STATISTICS

Welcome to Math 3200! My name is Professor Edward Spitznagel. This is the successor course to Math 320, and the two versions of the course have a history going back to 1970. It is a calculus-based introductory course in statistics and the underlying probability theory supporting it. This course is differentiated from the effectively non-calculus-based Math 2200.

When I began teaching Math 320 in 1970, it had an enrollment of 21 students. At that time, it was a calculus-based course. Over the years, it grew until it had over 400 students. Gradually, the calculus prerequisite became a nominal one-semester dose (Math 131), which meant that the quality of the course really suffered. Perhaps that would not have been a problem, except for the fact that many of our upper level courses depended on students being prepared for them by Math 320. Without that preparation, those courses had to spend their first third in reviewing what should have been covered in Math 320, and thus themselves became watered down.

By returning Math 320 to its roots, we have upgraded the quality of all our statistics offerings for both mathematics majors and minors. Of course, any student, major, minor, or not, who has the calculus background is welcome in the revitalized Math 320. Although what we did is in fact restore Math 320 to what it once was, it was decided that it might be more politically correct to give it a new number—thus its new designation as Math 3200.

Times and Places

Our course meets Monday, Wednesday, and Friday 10:10-11:00 in Louderman 458. **Each night before you come to class, please preview the section of the book to be covered that day.** Naturally I don't expect you to learn all the material from that reading. What I do expect is that you will be able to ask *much* better questions, having done that preview.

My *official* office hours are from 11:10 to 12 on Monday and Wednesday, in Room 118 of Cupples I. However, I am there at other times, on average perhaps 80 hours a week, and you are *welcome* to knock anytime you see the light on. Alternatively, if you are not close by, you are welcome to call to see if I am in. My telephone number is 935-6745.

Textbook

The text is Tamhane and Dunlop *Statistics and Data Analysis: From Elementary to Intermediate*. This is one of very few books from which a junior level course can be taught. Students sometimes refer to the textbook as "the burgundy book" from the color of the cover. Most other books are either too hard (too much mathematics) or too soft (too little mathematics). Like Baby Bear's bed, Tamhane and Dunlop is just right. What can you do with statistics as taught in Math 3200? Well, Math 3200 is a archetypal "STEM" course, and our students have parlayed their science-technology-engineering-mathematics knowledge into exciting and rewarding summer jobs and internships. Because we teach statistical computation using the most powerful software

available—SAS—those students are exceptionally competitive on the job market.

Because we teach probability theory using many of the problems found in the Society of Actuaries Exam P/1, some students have taken and passed that first exam and embarked upon careers in Actuarial Science. The highest-paid actuary in Saint Louis has a mid-seven-figure annual income. A former vice-chancellor of Washington University — relocated to New York City and now retired— was an actuary, with a similar income. He was largely responsible for the size of our endowment. If STEM is not exactly your cup of tea, maybe being an actuary is.

Other Math 320/3200 alums have earned PhD degrees from some of the finest statistics programs in the country and are doing cutting-edge research in statistics and its applications.

Hand Held Technology

Before he created Star Trek, Gene Roddenberry wrote many episodes of a cerebral Western called "Have Gun Will Travel." The protagonist Paladin solved problems creatively and nonviolently, often without recourse to his weapon.

I like to think of statisticians in that same vein, perhaps starring in a series called "Have Brain Will Travel." Instead of a six-shooter, their problem-solving tool is one of the **Texas Instruments calculators TI-83, TI-84, TI-89 and NSpire.** These contain essentially every probability function and statistical program we will be using during the course. Please bring your calculator to class to learn how to use it well, and bring it to our four exams to solve problems. Using a computer emulation of the TI-83, I will frequently work problems in class, projecting an image of the calculator on the screen. This family of calculators contain functions that supersede the distribution tables in the back of the book. I will not provide those tables for the exami-

nations; you will be expected to use the calculator instead.

Manual Homework

There are six recommended homework problems per day of class. Two are odd-numbered, with answers in the back of the book. The other four are even-numbered. I will usually work two of these even-numbered problems in class, leaving you with a net four problems per day to do on your own. These problems will not be graded. Your primary motivation for keeping up with the homework is that most of the examination problems are homework problems with simple changes in the numbers.

For those of you who wish it, a grader will provide you with feedback via email for any problems you choose to do. Those who participated regularly in this service last year all achieved course grades of A– or higher. By 9AM of the Tuesdays, Thursdays, and Saturdays following the Monday, Wednesday and Friday classes, you may drop off your solutions of whatever problems you wish by slipping them under my office door, Room 118 of Cupples I.

Please write only on the front side of each page, use a paperclip to hold them together, and pull off any jaggies if you tore them out of a notebook. Print your Washington University email address at the top of each page, **clearly**. We will score your solutions and email you scanned copies. I will also bring your originals to our next class meeting.

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 two 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 prob-

lems. We will not write in solutions, or even provide answers, on blank sheets of paper.

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

Computer Homework

There is a wide variety of computer software for doing statistics, ranging from the relatively primitive capabilities in Microsoft Excel® to the extremely powerful SAS® package. We will use SAS. It is so rich that we will be able to cover only a fraction of its capabilities, but that coverage should be enough to give you a foot-in-the-door when applying for jobs and internships. I will demonstrate its use in class, and will assign homework problems for you to hand in for grading.

Generally, there are three required computer homework problems per week of class. When it is convenient, these problems are chosen from the recommended manual homework problems. These problems are due at the beginning of class on most Mondays. There are a total of ten assignments. The computer homework will count as 20% of your course grade.

Examinations

As 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 multiple-choice problems, of which approximately fifteen will be homework problems with altered numbers. You may bring one 4×6 inch notecard to each examination (writing on both sides).

Over the four examinations, you can achieve a maximum of 80 points. With the computer homework added in, your maximum number of points will be 100. At the end of the semes-

ter, 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. The grade of B corresponded to being one to two standard deviations above the mean and was awarded to 13.6% of all students. The most common grades were C and D, at 34.1% each. I doubt any of you would like the 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 16% and the final counts 32%, giving you whichever score is higher. (The computer homework will still be counted at 20%.)

The latter weighting system rewards students who have tended to improve over the semester.

Examination Schedule

The three in-semester examinations will be given from 7:00PM to 9:00PM on the following days: Wednesday, September 16th, Wednesday, October 21st, and Monday, November 16th. Note that these are different days of the week.

The final examination will be given on **Thursday, December 10th, 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.

Recommended Homework

Following are the recommended homework problems. In each day's list, two or occasionally three are odd-numbered. You will find answers for those in the back of the book.

Aug 24	Chapter 2	6,9,10,11,12,14
Aug 26	Chapter 2	16,17,18,20,22,27
Aug 28	Chapter 2	28,29,30,32,33,34
Aug 31	Chapter 2	35,38,40,41,42,46
Sept 2	Chapter 2	48,49,50,52,53,54
Sept 4	Chapter 2	59,60,61,62,64,70
Sept 7	**Labor Day Holiday**	
Sept 9	Chapter 2	71,72,73,74,75,76
Sept 11	Chapter 2	78,79,80,81,82,83
Sept 14	Chapter 3	1,2,3,4,5,6
Sept 16	Chapter 3	7,8,9,10,11
Sept 16	**First Exam (Wednesday)**	
Sept 18	Chapter 3	12,14,15,16,17,18
Sept 21	Chapter 3	20,21,22,23,24,26
Sept 23	Chapter 4	2,3,4,5,6,8
Sept 25	Chapter 4	9,10,11,12,14,26
Sept 28	Chapter 4	30,31,33,34,38,40
Sept 30	Chapter 5	1,2,4,6,7,8
Oct 2	Chapter 5	16,18,19,20,22,23
Oct 5	Chapter 5	24,25,26,29,30,32
Oct 7	Chapter 6	1,2,3,4,7,8
Oct 9	Chapter 6	11,12,13,14,15,16
Oct 12	Chapter 6	17,18,20,22,24,30
Oct 14	Chapter 7	1,7,8,12,13,16
Oct 16	**Fall Break**	
Oct 19	Chapter 7	17,18,19,20,21,22
Oct 21	Chapter 8	1,2,3,6,7,8
Oct 21	**Second Exam (Wednesday)**	
Oct 23	Chapter 8	9,10,13,16,18,20
Oct 26	Chapter 9	5,6,8,11,14,16
Oct 28	Chapter 9	17,20,22,27,28,32
Oct 30	Chapter 10	2,4,5,6,7,8
Nov 2	Chapter 10	9,10,15,16,20,24
Nov 4	Chapter 10	28,29,30,31,32,34
Nov 6	Chapter 11	2,3,4,11,12,17
Nov 9	Chapter 11	22,23,28,30,34,37
Nov 11	Chapter 11	40,41,42,44,45,46
Nov 13	Chapter 12.	1,2,3,4,5,6
Nov 16	Chapter 12	8,9,10,11,12,16
Nov 16	**Third Exam (on Monday)**	
Nov 18	Chapter 12	18,19,20,21,22,,28
Nov 20	Chapter 13	2,3,6,16,17,22
Nov 23	Chapter 13	25,26,28,29,30,34
Nov 25	**Thanksgiving Holiday**	
Nov 27	**Thanksgiving Holiday**	
Nov 30	Chapter 14	2,3,4,12,13,16
Dec 2	Chapter 14	19,20,21,23,24,25
Dec 4	Chapter 15	14,15,16,17
Dec 10	**Final Examination**	

Required Homework

Here are the required computer homework problems. Three problems are due per week, always on Monday, at the beginning of class. All assignments are to be done with SAS.

Sept 14	2.61, 2.64, 2.74
Sept 21	2.78, 2.80, 2.83
Sept 28	3.23, 4.6, 4.8
Oct 5	4.12, 4.26, 5.2
Oct 12	5.22, 5.29, 6.7
Oct 19	7.7, 7.13, 7.16
Nov 2	8.13, 9.8, 9.32
Nov 9	10.4, 10.20, 10.28
Nov 16	11.4, 11.22, 11.44
Nov 23	12.16, 12.22, 13.2