Syllabus

Rutgers University
Research Methods and Design 070:580 Spring 2009

Course Topic: Research Methods and Design

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INTRODUCTION
As scientists, our job is to find stuff out and to answer questions. This class is about how to do that.

MATERIALS
There is no required text for the course. Instead readings from the primary literature available in pdf format will be used. We will also use other resources available online and elsewhere. These will be available as needed.

LEARNING GOALS
• Identify the key earliest steps in formulating a research problem.
• Explore approaches to reading papers and methods in general.
• Make practical decisions about the flow of data in a project. (What is data, observation, measurement, a variable?).
• Identify criteria useful in deciding “what to do and what to test?”
• Achieve mastery of some basic descriptive methods.
• Achieve proficiency with some basic inferential statistics.
• Become generally familiar with more advanced statistical approaches including multivariate statistical methods, resampling methods, parsimony-based methods, and geometric morphometrics.
• Think critically about methods and gain a familiarity with potential analytical pitfalls.
• Develop at least some proficiency with one or more “programming environments.”
• Implement a “solution” for your own question and data.
• Complete a term project and develop a presentation in the style of a professional society podium presentation. Ideally, the term project would be suitable for presentation at the annual professional meeting.
COURSE STRUCTURE
The course is meant to provide practical help to students on topics they are actually working on and to expose students to diverse problems and kinds of data. Thus, the exact readings and trajectory of the course will depend very much on which problems specific students are focused. Very broadly the course will cover three broad areas: 1) general issues with respect to research design and set-up, 2) specific methods (statistical and otherwise), and 3) discussion and analysis of specific student problems.

Given this structure, each student will be required to identify a specific question and data set with which they will be working by no later than the second class meeting. If you don’t have a data set, don’t worry. We’ll get one. Starting somewhere around week 3 or 4 we will devote part of class time to discussing specifically 1 or 2 or 3 students specific projects. March 3 is reserved for individual consultation on projects and March 10 for group consultation where everyone’s project is discussed.

The nature of this class is very collaborative in nature. This means we will be discussing everyone’s work. For this to work, we need to be respectful, friendly, and critical. Students in the course will span a range of levels in their development as professionals and this is something we all need to keep in mind. The kind of things that will benefit everyone will be commentary like these:

I don’t understand…, I am confused by…., Why didn’t you…, I think this is wrong because…., I might try this…., Here is what I did…., I think others might say…

I will be participating in the class in the same way as students at various points (doing some of the assignments as appropriate) and should be subject to the same criticism as your fellow students.

GRADING
Grading will be based on participation in class discussion and individual class assignments/presentations (40%), a preliminary oral presentation (10%), a term paper (20%), and a final oral presentation (30%). For the final presentations, we will try and arrange a larger audience.

ASSIGNMENTS AND CLASS DISCUSSION
Each class will be structured around a few required readings and one or more short assignments. Assignments are due at 11 pm on the Sunday before class in which they will be discussed. This will allow everyone to read the work of everyone else prior to the class meeting. The grading of each assignment will be part of your participation grade and your commentary on the work of your classmates will be as important as your own work.

TERM PROJECT
Each student will complete a term project analyzing their own data set. Presentation of the term project will include a preliminary presentation on March 31, a written paper, and a final presentation the last week of class. For the term paper, my policy is: the shorter and more purposeful the text and more exhaustive the citations, usually the better the paper.
SCHEDULE OF TOPICS

*Note 1:* Starting around week 3 we will begin discussing individual student projects.

*Note 2:* The syllabus will continue to evolve in response to student interests, needs, and what we have achieved / not achieved.

**Week One - Jan. 20, 2009**

Discussion of syllabus
Course planning
What is (a/your) question? Why do we care?
What else should we learn about?

**Required Reading:**
Hazelrigg, GA (2007). Honing your proposal writing skills. IN: NSF Career Proposal Writing Tips (ZJ Pei, Editor) – on sakai
Possibly something else short, will be announced via sakai in tip for you to read

**Assignments:**
1) Provide a copy of your CV.
2) Complete the initial survey (on sakai)
(leave the sakai assignments in the Drop Box)

**Week Two - Jan. 27, 2009**

Descriptive statistics
The comparative method

**Assignment:**
1) Express your question in different genres. (on sakai)

**Week Three - Feb. 3, 2009**

Inferential statistics
R-project, SAS, MatLab

**Week Four - Feb. 10, 2009**

Resampling
Parsimony

**Week Five - Feb. 17, 2009**

Multivariate statistics
Phylogenetic methods

**Week Six - Feb. 24, 2009**

Geometric morphometrics

**Week Seven – Mar. 3, 2009**

Individual consultations

**Week Eight - Mar. 10, 2009**
Group consultation

Week Nine - Mar. 17, 2009
SPRING BREAK

Week Ten - Mar. 24, 2009
[topic pending]

Week Eleven - Mar. 31, 2009
PRELIMINARY PODIUM PRESENTATION

Week Twelve - Apr. 7, 2009
[topic pending]

Week Thirteen - Apr. 14, 2009
[topic pending]

Week Fourteen - Apr. 21, 2009
[topic pending]

---term paper due on Friday, April 25 @ 6 pm---

Week Fifteen - Apr. 28, 2009
FINAL PODIUM PRESENTATION