

Math 448 Mathematical Statistics.

Spring 2016

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| | Section 01 |
| Instructor: | Xingye Qiao |
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| Meeting time: | MWF 8:00-9:30 |
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| Office hours: | MW 3-4 and F 9:45-10:45 |
| Grader: | Changwei Zhou |
| Grader's office hour: | Send email to him (zhou@math.binghamton.edu) to make appointments. |

Please include [Math448] in the subject line of your email, or your email may not be read promptly. In principle, only those questions regarding grading issues shall be addressed to the grader. Other questions should be addressed to the instructor.

Prerequisites

Math 447 with a grade of C or better. Probability is the foundation of developing statistical inference. There will be a *probability aptitude test* (referred to as the PAT below) at the beginning of the course. Please review materials in Math 447 as early and as thoroughly as possible, especially if you took Math 447 semesters ago. Lack of aptitude in probability may increase the difficulty in the current course.

Learning Objectives

1. Understand the fundamental idea of statistical inference; conduct standard inferences including point estimation, confidence interval and hypothesis testing.
2. Derive, evaluate and compare point estimators and confidence intervals. Apply statistical inference to simple linear regression models.
3. Use statistical software (R) to manipulate data, conduct simple statistical inferences, conduct simple linear regression analyses, simulate data, etc.

This course is a 4-credit course, which means that students are expected to do at least 12.5 hours of course-related work or activity each week during the semester. This includes scheduled class lecture/discussion meeting times as well as time spent completing assigned readings, studying for tests and examinations, preparing written and computing assignments, and other course-related tasks.

Required Textbook

Mathematical Statistics with Applications (7th ed.) by Wackerly, Mendenhall, and Scheaffer.

- This is the course text. Most if not all homework assignments will come from this book.
- A customized soft cover version used at BU is available from the University Bookstore. The custom book and the hardcover book are equivalent for the purpose of this course except that the former is offered at an affordable price, while the complete version may have a higher resell value. Students may choose whichever one to purchase.

In the University Bookstore, the list price for the soft cover version is 167 USD, and for the hard cover version 315 USD (as of 2014). Amazon has the hard cover book at price of 247 USD. You may also try to rent the textbook from providers such as Amazon.

Online resources for R

R is chosen to be the statistical software used in the current course. There are many online resources where the students can learn the basics of R.

1. The Undergraduate Guide to R
2. R tutorial by Kelly Black

Please install R before the beginning of the semester. In addition to R, some may find RStudio to be handy.

Downloads:

- R - mirror hosted at UC Berkeley.
- R Studio - a more user friendly platform for R.

Computing Homework

- [Computing Homework Assignments](#)
- [Computing Homework Solutions](#)

Grading

| Components | Dates | Points | Time allowed |
|--|--------|--------|----------------------------------|
| Quiz, homework & computing assignments | Daily | 200 | Quiz: 10-20 minutes/day if given |
| Probability Aptitude Test (PAT) | Sep 09 | 20 | 40 minutes |
| Test 1 | Feb 17 | 180 | 90 minutes |
| Test 2 | Mar 18 | 180 | 90 minutes |
| Test 3 | Apr 25 | 180 | 90 minutes |

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|---|-----|-------------|-------------|
| Exam | TBD | 240 | 120 minutes |
| TOTAL | | 1000 | |
| * Attendance Bonus | | 5-20 | |
| * Missing more than 12 classes (including three waivers) | | F | |

Quiz, homework & computing assignments

At the end of each class session, the instructor chooses to administer a quiz or to collect the written homework assigned at the last class session.

1. All problems in the quiz will be graded.
2. Normally, if a quiz is administered, then the written homework will not be collected.
3. When the written homework is collected, the grader will check whether all the problems have been duly finished by the student. The grader may choose to randomly grade a subset of problems.
4. On each lecture day, a score between 1 to 10 will be given to the quiz given on that day or written homework collected that day. Counter-intuitively, the score 1 indicates a quiz or homework with no work / effort shown on paper or completely incorrect answers. The 1 point is credited simply because the student attends the class.
5. A score 0 will be recorded if the student did not render either a quiz or written homework. In this case, the zero score indicates that the students did not show up in the class on that day. This will have some serious punitive consequence (see [Class Attendance](#) below..)
6. In addition to the quiz/written homework on each day, there will also be some computing homework assignments. Submission of the work is done by an online form. A score between 0-10 will be given to each computing homework. There will be about 5 to 10 such assignments.
7. The lowest five scores among all scores above over the semester (including those for the quizzes, written homework and computing homework) will be dropped when the final grade is calculated.
8. All the scores will be posted at the blackboard.
9. No make-up shall be arranged for quizzes.

Attendance Bonus

Attendance is partially mandatory, enforced by the daily quiz/homework. Full attendance will be rewarded as follows:

- Up to three waivers can be granted only if the student gives advance notice. The student needs to send an email to the instructor with the date that an absence is expected. **No reason or proof is needed.** The waivers are intended for the students to attend job interviews and other matters.
- 20 bonus points will be added if the student has attended all the class sessions (except those that are waived).
- 10 bonus points will be added if the student has attended all but one class sessions (except those that are waived).
- 5 bonus points will be added if the student has attended all but two class sessions (except those that are waived).

Class Attendance

Following the academic policy listed in the University Bulletin and the faculty-staff handbook, the instructor will *NOT* grade exams of any student missing more than 25% of the quiz/homework. The final grade will be an *F* if a student misses more than 25% of the quiz/homework. In particular, faculty-staff handbook, VII.B.2. stipulates that

instructors have the right to deny a student the privilege of taking the final examination or of receiving credit for the course, or may prescribe other academic penalties if the student misses more than 25 percent of the total class sessions. Excessive tardiness may count as absence.

For Spring 2016, missing 12 classes or more will lead to an F.

Calendar

| Week | Monday | Wednesday | Friday |
|------|----------------|----------------|----------------|
| 1 | Jan-25 | Jan-27 | Jan-29 |
| 2 | Feb-1 | Feb-3: PAT | Feb-5 |
| 3 | Feb-8 | Feb-10 | Feb-12 |
| 4 | Feb-15 | Feb-17: Test 1 | Feb-19 |
| 5 | Feb-22 | Feb-24 | Feb-26 |
| 6 | Feb-29 | Mar-2 | Mar-4 |
| 7 | Mar-7 | Mar-9 | Mar-11 |
| 8 | Mar-14 | Mar-16 | Mar-18: Test 2 |
| 9 | Mar-21 | Mar-23 | Mar-25 |
| 10 | Mar-28 | Mar-30 | Apr-1 |
| 11 | Apr-4 | Apr-6 | Apr-8 |
| 12 | Apr-11 | Apr-13 | Apr-15 |
| 13 | Apr-18 | Apr-20 | Apr-22 |
| 14 | Apr-25: Test 3 | Apr-27 | Apr-29 |
| 15 | May-2 | May-4 | May-6 |
| 16 | May-9 | May-11 | |

44 class sessions (41 regular sessions + 3 full exam sessions) * 1.5 hours = 66 hours.

- Feb 5: Course add and drop/delete deadline.
- Mar 24: Course withdraw/change grade option deadline.

Note that a "Pass" grade in the "Pass/Fail" grade option does not count toward math degrees. If you are a math major, it is not advised to change the grade option to "Pass/Fail" unless you are ready to retake the course at a later time.

Make-ups

If you need to take a make-up for an exam or test, if possible, an advance request should be given. Checkable written proof to justify the request should be given.

Academic Dishonesty

Students found cheating will be reported to the Provost Office following the academic procedure listed in the University Bulletin. Laptop and electrical communication devices cannot be used in a quiz, test or exam. Calculator in a cellphone cannot be used. Calculators are allowed for quizzes and tests.

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Disciplines

Text messaging should be minimal. Late arrivals, early departures, cell phone conversations, eating and drinking, etc., are inappropriate behaviors. According to the Faculty-Staff Handbook, the instructor may ask those who, in the instructor's judgment, have seriously impaired the class's ability to achieve the objectiveness of the course, to leave the classroom.

How to succeed in this course

1. Read the book once, **before** class!
2. Do not try to study by reading the book many times. Come to the class and listen to the lecture. Be proactive in class. Ask 'why?'. Focus on the motivations.
3. Don't solve a question by matching it to a formula in your memory. To understand statistical procedures is much easier than to memorize (and search for) these formulas.
4. Practice more on probability skills. You need them.
5. Don't be ashamed for low quiz grades. To be challenged is part of the life and is a very good way of study. Too many easy materials make people boring.
6. Do not skip class! You may never be able to make it up. The nature of the course decides that materials are built one upon another.
7. This is not a "read the book three times the night before the exam and you will get an A" class.

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