

## **Mathematics 107 - Introduction to Probability and Statistics**

Spring, 2010 - Dr. Evelyn C. Bailey; Dr. Fang Chen; Dr. Michael Rogers

Text and materials: *Elementary Statistics*, 6th ed., Allan G. Bluman;  
Calculator (TI-83, TI-83 PLUS, TI-84 or TI-84 PLUS recommended)

Course Content: Visual displays of data, measures of central tendency and of variability, classification of data, counting, probability, Chebyshev's Theorem, normal distribution, binomial distribution, Central Limit Theorem, hypergeometric distribution, Poisson distribution, Confidence Intervals, Hypothesis testing (means, proportions, variances), Simple linear regression and correlation, Analysis of Variance (one way), Chi Square Tests (Goodness-of-fit, Contingency Tables), Nonparametric methods (Wilcoxon [for independent samples], Kruskal Wallis, Spearman's rho). Emphasis is on inference.

### Goals:

1. Cognitive: At the end of this course students should be able to:
  - (1) Categorize a data set;
  - (2) Correctly work various simple probability problems;
  - (3) Articulate the role of functions in statistics;
  - (4) Describe major misuses of statistics,
  - (5) Recognize several distributions and characterize them;
  - (6) Analyze interval data for which statistical tests involving means, proportions, medians, rankings, and variances are the parameters;
  - (7) Interpret relationships in bivariate data;
  - (8) Discuss the difference between parametric and nonparametric statistics in relation to inherent assumptions of the general statistical model;
  - (9) Recognize and explain the limitations of statistics;
  - (10) Interpret the role of statistics in analyzing data and in inference;
  - (11) Use a calculator for appropriate statistical tests;
  - (12) Interpret statistical findings in relation to the situation from which the data was drawn,
  - (13) Describe the experimental nature of mathematical statistics,
  - (14) Draw inferences using the vocabulary of statistics.
2. Affective:
  - (1) Students may choose to use suggested organizational guidelines, study skills and test-taking approaches.
  - (2) Students will perform experiments and analyze the results by using appropriate statistical techniques.
  - (3) Students will have the opportunity to react to articles (readings) related to statistical methods.
  - (4) Group work for experiments will enable students to coordinate with others while completing a project and will enable students to develop problem-solving strategies.

The general goals for students taking this course are:

Students should: (a) begin to be good consumers of information through gaining knowledge about statistics, (b) become more focused on learning processes as they learn and apply study skills.

Responsibilities:

Each **student** has the following responsibilities:

1. Come prepared and on time to every class.
2. Complete all work on time with proper thought.
3. Consider that it is not always the fault of the instructor if the student doesn't understand the material.
4. Treat the instructor and peers with respect.
5. Ask questions. Asking questions is a sign of maturity, not ignorance, as long as the student thinks clearly before asking.
6. Understand that the instructor is not trying to "nit pick" when grading and remember that grading is the responsibility of the instructor.

The **instructor** has the following responsibilities:

1. Come prepared to every class.
2. Design each class so students can accomplish the cognitive objectives listed in the syllabus.
3. Provide appropriate tips for studying and study materials as seem appropriate.
4. Create a mutually respectful classroom environment.
5. Return tests and experiments in a timely manner so that students will know their grades.
6. Grading, as far as possible, to be consistent and impersonal even though students might not agree with the decisions concerning partial credit.

Organizational Guidelines for students:

- (1) As soon as you get your syllabi from all your courses, put all important dates on a single calendar, clearly labeled.
- (2) Stay current in your subjects by setting aside 8 to 9 hours per week to study each subject. You may need more time in some subjects. Spread this time out over the week. Marathon studying, especially in mathematics, does not work well!
- (3) Plan ahead so that you get enough sleep before a test or you will not be able to think clearly and logically.
- (4) Take advantage of the available outside help for this course. Schedule at least one SI session per week.
- (5) Have needed supplies for each course. For Math 107 you will need a notebook for class notes and homework; a calculator; a text book and notes as available from the class conference; and, of course, pens and pencils.
- (6) Follow each syllabus carefully. For Math 107, your homework will be posted on the class conference. Reading the indicated section(s) before coming to class will help your understanding of the material.

### Grading:

Grades will be determined by student performance on five tests, four experiments, three articles and a comprehensive final exam, as follows:

5 tests @ 100	500	In general,
4 experiments @40	160	A, A-: 900 points and above
3 articles/readings @30	90	B+, B, B-: 800-899 points
final exam	<u>250</u>	C+, C, C-: 700-799 points
Total	1000	D+, D: 600-699 points
		F: below 600 points

### Tests and Final Exam:

Tests will be given during class time on **February 3, February 19, March 17, April 5, April 21**. Each test will cover the topics listed for that test on the attached outline. There are no practice tests or additional problems outside those in the text and formal notes. Formulas will be provided and your calculator may be used for appropriate portions of tests, experiments, and the final exam. You are expected to take tests at the scheduled times. Any emergencies will be handled on an individual basis and must be documented. No make-up test will be given after the testing time and date. The final exam will include material selected from the entire course. The final exam will be given at the time designated on the final exam schedule, no exceptions.

### Experiments:

There will be four experiments, with students working in groups of three or four. Each student is expected to work as a group member on each aspect of the experiment and to participate in a somewhat "equal" manner. A signed form of individual contributions must accompany each experiment. No experiment will be accepted after class time on the due date. An individual's grade is based on the individual's contribution, the group's write-up, the statistical analysis used, the experimental procedure outlined and followed, and creativity including originality and neatness.

### Articles/Readings:

There will be three opportunities to do exercises and/or readings. These will be explained at the time they are assigned. Individual work is expected.

### Bonus/Extra Credit:

In general, there will be 10 bonus points on each test so that each test will provide the opportunity for students to earn up to 110 points (out of 100) per test. There may be occasion for additional extra credit during the semester. Any such opportunity will be agreed upon by all three instructors for this course.

### Homework:

Class time will be used to enrich topics in statistics but will not be used to merely summarize information from the text. It is each student's responsibility to read the textbook and make appropriate notes. Homework problems will not be collected but are

to benefit the student. Each student should work most of the problems assigned in the text and in the formal typed notes. Example problems will be worked in class, one for each major concept. Basic problems and concepts for which the student is responsible are included in the formal typed notes for this course, available on the class conference. To do well, the average student will need to study about 3 hours outside of class for every class meeting or around 8 to 9 hours per week. Preparing and executing experiments, studying and reviewing for tests will require more time.

Office Hours/Outside Help:

**Office hours** will be announced by your instructor. Students should use this time to come by and ask specific questions related to this course. In addition, students may email, privately or on the Math 107 class conference.

There is a **class conference**, Math 107 spring 2010. Students should have the class conference on their desktops and should consult this conference frequently for announcements about office hours, SI sessions, tutoring, formal notes, class notes, outlines for tests, etc. Students may pose individual questions on the class conference.

Our **SI** (Supplemental Instructor) student leaders will schedule review sessions each week. These sessions are optional, however each student is encouraged to pick one of the times per week and attend regularly. Even though these sessions are optional, students who attend SI sessions generally do better in the courses for which there are SI leaders. Student tutors are available in the mathematics department area (schedule to be posted as soon as it is finalized).

**Study groups** organized by students are highly recommended. The meetings should be scheduled weekly and should be part of a regular weekly routine.

Attendance Policy:

You are expected to attend all classes since you are responsible for work covered in class. Tests will not be given after the test day (listed on this syllabus), the student will not have the opportunity to make up that test. Emergencies and verifications are at the discretion of the professor. Arrangements related to grading because of an absence from a test are at the discretion of the professor. Absences from tests must have appropriate documentation.

**HONOR CODE: THE HONOR CODE APPLIES TO ALL WORK SUBMITTED FOR CREDIT POINTS TOWARD YOUR GRADE. ALL SUCH WORK WILL BE PLEDGED TO BE YOURS AND YOURS ALONE. YOU PLEDGE THAT WITH YOUR SIGNATURE. THE CONTRIBUTION SHEET WITH YOUR GROUP EXPERIMENTS PROVIDES YOUR INDIVIDUAL WORK WITHIN THE GROUP STRUCTURE.**

## Topics

### PART 1 for Test 1: Counting and Probability

1/13 (Wed.)	Introduction to Statistics, Jerome Cardan, the famous birthday problem
1/15 (Fri.)	Counting, Section 4.5 <b>Article 1 assigned, due 1/29</b>
1/18 (Mon.)	MLK day, no class
1/20, 1/22 (Wed., Fri.)	Laws of Probability, Sections 4.1, 4.2, 4.3, 4.4, 4.6
1/25 (Mon.)	Probability - Birthday problem revisited, Game of Craps <b>Experiment 1 assigned, due 2/1</b>
1/27, 1/29 (Wed., Fri.)	Discrete Distributions, Sections 5.1, 5.2, 5.3, 5.4 <b>Article 1 due on 1/29</b>
2/1 (Mon.)	Review for test <b>Experiment 1 due</b>
<b>2/3 (Wed.)</b>	<b>Test 1</b>

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### PART 2 for Test 2: Descriptive Statistics, Normal Distribution

2/5, 2/8 (Fri., Mon.)	Introduction to Statistics; Histograms Chapter 1 and Sections 2.2, 2.3
2/10 (Wed.)	Descriptive Statistics, Sections 3.1, 3.2, 3.3 <b>Article 2 assigned, due 2/15</b>
2/12, 2/15 (Fri., Mon.)	Normal Distribution, Central Limit Theorem, Sections 6.1, 6.2, 6.3, 6.4, 6.5 <b>Article 2 due 2/15</b> <b>Experiment 2 assigned, due on 2/24</b>
2/17 (Wed.)	Review for test
<b>2/19 (Fri.)</b>	<b>Test 2</b>

**PART 3 for Test 3: About Proportions**

2/22 (Mon.)	Normal Approximation to the Binomial, Section 6.6
2/24 (Wed.)	Confidence Intervals, Proportions, Section 7.4 <b>Experiment 2 due</b>
2/26 (Fri.)	Hypothesis Testing, Theory Section 8.1 <b>MUST READ BEFORE CLASS</b>
3/1 (Mon.)	Hypothesis Testing, one sample, two sample proportions Section 8.5, 9.6
3/3, 3/5 (Wed. Fri.)	Finish Hypothesis Testing, proportions, Chi Square Models Sections 11.1, 11.2, 11.3 <b>Experiment 3 assigned, due 3/22</b>

**3/8 (Mon.) through 3/12 (Fri.) is Spring Break**

3/15 (Mon.)	Review for Test 3
<b>3/17 (Wed.)</b>	<b>Test 3</b>

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**PART 4 for Test 4: About Means**

3/19 (Fri.)	Confidence Intervals, Means, Sections 7.1, 7.2, 7.3
3/22, 3/24 (Mon., Wed.)	Hypothesis Testing, one sample means Sections 8.2, 8.3, 8.4, 8.7 <b>Experiment 3 due on 3/22</b> <b>Article 3 assigned 3/24, due 3/31</b>
3/26, 3/29 (Fri., Mon.)	Hypothesis Testing, two sample means Sections 9.2, 9.3, 9.4, 9.5
3/31 (Wed.)	Review <b>Article 3 due</b>
4/2 (Fri.)	No class
<b>4/5 (Mon.)</b>	<b>Test 4</b>

**Part 5 for Test 5: Other Statistical Tests**

4/7, 4/9 (Wed., Fri.)	Regression, Sections 10.1, 10.2, 10.3, 10.4, 10.5
4/12 (Mon.)	ANOVA, Sections 12.1, 12.2, 12.3 <b>Experiment 4 assigned, due 4/19</b>
4/14 (Wed.)	Kruskal Wallis, Wilcoxon, Section 13.6, 13.4
4/16 (Fri.)	Spearman rho, Section 13.7
4/19 (Mon.)	Review for test 5 <b>Experiment 4 due</b>
<b>4/21 (Wed.)</b>	<b>Test 5</b>

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**Summary/Review**

4/23 (Fri.)	Evaluation, Discuss the final exam
4/26 (Mon.)	Wrap-up, last class day, papers returned

Final exams will be given according to the college schedule.

**GOOD LUCK TO ALL!**