# BIOL 36CH: HONORS EXPERIMENTAL RESEARCH IN BIOLOGY III

## Foothill College Course Outline of Record

| Heading | Value |
|---|---|
| **Effective Term:** | Summer 2025 |
| **Units:** | 1 |
| **Hours:** | 3 laboratory per week (36 total per quarter) |
| **Prerequisite:** | BIOL 36BH. |
| **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

- Access scientific literature to understand and effectively communicate the scope and depth of the current understanding in the area of study.
- Coordinate and lead a team of student scientists in 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.
- Expand the scope of their research project to add to the current scientific understanding.
- Learn new research techniques and develop further proficiency in the laboratory or field study techniques required to carry out the research project.

## Description

This course provides students with an opportunity to carry out an authentic research project in biology. Students will further explore their original research project while exploring how to narrow and/or expand the scope of their research project as it develops. Additionally, students will gain valuable leadership skills by coordinating projects with students in BIOL 36AH and BIOL 36BH. Emphasis is placed on leadership, scientific thinking, laboratory and/or field work skills, project design, coordination and implementation, bioethics, and scientific communication.

## Course Objectives

The student will be able to:

1. Carry out 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.
7. Coordinate and lead a team of student scientists in the research project.

## Course Content

1. Advanced experimentation
    a. Lab safety
    b. Posing new questions based on experimental results
    c. Experimental design
    d. Potential biases in experimental design
    e. Equipment operation and safety
    f. Problem solving and redesign
2. Data collection
    a. Methods of data collection
    b. Record keeping
3. Data analysis
    a. Methods of data analysis
    b. Evaluation of results
    c. Reliability of data
    d. Bias in data collection and analysis
    e. Accuracy and statistical standards
4. Relevance of findings
    a. Correlation to published work
        i. Literature search strategies
        ii. Reading scientific papers
    b. Significance to the field
5. Project management and coordination
    a. Coordinating with other student scientists
    b. Mentorship of new student scientists as they join the project
    c. Long term project planning
6. Science communication
    a. Science communication to other scientists
        i. Abstract
        ii. Scientific format
        iii. Science writing
        iv. Presentations
    b. Presenting data
        i. Graphs
        ii. Tables
        iii. Figures
    c. Science communication to the public

## Lab Content

1. Advanced experimentation
    a. Lab safety
    b. Posing new questions based on experimental results
    c. Experimental design
    d. Potential biases in experimental design

   e. Equipment operation and safety
   f. Problem solving and redesign
2. Data collection
   a. Methods of data collection
   b. Record keeping
3. Data analysis
   a. Methods of data analysis
   b. Evaluation of results
   c. Reliability of data
   d. Bias in data collection and analysis
   e. Accuracy and statistical standards
4. Relevance of findings
   a. Correlation to published work
      i. Literature search strategies
      ii. Reading scientific papers
   b. Significance to the field
5. Project management and coordination
   a. Coordinating with other student scientists
   b. Mentorship of new student scientists as they join the project
   c. Long term project planning
6. Science communication
   a. Science communication to other scientists
      i. Abstract
      ii. Scientific format
      iii. Science writing
      iv. Presentations
   b. Presenting data
      i. Graphs
      ii. Tables
      iii. Figures
   c. Science communication to the public

## 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:

Lab notebook and accurate record keeping
Science communication project: prepare a presentation, infographic, article, podcast, paper, or other form of presentation to communicate the purpose, scope, and current research results of the project to two different audiences, a scientist and a member of the general public

## 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. Laboratory notebook
2. Science communication project: prepare a presentation, infographic, article, podcast, paper, or other form of presentation to communicate the purpose and scope of the project to two different audiences, a scientist and a member of the general public
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