

# Minnesota State University Moorhead

## BIOL 478: Research Design

### A. COURSE DESCRIPTION

Credits: 3

Lecture Hours/Week: 3

Lab Hours/Week: 0

OJT Hours/Week: \*.\*

Prerequisites:

BIOL 111 - Cell Biology AND BIOL 115 - Organismal Biology AND BIOL 275 - Quantitative Biology

Corequisites: None

MnTC Goals: None

Students will identify a problem at any level of the biological sciences, complete a literature review of that topic, and design an experiment. This will include developing a question, conducting a literature search using current databases and techniques, develop an appropriate bibliography, examine ethical issues in research, understand plagiarism, and learn how to effectively communicate their research design through writing and presenting a research proposal.

**B. COURSE EFFECTIVE DATES:** 08/25/2008 - Present

### C. OUTLINE OF MAJOR CONTENT AREAS

1. The Philosophy of Science: science and pseudoscience, null hypothesis testing (NHT), the careful scientist and underdeterminism, the method of multiple working hypotheses, the method of strong inference, normal science and scientific revolutions, subjectivity, values, and ethics in science, scientific journals and the peer review process.
2. Practical Research Design: Observational study designs, elements of experimental study designs, record keeping in research, choosing your sample size, nested designs and pseudoreplication, randomized complete block design, repeated measures, and split-plot designs.
3. Grant Writing: The place of grants in research, searching and using literature, how to read a scientific paper, developing a good research question, review of basic grammar especially as it applies to technical scientific writing, writing the background, writing your methods, developing a budget, miscellaneous parts of the proposal & formatting.
4. Writing in the sciences: this course is a designated writing intensive course.

### D. LEARNING OUTCOMES (General)

1. To examine assumptions scientists use in executing and communicating research.
2. To learn core principles in proper experimental design that lead to robust results.
3. To write a grant in the style of the National Science Foundation (NSF)
4. To review peer grants in the style of NSF panels
5. To interface with primary literature
6. To communicate the research proposal effectively as an oral presentation to peers

### E. Minnesota Transfer Curriculum Goal Area(s) and Competencies

None

### F. LEARNER OUTCOMES ASSESSMENT

As noted on course syllabus

## **G. SPECIAL INFORMATION**

None noted