

Syllabus STOR 054
First year seminar – Adventures in Statistics
Fall 2016 (August 23 – December 7)
TuTh 3:30 – 4:45pm
Hanes 130

Instructor:	Jan Hannig	Phone: (919) 962-7511
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Office Hours:	M 2:30 – 3:30 PM W 11:00AM – 12:00noon and by appointment	Course home page on http://www.unc.edu/~hannig/STOR054 http://sakai.unc.edu

Required Text: None. The instructor will assign readings throughout the semester.

Recommended Texts:

- Charles Wheelan, *Naked Statistics: Stripping the Dread from the Data*, ISBN 978-0-393-07195-5 (This is an excellent book that introduces the basic ideas of statistics using many fun real life examples.)
- Lock, Lock, Lock, Lock and Lock, *Statistics: Unlocking the Power of Data*, ISBN-13: 978-0-470-60187-7 (This text might be useful to students who want to delve deeper into the technical aspects of statistics.)
- Introduction to the R programming language: <http://cran.r-project.org/doc/manuals/R-intro.pdf>

Required Software:

- Students will be asked to download and install R, a free software package, on their laptops. During the course students will learn rudimentary programming techniques and use their skills to demonstrate ideas and complete projects.
- If you are familiar with another programming language, e.g., Python or Matlab, you may ask for a permission to complete your homework assignments using an alternative programming language instead of R.

Course Outline:

The aim of this seminar is to show that contrary to the common belief statistics can be exciting and fun. The seminar will comprise of three modules: Statistics in our lives, randomness, and principles of statistical reasoning. We will focus on the big picture ideas. Instead of memorizing confusing formulas, many of the technical ideas will be demonstrated by computer experiments. This seminar is not a replacement for an introductory statistics course.

When discussing *statistics in our lives* we will explore how statistical reasoning impacts modern society. We will view the movies Moneyball, 21 and an episode of the Power of 10. We will

discuss the role statistics plays in sports, gambling, medicine, politics, finance, etc. The instructor will attempt to solicit interesting outside lecturers throughout the year.

In the second module we will study *randomness*. We will learn about what it means to be random and how the idea of randomness affects our daily decisions. We will see that random does not necessarily mean unpredictable and discover why the casino always wins. We will also take some time to learn rudimentary R programming.

In the last module we will discuss the basic *principle of statistical reasoning* – if something is highly unlikely, do not believe it, especially if there is a much more likely alternative explanation. We will see how this basic principle gets applied by different schools of statistics. In particular we will get to understand why a relatively small sample can carry a big punch. We will also learn how a statistician can lift herself by her bootstraps.

The remainder of the class time will be devoted to students' presentations.

Assessment: There will be no formal exams. Each student will be assigned one project each module. Each project will require completion of a 5-10 page report. At the end of the semester each student will select one of their projects they found most interesting and give an oral presentation on the findings. Course grade will be based on the three project reports (60% of the grade), oral presentation (20% of the grade) and homework (20% of the grade).

Final course grade will be determined using the usual scale: A – 90%, B – 80%, C – 70%, D – 60%, F – below.

Homework: Homework will be assigned regularly. Most of the homework assignments will require writing simple R programs and will be due one week from the date assigned.

SAKAI: You will need to provide your ONYEN and PASSWORD in order to login at Sakai. Class materials and grades will be posted there. *Visit the web page regularly.*

Note: The Honor Code will be observed at all times in this course. This course will participate in the Carolina Course Evaluation. Each student should feel comfortable approaching the Instructor with any concerns he/she has with the course.

The instructor reserves the right to make any changes he considers academically advisable. It is your responsibility to attend classes and keep track of the proceedings.

Tentative Course Outline:

Lecture 1	Introductions
Lecture 2	Watch: The Joy of Stats
Lecture 3	Guest lecturer
Lecture 4	Guest lecturer
Lecture 5	Basics of R programing
Lecture 6	Uncertainty and R
Lecture 7	Watch: Moneyball
Lecture 8	Probability
Lecture 9	Basic Rules
Lecture 10	Surprised by probability
Lecture 11	Random Variables
Lecture 12	Mean, SD – why not to gamble
Lecture 13	Blackjack and counting cards
Lecture 14	Class casino – blackjack (fake money, winner gets a cookie)
Lecture 15	Watch: 21
Lecture 16	Basics of Game theory
Lecture 17	Analysis of simplified poker
Lecture 18	Designing our own lottery
Lecture 19	Intro to statistics – sampling Watch Power of 10.
Lecture 20	Designing a good questionnaire
Lecture 21	Is there a difference between premier league teams? Making statistical decision using R
Lecture 22	Statistics according to Reverend Bayes
Lecture 23	Bootstrap and analysis of poll data
Lecture 24	More complicated models: capture/recapture and linear regression
Lecture 25	Reverend Bayes strikes back
Lecture 26	Student presentations