

Syllabus

BIO 291 - Research Methods in Biology

General Information

Date April 11th, 2023

Department Science and Technology

Course Prefix BIO

Course Number 291

Course Title Research Methods in Biology

Course Information

Catalog Description Under supervision of biology faculty mentors, students will select a research project, write a literature review and research proposal, conduct preliminary experiments, and write a research report. Research methods and experimental design will be emphasized, including the location and study of articles from the professional literature. The undergraduate research projects will help students develop valuable research skills, and it will provide students with an opportunity to apply scientific knowledge in the context of "real world" problems. Participation will also open up opportunities for students to take part in analyzing data and conducting field research. One 2-hour lecture period, and 4 hours of laboratory work per week. Students must also schedule time for consultation with the supervising faculty member.

Credit Hours 3

Lecture Contact Hours 2

Lab Contact Hours 4

Other Contact Hours 0

Grading Scheme Letter

Prerequisites

BIO 121 General Biology I, BIO 122 General Biology II, and permission from the instructor

Co-requisites

None

First Year Experience/Capstone Designation

This course is designated as satisfying the outcomes applicable for status as a Capstone Course

SUNY General Education

This course is designated as satisfying a requirement in the following SUNY Gen Ed category

None

FLCC Values

Institutional Learning Outcomes Addressed by the Course

Inquiry and Perseverance

Course Learning Outcomes

Course Learning Outcomes

1. Demonstrate the use of modern biological research methods.
2. Utilize skills relating to the process of conducting science and apply the scientific method.
3. Apply the basics of experimental design, data collection, data analysis and hypothesis testing.
4. Critically analyze current research published in the primary scientific literature.
5. Convey ideas, scientific knowledge and experimental outcomes through written and oral communication.

Outline of Topics Covered

- I. Sources of Scientific Information
- II. Searching for Scientific information
 - A. Library Technology
 - B. Electronic Searches
 - C. Primary Literature Searches
- III. Primary Literature
 - A. Reading scientific papers

B. Critical analysis of research results

IV. Doing Science: Where do questions come from?

- A. Science as asking questions
- B. Basic considerations
- C. The skill of asking questions
- D. Where do questions come from?

V. Asking Questions: The art of framing hypotheses and predictions

- A. Observation
- B. Exploratory analysis
- C. Forming hypotheses

VI. Answering Questions: What do the results say?

- A. Confirmatory analysis
- B. What is statistical significance
- C. Significance tests
- D. Testing hypotheses
- E. Testing predictions
- F. Refining hypotheses

VII. Presenting Information: How to communicate outcomes and conclusions

- A. Presenting figures and tables
- B. Presenting results
- C. Writing reports

The remaining topics covered in this course will be project-specific. Faculty mentors will work with undergraduate researchers to provide them with up-to-date information on the current state of understanding as it relates to the specific research question being explored by each student.