

# Math 345: Statistics for Scientists and Engineers

Fall 2009

Instructor: Songfeng (Andy) Zheng

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Room and Time: Cheek 207, 12:30pm – 1:45pm, TR

Office and Hours: Cheek 22M, 2:00pm – 3:30pm, MWF; 12:00pm – 1:00pm, TR; or by appointment. Office hours are offered for individual help and getting to know how you understand the material, so please use them.

**Textbook:** William Navidi, Statistics for Engineers and Scientists, 2-nd Edition, McGraw Hill. This is a good textbook, providing a lot of examples in science and engineering. I strongly suggest you read the textbook regularly.

## Course webpage:

[http://faculty.missouristate.edu/s/songfengzheng/MTH345\\_F09.htm](http://faculty.missouristate.edu/s/songfengzheng/MTH345_F09.htm) will provide homework assignments, announcements; the topics covered each week, and the suggested reading materials. Also the solutions to the homework will be available on the course webpage.

**Objectives & Prerequisites:** Statistical theory and methodology are needed in almost all disciplines. The course Math 345 is a beginning course in probability and statistics emphasizing applications in science and engineering. This course deals with various statistical tools and ideas to collect, analyze, and draw inference from data arising from both observational and experimental studies in science and engineering. The students will receive training in descriptive statistics, probability, and statistics inference. Theoretical concepts needed for the study of statistical inference will be introduced.

The prerequisite for this course is Math 280 or Math 288 or equivalent. The knowledge of differentiation, integration and summation of infinite series will be needed in the course.

**Outcomes:** Understand and create graphical summaries of data, and compute various descriptive measures of data. Work with introductory probability, discrete and continuous probability distributions and their simulations. Work with sampling distributions, and the Central Limit Theorem. Construct confidence intervals including bootstrap methods for population means, proportions, and variances. Conduct tests of hypotheses for population means, proportions and variances. Understand and analyze data using regression methods. Understand and work with

one-way analysis of variance. Become aware of the applications of statistics. Use statistical software S-Plus for simulation study and analysis of data.

**Materials to be covered (tentative):** Descriptive statistics, Graphical Summary. Events, basic properties of probability, conditional probability, discrete and continuous random variables and their distributions, expectation and variance. Commonly used distributions, central limit theorem. Confidence intervals for population means and population proportions, confidence intervals for the difference of the means and proportions. Hypothesis testing about the population mean and population proportions. Hypothesis testing about the difference between two population means and population proportions.

The appended is a copy of the topics covered in Fall 2008. We will largely follow what I did in Fall 2008.

### **Grading Policy and Studying Suggestions:**

Class attendance: 10%

Homework: 30%

In-class 2 Tests: 30%

Final Exam: 30%

It is important that you read the text book and lecture notes regularly (I will list the suggested reading materials online for each week), understand the problems worked out in the text and practice by doing the problems. Doing the homework problems is absolutely essential to get a better grade in this course. You are allowed to discuss the homework problems among yourselves or with me. However the final work handed in must be completely your own. Anyone who receives or gives an unauthorized aid on a homework or test is considered to be cheating.

No make-up test or exam will be given under ordinary conditions. The only acceptable excuse for missing a test is an extreme emergency. However, you must obtain a written explanation from a physician, etc. If you cannot take the test on the scheduled day, you must contact me before the test date.

### **Miscellaneous Notes:**

Missouri State University is an equal opportunity/affirmative action institution, and maintains a grievance procedure available to any person who believes he or she has been discriminated against. At all times, it is your right to address inquiries or concerns about possible discrimination to the Office of Equal Opportunity Officer, Siceluff Hall 296, (417) 836-4252. Other types of concerns (i.e., concerns of an

academic nature) should be discussed directly with your instructor and can also be brought to the attention of your instructor's Department Head.

To request academic accommodations for a disability, students must contact the Director of Disability Services, Plaster Student Union, Suite 405, (417) 836-4192 (voice) or (417) 836-6792 (TTY), <http://www.missouristate.edu/disability>. Students are required to provide documentation of disability to Disability Services prior to receiving accommodations. Disability Services refers some types of accommodation requests to the Learning Diagnostic Clinic, which also provides diagnostic testing for learning and psychological disabilities. For information about testing, contact the Director of the Learning Diagnostic Clinic, (417) 836-4787, <http://psychology.missouristate.edu/ldc/>.

Missouri State University is a community of scholars committed to developing educated persons who accept the responsibility to practice personal and academic integrity. You are responsible for knowing and following the university's student honor code, Student Academic Integrity Policies and Procedures, available at <http://www.missouristate.edu/provost/AcademicIntegrity.html>, and also available at the Reserves Desk in Meyer Library. Any student participating in any form of academic dishonesty will be subject to sanctions as described in this policy.

It is your responsibility to understand the University's procedure for dropping a class. If you stop attending this class but do not follow proper procedure for dropping the class, you will receive a failing grade and will also be financially obligated to pay for the class. To drop a class anytime after the first week of classes, you must complete and turn in a drop slip at an authorized registration center (see <http://www.missouristate.edu/recreg/chnsched.html>). You do not need to obtain any signatures on the drop slip. It does not need to be signed by your instructor, your advisor, or a department head. If you wish to withdraw from the University (i.e., drop all your classes), contact the Registration Center, Carrington 320, 836-5522. See Academic Calendars (<http://www.missouristate.edu/recreg/acadcal.html>) for relevant drop deadlines.

Students who require assistance during an emergency evacuation must discuss their needs with their professors and Disability Services. If you have emergency medical information to share with me, or if you need special arrangements in case the building must be evacuated, please make an appointment with me as soon as possible.

For additional information students should contact the Office of Disability Services, 836-4192 (PSU 405), or Larry Combs, Interim Assistant Director of Public Safety and Transportation at 836-6576.

For further information on Missouri State University's Emergency Response Plan, please refer to the following web site: <http://www.missouristate.edu/safetran/erp.htm>.

### Topics Covered in Spring 2009 (MTH 345)

week 1: Sampling, Descriptive Statistics. Reading materials: Sec. 1.1 and 1.2 of Navidi.

week 2: Summary Statistics, Graphical Summaries. Sec. 1.2 and 1.3 of Navidi.

week 3: sample spaces, events, probability. Sec. 2.1 of Navidi.

week 4: Conditional probability, independence. Sec. 2.3 of Navidi.

week 5: Discrete random variables, distribution, cumulative distribution functions, expectation, variance, Sec. 2.4 of Navidi

week 6: Continuous random variables, density function, cumulative distribution function, expectation, variance; Linear functions of random variables. Sec. 2.4 and Sec. 2.5 of Navidi

week 7: Bernoulli distribution, Binomial Distribution, Test-1. Sec 4.1, 4.2 of Navidi.

week 8: Binomial distribution, Poisson distribution, Geometric distribution. Reading material: sec. 4.2, 4.3, 4.4 of Navidi.

week 9: Normal distribution. Reading material: sec. 4.5 of Navidi.

week 10: Normal distribution, central limit theorem, normal approximation to Binomial model. Sec 4.5, 4.11 of Navidi.

week 11: Spring Break! No Class! Enjoy!

week 12: Large sample confidence interval for population mean. Reading: Sec. 5.1

week 13: Test-II. Spring holidays. no class.

week 14: large sample confidence interval for proportion. small sample confidence interval for mean values. Reading: Sec. 5.2, 5.3.

week 15: Confidence interval for the difference of two means. Large sample Hypothesis testing about the population mean. Reading: sec 5.4, sec. 6.1

week 16: p-values, CI and HT, Test for population proportions. Reading: Sec. 6.2 --- 6.3

week 17: small sample test for population mean, Large sample test for difference between two means. Reading: Sec. 6.4 ---- 6.5.

Done~~~~~ Have a nice summer!