Mathematics 107 - Introduction to Probability and Statistics
Spring, 2005 - Dr. Evelyn C. Bailey, Dr. Fang Chen

Text and materials: Elementary Statistics, 5th ed., Allan G. Bluman; Math 107 Notebook; 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 (multinomial, Contingency Tables), Nonparametric methods (median test, Spearman's correlation, Wilcoxon [for dependent and independent samples], Kruskal Wallis). Emphasis is on inference.

Goals: 1. Cognitive: At the end of this course students should be able to: categorize a data set; work various simple probability problems; understand the role of functions in statistics; describe major misuses of statistics, recognize several distributions and characterize them; analyze interval data for which statistical tests involving means, proportions, medians, rankings, and variances are the parameters; interpret relationships in bivariate data; know the difference between parametric and nonparametric statistics in relation to inherent assumptions of the general statistical model; recognize the limitations of statistics; understand the role of statistics in analyzing data and in inference; use a computer and/or a calculator; interpret statistical findings in relation to the situation from which the data was drawn, describe the experimental nature of mathematical statistics, draw inferences using the vocabulary of statistics.

2. Affective: Students may choose to use suggested organizational guidelines, study skills and test-taking approaches. As a service component and to reinforce concepts, students will explain some aspect of counting or probability to fourth grade students in Newton County by producing a children's book. Students will perform two experiments, using appropriate statistical techniques.

In summary, the goals are for students: (a) to begin to be good consumers of information through gaining knowledge about statistics, (b) to be more focused on learning processes as they learn and apply study skills, (c) to complete a service project, and (d) to be active in the learning process thus integrating cognitive and affective goals.

Grading: Grades will be determined by student performance on four tests, the TPSL (Theory Practice Service Learning) project, two experiments and a comprehensive final exam, as follows:

4 tests @ 100	400
TPSL project	200
2 experiments @ 50	100
final exam	300
total	1000

In general,

A, A-:	900 points and above
B+, B, B-:	800-899 points
C+, C, C-:	700-799 points
D+, D:	600-699 points
F:	below 600 points

Tests and Final Exam: Tests will be given during class time on **February 9**, **February 25**, **April 4**, and **April 27**. Each test will cover the topics listed for that test on the attached outline. At least 48 hours prior to each scheduled test, a topical outline will be posted on the Math 107 class conference. There are no practice tests or additional problems outside those in the text and notebook. 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. 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.**

TPSL Project: In groups of four, students will work with fourth graders in Newton County elementary schools. Each group will produce a book that will explain an aspect of probability or counting and will make a presentation of the book to a class of fourth graders. During this process, each student will keep an individual journal of all writing attempts, observations and reflections.

Visits: Prior to making the presentations at the elementary schools (**March 2** or **March 4**), groups will sign up and visit their school for two visits of one hour each during the period of February 7-17, specific dates and times will be covered in class. In the initial two visits, students will work with a 4^{th} grade class in activities designated by the teacher (tutoring, etc). On the third visit (**March 2** or **March 4**), students will make a 10 to 12 minute interactive presentation of the book. Each class of fourth graders will have one or two Math 107 groups assigned. Ms. Crystal McLaughlin will arrange your schedule and transportation. You are required to dress appropriately for the visits.

Book: The book should clearly explain an aspect of probability or counting, specifically designed for fourth graders, should be at least 16 pages long but no longer than 24 pages. Topics must be appropriate for fourth grade children (G-rated). Some class time and the class conference will provide discussions of possibilities for topics. Each group will provide a draft of the book to your instructor by **February 18**. Your group may choose to make appointments with your instructor prior to this date. Your draft, with comments, will be returned on **February 21**. Each book will be presented in Math 107 class on **February 28** and to the fourth graders to whom you have been assigned on either **March 2** or **4**, during Math 107 class time. These books will be the property of the respective fourth grade class, so make them sturdy!

Presentation: Each group will give a presentation on **February 28**, critiqued by the Math 107 class thus providing an opportunity to polish each group's presentation. The group presentation will be made at least twice, to small groups of fourth graders at the elementary school, on either **March 2** or **4**. Since these presentations should be focused on the fourth graders, groups should show the book while they interact with the "audience" whether that is the Math 107 class or the elementary students. Each group should prepare a 10 to 12 minute presentation (check this prior to February 28). Each member of the group should be an integral part of the presentation.

Contributions: Each group must submit a single page sheet itemizing individual contributions to this project and signed by all group members, due class time **March 7**.

Journal: Each student will need a spiral notebook or a lab-type notebook to document progress. Each entry must be dated and include what was accomplished or any observations from a visit. These journals are due on **March 11,** after completion of the project, with sufficient time for each student to write his/her individual reflections about the presentation and about this project in general.

Time table: The following dates should be put in the student's assignment book:

January 26 (during class)	Determine groups of four
January 31 (during class)	Visit from Ms. Crystal McLaughlin
February 7-18	Two one hour visits scheduled to your elementary school
February 18	Draft of book due
February 21	Draft returned
February 28	Group presentation to the class
March 2 or 4 (class time)	Presentation to the fourth graders
March 7	Contribution sheet due
March 9	Groups share experiences
March 11	Journal due

Grading: Your grade on the TPSL project is based on 200 points as follows:

Book (draft, content, appropriateness, contribution)	80 points
Presentation (Math 107 class, fourth grade)	40 points
Journal (visits, observations, reflections)	80 points

Experiments: There will be two experiments, with students working in groups of two to three and assigned in class on **April 4**, due **April 15** and assigned on **April 13**, due on **April 29**. Example experiments are provided in the notebook for this course. Each student is expected to participate in a somewhat "equal" manner. A signed form of individual contributions must accompany each experiment (Notebook p. 60). 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 as far as clarity, the statistical analysis used, the experimental procedure outlined and followed, and creativity including originality and neatness (Notebook, p. 61).

Homework: Class time will be used to enrich topics in statistics but will not be used to 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 notebook. Example problems will be worked in class with limited time to work homework problems. Basic problems and concepts information for which the student is responsible is included in the notebook for this course. 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 and the TPSL project, studying and reviewing for tests will require more time. Study groups and individual use of the Math 107 tutors (schedule to be posted as soon as it is finalized) have proved helpful in the past. Your instructor is available during office hours.

Attendance: You are expected to attend all classes since you are responsible for work covered in class. After two absences of any type, five points will be deducted for every unexcused absence. There must be documentation for a student to receive an excused absence after two. Emergencies and verifications are at the discretion of the professor.

Office Hours: Office hours will be posted weekly on the class conference. Students should use this time to come by and ask specific questions related to this course. In addition, both instructors may be reached privately through Learnlink.

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.

Topics and homework assignments

PART 1 for Test 1:

1/19 (Wed.) Introduction to Statistics

Chapter 1: Make study notes on the types of data (pp 8-9); on the types of sampling (pp 11-13), on an experimental design; begin a list of "misuses" of statistics; record stories from history (class notes); summary on p. 25; p. 26: 7, 8, 12, 13, 17, 19, 29.

1/21 (Fri.) Introduction to Statistics, Jerome Cardan

Chapter 2: Make study notes on categorical frequency distributions (class tally, frequency, percent), group frequency distributions (class limits, class boundaries [use of ".5"], tally frequency, cumulative frequency), grouped frequency distribution rules (pp 38-39). Be able to create a frequency histogram and a relative frequency histogram. Be able to create a display using stem and leaf; summary pp 38-39; p. 43: 7, 15; p. 58: 9, 7 & 17; p. 78: 15, 17; p. 86: 5, 7, 8, 11, 21.

1/24 (Mon.) Descriptive Statistics

Chapter 3: p. 109: 1, 9, 11, 13, 31; p. 126: 5, 15, 17, 33, 35; p. 142: 29; p. 160: 14.

Find the smallest integer value, x, such that x is an outlier of the following data set: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, x. Use both definitions and compare.

Notebook, pp 3-5, notes and problems.

1/26 (Wed.) **Discuss the TPSL project and form groups**

Counting

Chapter 4, Section 4-5: p. 211: 1, 3, 5, 9, 11, 13, 15, 19, 23, 29, 35, 37, 39, 49, 51

Begin TPSL Journal, determine TPSL group meeting times

1/28 (Fri.) Finish Counting, Laws of Probability

Chapter 4, Sections 4-2. 4-3, 4-5: p. 180: 9, 12, 13, 14, 15, 17, 21, 23, 25; p. 187: 3, 5, 9, 11, 13, 17, 19, 23; p. 201: 3, 7, 12, 19, 23, 25, 29, 33, 35, 41, 43, 47.

1/31 (Mon.) **Ms. Crystal McLaughlin - elementary visiting dates determined**
Combining Probability and Counting
Chapter 4, Section 4-6: p. 216: 1, 3, 5, 7, 9; summary p. 218; p. 219: 3, 5, 7, 9, 13, 17, 19, 21, 25, 27, 29, 31, 35, 37, 41

2/2 (Wed.) Bayes Theorem, birthday problem
Appendix B-2, p 707; p. 710: 1, 3, 5, 7, 9, 11

2/4 (Fri.) Game of craps, catch up on Probability
Class notes
Notebook pp 6-10, notes and problems.

2/7 (Mon.) Review for test 1

2/9 (Wed.) **Test 1**

First visits for TPSL groups on 2/8 (Tues.) or 2/10 (Thurs.) at 8:30 am

PART 2 for Test 2:

2/11 (Fri.) Probability Distributions
Chapter 5, Sections 5-2, 5-3: p. 230: 1, 7, 9, 22, 12-18, 19, 23, 25 (make a probability graph and a probability histogram); p. 238: 1, 5, 7, 11, 15

2/14 (Mon.) and 2/16 (Wed.) More Probability Distributions
(Binomial, Multinomial, Poisson, Hypergeometric)
Chapter 5, Sections 5-4, 5-5: p. 247: 1, 3, 5, 9, 11, 13, 15, 19, 21, 23, 25, 29; p. 260: 1, 3, 5, 9, 11, 13, 15, 17, 19; p. 263: 17,19,21, 23, 25, 27, 29, 31.

Second visits for TPSL groups on 2/15 (Tues.) or 2/17 (Thurs.) at 8:30 am

2/18 (Fri.) and 2/21 (Mon.) Normal Distribution, Central Limit Theorem
Chapter 6: p. 282: 1-49 odd; p. 296: 3, 5, 9, 13, 15, 17, 19, 21, 23, 27, 33, 35, 38, 41; p. 309: 9, 11, 13. 15, 19, 21, 23; p. 316: 1, 3, 5, 7, 9, 11, 13; p. 318: 3, 5, 7, 9, 15, 16; p. 320: 1-34 (for more problems, if you need them)

Draft of the TPSL book due on 2/18, class time; draft returned on 1/21

2/23 (Wed.) Review for test 2
Notebook pp 11-16, notes and problems.

2/25 (Fri.) Test 2

2/28 (Mon.) Group presentations of the books for TPSL

PART 3 for Test 3:

3/2 (Wed.) **or** 3/4 (Fri.) Confidence Intervals, Means

Chapter 7, Sections 7-2, 7-3: know the characteristics of the student t distribution (p. 240); p. 336:1, 3, 5, 9, 11, 13, 17, 21, 23; p. 343: 1, 3, 5, 7, 11, 13 15, 16.

3/2 or 3/4 Group presentations at the schools, during class time.

3/7 (Mon.) Confidence Intervals, Proportions

Chapter 7, Section 7-4: p. 350:3, 5, 7, 9, 11, 13, 15, 17, 19; p. 316:1, 3, 5, 7, 9, 11.

Contribution Sheet due for TPSL

3/9 (Wed.) **Each group shares what happened at their school presentation**

Be prepared!

Finish previous homework

3/11 (Fri.) Hypothesis Testing

Chapter 8, Sections 8-1, 8-2: know the five step hypothesis testing procedure, the two types of errors (p. 371, 421); p. 377: 1-13; Read this first section slowly and carefully!

TPSL Journal due

Mid-semester Break 3/14 to 3/18

3/21 (Mon.) and 3/23 (Wed.) Hypothesis Testing from One Sample

Chapter 8, Sections 8-3, 8-4, 8-5, 8-7, 8-8: p. 387:1, 3, 5, 7, 9, 13, 14, 15, 17, 19, 25; p. 398: 1, 2, 3, 5, 7, 9, 11, 13, 15, 19; p. 405: 1-4, 5, 7, 11, 13, 15, 17, 19; p. 423: 1, 3, 5, 7; p. 425: 1, 3, 5, 7, 13, 19; Not Section 8-6.

Notebook pp 17-24, notes and problems

3/25 (Fri.) NO CLASS, Good Friday

3/28 (Mon.) and 3/30 (Wed.) Inferences from Two Samples

Chapter 9: Summary pp 491-492; p. 439: 5, 7, 9, 11, 13, 15; p. 450: 7, 9, 13, 19; p. 459: 1, 3, 5, 7, 9, 13; p. 472: 3, 5, 7, 9; p. 485: 1, 9, 11, 13, 15; p. 468: 14, 15, 16, 18, 22, 23, 24, 25, 26, 27, 29.

Notebook pp 25-31, notes and problems

4/1 (Fri.) Review for Test 3

4/4 (Mon.) Test 3

PART 4 for Test 4

4/4 (Wed.) Chi Square Models

Chapter 11: Characteristics of the Chi Square function p. 355; p. 556: 5, 7, 9, 11, 13, 15; p. 568: 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31; p. 577: 1, 3, 5, 7, 9.

Experiment 1 assigned, due on 4/15 (Fri.)

4/8 (Fri.) NO CLASS

Read the history portion of the Notebook, page 62-71. This history will be included on test 4 and the final exam. Make notes so you can remember what you read.

4/11 (Mon.) and 4/13 (Wed.) Correlation and Regression, USE Formal hypothesis testing

Chapter 10, 10-2, 10-3, 10-4 and parts of 10-5: p. 541: 1, 3, 5, 7; answer problems/questions, p. 543: 1-21.

Experiment 2 assigned on 4/13, due on 4/29

4/15 (Fri.) ANOVA

Chapter 12, Sections 12-2, 12-3: p. 597: p. 1-7, 9, 17, 19.

Notebook pp 32-38, notes and problems

Experiment 1 due, class time

4/18 (Mon.) Spearman's correlation, Nonparametric statistics

Chapter 13, Sections 13-2, 13-2, 13-7: Table L on p 739 gives the critical values; procedure summarized on page 653-4; p. 658: 5, 7, 9, 11, 13;

4/20 (Wed.) and 4/22 (Fri.) Wilcoxan and Kruskal-Wallis tests

Chapter 13, Sections 13-4, 13-5, 13-6: p. 639: 5, 7, 9, 22; p. 644: 3, 7, 9, 11; p. 649: 1, 3, 5, 7, 9, 11; p. 663: 5, 9, 11

Notebook pp 39-45, notes and problems

4/25 (Mon.) Review for Test 4

4/27 (Wed.) Test 4

4/29 (Fri.) and 5/2 (Mon.) Review/ Uses of Statistics/ Evaluation

Chapter 14 terms: Random sampling p 674; Cluster sample p. 679; Surveys and Questionnaires design p. 686; simulation and Monte Carlo Method p. 688; p. 681: 1-14; p. 687: 1-8; p. 693: 1-7; summary p. 694.

Notebook p 46

Experiment 2 due on 4/29, class time

Final exams will be given according to the college schedule.

GOOD LUCK TO ALL!