

## **Independent Study in Biology for Experiential Learning Credit**

### **Bio 397 Mentored Research Experience in Biology**

#### **Course description**

The faculty research mentor and student will work together to formulate a research question based on current biological knowledge and the scientific literature. They will develop hypotheses to guide designing and conducting experiments to test the hypotheses. Under faculty supervision, the student will analyze their data and propose follow up experiments. The results and conclusions will be reported in a final project which may be a poster or oral presentation, or research manuscript. In addition, the student will reflect on how the project activities and experiences have contributed to their personal growth as a scientist and their future career plans. Relevant safety and ethical training will be based on the specific proposed research.

#### **Syllabus – Template**

##### **Learning Outcomes**

1. Students will apply concepts from previous coursework and readings in the scientific literature to the research project.

Students will need to rely upon their previous coursework in biology and the scientific literature to understand the knowledge gaps that pose new questions for research. They will also need to use the scientific literature to understand the current practices and approaches specific their research field that can serve as the basis or tools for further exploration.

2. Students will use the experiences provided by the research project to construct and articulate the impact of their experience on their understanding of the process of scientific research.

Through designing and conducting experiments and recording the process and results, students will not only learn about their research problem, they will understand the rigors of conducting research and gain an appreciation for the challenges. Through analyzing their data, interpreting their results, and evaluating its significance, they will improve their overall ability to evaluate scientific data and conclusions.

3. Students will demonstrate an understanding of the safety implications and ethical considerations associated with their research project as well as the demands conducting research responsibly.

In compliance with the guidelines established by the Office of Research Services students will undergo safety and ethical training applicable to their research project. In addition, the research mentor will emphasize the importance of responsible conduct of and integrity in conducting research. Central to this is keeping a detailed and accurate record of the research and honestly interpreting the results.

4. Students will synthesize the ideas and experiences provided by the course to inform their personal, academic and/or professional pursuits and be able to articulate the process.

Through discussion with and feedback from the research mentor the student will be encouraged to reflect on their research challenges and the strategies that they employed to overcome them. As the student practices the conventions of scientific reporting and communication they will be asked to consider how those conventions are similar to or different from the conventions of other fields. Students will reflect on how the research experience has deepened their understanding of biology, as well as, skills that they have developed and how those skills might be useful in their future work or continued studies.

## Learning Objectives

- Formulate a research question based on current biological knowledge and the scientific literature
- Design and conduct experiments and collect data
- Analyze data from experiments and propose follow up experiments
- Communicate the results of the research in a format reflecting scientific conventions (for example, poster or oral presentation, or research manuscript)
- Understand the project results and conclusions in relation to current knowledge in the field
- Reflect on how the project activities and experiences have contributed to personal growth as a scientist and will impact your future

The instructor and student will work together to develop the project guided by the following prompts:

**Project Title** (30 characters or less including spaces – appears on transcript)

**Project Question to be Explored** – as guided by the research mentor and developed through readings in the relevant scientific literature

**Goals of the Project** – what will be accomplished during the quarter

**Project Activities** – what will the student do in pursuing their project. These are the activities that are designed to fulfill the learning objectives.

**Proposed outcomes** – final project (for example: research summary, preparation of a research presentation in poster or talk form, research manuscript or portion of a manuscript—this is expected to be a substantial product in the format agreed to with the faculty advisor). It is expected that the student and faculty advisor will meet weekly to discuss the student's progress and that these discussions will include reflection on the process of conducting research. The student will keep a detailed record of their research following scientific conventions. Formal or informal written updates during the quarter will be assigned by the instructor as appropriate.

The student will receive **safety and ethical training**; the appropriateness to be determined by the faculty advisor in compliance with the guidelines set forth by the Office of Research Services. The faculty advisor and student will also discuss the responsibilities associated with conducting research according to established standards.

The student and instructor will sign the **Independent Study Contract** which outlines the expectations for the student and advisor.

**Reflection** -- in addition to the final project, the student will submit an essay outlining the skills, competencies, and insights they have gained through conducting a mentored research project. They will reflect on how the research experience relates to their understanding of previous coursework and to their future goals.

**DePaul University**  
**Department of Biological Sciences**  
**BIO 397 Experiential Learning Research Contract**

Research Advisor:

Research Student:

Student ID number:

Student email address:

Quarter taken (circle): Autumn Winter Spring Summer I Summer II

Year: |\_\_| |\_\_| |\_\_| |\_\_|

Quarter hours (circle): 4.0 2.0

Students must have a total of 4.0 credit hours in experiential learning in order to fulfill the requirements of the Liberal Studies Program. If the 2.0 credit hour option was chosen above and you have already completed 2.0 credit hours of BIO397, please indicate the session in which that credit was earned:

Quarter taken (circle): Autumn Winter Spring Summer I Summer II

Year: |\_\_| |\_\_| |\_\_| |\_\_|

Undergraduate research in the Biological Sciences should be taken seriously. The quality of your research experience will be directly associated with the time you spend on the research project. As a consequence, your research time must be scheduled each week and you are expected to make progress on your project every week. Faculty members appreciate the need for flexibility, but research time deferred one week must always be made up. This course is designed to meet the Liberal Studies requirements for Experiential Learning.

**Students enrolled in Bio 397 are expected to:**

1. Work on their research project weekly (where work is equivalent to laboratory or library research). A minimum of ten hours per week is expected for a 4 credit course and 5 hours per week for a 2 credit course.
2. You must complete all of the required training appropriate for your research project, as outlined by the Office of Research Services.

<https://offices.depaul.edu/research-services/research-protections/Pages/training.aspx>

Your advisor will help you to determine the appropriate training and discuss with you guidelines for the responsible conduct of research, including ethical issues associated with your research.

3. Attend and participate in all BIO 397 assignments and activities, as indicated by your research advisor—this may include attending research group meetings, or department seminars.
4. Update your advisor weekly on your progress or any issues/problems that you are encountering.
5. Check email every weekday and respond to relevant emails in a timely fashion (usually no later than 48 hours for non-emergency correspondence).
6. Maintain a notebook/research record in the format required by your advisor. Be prepared to show this to your research advisor during each weekly update.
7. At the end of each quarter you are engaged in research for credit (2 or 4 units) you must submit to your advisor a formal final project report. In addition to summarizing your research, you should include a reflection on what you have learned (skills or approaches) about conducting research, ethical issues that you confronted, and how this relates to your previous coursework and future goals. The details of this report should be discussed in advance with your research advisor.

Your research advisor will specify their expectations. These may include giving a formal presentation of your research results (in the form of a poster or a talk) at showcase or another conference.

The student agrees to fulfill the expectations as listed above.

The faculty research advisor sponsoring your project agrees to work with you on its development, be available to meet with you weekly for discussion and feedback, and to evaluate your final project report.

Student signature

date

Faculty signature

date