

## OA 3102: Statistics Syllabus (4-2) Summer, 2015

**Instructor:** Professor xxxxx, Glasgow xxx

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**Lectures:** Section 1: Monday through Thursday in GL-118 from 0900 to 0950

**Lab:** Section 1: Friday in GL-203 from 1300 to 1450

**Final:** Thursday 3/18/14 in GL-115 from 0800 to 0950

**Office Hours:** By appointment (one day in advance is best). I am usually in my office and can accommodate drop-ins, so please don't hesitate to drop by.

### OBJECTIVES

OA 3102 covers the basic tools and concepts of statistics: **statistical vocabulary**, **summary statistics**, **estimation**, **hypothesis testing**, an introduction to **non-parametric methods**, **goodness of fit**, and **analysis of categorical data**. We will also try to "introduce" key ideas such as the **Bootstrap** and **Bayesian statistics**, with the depth a function of the time available.

The primary course objective is to give you an *understanding* of how statistical reasoning is used to make inferences about populations in the presence of uncertainty. For example:

- (1) How many sailors should we survey to get an accurate estimate of their view on an important Navy topic?
- (2) Do two Navy suppliers have the same reliability?
- (3) What is the performance of a weapon system or sensor (e.g., probability of kill, mean detection range, etc.)? Does a new system meet its requirement specifications?
- (4) What input variables and interactions, according to a computer model, significantly affect mission outcomes?

You will learn statistical terminology and gain a perspective that will be useful in the empirical aspects of other courses and in evaluating information in the broader world.

Another course objective is to give you the tools to carry out your own analyses. In addition to covering the technical aspects of basic methods, the course includes assignments that will teach you to select and apply the appropriate techniques to real problems. You will learn how to use **R**, a very powerful statistical and graphics package, to analyze data. Time permitting, we may provide a brief overview of two other popular statistical software packages (Excel and JMP).

## Prerequisites

OA3101, MA1115, or MA3110 (or equivalent).

## Course Outline

The topics for the course are listed below. Specific dates will be announced in class.

<u>Topic</u>	<u>WM&amp;S Chapter</u>
Course Introduction	--
Descriptive Statistics	1
Sampling Distributions and the CLT	7.1-7.3, 7.5
Point Estimation	8.1-8.4
Interval Estimation	8.5-8.9
Methods of Deriving Estimators	9.6-9.7
Hypothesis Testing	10.1-10.12
Nonparametric Statistics	15.1-15.6
Categorical Data Analysis	14

## Required Course Materials

**Textbook:** The course text is *Mathematical Statistics with Applications* by Wackerly, Mendenhall, and Scheaffer (7th edition). Note: Additional reading material will be posted on the course website. Also, the course text is meant to complement the lectures—i.e., they are not replicates of each other.

**Software:** We will predominantly use **R**, a powerful open-source statistical software tool, for course labs. However, you may also get an introduction to **JMP** and statistics in **Excel**.

## COURSE REQUIREMENTS AND GRADES

Grades will be assigned consistent with the grading guidelines at the Naval Postgraduate School and the amount of understanding of the course material demonstrated by you. There is no preset class average. Feedback as to how you are doing will be provided throughout the course. The information below is subject to change as developments warrant.

The final grade will have four components: “ungraded” homework, some small projects (really graded big homework assignments—often associated with a lab), two midterms, and a final exam. The following is a description of the four components and their *approximate* contribution to your final grade:

**1. Ungraded homework and class participation (~10%).** There will be about one homework assignment per week. I may spot grade them, if necessary. Assignments will typically be given near the end of a section and you will be given several days to complete them. That said, don’t wait until the end of a section to look at and do the problems you are able to solve. Homework should be a learning activity; therefore, you can discuss the problems with your fellow classmates up to the point that no writing is involved. That is, all students must complete their homework without the benefit of looking at what others have written. Also, attentive, active, and interacting students

make the course more interesting for everyone. You can get easy points simply by actively participating in classroom and lab discussions.

**2. mini-Projects (graded homework/lab assignments)** (~10%). There will be a few graded projects, usually based on a lab. These will be extensive computer-based homework and may be carefully graded. These assignments will typically be about one week in length. These must be done individually. All project write-ups should be organized to make things easy on the grader. Core-dumps will be treated harshly. More information will be provided at a later date.

**3. Exams and quizzes** (45% total). There will be two exams (at about 4 and 8 weeks in). No notes or books will be allowed, with the exception of a single 8.5 by 11 *handwritten or typed* crib sheet. All exams are cumulative. Exam questions are often based on homework problems and classroom examples. Note: there will be a couple of closed book quizzes at the start of some labs (to help you memorized some important definitions and concepts).

**4. Final** (35%). This will have the same format as the quizzes, except you will be allowed two hours to complete it. It will be cumulative and you will be allowed two handwritten sheets of paper.

### **Policy on Taking Exams and Quizzes**

**Absences and Make-ups:** There will be no make-ups for missed quizzes. If you miss a quiz, and have a good excuse, your grade will be based on the remaining portion of the material. If necessary, there will be one scheduled makeup for the final—only for those who provide advanced notice of an excused absence.

**Academic Integrity:** University policy is that any form of cheating or plagiarism is prohibited and will be harshly dealt with. All students are expected to do their own work under the standards set above. If you have any doubts, ask me. An exception is for R assignments. *You are to freely ask for (and provide) R help from your fellow officer-students.* This is, of course, not to include directly copying assignments! Be sure to acknowledge any help of substance on anything you turn in.

### **Miscellaneous Class Rules**

(A) **Be courteous!** Some examples: (1) *Be in class and ready to start on time*—and I will strive to get you out on time; (2) Minimize distractions, such as eating, side conversations, *browsing the internet*, and cell phones beeping.

(B) **Participate!** Learning should be interactive. Don't be shy about asking questions or making comments—contribute any way you can. Be an active learner!

### **Grading rules**

Grades for all required work will be provided expeditiously. You are responsible for verifying that the assignments have been graded accurately and that the grades have been entered correctly. Any disputed grades should be taken up with me as soon as possible—*but not on the day you get your assignment back*. Take some time to think about your questions, and then, if you have not satisfactorily resolved the problem, come see me.

NO GRADE CHANGES WILL BE MADE LATER THAN ONE WEEK AFTER THE ASSIGNMENT HAS BEEN RETURNED.

Organization and neatness count in your job—and they will here too! It is up to you to make sure what you turn in is clear and legible. *If I can't understand your work it will be marked wrong—with some leniency given for in class tests.* Show all relevant work and give credit where credit is due (i.e., cite a reference book or classmate etc.).

### **Calculators**

Everyone should have a working calculator for use during quizzes and exams. It is important to have a square root key and at least one memory. "Scientific" calculators with features like function keys for the mean and standard deviation, log, powers, and exponentiation are useful in statistics and cost only a bit more. You are responsible for bringing your calculator to exams.

### **Free Advice**

Statistics is a participatory sport! The secret to doing well in a class such as this is to regularly do lots of problems and be active in lectures. Homework/review problems will be assigned on a regular basis. Problem sets will be randomly graded and problems will be drawn from them for the quizzes. It is your responsibility to understand how to do all of the homework problems. History has shown that there is a strong correlation between working the homework problems and doing well on the exams.

You are responsible for everything that goes on in lecture and in the labs and for obtaining any handouts. Please do assigned readings before class (at least skim them). The lectures and the readings are not substitutes for one another.

This course moves fast, with the later material building on the earlier. It is essential that you do not fall behind. Doing problems most every day is the best advice I can provide!

### **Tentative Exam Schedule**

**Exam one:** Friday, 1 August

**Exam two:** Friday, 29 August

**Final:** Thursday, 18 September