STATISTICAL FOUNDATIONS
Summer Statistics Institute
The University of Texas at Austin
May 20 - 23, 2013

Lectures: CLA (Liberal Arts Building) 1.106
(Building Map: www.utexas.edu/maps/main/buildings/mez.html)

Mon 1.30 – 4.30 PM
Tue   1.30 – 4.30 PM
Wed 1.30 – 4.30 PM
Thu   1.30 – 4.30 PM

Breaks: Mon – Thu 3.00 – 3.30 PM

Instructor:
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Office Hours: By appointment – please email me 4 convenient day/time ranges

Teaching Assistant:
T.B.A.

Course Summary Description:
An appreciation of the importance of statistics within academic pursuits has become apparent to most students, instructors and researchers. It is now readily appreciated that the majority of subjects require the description and understanding of information and data that are not purely or innately black and white.

Statistics is a vital philosophical approach, which allows everyone to more readily comprehend and understand the world around us and to make better decisions within our daily lives.

This course is designed for an audience ranging from complete novices to graduate students requiring help with analysis and design of their research. The course will showcase the fundamental concepts of statistics and will emphasize a simple systematic approach to problem solving.

Course Objectives:
The course is designed to promote **CRITICAL THINKING & PROBLEM SOLVING skills,** which will enable students to master statistical tests used frequently within the scientific arena and to decide when these tests are appropriate to use. Refinement of CRITICAL THINKING & PROBLEM SOLVING skills will assist students in all academic pursuits; especially when approaching new and complex topics and information.

Students completing the course will learn how to:
- ask appropriate questions
- design surveys & controlled experiments
- acquire information & samples
- manipulate & recode data for analysis
- efficiently summarize information
- understand distributions (sampling & normal)
- understand the theory behind inferential statistical techniques
- conduct multiple rounds of hypothesis testing
- achieve statistically sound inferences
- assess the strength of their conclusions
- report research findings in a scientifically sound fashion

Texts & Further Readings:
Although there are no required texts for this course, several background texts are listed, which act as a broad resource to understanding statistics ('frequentist').

- **How To Lie With Statistics**, Huff, D., (W.W. Norton, New York, 1993)
  This is a useful overview of how statistics have been misused in the past. By understanding how information can be misrepresented through the use of inappropriate statistical methods, the reader can appreciate more fully how to present information which is complete & fully descriptive of reality.

- **Statistics for the Life Sciences**, Samuels, M.L. & J.A. Witmer, 4th Edition (Pearson Education, Inc., New York, 2003)
  Samuels is a particularly good introductory statistics text. The book is clearly laid out & logically presents statistics methods. Inferential statistical tests are built upon in an incremental mathematical order, from simple first principals.

- **Biostatistical Analysis**, Zar, J.H., 4th Edition (Prentice Hall, 1999)

- **Biometry**, Sokal, R.R. & Rohlf, F.J., 3rd Edition (Freeman, New York, 1995)
  Both 'Biostatistical Analysis' & 'Biometry' are viewed widely as graduate level statistical course books. Both provide details about quite a wide array of statistical tests. Although these texts are exceptionally good reference materials, they are not necessarily books one would use to learn statistics from scratch.

Blackboard (Bb):

Announcements, course material and discussion boards will be posted on the SSI – Statistical Foundations Blackboard site (http://courses.utexas.edu). Students are requested to **CHECK Bb & EMAILS ON A DAILY** basis.

Students are encouraged to post ANY questions & answers to the discussion boards during the course, to highlight and promote understanding of the course material, for all. Students are also encouraged to post suggestions and feedback to help improve the course.

Emails:

Students are requested to **CHECK EMAILS ON A DAILY** basis. Students who do not receive regular emails from their instructor through Bb should immediately contact their instructor, as this may be a symptom of a problem.

Students should feel free to email their instructor to request an appointment, if you have any questions or problems. Please include "SSI –" as the first word in the subject line and also please note your full name at the end of your emails. If you would like to schedule an appointment please just provide 4 day/time ranges which are convenient for you. Your instructor can then select the earliest available time to meet.

Classroom Response System (iClicker):

Data collection, audience views & understanding will be assessed using CRS handsets; clickers. iClicker handsets will be provided on the first day of class.

PLEASE NOTE:
o *iClickers will be used to provide students with ANONYMOUS feedback during the course.*

Preparation For Lectures:

Classroom sessions are designed to be interactive & students are **STRONLY** encouraged to **ASK QUESTIONS all the way through the class sessions**.

Lecture notes from each class will be posted on Bb following the lecture. Students are encouraged to review lecture notes, prior to each successive class.

Students who would like to make supplemental notes may wish to record the slide numbers on their personal notes, in order to assist with identifying lecture slides at a later time.

Lab Sessions:

The times for computer lab session will be announced on the first class day. Lab sessions will be carried out in **CLA 1.106**.

The lab sessions are designed to:
1. Review problem solving & interpretation skills
2. Highlight statistical software tool sets (SPSS)
3. Demonstrate how real data can be presented & interpreted

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Students will work together in their assigned small groups. After initial small group discussion, students will review data sets together as a whole class.

Computer Software:

Statistical software (SPSS) will be used to speed up statistical analyses of larger data sets & to demonstrate one of the more common analysis packages available.

A 21 day free trial of the SPSS package can be downloaded from (T.B.A.).

Please ensure that you have a working version of SPSS on your laptop before the last class day.

Alternatively students enrolled at UT may purchase the SPSS "Grad Pack" in the University Co-Op for $196. This is a great offer for those student's who will be carrying out more data analysis in the future. The base SPSS module can cost as much as $7,000, depending upon academic affiliation and corporate licensing agreements. In contrast the Grad Pack includes the base module and advanced modules.

Classroom Distractions:

- To promote a positive learning environment within the course, students are requested to sit together near to the front of the room.
- Late comers are asked to sit on the sides of the room closest to the door to minimize distraction.
- Cell phones should be turned **OFF PRIOR** to class
- *Laptops are NOT permitted in class, except for the last class day*.

Accommodations For Students With Disabilities:

Any student with a disability who requires ANY accommodations should contact the instructor as soon as possible.

Course Schedule:
The times of delivery & emphasis of course content are tentative.
Lab times & dates will be determined on the first class day.

Day 1:
Introductions & groups
Philosophy & Reality
Branches of statistics
Study design
Sampling techniques
Experimental problems
Controlling for problems:

Day 2:
Descriptive statistics - Describing the world
Summarizing the facts – Indexes & Graphs
Interpreting descriptive statistics
Probability
Important distributions
The Sampling Distribution
More probability
SPSS Session
Entering data
Re-coding data
Viewing data

Day 3:
Philosophical problems with questioning
Inferential statistics
The purpose & need for inferential statistics
Sampling & the sampling distribution revisited
Indexes; standard error & confidence intervals
Testing your ideas - Hypothesis testing
The t-test

Day 4:
Inferential statistics II
Other hypothesis tests – other types of information
When to use inferential tests
Making inferences & telling stories
Philosophy, questions & answers
SPSS session
testing data
statistical inference

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