Bio 297 – Directed Research

Course Description (for Undergraduate Bulletin)

An introduction to laboratory or field methods intended to prepare students for independent research. This course may not be repeated; research students should enroll in BIO 397 or 497 in subsequent semesters. (No more than 12 semester hours of credit may be accrued in any combination of BIO 297, 397, 493, 495, and 497.)

Credit hours: 0-2  
Prerequisite: Instructor’s consent  
Grading: SA/UN

Course objectives and topics

The goal of this course is to introduce undergraduate students to the craft and practice of biological research. It is intended to give students without formal research experience an opportunity to explore research under the supervision of a mentor, either within or outside of the Biology Department, and to begin the development of the skills necessary for independent scholarship within the general field of Biology.

The topics to which students will be introduced will include:

- The scientific method.
- Experimental techniques and approaches appropriate to the area of research.
- Accurate record keeping, including documentation using laboratory notebooks.
- Experimental design and planning.
- Critical evaluation of experimental data.
- Reading and discussion of appropriate scientific literature.
- Responsible participation in laboratory co-operation and maintenance.

Course requirements

The specific requirements will vary based on the specific nature of the research and thus will be determined by the research mentor. The mentor will clearly describe his or her expectations for attendance and participation in the project. A requirement for all personnel working in laboratories is the completion of safety training. Students are expected to carry out their assigned responsibilities to the best of their ability.

General requirements are that students:

- Comply with the mentor’s expectations for attendance and participation in the project.
- Keep a laboratory notebook for the duration of the project in the manner specified by the research mentor. (General guidelines for keeping a lab book can be found at http://blog.lib.umn.edu/jveldof/calculator/BiologyLaboratoryNotebooks.pdf.) The laboratory notebook will remain with the research mentor after the student has completed the research project.
- Complete laboratory tasks assigned to them by the mentor. These may include tasks that contribute to general laboratory upkeep, as well as the student’s specific project.
- Comply with all lab safety requirements.
Laboratory Safety Training

As a requirement for course participation, students must complete federally mandated laboratory safety training on an annual basis. TA safety training does satisfy this requirement for most laboratories.

The Creighton University Department of Environmental Health and Safety has created an on-line training module addressing lab safety:

http://www.creighton.edu/adminfinance/facilities/ehs/training/online/index.php

Students should view the online safety training video, then take the competency quiz. When completed, a student should include his or her mentor’s email address in the list of addressees for the certificate so that the mentor has a record of the training.

Grading policy

This is a Satisfactory/Unsatisfactory course. Each research mentor will develop his or her own evaluation criteria depending upon the specific nature of the research project, the expected lab duties and their difficulty, and the experience of the student. The criteria will be part of the specific syllabus developed by each mentor. An example evaluation scale is outlined below.

Sample evaluation criteria

Students will be assessed on their effort, participation in the lab community (attending meetings, cooperating with general lab tasks), timely completion of research tasks, documentation of research tasks in a laboratory notebook, and use and care of laboratory facilities and materials. General improvement over the course of the semester is expected.

Each student begins the semester with 100 points. A substandard performance in any of the areas listed above will result in loss of points:

<table>
<thead>
<tr>
<th>Issue</th>
<th>Point deduction</th>
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<tbody>
<tr>
<td>Failure to complete tasks, including assigned readings</td>
<td>2-5 points per task</td>
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<tr>
<td>Failure to follow lab safety protocol</td>
<td>5-10 points per instance</td>
</tr>
<tr>
<td>Failure to follow instrument use guidelines</td>
<td>1-5 points per instance</td>
</tr>
<tr>
<td>Failure to adequately document experimental work</td>
<td>1-5 points per instance</td>
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<tr>
<td>Failure to work the expected minimum hours per week</td>
<td>1-2 points per week</td>
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<tr>
<td>Failure to attend required meetings</td>
<td>1 points per meeting</td>
</tr>
<tr>
<td>Poor use of time or lab materials</td>
<td>2-10 points per semester</td>
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<tr>
<td>Failure to demonstrate understanding of the background and approaches to the study questions</td>
<td>2-10 points per semester</td>
</tr>
<tr>
<td>Failure to assist with general lab tasks</td>
<td>10-20 points per semester</td>
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The final assessment will then be based on the following scale:

Satisfactory: 70.0% or above

Unsatisfactory: 69.9% or below
**Attendance policy**

Students are expected to comply with specified attendance expectations of the research mentor. Failure to do so will result in a deduction of 5 points per meeting and if repeated regularly may result in a failing grade.

**Academic Honesty**

As in all courses, students in this course should abide by the general rules of academic honesty described in the Creighton University Student Handbook (available at http://www.creighton.edu/ccas/currentstudents/studentpolicies/). However, students engaging in scientific research bear extra responsibilities due to the potential impacts of scientific misconduct on their mentor, the University, and the scientific community. Students are reminded that any of the following activities would be considered misconduct, and are grounds for a failing grade in the course:

- Deliberately ignoring or failing to record procedural errors
- Altering or fabricating data or whole experiments
- Excluding data from analyses without proper justification

This is in addition to more universal forms of scholastic dishonesty, such as plagiarism and having assigned work completed by others without approval.