

**BTEC 180 - BIostatistics**

Units Lecture	3.00	Units Lab	1.00	Units Total	4.00
Total Hrs Lecture	50.00	Total Hrs Lab	50.00	Total Course Hrs	100.00

COURSE DESCRIPTION

This introductory statistics course covers the principles and practice of statistical design and analysis for scientific experimentation. Topics include hypothesis formation, experimental design and execution, data analysis, and communication with application to scientific fields, such as the biological and health sciences. The course includes laboratory application with extensive use of computer software for statistical analysis and simulation. (Not open to students with credit in BIO 180/BTEC 180 or PSYC 104/SOC 104 or PSYC 104H/SOC 104H.) UC Credit limitation: Credit for BIO 180/BTEC 180, MATH 103, PSYC 104/SOC 104 PSYC 104H/SOC 104H.

ENROLLMENT RESTRICTIONS**PREREQUISITES**

MATH 64 or eligibility determined by the math placement process.

COREQUISITES

None

ADVISORIES

BIO 100 or BIO 101.

OUTLINE OF COURSE CONTENT

The course will address the following topics:

Lecture:

- I. Introduction to scientific data
 - A. Types of data
 - B. Graphical representation
 - C. Measurement accuracy, precision, and significant figures
 - D. Frequency distributions.

- II. Descriptive statistics
 - A. Measures of central tendency
 - B. Measures of dispersion
 - C. Outliers and unusual points
 - D. Data transformation.

- III. Probability distributions
 - A. Normal
 - B. Binomial
 - C. Sampling.

- IV. Hypothesis testing and estimation
 - A. One- and two-sample scenarios
 - B. T-distributions
 - C. Confidence intervals
 - D. Test statistics
 - E. Statistical power and sample size.

- V. Analysis of variance
 - A. Comparing two groups
 - B. Comparing more than two groups
 - C. Factorial ANOVA.

- VI. Design of experiments
 - A. Hypothesis formation
 - B. Random sampling and random assignment
 - C. Response, treatment, and units
 - D. Major sources of variation (bias) and their classification



- E. Single factor experimentation
- F. Completely randomized design
- G. Randomized block (two factor) design.

VII. Simple linear regression and correlation

- A. Correlation coefficient
- B. Least-squares model and regression equation
- C. Prediction and confidence intervals
- D. Analysis of residuals.

VIII. Frequency analysis

- A. Goodness of fit
- B. Contingency tables.

IX. Nonparametric tests

- A. Resampling methods
- B. Distribution-free statistics.

Lab:

All topics addressed in the lecture are applied to lab activities.

PERFORMANCE OBJECTIVES

Upon successful completion of this course, students will be able to do the following:

- 1). Analyze biological and health science data sets using a variety of graphical and numerical methods
- 2). Collect, organize, and describe data in a systematic and controlled manner
- 3). Construct, interpret, and draw inference from tables, charts, and graphs that appropriately summarize data from various sources
- 4). Employ statistical decision making through proven methods in data analysis
- 5). Evaluate the arguments and decisions reached through statistical data analysis
- 6). Apply measures of central tendency, dispersion, variance, and correlation
- 7). Describe sampling and its implications in statistical conclusions
- 8). Design experiments to test a hypothesis, conduct the experiments, and interpret and communicate the outcomes
- 9). Recognize the conditions that lead to data transformation; perform data transformation techniques for data modeling and interpretation
- 10). Select and use statistical methods to test hypotheses in the biological and health sciences and evaluate various forms of data.