

Biology 280 – *Applied Research in Biology I*
Winter 2017 – Section W01

Course Information

Biology 280 – Applied Research in Biology

Credit Hours: 3 (5 contact hours)

Lecture Hours: 2 per week

Lab Hours: 3 per week

Prerequisites: C or higher in any Biology course; instructor permission

Corequisites: None

Catalog Description

This lecture/lab course will focus on preparing students to conduct group research projects in a biology-based laboratory setting. The lecture part of the course will provide students the opportunity to learn how to define a research question, formulate a relevant hypothesis, search the literature to gather information related to their research question and hypothesis, analyze scientific literature, prepare a research proposal, analyze and present data, and write a lab report. The lab experience will teach students biological laboratory skills and techniques that they will use when conducting their research project, including, but not limited to, genetic analysis techniques, microbiological techniques, preparation of solutions, pipetting, using instrumentation, and lab safety. Students will be required to present their research at MCC's annual *Science Day* in April and submit a final research report. *The application of these credits towards a given major or minor will be judged by the institution accepting these credits.*

Note: you may be required to stop into the lab to check your samples outside of your normal lab time.

Faculty Information

Professor: Darren Mattone

Office Location: 1116C

Office Hours: See Blackboard

Telephone: (231) 777-0398

Email: darren.mattone@muskegoncc.edu

Major Course Goals

After completing this course students will be able to

- Formulate a research question for your topic of interest
- Propose a hypothesis that is relevant to a research question.
- Search the scientific literature for information related to a specific topic.
- Prepare a literature review related to a specific topic or research question
- Design experiments to collect data relevant to your research question.
- Use lab techniques to gather laboratory data.
- Analyze scientific data collected through experimentation.
- Present research findings to their peers.

Course Objectives

- Define an appropriate research question
- Explore other questions relevant to the original research question
- List all possible hypothesis for a research question
- Make scientifically sound predictions about the hypothesis based on background research.
- Evaluate the relevance of the literature to their topic
- Describe the methodology use in experiments presented in scientific papers
- Critically examine the data presented in scientific papers
- Apply the literature to the justification of an hypothesis.
- Properly use science research databases
- Select appropriate articles that are relevant to the research question
- Develop an outline showing how the background information will be used to lead up to the presentation and justification of the hypothesis.
- Use proper writing style, techniques, and citations.
- Present information in the literature review that is relevant to the hypothesis.
- Use proper controls in the experiment.
- Correctly identify and use appropriate experimental variables
- Use relevant and correct techniques to collect data required to support the hypothesis
- Critically analyze the experiment designed by a peer.
- Learn to properly weigh, measure, mix solution, prepare serial dilutions, pipetting, standard curves, and laboratory math.
- Use lab equipment (centrifuge, thermal cycler, electrophoresis equipment, spectrophotometers, incubator, autoclave, microscopes, bio-hood) to properly collect data.
- Conduct pilot experiments as necessary to gather data to aid in designing the final experiment.
- Use the appropriate equipment and techniques for collecting data for the final experiment.
- Properly use a laboratory notebook.
- Apply statistical methods of hypothesis testing when appropriate.
- Organize data into appropriate formats for interpretation and presentation
- Use scientific reasoning to interpret and justify the data collected
- Explain the relevance of the data collected to the hypothesis and predictions
- Critically analyze the scientific process and design of the experiment used to gather the data.
- Prepare a poster presentation for Science Day.
- Write a final lab report in the form of a scientific article.

Methods of Evaluation

- Participation and Attendance (15%)
- Quizzes and Assignments (25%)
- Final Lab Report (25%)
- Poster Presentation (10%)
- Oral Presentation (15%)
- Lab Notebook (10%)

Required Course Materials

- PPE: lab coat, safety glasses, gloves (will be provided), closed-toed shoes
- Laboratory Notebook

Attendance Policy

Attendance at all lecture and lab sessions is required. Missing a lecture will result in a 10% deduction from your final grade. After missing 2 lectures you will be dropped from the course. You must make up any lab time that you miss. This may include attending lab on Friday afternoons or Saturday mornings.

Course Calendar

Please note that this schedule is subject to change based on the pace of the course.

Lecture	Lab
<i>Jan 10:</i> Course Introduction; The Nature of Science; Scientific Process; Research Topics and Research Questions; HW: Formulate your Research Question; Complete PreLab exercises for Jan 12	<i>Jan 12:</i> Lab Overview; Pipetting, Solutions, Dilutions, Lab Math, sponge prep Due: Lab Notebook, prelab exercises
<i>Jan 17:</i> Research Question Review; Searching for Literature; Anatomy of a Research Article HW: Revise Research questions; Literature Review outline; Annotated Bibliography of 4 articles; Complete Lab Module 2	<i>Jan 19:</i> DNA extraction, Electrophoresis, PCR calculations, PCR prep Due: Lab 2 module; notebook prep
<i>Jan 24:</i> Literature reviews and Hypothesis formulation; V-diagrams HW: 2-3 page literature review (see rubric); Lab 3 prelab exercises	<i>Jan 26:</i> Electrophoresis of Samples and sequencing prep; Bioinformatics; <i>Research Methods Lecture</i> Due: lab notebook prep; prelab exercises
<i>Jan 31:</i> Developing Research Methods/Experimental Design HW: Methods section of paper	<i>Feb 2:</i> Analysis of Sequences; Advanced Lab Methods; Student project methods development
<i>Feb 7:</i> Experimental Design/Methods planning and development	<i>Feb 9:</i> Bioinformatics, sequence analysis
<i>Feb 14:</i> Sample Collecting and experiment preparation Revised Methods Due	<i>Feb 16:</i> Data Collection
<i>Feb 21:</i> Data Collection	<i>Feb 23: *Mr. Mattone will be gone today</i> Data Collection
Mid Semester Vacation Feb 27-March 3	
<i>Mar 7:</i> Data collection	<i>Mar 9:</i> Data Collection
<i>Mar 14:</i> Data Collection Revised Lit Review Due	<i>Mar 16:</i> Data Collection
<i>Mar 21:</i> Data Collection	<i>Mar 23:</i> Data Collection
<i>Mar 28:</i> Data Collection	<i>Mar 30:</i> Data Collection
<i>Apr 4:</i> Data Analysis, Graphing, Statistics	<i>Apr 6:</i> Data Analysis, Graphing, Statistics
<i>Apr 11:</i> Poster Preparation	<i>Apr 13:</i> Poster Preparation
<i>Apr 18:</i> Student Presentations	<i>Apr 20:</i> Student Poster Presentations
<i>Apr 24:</i> Student Presentations Final Paper Due	<i>Apr 26:</i> Optional: CCURI Symposium at Anoka Ramsey CC (Minnesota)

