

# Course Syllabus

**Department:** Science and Technology

**Date:** 2/5/13

**I. Course Prefix and Number:** BIO 291

**Course Name:** Research Methods In Biology

**Credit Hours and Contact Hours:** 3 credit hours and 6 contact hours

**Catalog Description including pre- and co-requisites:** *supporting data required for grade prerequisite of 'C' or higher. :*

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.

Prerequisites: BIO 121 and 122, AND permission from the instructor

**Relationship to Academic Programs and Curriculum including SUNY Gen Ed designation if applicable:**

This course was designed to fulfill science and math requirements for the A.S. Liberal Arts and Sciences degree.

**II. Course Student Learning Outcomes:** *State the student learning outcome(s) for the course (e.g. Student will be able to identify...)*

At the completion of this course the students should be able to:

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

**College Learning Outcomes Addressed by the Course:** *(check each College Learning Outcome addressed by the Student Learning Outcomes)*

- |   |   |
|---|---|
| <input checked="" type="checkbox"/> writing             | <input checked="" type="checkbox"/> computer literacy     |
| <input checked="" type="checkbox"/> oral communications | <input type="checkbox"/> ethics/values                    |
| <input type="checkbox"/> reading                        | <input type="checkbox"/> citizenship                      |
| <input type="checkbox"/> mathematics                    | <input type="checkbox"/> global concerns                  |
| <input checked="" type="checkbox"/> critical thinking   | <input checked="" type="checkbox"/> information resources |

**III. Assessment Measures (Summarize how the college and student learning outcomes will be assessed):** *For each identified outcome checked, please provide the specific assessment measure.*

List identified College Learning Outcomes(s)	Specific assessment measure(s)
<i>eg: writing</i>	<i>eg: student will complete a research paper</i>
Writing	Students will produce a written research proposal with the opportunity for revision and improvement.
Oral Communication	Students will present their research results to the classroom
Critical Thinking	Students will demonstrate their ability to design experiments as part of a research proposal
Computer Literacy	Students will use computer resources / tools for research, presentations, and data management.
Information Resources	Students will demonstrate the ability to identify, locate, evaluate, use, and share information from relevant resources in producing a research proposal.

**IV. Instructional Materials and Methods**

**Types of Course Materials:**

Assigned Readings, Laboratory Notebook

**Methods of Instruction (e.g. Lecture, Lab, Seminar ...)**

Two hours of lecture and four hours of laboratory per week.

## **V. General 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.