GROSSMONT COLLEGE

COURSE OUTLINE OF RECORD

Curriculum Committee Approval: 05/18/2021

GCCCD Governing Board Approval: 06/15/2021

BIOLOGY 215 – STATISTICS FOR LIFE SCIENCES

1. Course Number Course Title Semester Units

BIO 215 Statistics for Life Sciences 3

Semester Hours

2 hours lecture: 32-36 hours 64-72 outside of class hours 3 hours lab: 48-54 hours

144-162 total hours

2. Course Prerequisites

A “C” grade or higher or Pass in Mathematics 110or equivalent and Biology 120 or 230 or 240 or equivalent.

Corequisite

None

Recommended Preparation

None

3. Catalog Description

Methods and experience in defining and solving quantitative problems in the life sciences. Emphasis is on the design of experiments and the application of a variety of parametric and nonparametric statistical techniques to the analysis of data.

4. Course Objectives

The student will:

1. Analyze representative data from the life sciences using a variety of statistical techniques both by hand and using statistical software, including

1) Correlation and regression analysis

2) T-tests and non-parametric equivalents

3) ANOVA and non-parametric equivalents

4) The chi-square test.

b. Compose written discussions of statistical problems which integrate statistical hypothesis testing into the framework of scientific methodology.

c. Explain in writing the statistical decision relative to probabilities.

d. Evaluate in writing the limitations of statistical inference.

e. Apply statistical considerations to the formulation of hypotheses and the specific design of experiments.

5. Instructional Facilities

a. Standard classroom

b. Instructional laboratory, equipped with black or white board and AV facilities, personal computers (one per student required) and with the latest Microsoft Excel. A printer must be available for students to print the results of their analyses.

c.Basic laboratory supplies needed for demonstrations and experiments conducted to generate data.

6. Special Materials Required of Student

Hand-held scientific calculator

7. Course Content

All course content is taught in lecture and laboratory

a. Descriptive Statistics

1) Considerations for obtaining data and measurement

2) Summarizing data in graphs and tables

3) Measurement of Central Tendency and Dispersion

4) Probability models and rules

5) Conditional probability

b. Inferential Statistics

1) The Normal and Binomial Distributions

2) Sampling Distributions

3) Confidence Intervals and Statistical hypothesis Testing

4) t-tests: one-sample, two-sample, and paired

5) One-way Analysis of Variance

6) Regression

7) Correlation

8) Chi-square test

9) Non-parametric tests, including the Sign, Rank Sum, and Kruskal-Wallis

c. Use of Statistical Tests and Interpretation of Results

1) Experimental design

2) Choosing the right test for an experimental design

3) Drawing conclusions in the context of the research question

8. Method of Instruction

a. Lecture, including solved sample problems & multimedia presentations

b. Discussion

c. Assigned problems from the textbook and handouts. These require written discussions of statistical analyses and scientific conclusions

d. Laboratory activities

1) Supervised problem-solving.

2) Supervised activities to collect and/or generate data

3) Demonstrations of Excel procedures

9. Methods of Evaluating Student Performance

a. Supervised group-oriented worksheets and lab activities using Excel.

b. Quizzes and exams requiring problem solving, discussion, and interpretation of results as well as definitions and theorems.

c. Comprehensive final examination: Summary and analysis of data with written discussions of statistical analyses and scientific conclusions.

10. Outside Class Assignments

a. Textbook reading assignments.

b. Assigned homework problems from the textbook and/or handouts.

c. Reading and summarizing statistical content of research papers from primary literature.

d. Assigned problems using online statistical simulation software.

e.Other written assignments, such as reporting on data presented in popular press or written plans for experiments designed by the student.

11. Representative Texts

a. Representative text(s):

1) Baldi, B. and D. S. Moore. *The Practice of Statistics in the Life Sciences*, 4th edition. New York, New York: W.H. Freeman and Co., 2017

2) Glover, T and K. Mitchell. *Introduction to Biostatistics*. 3rd edition. New York, New York: McGraw-Hill Publishers, 2015.

b. Supplementary texts and workbooks:

None

Addendum: Student Learning Outcomes

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

1. Understand statistical reasoning in the context of the scientific research in biology.
2. Read and interpret biological research presented in scientific literature and popular publications.
3. Use Microsoft Excel to enter data, calculate statistical summaries, make tables and graphs, and explain and interpret these summaries.
4. Select appropriate analysis, make calculations of test statistics, and find probabilities to test hypotheses (using both calculators and Microsoft Excel) and communicate results from statistical analyses.