BIOL 36AH: HONORS EXPERIMENTAL RESEARCH IN BIOLOGY I

Foothill College Course Outline of Record

Heading	Value
Effective Term:	Summer 2025
Units:	1
Hours:	3 laboratory per week (36 total per quarter)
Prerequisite:	One of the following: BIOL 1A, 10, 14, or 41.
Degree & Credit Status:	Degree-Applicable Credit Course
Foothill GE:	Non-GE
Transferable:	CSU/UC
Grade Type:	Letter Grade (Request for Pass/No Pass)
Repeatability:	Not Repeatable

Student Learning Outcomes

- Propose a novel research project to add to the current scientific understanding.
- Access scientific literature to understand and effectively communicate the scope and depth of the current understanding in the area of study.
- Develop proficiency in the laboratory or field study techniques required to carry out the research project.
- Demonstrate critical thinking and problem-solving skills to troubleshoot experiments and research design.
- Effectively communicate research findings to both the scientific community and the public.

Description

This course provides interested students with an opportunity to carry out an authentic research project in biology. Students will coordinate research and planning of an original research project, write a proposal and research design, carry out the research, and report on their results. Emphasis is placed on scientific thinking, experimental design, laboratory and/or field work skills, project design and implementation, bioethics, and scientific communication.

Course Objectives

The student will be able to:

1. Propose a novel research project to add to the current scientific understanding.
2. Access scientific literature to understand and effectively communicate the scope and depth of the current understanding in the area of study.
3. Discuss and evaluate the bioethical considerations of biology research.
4. Proficiently and safely perform laboratory or field study techniques required to carry out the research project.
5. Demonstrate critical thinking and problem-solving skills to troubleshoot experiments and research design.
6. Effectively communicate research findings to both the scientific community and the public.

Course Content

1. The scientific method
    a. Application of the scientific method to research problems
    b. Integrating observations, curiosities, and questions into the framework of the scientific method
    c. Hypotheses development and evaluation
    d. Literature search strategies
    e. Reading scientific papers
2. Project design
    a. Scientific literature review
    b. Experimental design and optimization
    c. Project proposals
    d. Budget proposals and limitations
    e. Equipment considerations
    f. Project timeline considerations
    g. Bioethical considerations
3. Experimental design
    a. Lab safety
    b. Experimental design
    c. Potential biases in experimental design
    d. Equipment care and maintenance
    e. Equipment operation and safety
    f. Limitations of available equipment
    g. Problem solving around limitations
4. Data collection and analysis
    a. Methods of data collection and analysis
    b. Record keeping
    c. Bias in data collection and analysis
    d. Accuracy and statistical standards
5. Science communication
    a. Science writing
    b. Presenting data in graphs, tables, and figures
    c. Science communication to other scientists
        i. Writing
        ii. Presentations
    d. Science communication to the public
6. Ethics in biology research
    a. Bioethics of research
    b. Government and institutional regulations
    c. Animal/human subjects and informed consent guidelines

Lab Content

1. The scientific method
    a. Application of the scientific method to research problems
    b. Integrating observations, curiosities, and questions into the framework of the scientific method
    c. Hypotheses development and evaluation
    d. Literature search strategies
    e. Reading scientific papers

2. Project design
    a. Scientific literature review
    b. Experimental design and optimization
    c. Project proposals
    d. Budget proposals and limitations
    e. Equipment considerations
    f. Project timeline considerations
    g. Bioethical considerations
3. Experimental design
    a. Lab safety
    b. Experimental design
    c. Potential biases in experimental design
    d. Equipment care and maintenance
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    a. Methods of data collection and analysis
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    a. Bioethics of research
    b. Government and institutional regulations
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Special Facilities and/or Equipment

1. Fully equipped multi-media laboratory classroom with support of laboratory technician.
2. Materials and equipment such as glassware, chemical and biological reagents, microscopes (oil immersion capacity), gas outlets, autoclave, hot-air sterilizer, incubators, refrigerator, media preparation area, glass washing facilities, laboratory coats, disposable gloves, and safety equipment.
3. Students need internet access.

Method(s) of Evaluation

Methods of Evaluation may include but are not limited to the following:

Written original project proposal
Lab notebook and accurate record keeping
Presentation of original research project at research symposium

Method(s) of Instruction

Methods of Instruction may include but are not limited to the following:

Lecture
Discussion
Cooperative learning exercises
Laboratory activities and/or field studies

Representative Text(s) and Other Materials

Knisely, Karin. A Student Handbook for Writing Biology. 2021.

Types and/or Examples of Required Reading, Writing, and Outside of Class Assignments

1. Project proposal for original research project, including budget and timelines
2. Laboratory notebook
3. Presentation of data at research symposium, either in-class or a campus-wide symposium, such as the Research and Service Leadership Symposium (RSLS)

Discipline(s)

Biological Sciences