

# ESM 340 – Research Methods in Environmental Science

## Fall 2019 Syllabus

Monday & Wednesday 2:00pm – 3:50pm, SB1 426

### Instructor: Brian C. Turner, Ph.D.

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Office: Harrison Street Building Room 108

Office Hours: Monday & Wednesday 4:00pm – 6pm or by appointment

### Course Theme:

This course will introduce you to methods used in environmental studies, including environmental study designs, data analysis and data interpretations. Students will be able to formulate and identify research questions and conceptual framework for environmental research. They will analyze study and experimental designs, manage and summarize data, test hypotheses, analyze data, interpret results and communicate their findings.

### Course Objectives:

- 1) Identify and critically evaluate the structure of mensurative and manipulative environmental science studies.
- 2) Summarize, analyze and interpret data with descriptive and basic univariate statistics.

### Expectations:

- 1) *Ask questions:* If something is unclear, please ask and we will try to clarify. Ask your classmates, ask the TA, or ask the instructor.
- 2) *Be respectful:* This course has several online discussion sections. Please be respectful of the shared space and of other people as you interact with them online. Being respectful means not only approaching discussions and interactions in a responsible and thoughtful manner, but it also refers to being respectful of everyone's time by turning in assignments and participating in discussions in a timely manner. Adhere to the code of conduct: <http://www.pdx.edu/dos/codeofconduct>
- 3) *Make mistakes:* Mistakes are NOT a waste of time. Mistakes mean you are trying and by fixing the mistakes you are persevering and learning.

**Instructor Inclusivity Statement:** It is my intent that students from all backgrounds and perspectives be well served by this course, that students' learning needs be addressed both in and out of class, and that the diversity that students bring to this class be viewed as a resource, strength and benefit. It is my intent to present materials and activities that are respectful of diversity: gender, sexuality, disability, age, socioeconomic status, ethnicity, race, and culture. But there is always room for improvement. Your suggestions are encouraged and appreciated. Please let me know ways to improve the effectiveness of the course for you personally or for other students or student groups. In addition, please let me know of any religious or other events that may conflict with any of our class meetings this term so that we can make arrangements for you.

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**Schedule (subject to change; all changes will be announced in class and via email):**

Date	Lecture	Readings	Submit to D2L by 11:59 pm	Quiz to complete on D2L by 11:59 PM
30-Sep	The scientific method, Introduction to Research Project			
2-Oct	Establishing a conceptual framework, types of variables	HBI Chp 1, 2, 3, 9, 10		
7-Oct	Survey Design	HBI Chp 6, 11 pgs 118-126, BLM Chp 2 & 7	HW 1 Conceptual framework	Quiz 1
9-Oct	Performing a survey			
14-Oct	Experimental Design	Hurlburt 1984		Quiz 2
16-Oct	Performing an experiment		Draft: Introduction	
21-Oct	Research Project Proposals and Workshop	Heath Chp 12, HBI Chp 13 & 11 pgs 126 -131	Proposal Presentation (Present in class & submit to D2L)	Quiz 3
23-Oct	Knowing your data: summary statistics, types of tests, graphs	HBI Chp 4, 5 McDonald pgs 20-27		
28-Oct	Why, how and when to use statistics.	HBI Chp 7, McDonald pgs 101-121	Draft Methods	Quiz 4
30-Oct	Detecting differences in distributions: chi-square	HBI Chp 8 pgs 92-98		
4-Nov	Detecting differences in averages: t-test & ANOVA Part 1	HBI Chp 8 pgs 51-71, 85-91	HW 2 Chi-square	Quiz 5
6-Nov	Detecting differences in averages: t-test & ANOVA Part 2			
11-Nov	<b>No class due to holiday</b>		HW 3 t-test and ANOVA	Quiz 6
13-Nov	Research Project Check In and Workshop			
18-Nov	Looking for associations between 2 variables: Regression Part 1	HBI Chp 8 pgs 72-84, Chp 11 pg. 131-135	HW 4 Assessing Research	Quiz 7
20-Nov	Looking for associations between 2 variables: Regression Part 2			
25-Nov	Results: Presenting you findings	HBI Chp 12, McDonald pgs 274-284	HW 5 Regression	Quiz 8
27-Nov	Research Project Check In and Workshop			
2-Dec	Presentations: Do's and Don'ts of PowerPoint	HBI Chp 14	Draft Results	Quiz 9
4-Dec	Peer Review, <i>Bring an up to date copy of your paper to class</i>		<i>Final paper (Due on Dec 8th)</i>	
11-Dec	<i>Final Presentation 1230pm-2:20pm</i>			Quiz 10 (due by Dec 11)

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<b>Student Evaluations:</b>		
		Points
Homework (25%)	HW1: Conceptual framework map	20
	HW2: Chi-square	20
	HW3: T-test and ANOVA	20
	HW4: Assessing Research	20
	HW5: Regression	20
Group Peer Evaluation (5%)	Participate and contribute to group activities be a productive team player	20
Quizzes (20%)	10 weekly quizzes	80
Research Project (50%)	Draft Introduction	20
	Research Proposal Presentation	10
	Draft Materials & Methods	20
	Research Project Check-Ins (5 pts each)	10
	Draft Results	20
	Peer Review	20
	Final Research Project	80
	Final Presentation	20
<b>Total</b>		<b>400 points</b>

Scores for each graded assignment/test will be totaled and a final grade will be based on the total score as a percent of 400 as follows: A= 100 to 94%; A-= 93 to 90%; B+= 89 to 87%; B= 86 to 84%; B-=83 to 80%; C+=79 to 77%; C=76 to 74%; C-= 73 to 70%; D= 69 to 60%; F= 59% and below.

### **Group Peer Evaluation:**

Your group members will evaluate based on your participation and contribution in regards to the group activities and the research project.

### **Attendance:**

There is no daily attendance, but you are responsible for keeping up with the class. Be sure to be in contact with other students to keep you up to date if you miss class. Keep in mind dates where group events are occurring (proposals, check-ins, presentations) are mandatory. If you miss, you (not your group) will receive zero points for the activity. The same is true for the peer-review date.

### **Quizzes:**

This course has no formal exams (midterm or final). Instead, an online quiz will be posted to D2L after class every Wednesday. These quizzes will cover the material presented during the week, and will consist of 8 questions. You will have 2 attempts to complete the quiz, and the highest score will be your final grade. There is no time limit for each quiz and it is open note, so take your time once you start.

Additionally, you will be shown the results of your quiz upon the completion of your first attempt. The answers will not be provided, but you will know which questions you got right, and which were incorrect. Once a quiz is activated, it will remain active until 11:59pm the following Monday. Failure to compete a quiz will result in a score of zero. Please notify the instructor ASAP of any technical problems or issues.

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### Homework:

You will be assigned four homework assignments throughout the term. Homework assignments are to be submitted by 11:59pm the day it is listed as due. All assignments must be submitted via the D2L dropbox (assignments emailed to the instructor will not be accepted). Assignments must be typed and on-time.

### Late work:

All late work will be docked 15% per week, up to four weeks (60% deduction). Any assignments more than four weeks late will not be accepted. Any assignments submitted after December 11<sup>th</sup> will not be graded.

### Research Project:

Choose your own research adventure! The Research Project will be a scientific study of your choosing to be conducted in groups of 3 or 4 (no more than 5 groups total). Your mission is to develop a research question and identify a testable hypothesis. Your group will create a good experimental design that will test your hypothesis. Your group will present ideas to the instructor for approval, and use your developed methods to collect your data. Your group will analyze your data using the methods we have discussed in class. Each of you will individually write up your groups findings as a scientific report with an Introduction, Methods, Results and References section. You will submit draft versions of these sections to the instructor throughout the term to receive feedback and improve upon the report. Using this feedback, you will create a final report. **To give your study context, you will need to include at least 8 peer-reviewed papers.** Your group will also be presenting your findings to your classmates at the end of the term in a short PowerPoint presentation. **The full rubric for each component of the Research Project will be posted to D2L.**

### Peer Review:

You will perform a peer review of another student's scientific report. The goal is to provide constructive feedback of the work, highlighting elements that work as well as areas where improvements can be made. Your grade will be based on the quality of your feedback, not the number of errors you point out.

### Required Texts and Readings:

Ambrose, H.W., Emlen, D.J., Ambrose, K.P. and K.L. Bright. A Handbook of Biological Investigation (7<sup>th</sup> ed.). Hunter Textbooks, Inc. Knoxville, Tennessee

Elzinga, C., Salzer D., Wiloughby J. (1998) Measuring and monitoring plant populations. BLM Technical Reference 1730-1: 477 pp. (on D2L)

Hurlburt, S. (1984) Pseudoreplication and the design of ecological field experiments. Ecological Monographs. 52(2): 187-211. (on D2L)

McDonald, J.H. (2014). Handbook of Biological Statistics (3rd ed.). Sparky House Publishing, Baltimore, Maryland. <http://www.biostathandbook.com/> (also on D2L)

Heath, D. (1995) An Introduction to Experimental Design and Statistics for Biology. Boca Raton: CRC Press (Chp. 12 on D2L)

### \*PREFERRED FORMAT FOR CITATION OF RESEARCH PAPERS:

Last name, first initial of all authors. (Year) Title of article. Journal title. Volume(issue): pgs.

Ex: Hurlburt, S. (1984) Pseudoreplication and the design of ecological field experiments. Ecological Monographs. 52(2): 187-211.

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Please notice what is NOT included in this reference...eliminate any extraneous information including the date accessed, publisher, which website you used, the doi (unless extremely relevant).