

Anthropology 316: Quantitative Methods in Evolutionary Anthropology
Spring 2018; 3 credits
T/F 9:15 – 10:35 AM
Classroom: LOR 023

HOW THIS SYLLABUS IS ORGANIZED

The syllabus is meant to be a complete document and *everything* in the syllabus is important. The *most important* things come first. For example, please review the policy on academic integrity at <http://ctaar.rutgers.edu/integrity/policy.html#Integrity>. It is very important.

PROFESSOR:

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BOX 1

Core Curriculum Learning Goals Met by this Course

QFR: Quantitative & Formal Reasoning

- ✓ **Formulate, evaluate, and communicate conclusions and inferences from quantitative information.**

Major Requirements Met by this Course

This course meets the *statistics requirement* for the Bachelor of Science degree in Evolutionary Anthropology.

CATALOG DESCRIPTION

This course is about how to answer scientific questions using quantitative and statistical approaches. The specific focus is on questions asked by evolutionary anthropologists and the quantitative methods employed to answer these questions. Topics include what is a scientific question, how to read the primary literature, scientific methodology, hypothesis testing, ethical research design and presentation, descriptive statistics and basic inferential statistics. The course is especially intended for Anthropology majors who are considering a senior thesis.

INTRODUCTION

As scientists and evolutionary anthropologists, our job is to find stuff out and to answer questions. This class is about how to do that using quantitative approaches (counting, measuring, assessing probability). "Finding stuff out" should proceed in an ethical fashion and has wider social implications, so these issues are also addressed in this class.

TEXT BOOKS:

REQUIRED: Introductory Statistics With R (2nd Edition, 2008) by Dalgaard ISBN: 9780387790534

RECOMMENDED: R Cookbook by Teetor (Edition 11); ISBN: 9780596809157

Many readings will come from *Introductory Statistics for the Behavioral Sciences* (4th edition) by Young and Veldman. This is available online very inexpensively plus I have put several chapters in Sakai.

Readings from the primary literature and selected texts available in pdf format will be used. We will also use other resources available online and elsewhere. These will be available as needed on Sakai.

SPECIFIC COURSE OBJECTIVES

- Be able to describe the scientific method. What is an observation, hypothesis, prediction, test of a hypothesis?
- Identify the key earliest steps in formulating a research problem or question.
- Explore approaches to reading papers and methods in general. How do we read the primary scientific literature? What is the primary scientific literature?
- Make practical and ethical 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. Read various kinds of graphs and charts. Understand means, standard deviations. What is variance, central tendency, skewness?
- Be introduced to the concept of probability (what is a “p-value”?).
- Answer the question “what is random?”
- What do we mean by parametric and non parametric methods in statistics?
- What is correlation? What is regression?
- Be introduced to basic inferential statistics: the t-test, ANOVA, chi-squared.
- Learn what “dimension reduction” is and for what multivariate statistic might be useful.
- Work with some real data.
- Answer the question “What is “goodness of fit”?”
- Explore resampling approaches to questions
- Be able to describe the multiple comparison problem and explore ethical and practical issues surrounding this problem.
- Describe ethical approaches to research design and results presentation.

- Describe principles of respect for persons, beneficence, and justice as they apply to research on human subjects.
- Discuss critically practices relating to research design on archaeological and paleoanthropological sites and data.

COURSE STRUCTURE

This course is meant to be an introduction to quantitative methods. These include descriptive statistics and more common and basic inferential statistics. These methods are, however, not useful without a good understanding of what a scientific question is and what the primary scientific literature is. Thus, these two issues will be recurrent themes in the course. Each student will also have the opportunity to work with some already published data. The research arc includes ethical research practices and ethical presentation of data which will be addressed throughout the course. Finally, students will be asked to approach a contemporary social issue from the perspective of science.

Each week, we will have lectures and/or work on computer based exercises in MS excel, JMP software, or R. You will learn basic computer skills for statistical computation. This is not only a statistics class but a class that will teach you about experimental design and hypothesis testing.

GRADING

Grading will be based on class assignments (30%), classroom participation (10%), two midterm exams (20% each), and a final exam (20%).

PREPARATION FOR CLASS

Each week's classes will be structured around required readings and/or some simple in-class exercises. Each class meeting will include some lecture as well as class discussion.

EXAMS

All three exams will ask students to solve a variety of problems and will also include a few short answer questions. A sample problem is available on the course Sakai site. Each exam question will be linked with one of the course objectives.

BOX 2

Assessment of Core Curriculum Learning Goals Met by this Course

Achievement of SAS Core curriculum learning goals will be assessed as follows:

- 1) **Goal w.** A pre-test and post-test will be used to assess how well this goal is achieved.

SCHEDULE OF TOPICS (assignments are due 1 week after assigned)

DATE	TOPICS	ASSIGNMENT	READING
1/16/2018	<u>First class; What is a question and why do we care?</u>		Hazelrigg, 2007 Aresty Grant Directions
1/19/2018	<u>What are "data"?; What are "stats"?; What is the primary scientific literature?; How do people read the primary literature?</u>		
1/23/2018	<u>Ethics in research</u>	Assignment # 1: NIH Human Subjects Training (https://phrp.nihtraining.com/users/login.php) complete training and submit certificate	Y&V1: Introduction
1/26/2018	<u>NO CLASS</u>		
1/30/2018	<u>Populations, samples, and distributions</u>	Assignment # 2: Means and variance Ch 3: 2, 3, 5c, 6b, 7b, 7c, 9, 10, 12, 14	Y&V3
2/2/2018	<u>Populations, samples, and distributions</u>		
2/6/2018	<u>Descriptive statistics I; Central tendency;</u>		Y&V4: Measures of Central Tendency
2/9/2018	<u>LAB – Intro to R</u>		
2/13/2018	<u>Descriptive statistics II; Variability; Skew</u>		Y&V5: Measures of Variability
2/16/2018	<u>Data visualization</u>	Assignment # 3: Calculating simple descriptive statistics	
2/20/2018	<u>The comparative method; What is an inferential statistic?; What is a "test"?</u>		
2/23/2018	<u>Probability; Binomial distribution</u>		Y&V6: Standard Scores

			Y&V7: Foundations of Statistical Inference
2/27/2018	<u>Review and catch-up day</u>		
3/2/2018	<u>Midterm I</u>		
3/6/2018	<u>Student's t-test</u>	Assignment # 4: Pipestems, relative age, and a t-test	Y&V8: The Normal Distribution Y&V11: Standard Error of the Mean Y&V12: The t- Distribution
3/9/2018	<u>Chi-squared</u>		Y&V17: Chi Squared
3/20/2018	<u>Baboon behavior simulation</u>	Assignment # 5: Chi-squared test of in-class baboon behavior simulation data	
3/23/2018	<u>ANOVA, Part 1</u>		Y&V13: The F Test Y&V14: Notation Y&V15: ANOVA
3/27/2018	<u>ANOVA, Part 2</u>	Assignment # 6: ANOVA Exercise	Y&V13The F Test Y&V14: Notation Y&V15: ANOVA
3/30/2018	<u>Potential pitfalls in any analysis</u>		
4/3/2018	<u>The multiple comparisons issue (ethical and practical dimensions)</u>		TBD
4/6/2018	<u>Correlation</u>		Y&V9: Correlation
4/10/2018	<u>Midterm II</u>		
4/13/2018	<u>NO CLASS</u>		
4/17/2018	<u>Regression</u>		Y&V9: Regression and

			Prediction
4/20/2018	<u>Non-parametric statistics</u>		Y&V19: Nonparametric Statistics
4/24/2018	<u>Brute-force methods: The marvelous world of resampling</u>		TBD
4/27/2018	<u>What are multivariate statistics?; What is "dimension reduction"?</u>		TBD
5/8/2018	<u>Final Exam 8-11am</u>	LOR 023	