

MIDDLESEX COUNTY COLLEGE
EDISON, NEW JERSEY

MATHEMATICS DEPARTMENT

Date: April 16, 2009

Course Title: **Statistics I**

Course No. MAT 123

Class Hours: 3

Laboratory Hours: 0

Credit Hours: 0

Department Head Approval: _____
Maria DeLucia, Ph.D.

Dean Approval: _____
Reginald Luke, Ph.D.

Prerequisite: MAT 014 or appropriate score on the college placement test.

Textbook of Course:

Author: Allan Bluman

Title: Elementary Statistics: A Step by Step Approach, 7th Edition

Publisher: McGraw Hill

Special Note: The textbook, as sold by the Blue Colt Bookstore, will have bundled with it an Excel manual and an access code for MathZone. Each will be discussed later on in this outline.

Calculator Required: TI-84 or TI-Nspire calculator.

Computer Lab

Most classes are assigned to be in the computer lab once a week. Students pay a technology fee for this course. As an instructor, you should provide students the opportunity to use the computers for doing work of a statistical nature. The manual that is bundled with the text has step by step directions for Excel 2007 and is coordinated to sections of the text book. Practice problems are in this manual. They can be used as homework problems.

MathZone

MathZone is a web site that faculty can use to establish "courses" for each section that they teach. Students then register for the "courses" using the access codes bundled with the text book. Some of the features for students are on-line homework, tutorials, videos, and quizzes. It requires some time for faculty establish the "courses", but once it is set up, it does provide a supplement for students that is text-book specific. Faculty resources are also available.

Catalog Course Description:

Familiarizes students with mathematical models that occur in more advanced courses and in professions through the use of exploratory data analysis and statistical methods. Topics include descriptive statistics, regression, probability, probability distributions, confidence intervals, and an introduction to hypothesis testing.

Behavioral Objectives:

The student will demonstrate through quizzes, examinations, homework and projects the ability to:

1. interpret charts and graphs and to discover the relationships among the variables involved
2. use various modes to present data
3. interpret measures of central tendency and dispersion
4. explain the graphical representation of the measures of central tendency and dispersion
5. identify the basic characteristics of the normal distribution
6. estimate probabilities from experiments or data
7. judge the reasonableness of answers
8. fit data to mathematical models
9. carry out computer simulations as a method of collecting and analyzing data
10. describe the sampling distribution of means taken from equal sized samples
11. identify the types of questions that statistical reasoning addresses
12. develop a checklist of features to look for when describing a distribution of data and be able to describe features of a distribution verbally
13. compute and use an estimate of a parameter
14. formulate statistical hypotheses and identify one or two tailed tests

COURSE OUTLINE MAT 123

CHAPTERS	<u>TOPICS</u>	<u>APPROXIMATE NUMBER OF WEEKS (includes review and testing time)</u>
1	Introduction to Statistics	1/2
2, 3	Single Variable Data	2
10	Bivariate Data	1
4	Probability	2
5	Probability Distributions (Discrete)	1 1/2
6	Normal Probability Distribution	3
7	Confidence Intervals and sample size for the mean only	1/2
8	Hypothesis testing for the mean only	1
	Final exam (in class)	1 1/2
	TOTAL	14 weeks

SUGGESTED DAY BY DAY OUTLINE:
 Orders may switch due to lab meeting days
 MAT 123

Week	First meeting	Second meeting
1	Introduction to course Chapter 1	2-1
2	2-2 and 2-3	3-1, 3-2
3	3-3 and 3-4	Review, possible catch up
4	Test 1	10-1
5	10-2	4-1
6	4-2	4-3
7	5-1 and 5-2	5-3
8	Review, possible catch up	Test 2
9	6-1	6-2
10	6-3	6-4
11	Review, possible catch up	Test 3
12	7-1	8-1
13	8-2	Review
14	Review	Final Exam

Some notes regarding the minimum content of each chapter:

- Chapter 1 contains basic terminology. Students should understand the difference between sample, population, statistic and parameter. Students should be able to distinguish between quantitative data and qualitative data. Students should be able to distinguish between discrete data and continuous data. Students should be able to identify the levels of measurement: nominal, ordinal, ratio and interval. Students should be able to recognize the different methods of sampling: random, stratified, cluster, systematic, and convenience.
- Chapter 2 contains the graphical analysis. Students should be able to construct frequency tables, histograms, frequency polygons, cumulative frequency polygons and stem and leaf graphs. Class sections meeting in the computer lab should do these graphs with a statistical software package (Excel or Fathom).
- Chapter 3 contains the calculations for data. Basic calculations should include measures of central tendency (mean, median, mode and midrange), measures of dispersion (range, variance and standard deviation for both samples and populations, coefficient of variation, percent of scores within one or two standard deviations of the mean) and measures of position (concept of percentiles, location of quartiles, outliers, and z score). Descriptive statistics should also be determined with a statistical software package. The graphing calculator should also be utilized. Box plots are to be constructed, both with and without outliers.

4. Chapter 10 contains regression and correlation. This topic will be covered very lightly in Math 123 with more in-depth analysis in Math 124. Students should understand the difference between the independent variable and the dependent variable. Based on the variables, they should be able to predict if there is a positive, negative or no relationship between them. They should be able to make a scatter plot. Using the plot, they should be able to choose 2 points that they feel would belong on a line that fits the data. They should be able to calculate the slope and y intercept, using techniques of algebra. They should be able to use the TI's built-in regression to determine the equation of the line of best fit. Students should understand the meaning of the coefficient of correlation and report the value from the TI. Statistical software packages should also be used to plot the points, draw the regression line, and report the equation. **Hand calculations for the coefficient of correlation and regression line are not required nor should they be done.**
5. Chapter 4 contains probability. Students should be able to determine simple probabilities. Students should be able to construct simple tree diagrams. Additional concepts that are to be covered include complements, AND, OR, independent events versus dependent events and mutually exclusive events. The conditional is an option. When covering the formulas for AND and OR situations, emphasize the use of contingency tables. The concept of combinations should be covered but not to hand calculate as this will be needed in the binomial probability formula.
6. Chapter 5 contains probability distributions. Students should be able to determine whether the conditions for a generic probability distribution are satisfied. The mean and standard deviation should be calculated. The binomial distribution is required; Poisson is an option.
7. Chapter 6 contains the normal probability distribution. This new edition uses a cumulative normal distribution, so faculty familiar with earlier editions should be careful in the presentation. Students should be able to find probabilities with both the standard normal probability distribution and the non-standard normal distribution. Students should be able to determine the value of a particular score, given the area under the normal curve. This chapter also contains using the normal curve to approximate the binomial distribution. The chapter contains the sampling distribution of the mean. This is important as it is the foundation for confidence intervals and hypothesis testing.
8. The remaining 2 chapters are included as a means of introduction to Math 124. Only a few sections from each chapter is to be included. Students should be able to find confidence intervals for the mean, using only the z formula. Sample size required for estimating the mean is also to be covered. The process of hypothesis testing is to be covered; the only test covered is for the mean, again using the z score.

Project(s)

In Math 124, the department outline calls for students to collect, analyze and interpret data. If students have had some experience with this in Math 123, they will be better prepared for Math 124.

Some suggestions:

1. Collect 30 data items, make graphs, calculate descriptive statistics, write a short essay
2. Collect 20 paired data items, make a scatter plot, calculate a line of fit, obtain regression line, write a short essay
3. Make a tree diagram for tossing some specified number of coins or dice. Determine the probability distribution, make a histogram, calculate the mean and standard deviation. Then, physically toss the coins or dice some specified number of times (like 30) and then more times (like 150). Determine the probability distribution, make a histogram, calculate the mean and standard deviation. Compare and contrast the graphs and calculations in an essay. Discuss how the law of large numbers is demonstrated.