



Request to Enroll in Biology 399: Undergraduate Research

Revised November 2016

This course will provide the student with the opportunity to learn and participate in all aspects of conducting biological research, including experimental design, literature searches, use of experimental techniques and scientific instruments, and collection, analysis, and interpretation of data. The student will also learn to prepare the results of experiments for presentation by writing a thesis in the format of a scientific publication and by presentation of a seminar to the Biology Department or a poster on Student Research Day. The research project will typically be carried out in the context of the ongoing research project of a faculty member. This has the advantage giving the student the opportunity to conduct experiments that will make a contribution to a significant project, with the possibility of publication. This arrangement will also allow the student to participate in the cooperative team approach that is typical of biological research while being mentored by the faculty supervisor. Capable students will also be permitted to conduct studies of their own design in areas of faculty expertise.

The student will be required work on the project for at least 3 hours a week per credit hour. To fulfill the requirement for an investigative course in the biology major the student must carry 4 credit hours.

Research projects must be defined in advance of registration for the course. A student wishing to register for Biology 399 must complete this form in consultation with the supervising faculty. Biology 399 is normally completed within a regular semester, interim, or summer.

Biology 399 may carry 1 to 4 semester hours of credit. No more than 4 semester hours of BIOL 399 may be applied toward a biology major, and no more than 8 semester hours may be applied toward graduation requirements. To be eligible for BIOL 399, a student must have completed at least four courses in Biology.

Applicant Name: _____ **Major:** _____

Class level: sophomore; junior; senior; other **Cumulative GPA:** _____

No. of Credits for Biology 399: 1; 2; 3; 4 **Anticipated graduation date:** _____

Do you intend to take Biology 399 for honors credit? yes no

Approved by:

Student local address

Supervising instructor name (printed)

Student telephone

Supervising instructor signature

Date

Student email

Academic advisor name (printed)

Student ID

Academic advisor signature

Date

Intended term for BIOL 399

Department chairperson name (printed)

Student signature

Date

Department chairperson signature

Date



Indicate the biology courses that you have completed by listing the letter grade you received next to each course. For courses that are in progress, write "IP".

115 _____	207 _____	323 _____	338 _____	385 _____
123 _____	230 _____	325 _____	341 _____	390 _____
141 _____	250 _____	331 _____	344 _____	395 _____
160 _____	295 _____	332 _____	345 _____	396 _____
161 _____	311 _____	333 _____	346 _____	399 _____
205 _____	313 _____	335 _____	354 _____	other (specify): _____
206 _____	321 _____	336 _____	364 _____	other (specify): _____

List the chemistry courses that you have completed by listing the letter grade you received next to each course. For courses that are in progress, write "IP".

103 _____	115 _____	253 _____	271 _____	324 _____
104 _____	201 _____	261 _____	303 _____	383 _____
105 _____	230 _____	262 _____	323 _____	other (specify): _____

Do you have field/laboratory experience other than that associated with courses? If so, describe briefly.

What aspect(s) of field/laboratory work appeals to you most?

Brief description of proposed project, including the research that will be done, the basis for determining the level of achievement, and the long-term benefit of the research project to you.

Does the proposed project involve animal research and/or recombinant DNA? yes no

If yes, has it been approved by an institutional review board? yes no

What precautions will be followed in conducting such research?



Guidelines Regarding Student Participation in Biology 399: Undergraduate Research (laboratory or field-based research format)

Undergraduate Research Projects

Calvin College provides an opportunity for students to do undergraduate research when they have demonstrated their competence in the academic discipline(s) involved and have shown an ability to work on a research project. BIOL 399 includes substantial investigative experience, including experimental design, literature searches, use of experimental techniques and scientific instruments, and collection, analyses, and interpretation of data.

The Biology 399 course is an opportunity for a student to conduct a research project under the supervision of a Biology Department faculty member (the principal investigator). Projects for such study must be defined in advance of registration and must be approved by the instructor directing the study, the academic advisor of the student, and the department chairperson. Each course must be completed within the term. Because research projects require considerable time of the instructor and student, an instructor is not obligated to approve a project and is expected to limit the number of students accepted. BIOL 399 (4 semester hours) may serve as an alternative to a BIOL 354 investigations course for the Biology major.

Eligibility for an Undergraduate Research Project

To be eligible, a student must have completed four courses in biology and must have an overall GPA of at least 3.0 in those courses. BIOL 399 shall carry credit of 1 to 4 semester hours. No more than 4 semester hours of BIOL 399 may be applied toward a biology major and no more than 8 semester hours of such study may be applied toward graduation requirements.

Expectations of Students Participating in BIOL 399

To maximize the benefit of a research project to a student, the Biology Department requires that the following items be included in a course:

1. **Preparation.** For a project to have significance, it must be well-conceived and tied to the existing knowledge in the field. To assure that a project has such a basis, the student is required to complete:
 - a. **a bibliography** (a listing of a body of literature appropriate to the project). As an option, a student may be required to complete an **annotated bibliography**, i.e., a bibliography accompanied by a brief paragraph for each entry indicating the significance of the item. A bibliography may also include a report of the sources searched. The bibliography may be submitted at the end of the semester.
 - b. **a project proposal.** The proposal should be prepared in rough form for the initial course proposal, but should be prepared in detail at the beginning of the semester in consultation with the supervising faculty member and the literature. A rough project proposal must be completed before the project is undertaken.
2. **Project.** The heart of any scientific study is the data collected. Securing useful data entails appropriate experiment design, careful data collection and regular recording and review of work

in progress. To assure that adequate and appropriate data are collected, the following items will be an ongoing part of the project:

- a. a **log** of work done on the project, i.e., a laboratory and/or field notebook in which records, dates, times, places, experimental conditions, and data are kept.
 - b. a **weekly progress review**, i.e., a meeting with the supervising faculty member to review work done in the past week and the work planned for the following week. The log should be clearly labeled and kept up-to-date so that data, sites visited, experimental techniques, data analyses, etc. can be reviewed at the weekly progress sessions. The log will be submitted with the final project report.
3. **Report.** The proper end of a research project is a report (thesis) on the study and its findings. The report may be a formal paper or a poster presentation. A written report will include the usual components of a scientific paper (title, abstract, introduction, methods and materials, results, discussion, literature cited as well as supporting tables and figures). The style for citations, figures, tables, etc. in the paper will be that of a major journal in the disciplinary area of the study. A thesis is required of students taking Biology 399 for honors credit.

Instead of, or in addition to the written report, a student may be required to present the study in poster form. The style of the poster will be that which is common to the particular disciplinary area involved in the study and will be arranged in consultation with the supervising faculty member. A student applying for investigations exemption on the basis of his or her Biology 399 experience will present a seminar, paper, or poster as the final report of the result of that study.

Students will also be encouraged, but not required, to present a seminar to the Biology Department students and staff if the study and data are appropriate. The principal investigator may also encourage the student to present the work at a scientific conference.

Work completed during the project is legally the intellectual property of the principal investigator, who is primarily responsible for any publication and/or communication of all or parts of the project. Students may not presume this responsibility without the consent of the principal investigator.