual or multiple submission) without prior approval from all instructors involved.
* Using any unauthorized material during an examination, such as notes, tests, calculators, cell phones, or other electronic devices.
* Obtaining answers to examination questions from another person with or without that person's knowledge; furnishing answers to examination questions to another student; using or distributing unauthorized copies of or notes from an examination.
* Submitting as one's own an examination taken by another person; or taking an examination in another person's place.
* Interfering with an instructor's ability to evaluate accurately a student's competence or performance; misleading any person in connection with one's academic work.

# Other Pertinent and Important Information

**Cell Phones: Cell phones must be POWERED OFF during class.**   
  Much of this class is discussion, and use of phones in class is disruptive and disrespectful to your fellow students to withdraw from the conversation. I will give you one warning inside or outside of class, and then ask you to please leave in any future classes if it happens again. That class will be counted as an un-explained absence.

**Attendance in WIMBA Sessions:**

* You are responsible for material covered in any class that you do not attend.
* If you miss a WIMBA session you must review the recorded class and write a 1-2-page summary of your understanding of what was covered.

**Incomplete Policy:** [Include what is documented in Graduate Catalog]

**Coursework Difficulties:** Please discuss all coursework matters with me sooner than later.

**Withdrawing From This Course**: Please refer to the written policies and procedures on formal withdrawal and add/change dates listed in the Graduate Studies Catalog.

You are advised to retain a copy of this syllabus in your personal files for use when applying for future degrees, certification, licensure, or transfer of credit.