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WSU Registrar

Washington State University
MAJOR CURRICULAR CHANGE FORM - - COURSE
(Submit original signed form and ten copies to the Registrar's Office, zip 1035)

Future Effective Date: 01/01/2013 (**effective date cannot be retroactive**)
☑ New course ☐ Temporary course ☐ Drop service course
☐ There is a course fee associated with this course (see instructions)

☐ Variable credit _____
☐ Repeat credit (cumulative maximum _____ hours)
☐ Increase credit (former credit _____)
☐ Lecture-lab ratio (former ratio _____)
☐ Number (former number _____)
☐ Prefix (former prefix _____)
☐ Crosslisting (between WSU departments) **(Must have both departmental signatures)**
☐ Cooperative listing (UI prefix and number _____)
taught by: WSU ☐ UI ☐ jointly taught ☐
☐ Conjoint listing (400/500)
☐ S, F grading
☐ Request to meet Writing in the Major [M] requirement **(Must have All-University Writing Committee Approval)**
☐ Request to meet GER in _____ **(Must have GenEd Committee Approval)** ☐ Fulfills GER lab (L) requirement
☐ Professional course **(Pharmacy & Vet Med only)** ☐ Graduate credit **(professional programs only)**
☐ Other (please list request) _____

BIOLOGY (course prefix) | 572 (course no.) | Quantitative methods and statistics in ecology (title)

4	3	3		Permission of Instructor
credit	lecture hrs per week	lab hrs per week	studio hrs per week	prerequisite

Description (**20 words or less**) The philosophy and methods of formulating hypotheses as mathematical models and confronting them with data.

Instructor: Jesse Brunner Phone number: 335-3702 Email: jesse.brunner@wsu.edu
Contact: Justine Rupp Phone number: 335-3553 Email: ruppj@wsu.edu
Campus Zip Code: 4236

- Please attach rationale for your request, a current and complete syllabus, and explain how this impacts other units in Pullman and other branches (if applicable).
- Secure all required signatures and provide 10 copies to the Registrar's Office.

12 Dec. 2011 — **Chair/date**
12/13/11 — **Dean/date**
General Education Com/date
Chair (if crosslisted/interdisciplinary)*
Dean (if crosslisted/interdisciplinary) *
Graduate Studies Com/date
All-University Writing Com/date
Academic Affairs Com/date
Senate/date

***If the proposed change impacts or involves collaboration with other units, use the additional signature lines provided for each impacted unit and college.**

Quantitative methods and statistics in ecology (Biol 572)

Instructor	**Prof. Jesse Brunner**
Office hours	XXX, or by appointment (email me)
Location	283 Eastlick Hall
Email	Jesse.brunner@wsu.edu
Phone	(509) 335-3702

Lectures	Tu/Th XXX
Lab	W XXX

Text book	Bolker, Ben. 2008. Ecological Models and Data in R. Princeton University Press (required)
	Scheiner, Samuel M. & Jessica Gurevitch. 2001. Design & Analysis of Ecological Experiments. Oxford University Press (optional)
	Additional readings will be provided by instructor.

Course Description and Goals:

One of the often-neglected arts of scientific research is data analysis. Wringing from carefully collected, hard-won data as much information and inference as possible is an involved, thoughtful process. It takes knowledge and perspective, as well as a quiver of statistical tools. But having gained this knowledge and perspective, one can design better studies and experiments, and can make the most of the messy, flawed datasets that are a common thread in ecological research. *The goal of this course is to teach students this art, to prepare them to think broadly about their research problems, select amongst the myriad statistical tools available (or create their own), carefully and thoroughly analyze their data, and clearly convey their findings.*

This course is built around the philosophy of multi-model inferential statistics. It focuses on formulating alternative hypotheses as models, fitting these models to the data, and then comparing the ability of the models (or hypotheses) to explain the data. It also emphasizes the pragmatic nature of data analysis and visualization using the open-source R statistical platform in weekly laboratories.

It is well known that one of the best ways to learn a topic is to teach it. In this vein on each Tuesday a pair of students will, after consulting a couple times with me, lead a class discussion or lecture on the topic of the week. On Thursday I will lead a recitation / discussion to clarify concepts, make connections between ideas, and explore new topics. Depending on class size, students may present two topics. *Preparing to lead a class requires meeting with me at least two weeks in advance and a follow up meeting*, so make sure to read and start thinking about the class early!

Student Learning Outcomes

At the end of this course, students should be able to:

- Describe and contrast the methodologies and philosophies of the major statistical frameworks used in ecology, as well as their pitfalls and limitations
- Graphically explore various types of ecological data
- Identify and use appropriate stochastic distributions to model the error in ecological data
- Describe ecological processes as deterministic mathematic models, whether using phenomenological descriptions, adopting existing models, or "rolling" their own
- Simulate ecological data
- Fit models to data using likelihood and Bayesian methods
- Evaluate and compare models in each statistical framework
- Clearly present mathematical and statistical concepts to a class

Expectations and Grading

This course is designed to provide a synthesis of concepts and practice in data analysis and quantitative modeling *through active learning*. Students are expected to:

- Critically question and discuss the assigned readings each week in class (which come from the book as well as supplemental materials),
- Develop and deliver a lesson for one or more chapters of the book as assigned at the start of the semester (and to work with the instructors in advance to do so effectively),
- Complete weekly lab exercises that challenge students to think beyond the physical process of data analysis to the biological meaning and implications of the analysis, and
- Successfully apply the quantitative skills developed in class to a novel problem (preferably related to one's own thesis or dissertation work).

Important: teaching a chapter of the book effectively requires considerable prep time well in advance of the day of delivery – starting with a planning meeting with the professors two weeks in advance, and a dry run the week prior to the lesson.

Grades will be calculated as follows:

- Participation in discussions: 30%
- Teaching assigned lessons: 30%
- Weekly lab exercises: 20%
- Independent project: 20%

Letter grades will be assigned as follows:

A 92-100%	B^+ 88-89	C^+ 78-79	D^+ 68-69
A^- 90-91	B 82-87	C 72-77	D 60-67
	B^- 80-81	C^- 70-71	F ..... < 60

Reasonable accommodation

Reasonable accommodations are available for students with a documented disability. If you have a disability and may need accommodations to fully participate in this class, please visit the Access Center (Washington Building 217; 509-335-3417; http://drc.wsu.edu) to schedule an appointment with an Access Advisor. All accommodations MUST be approved through the Access Center.

Academic Integrity

I expect students to act with integrity and follow the University's Code of Academic Integrity. No exceptions.

You are encouraged to study together and to discuss information and concepts covered in class and lab with other students. You can give and receive "consulting" help. However, all work you submit must be your own. Anyone caught cheating or plagiarizing on any assignment will be given an F for the entire course. If you have any questions about what might constitute cheating or plagiarism, please refer to the following websites (and talk to me): http://conduct.wsu.edu/ and http://www.wsulibs.wsu.edu/plagiarism/main.html

WSU Safety

Please familiarize yourself with information regarding campus emergencies and school closings by visiting this website: http://oem.wsu.edu/emergencies

Tentative schedule of topics and readings

Wk	Topic	Presenter	Readings	Lab topic	Term project
1	Becoming an "ecological detective"	Dr. B	Syllabus, Preface, Ch1	Gentle Intro to R	
2	Ecological models and data	Dr. B	Ch1-2	Graphing & exploring data	
3	Bestiary of functions	Student	Ch3	Deterministic functions	
4	Algebra and calculus review	Student	Appendix, Ch 4, handouts	Stochastic distributions	
5	Probability and stochastic distributions	Student		Using stochastic distributions	
6	Stochastic simulation & power	Student	Ch5	Simulation & power analysis	Think about ideas
7	Likelihood and all that	Student	Ch6	Likelihood & parameter estimation	
8		Student		Model selection	Data in hand!
9	Optimization methods	Student	Ch7	Intro to WinBUGS	Consultation period
10	Likelihood examples	Student	Ch8	*Talk to instructor*	
11	Standard statistics revisited	Student	Ch9	Standard stats in R	*work*
12	Modeling variance	Student	Ch10	Hierarchical models	*work*
13	Start to finish: working through an example	Dr. B	handout	Work on example / open lab	Final consult
14	*Open: consult / work on projects*				*work*
15	Group project presentations				Present!