

# Math 130 Basic Statistics

## Course Objectives & Description

Department of Mathematics

Morehouse College

Spring 2003

### **Length of Course:**

One semester

### **Prerequisite:**

MAT 110 (Finite Mathematics) or 160 (Business Calculus) with a "C" or better  
(a "C-" in Math 140 requires repeating Math 120).

### **Text (required):**

*Introductory Statistics*, Second Edition, DeVore & Peck

### **Course Objective:**

This course is designed to provide the non- science/ mathematics/ engineering/ business student a intense foundational introduction to the fundamental concepts in Mathematics. The course continues the introduction the student started in Math 140 to many branches of Mathematics and concentrates on pertinent and concrete examples and applications. After completing the course the student should be able to work basic problem and word problems in logic, set theory, counting methods, probability, and statistics.

In conjunction with Math 110 (Finite Math), the course fulfills the Morehouse College Core requirement for Mathematics for the non- science/ mathematics/ engineering/ business student.

The non- science/ mathematics/ engineering/ business student should have mastered and demonstrated the following quantitative skills after completing Math 140:

- the student is able to think logically
- the student is able to reason and recognise patterns and be able to make conjectures
- the student is able to create, read, and interpret graphs, charts, histograms, and diagrams
- the student is able to perform operations on matrices and apply them
- the student is able to perform set - theoretic operations and understand their applicability to surveys
- the student is able to collect, organise, and represent data, and be able to recognise and describe relationships
- the student is able to understand and use the basic measure of central tendency
- the student is able to understand and use the language of probability
- the student is able to compute the probabilities of composite events using the basic rules of probability
- the student is able to understand the significance of statistics and probability in the real world
- the student is able to understand the significance of the connection between logic and sets and their applicability to the real world
- the student is able to understand the significance of the connection between linear algebra and probability and their applicability to the real world
- the student is able to understand the significance of the connection between statistics and probability and their applicability to the real world
- the student is able to understand the concept of approximation, quantities, estimation, error, precision, and accuracy in interpreting the results of such measurements
- the student is able to understand the role of numbers as a logical, predictable system for expressing and relating quantities in analyzing and solving problems in the real world
- the student is able to demonstrate several approaches to basic problem solving and implement those strategies
- the student is able to acquire, organise, and synthesize information and creatively use that information

- the student is able to understand and appreciate the significance of the interconnection between areas of mathematics (especially applied finite mathematics) and their applicability to the real world

**Outline of the Course (continuation of Math 110 - begins where 110 left off):**

I Preliminaries

On the first day of the course, the student will be familiarised with definition of finite mathematics, the basic mathematical symbols, subscripts, superscripts, absolute value notation, and proof notation.

II Introductory Statistics Chapter I, Sections 1 through 3

After completing this section of the course, the student should be familiar with the populations, samples, what and why experimentation, and statistics.

III Probability Chapter IV, Sections 1 through 4

A review of basic probability. After completing this section of the course, the student should be familiar with sample spaces, experiments, events, the rules of probability, probability functions, conditional probability, independence or dependence, Tree Diagrams, Bayes' Theorem, odds and the fundamental probability principles. Further, the student will have mastered the use of Pascal's Triangle, as well as the material from this section, to solve problems.

IV Tabular and Pictorial Methods for Describing Data Chapter II, Sections 1 through 5

After completing this section of the course, the student should be familiar with the concepts of: the different types of data, stem-and-leaf displays, frequency distributions, histogrammes, and interpretation of results.

V Numerical Summary Methods Chapter III, Sections 1 through 4

After completing this section of the course, the student should be familiar with central tendencies and the computation thereof, with variability and the computation thereof, summarisation of a data set and interpretations.

VI Random Variables and Discrete Probability Distributions Chapter V, Sections 1 through 4

After completing this section of the course, the student should be familiar with sample spaces, experiments, events, random variables, probability distributions for discrete random variables mean value, standard deviation, and the binomial distribution.

VII Continuous Probability Distributions Chapter VI, Sections 1 through 3

After completing this section of the course, the student should be familiar with probability distributions for continuous random variables, when we use these versus the discrete p.d.s, and the most useful and important of the c.d.f.s: the Normal distribution, and other distributions, expected value, variance, standard deviation, Chebychev inequality, percentiles, and other selected topics in statistics.

VIII Sampling Distributions Chapter VII, Sections 1 through 4.

After completing this section of the course, the student should be familiar with statistics and random samples, sampling experiments, the sampling distribution for a sample mean, and the sampling distribution of a sample proportion.

IX Estimation Using A Single Sample Chapter VII, Sections 1 through 3.

After completing this section of the course, the student should be familiar with point estimation, large sample confidence intervals for population means, for population proportions, small sample confidence intervals for means from normal distributions, and interpretation of the results.

X Hypothesis Testing Using A Single Sample Chapter IX, Sections 1 through 7.

After completing this section of the course, the student should be familiar with estimation, hypothesis tests and errors, large sample hypothesis tests for a single mean, p-values, large sample hypothesis tests for a population proportion, interpretation and conclusions.

XI In Depth Application

The rest of the book.

An in depth analysis of application using the subjects studied in the previous part of the course. This section changes from semester to semester and is based on a survey of the interests and needs of the students taking the course. It can be, but is not limited to, more hypothesis testing, comparing two population means, regression, correlation, ANOVA, or categorical data analysis and the chi-squared test.

**Pace of the course:**

I	Preliminaries	1 day	
II	Introductory Statistics	1 day	
III	Probability	$\leq 1$ week	
IV	Tabular and Pictorial Methods for Describing Data		
VI	Random Variables and Discrete Probability Distributions	$\leq 1$ week	
V	Numerical Summary Methods	1 week	
VI	Random Variables and Discrete Probability Distributions	$\leq 2$ weeks	Test I
VII	Continuous Probability Distributions	2 weeks	
VIII	Sampling Distributions	2 weeks	Test II
IX	Estimation Using A Single Sample	$\leq 2$ weeks	
X	Hypothesis Testing Using A Single Sample	3 weeks	Test III
X	In Depth Application	The rest of the semestre.	