

# Statistics

**W**elcome to Math 2200! My name is Professor Edward Spitznagel. This is an introductory course in statistics and the underlying probability theory supporting it. (*Revised 1/24/2011.*)

## Times and Places

**T**he two sections of our course meet Monday, Wednesday, and Friday 10-11 and 11-12 in Seigle Hall 304. **Before you come to class, please study the section of the book to be covered that day.**

My office hours are from 12 to 1 on Monday, Wednesday, and Friday in Seigle Hall L016. If I still have “customers” at 1 o’clock, I will stay up until 2 pm.

## Textbook

**T**he text is De Veaux, Velleman, and Bock’s *Stats: Data and Models*, Second Edition. When you first get a look at it, the cover may give you the impression that it is a “blow-off” book, written by people at bottom-of-the-barrel schools. I assure you that’s not true. In fact, I encourage you to look up the rankings of their schools at:

[http://www.wsjclassroomedition.com/pdfs/wsj\\_college\\_092503.pdf](http://www.wsjclassroomedition.com/pdfs/wsj_college_092503.pdf)

This ranking by the Wall Street Journal is fully objective, based solely on the percentage of their graduates admitted to the very best professional schools.

## Hand Held Technology

**T**he Texas Instruments calculators **TI-83, TI-84, and TI-89** contain essentially every probability function

and statistical program we will be using during the course. It would be foolish not to use such technology in our course, as it saves memorizing a huge number of arcane formulas. I have therefore declared the above to be the official calculators for the course. These calculators obviate use of the tables in the back of the book. Hence, I will not provide those tables for the examinations. *Verbum sapienti!*

## Homework

**T**here is no graded homework. In past years, only about half of the graded homework was picked up. I’ve concluded that students will be better off just keeping their homework to study from for the examinations.

I have recommended six homework problems per class meeting, with the promise that 60% of the examination questions will come from those problems. **Before you come to class, please read the recommended homework problems for that day.**

Two will be odd-numbered, with answers in the back of the book. Since the answers are provided, you can practice and test your knowledge by doing them.

Four will be even-numbered. There will usually be enough time for me to go over two of the even-numbered problems in class. That leaves you with two problems whose answers and solutions are not available to you.

For those of you who wish, a grader will provide you with feedback on those two problems via email. By 9AM of the Tuesdays and Thursdays following the Monday and

Wednesday classes, you may drop off your solutions of the two problems in the Math Dept office, Room 100 of Cupples I. **Following the Friday class, you may slip your solutions through the mail slot in the door of Room 100 of Cupples I, by noon Saturday.**

Please write only on the front side of each page, use a paperclip (not a staple) to hold them together, and pull off any jaggies if you tore them out of a notebook. Print your Washington University email address *clearly* at the top of each page. We will score your solutions and email you scanned copies so you can get feedback as quickly as possible.

For those of you studying as a team, submit one copy. Whoever submits it will receive the email and can forward it to everyone else. We're sorry that, due to the limitations of our scanner, we can only email a scored assignment back to a single address.

There are three simple conditions on this offer. First, we will only score original, handwritten work, not photocopies. Second, we will only score good-faith attempts to solve the problems; we will not write in solutions, or even provide answers, on blank sheets of paper. Third, we will not score illegible solutions; we will simply return these marked as illegible.

We will keep no records of how well you did on these problems. This is strictly a feedback service. Therefore, there is no need to give us your name; just provide your email address.

## Examinations

**A**s mentioned earlier, examinations are closely linked to the homework problems. If you faithfully work the problems, you should have no trouble scoring well on the examinations. Each examination will contain twenty-five multiple-choice questions, of which fifteen will be homework problems with altered numbers. You may bring one 4×6 inch notecard to each in-semester examination. For the final exam, you will be permitted to bring all your previous notecards,

plus one you have prepared for the final exam. You may use both sides of each notecard.

Over the four examinations, you can achieve a maximum of 100 points. At the end of the semester, the A range will be 90 and above, the B range will be 80 to 90, the C range will be 70 to 80, and the D range will be 60 to 70, with plus and minus grades at the tops and bottoms of each of these ranges.

Students ask if I ever grade on a “curve.” Curve grading was popular about fifty years ago. It assigned six letter grades A, B, C, D, E, and F based on a Gaussian, also called a “normal” curve. The grade of A corresponded to being 2 standard deviations above the mean and was awarded to the upper 2.5% of all students. I doubt any of you would like grades to be assigned based on that system.

Instead, I will follow the modern convention, in which the A range will be 90 to 100, the B range will be 80 to 90, the C range will be 70 to 80, and the D range will be 60 to 70, with plus and minus grades at the tops and bottoms of each of these ranges. If you are registered pass/fail, you must achieve at least 70 points to pass, which is the lowest score for a C-.)

In addition to calculating the straight sum of points, I will also average the examination scores following a weighting process, in which each in-semester examination counts 20% and the final counts 40%, giving you whichever score is higher.

This alternative weighting system rewards students who have improved over the course of the semester.

## Examination Schedule

**T**he three in-semester examinations will be given from 6:30PM to 8:30PM the following **Tuesday evenings**: February 8<sup>th</sup>, March 8<sup>th</sup>, and April 12<sup>th</sup>.

The final examination will be given on **Thursday, May 5<sup>th</sup>, 3:30PM-5:30PM.**

As always, examination room assignments are posted on the Math Dept website:

<http://www.math.wustl.edu/seatlookup/>

the day of the examination.

## Computing

**R**eal statistical analysis is practical only in the context of computer statistical packages. Since it is not practical to allow computers in the examination room, there is no way to test you on your ability to compute. However, since the software in the **TI-83** and its cousins closely follows the style of computer packages, you will learn the basics of statistical computation as you do the homework and the examination problems.

I will occasionally show you how the problems can be solved using the JMP statistical software from SAS Institute. While I do not expect you to become skilled at doing data analyses with a computer, it is very important for you to be able to read intelligently the results of such analyses. The authors of our textbook realize this, and from time to time they display computer output (usually without identifying which software package generated it). If I show you computer output in class and explain what it contains, you can expect that I will devote questions to it on our examinations. Those will be part of the ten questions that are not taken directly from the homework.

## JMP for Extra Credit!!

**I** have bundled the JMP software with your textbook, and am encouraging you to give it a try. Beginning with the second day of class, I will give you one problem each Friday that you can solve with JMP. These are worth one point each, for a total of twelve extra points over the semester. Thus, by doing these extra credit problems (correctly) you can raise your course GPA by one full point (e.g., from a B to at least an A). The CD for JMP is shrink-wrapped into the bundle, and

can be installed on a Mac or a PC. The JMP formatted datasets are on the CD that is glued into the back of the textbook.

I will provide an MS Word template for each problem by class time on Friday, and the completed problem will be due in class the following Monday. If you did not buy the bundle from the bookstore, you may be able to team up with another student. I'm not sure of the legality, but SAS Institute probably will not sue you. (I don't think they're as Draconian as the RIAA is.)

This is a gentle, tentative attempt to reintroduce computing into our introductory course. If it works out well, we may make it a regular feature.

## Recommended Homework

**H**ere are the recommended homework problems. In each day's list, two are odd-numbered, for which you will find answers in the back of the book.

Mastering these and faithfully reading the book should give you the two hours-out-of-class-for-every-one-in-class needed for success in the typical undergraduate course. The last time I taught a course to engineering students, they complained to their dean that I was working them too hard, giving them homework that took two hours per class period (gasp, shudder). He asked them how much homework time they spent in their other courses, and they said, oh, about half an hour. Would you really want to fly in an airplane designed by students like that?

Two schools, CalTech and MIT, award credits equal to the weekly sum of lecture hours and expected amount of hours outside of class. As a reality check, I visited their websites and found the credits for their equivalent statistics courses to be:

CalTech: Ma112a lists 9 units of credit.

MIT: 18.443 lists 12 units of credit.

Thus, these two schools expect their students to spend between two and three hours outside

of class for every hour inside class. (One of my kids graduated from MIT with over 500 credit hours.)

Jan 19	Chapter 2	1,3,8,10,12,16	Mar 8	<b>Second Examination</b>
Jan 21	Chapter 3	3,12,22,26,28,39	Mar 9	Chapter 19 2,7,14,16,30,35
Jan 24	Chapter 4	3,22,26,28,35,38	Mar 11	Chapter 20 2,7,14,16,30,35
Jan 26	Chapter 5	2,3,20,27,28,44	Mar 14 – 18	<b>Spring Break</b>
Jan 28	Chapter 6	14,22,25,29,30,44	Mar 21	Chapter 21 2,9,11,18,22,26
Jan 31	Part I Rev.	13,22,24,30,35,36	Mar 23	Chapter 22 1,3,14,16,22,28
Feb 2	Chapter 7	10,15,20,22,28,33	Mar 25	Part V Rev. 16,17,20,23,28,36
Feb 4	Chapter 8	6,12,14,25,31,50	Mar 28	Chapter 23 3,20,21,22,28,34
Feb 7	Chapter 9	6,13,14,15,16,20	Mar 30	Chapter 24 1,9,26,28,30,34
<b>Feb 8</b>	<b>First Examination</b>		Apr 1	Chapter 25 2,10,12,14,15,27
<b>Feb 9</b>	<b>Chapter 10</b>	<b>2,6,7,16,18,21</b>	Apr 4	Chapter 26 4,14,22,23,27,32
Feb 11	Part II Rev.	21,24,28,32,33,36	Apr 6	Part VI Rev. 19,29,36,38,40,44
Feb 14	Chapter 11	3,20,24,25,34,36	Apr 8	Chapter 27 5,10,11,18,22,26
Feb 16	Chapter 12	2,8,12,16,17,23	Apr 11	Chapter 27 31,32,36,3×L.R.*
Feb 18	Chapter 13	8,13,16,21,22,42	Apr 12	<b>Third Examination</b>
Feb 21	Part III Rev.	3,6,15,16,34,38	Apr 13	Chapter 28 1,2,4,5,6,8
Feb 23	Chapter 14	3,8,26,32,33,34	Apr 15	Chapter 28 12,14,15,16,19,22
Feb 25	Chapter 15	4,11,16,38,41,42	Apr 18	Chapter 29 5,6,13,14,16,18
Feb 28	Chapter 16	8,14,20,24,29,33	Apr 20	Chapter 30 1,2,3,4,6,8
Mar 2	Chapter 17	4,13,15,32,34,36	Apr 22	Chapter 30 9,10,12,13,14,16
Mar 4	Part IV Rev	4,7,13,20,34,40	Apr 25	Chapter 31 1,2,3,4,5,6
Mar 7	Chapter 18	4,7,8,17,28,36	Apr 27	Chapter 31 7,8,9,10,11,12
			Apr 29	Part VII Rev. 16,26,30,35,36,41
			May 5	<b>Final Examination</b>

\*I will give you three logistic regression problems on this day.