

MATHEMATICS 160

INTRODUCTION TO APPLIED STATISTICS

I. Introduction

A. Catalog Description

An introduction to statistics concentrating on statistical concepts and the "why and when" of statistical methodology. The focus of the course is the process of learning to ask appropriate questions, to collect data effectively, to summarize and interpret that information, and to understand the limitations of statistical inference. Statistical software is used in the analysis of data and in statistical inference. Students with Advanced Placement credit for MATH 160 should consider enrolling in MATH 260. Students who have received credit for MATH 271 may not receive credit for MATH 160. *Prerequisite: Three years of high school mathematics.* Satisfies the Mathematical Approaches core requirement

B. Objectives

The primary objective of the introductory statistics course is to introduce students to variability and uncertainty, data analysis, and statistical inference, and to teach students tools for interpreting the statistics they encounter in the media, the classroom, and the workplace.

This course satisfies the Mathematical Approaches category of the university's core curriculum by developing an appreciation of the power of Mathematics and formal methods to provide a way of understanding a problem unambiguously, describing its relation to other problems, and specifying clearly an approach to its solution. A student in this course will develop a variety of mathematical skills, an understanding of formal reasoning, and a facility with applications. Specifically, this course will provide the student with the ability to work with numeric data, to reason from those data, and to understand what can and can not be inferred from those data.

C. Prerequisites

Three years of high school mathematics.

II. Required Topics

A. Data Analysis

1. Graphical and tabular methods for investigating distributions of a single variable
2. Numerical summary measures for distributions of a single variable
3. Graphical and tabular methods for exploring relationships of two variables
4. Numerical measures of association of two variables
5. A descriptive use of regression

B. Data Collection

1. The reasons for the systematic collection of data
2. Some Sample Survey basics
3. Some fundamental principles of Experimental Design

C. Probability and Sampling Distributions

1. Basic concepts
2. Simple discrete univariate probability distributions
3. Expectation and variance of discrete random variables
4. Binomial probability distribution
5. Continuous probability distributions
6. Normal probability distribution
7. Sampling distribution of a sample mean
8. Central Limit Theorem
9. Sampling distribution of a sample proportion

D. Statistical Inference

1. Introduction to interval estimation - large samples
2. Introduction to significance testing - large samples
3. The use and abuse of tests
4. Inferences for population means - small samples; dealing with non-normal populations
5. Inferences for population proportions
6. Comparison of two populations
7. Inference for two-way tables

III. Optional Topics

- A. Analysis of variance
- B. Nonparametric methods
- C. Quality control
- D. Time series
- E. Inference in the regression setting

IV. Bibliography

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| DeVeaux, R. & Velleman, P. | <u>Intro Stats, Addison-Wesley</u> |
| Devore, J. & R. Peck | <u>Statistics, Duxbury</u> |
| Moore, D. | <u>The Basic Practice of Statistics, Freeman</u> |
| Moore, D. & McCabe, G. | <u>Introduction to the Practice of Statistics, Freeman</u> |