

# *Experimental Design in Marine Ecology*

Course Syllabus (Fall 2013)

## **Instructor**

Catherine Matassa

## **Required Text**

Gotelli, N.J. and A.M. Ellison. 2013. *A Primer of Ecological Statistics* (2<sup>nd</sup> Edition). Sinauer Assoc. Inc., Sunderland, MA, USA. URL: [sinauer.com/a-primer-of-ecological-statistics.html](http://sinauer.com/a-primer-of-ecological-statistics.html)

## **Course Description**

Experimental Design (BIOL5521) is not a typical statistics class. You will not receive comprehensive training in biological statistics in this course. Rather, the goal is to provide you with a sample of practical, powerful, and accessible tools that will allow you to design, execute, analyze, and interpret ecological experiments, while giving you the mathematical and conceptual background to pursue more complex designs and analyses in the future.

You will be introduced to a variety of experimental designs and statistical methods based on Analysis of Variance (ANOVA). Homework exercises will be assigned with each new topic for you to independently review the techniques, perform analyses using statistical software, and practice interpreting and communicating the results of your analyses. Exams given throughout the semester will be used to assess your progress. Together as a class, we will conduct a novel ecological experiment, the results of which you will independently analyze, interpret, and present in a short manuscript. This aspect of the course is both challenging and rewarding; it provides a rare opportunity for you to experience the scientific process from start to finish in a guided, hands-on environment, all the way through the peer review/publication process. A description of the manuscript portion of the course follows the schedule.

## **Expectations**

Please come to class each week prepared for lecture, field work (weather-appropriate attire and footwear), and computer work. Assigned readings from the textbook ("G&E") and the primary literature should be completed before the date under which they are listed. These readings are selected specifically to help you prepare for participating in class dialogue. Participation during lectures and lab/field work is considered when calculating your final grades.

All assignments are due by the dates/times specified in the syllabus. Please note that these deadlines are not always on a class day (instructions to follow). Late assignments receive a score of 0%, no exceptions.

All course communications will be sent to your university-assigned e-mail address.

You are expected to adhere to the University's Academic Integrity Policy. Violations of this policy will be reported to and handled by the Office of Student Conduct.

## **Grading Breakdown**

Assignments: 30% - Exams: 35% - Participation: 5% - Manuscript: 30%

## **Schedule**

The attached course schedule is subject to change: we may reach some topics sooner or later than listed on the schedule, depending on how things are going. The most **up-to-date schedule will always be posted on blackboard**, and you will be notified of any changes via e-mail. Note important exam dates (*\*Exam\**), manuscript deadlines (*\*MS\**), and due dates for homework assignments (**HWx**).

## ***Experimental Design in Marine Ecology Weekly Schedule:***

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### **Week 1: September 10th (LT: 09:06, +0.03m)**

*Readings:* Gotelli & Ellison: Ch. 3, Ch. 4, Ch. 5 (pp.117-122)  
*Topics:* -Course Overview; Review of Descriptive Statistics  
-Introduction to Experimental Design & Hypothesis Testing  
*Tasks:* Explore the rocky intertidal; collect organisms for class experiment  
*Assignment:* Review this week's reading assignments and complete those for next week

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### **Week 2: September 17th (LT: 16:01, -0.09m)**

*Readings:* -Hulbert S.H. 1984. Pseudoreplication and the design of ecological field experiments.  
*Ecological Monographs* 54(2): 187-211.  
-G&E: Ch. 6, Ch. 7 (pp.163-175), Ch. 10 (pp.289-300)  
*Topics:* Issues in Experimental Design; Introduction to ANOVA  
*Tasks:* Design/organize/prepare for class experiment  
*Assignment:* **HW1** (ANOVA by hand + software Installation): due by 09:00 on Tuesday, 9/24

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### **Week 3: September 24th (LT: 09:15, +0.24m)**

*Readings:* -G&E: Ch. 8 (pp.212-236), Ch. 10 (pp. 325-327, 335-348);  
-Journal Articles for MS  
*Topics:* -Before and After ANOVA: Assumptions and Post-Hoc Tests  
-Introduction to statistical software  
*Tasks:* Start class experiment  
*Assignment:* **HW2** (ANOVA w/ software): due by 09:00 on Tuesday, 10/1

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### **Week 4: October 1st (LT: 15:15, +0.46m)**

*Readings:* -G&E: Ch. 9  
-Journal Articles for MS  
*Topics:* Linear Regression; Review for Exam I  
*Tasks:* Experiment Maintenance and Data Collection  
*Assignment:* **HW3** (Linear Regression): due by 09:00 on Friday 10/4

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### **Week 5: October 8th (LT: 07:56, -0.06m)**

*Readings:* -Review readings for Exam I (weeks 1-4)  
-Journal Articles for MS  
**\*Exam\*:** **Exam I** (10%, weeks 1-4)  
*Topics:* Introduction to ANCOVA; Manuscript Preparation  
*Tasks:* Experiment Maintenance and Data Collection  
*Assignment:* Prep for experiment take-down

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### **Week 6: October 15th (LT @ Cobscook Bay, ME: 15:15, +0.02m)**

*Readings:* Journal Articles for MS  
*Tasks:* Field work in Lubec, Maine  
*Assignment:* Read papers, work on your manuscripts

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**Week 7: October 22nd (LT: 08:00, +0.18m)**

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*Readings:* G&E: Ch. 10 (pp. 314-317, 333-335), Journal Articles for MS

*Tasks:* ANCOVA and Interpretation of Results

*Tasks:* Take down class experiment and complete data entry

*Assignment:* **HW4** (ANCOVA): due by 09:00 on Tuesday 10/29

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**Week 8: October 29th (LT: 13:42, +0.58m)**

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*Readings:* -G&E: Ch. 7 (pp. 182-188), Ch. 10 (pp. 304-308; 322-333)

-Journal Articles for MS

**\*MS\*:** **Preliminary MS** (Intro/M&M/Citations): due by 09:00 on 10/29

*Topics:* Two-Way ANOVA and Factorial Designs

*Tasks:* Preliminary analysis of class experiment data

*Assignment:* **HW5** (Two-Way ANOVA): due by 09:00 on Tuesday 11/5

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**Week 9: November 5th (LT: 05:47, -0.15m, 18:22, -0.49m)**

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*Readings:* -G&E: Ch. 7 (pp.175-182; 188-190), Ch. 10 (pp. 300-322)

-Journal Articles for MS

*Topics:* Randomized Block Designs; Introduction to Nested Designs

*Tasks:* Finalize data analyses, figures, and tables

*Assignment:* Work on MS and prep for Exam II

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**Week 10: November 12th (LT: 12:31, +0.18m)**

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*Readings:* -Review previous readings for Exam II (weeks 5-8)

-Journal Articles for MS

**\*Exam\*:** **Exam II** (10%; weeks 5-8)

*Topics:* Submitting your Manuscripts, The Peer Review Process

*Tasks:* Work on your manuscripts and meet with instructors for reviews

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**Week 11: November 19th (LT: 05:55, +0.15m, 18:30, -0.09m)**

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*Readings:* G&E: Ch. 12 (pp. 383-406), review readings from Week 9

**\*MS\*:** **Complete MS & Cover Letter:** due by 09:00 on 11/19

*Topics:* More on Nested Designs, Random Effects, and Repeated Measures

*Assignment:* **HW6** (Nested Designs): due by 09:00 on Tuesday, 11/26

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**Week 12: November 26th (LT: 11:01, +0.55m)**

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*Readings:* G&E: Ch. 12

*Topics:* -Review of Complex Nested Designs

-Introduction to MANOVA

*Tasks:* Manuscript reviews with instructor/TA; work on manuscript revisions

**\*MS\*:** **Peer Review:** due by 09:00 on 11/26

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**Week 13: December 3rd (LT: 17:15, -0.52m) (Last week of classes)**

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*Readings:* G&E: Ch. 9 (pp. 268-287), Ch. 11

**\*MS\*:** **Revised MS & Cover Letter:** due by 09:00 on Tuesday 12/3

*Topics:* -Introduction to Analysis of Discrete Data

-Course Review for Final Exam

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**Week 14: December 10th (Final Exam Week)**

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*Readings:* Review all reading materials

**\*Exam\*:** **Exam III** (15%; weeks 1-13)