Southeast Missouri State University

Department of Biology BI 152

Introduction to Scientific Investigation New Spring 2006

I. Catalog Description and Credit Hours of Course:
An introduction to science as conjecture and refutation. Students will conduct multiple studies in which they generate hypotheses, design tests of the hypotheses, and collect, analyze and present data. Computer-based statistical and graphing functions will be used. One two-hour lab per week. (1)

II. Prerequisite (s): Pre- or Co-registration in BI 151.

III. Purposes or Objective of the Course:

After taking this course, students will be able to

A. Understand the philosophical basis of the model of science as conjecture and refutation.

B. Identify variables and operationally define them.

C. Apply certain statistical tests to appropriate experimental designs

D. Organize a scientific report of experiment and findings

E. Design, conduct, analyze and present findings of an individually conducted experiment.

IV. Expectations of Students:

A. Attend and participate in all of the labs

B. Complete all assignments

C. Conduct individual research outside of class.

D. Present the individual experiments and findings

E. Take one midterm exam and a take-home final

V. Course Content or Outline:

Week	Topic	Materials	Lab Hours
1	Science as a Way of Knowing *Fact/ Truth/ Reality* *Conjecture and Refutation: The Model Vs. forming everyday opinions.* Begin collecting Class Vital Data	Analysis of scenarios; Conjecture/ Refutation Model	2
2	Observation and Inference Identifying Variables, analysis of experiments *Independent (manipulated), Dependent (responding), Controlled*	Footprints Analysis of scenarios	2
3	Patterns and Relationships Errors in Data Stating Generalizations	Class Vital Data	2
4.	Presenting Data: Tables, Graphs, Figures	Excel Chart Wizard Class Vital Data	2
5	Developing conjectures: seed germination studies Designing Tests, Operational Definitions *Cardiac blood pressure experiments.*	Lettuce and radish seeds and materials for germination studies	2
6.	Introduction to Probability, Chi squared test on seed germination data. Complete design of b.p. experiments, begin to collect data	Seed germination data	2
7.	Measures of Central Tendency *Excel statistical tools for descriptive statistics*	Pine needle data (collected in class) In computer lab	2
8.	Mid Term Exam		2
9.	Decision theory *Type I and Type II errors, alpha levels*	Pine needle data, cardiac data, scenarios	2
10.	Statistical Tests of Difference and Relationship Conceptual introduction to ANOVA, regression and how these relate to design of experiments.	Scenarios Need computer lab	2
11.	Introduction to the individual research on factors affecting seed germination *Develop tentative conjectures*		2
12.	Proposal Peer Reviews *Share the Introduction and Design of proposed experiments.* Prepare equipment and supply lists		2
13.	Introduction to statistical software *How to use* *How to read output* *Interpreting statistical findings* Obtain materials and supplies for experiments	Various data sets In computer lab	2

14.	Data collection and write up Optional help sessions on making PowerPoint slide shows		2
15.	Student Presentations. Get take home final exam		2
Final Exam	Student Presentations. Turn in final exam.		2

VI. Textbook(s) and/or Other Required Materials or Equipment:

A. Campbell, N. A. and J. B. Reece. 2004. *Biology* 7th ed. San Francisco: Benjamin/Cummings (tentative, will use same text in BI151, BI153)

B. Lab manual (Will be created to fit the labs)

VII. Basis for Student Evaluation:

A. 1 midterm exam and a final (40% of overall grade)

B. Homework, lab reports and/or Quizzes (50% of overall grade)

C. Presentation of individual experiments (10% of overall grade)