

**BIO 393 Independent Research in Biology I
and
BIO 493 Independent Research in Biology II or
BIO 494 Honors Independent Research in Biology II**

There are three options for Biology students to receive academic credit for participating in research under the supervision of faculty members at TCNJ. These are BIO 393, Independent Research in Biology I, BIO 493, Independent Research in Biology II, or BIO494, Honors Independent Research in Biology II. Any of these courses may be taken as a ½ or 1 course unit, but a maximum of 1 course unit of either course only may be applied to the 5-credit 'Biology Option' requirement.

Biology 393/394 Independent Research in Biology I (½ or 1 course unit)

Pre-requisites: BIO 201

A hands-on research experience under the supervision of a professor. This experience culminates in the production of a final product, the specific details of which are at the discretion of the advisor. Examples of appropriate final products include, but are not limited to: significant data analysis, a paper, or a poster. All final documents must be archived by the Department of Biology. May be taken for credit more than once.

Biology 493 Independent Research in Biology II (½ or 1 course unit)

Pre-requisites: Completion of the Biology Core Classes (BIO 211, 221, 231) or concurrent enrollment in the third core course

Pursuit of an original research project under the direction of a supervising professor. Results and conclusions serve as the basis of an oral or poster presentation to faculty and students, as well as a written paper submitted to the faculty mentor. All final papers must be archived by the Department of Biology. May be taken for credit more than once. Refer to the syllabus for additional requirements for BIO 494 Honors Independent Research in Biology II.

Guidelines for Independent Research in Biology I and II (BIO 393, BIO 493, and BIO 494)

Enrollment requirements:

1. Student must have a 2.5 GPA in sciences in order to enroll
2. Student should have achieved sophomore status, but exceptions may be made
3. The first credits of either 393, 493, or 494 may count toward the Biology Option requirements. But subsequent credits count as electives. A student cannot receive Biology Option credit for BOTH 393 and 493/494.
4. Student must obtain the agreement of a research mentor before registering for the class.
5. Student must file a signed copy of the 'Independent Research Guidelines' as a formal acknowledgement of the course requirements.
6. Student must file an Independent Study Enrollment Form (from Records and Registration) and file with the department and R&R.
7. Pre-requisites
 - a. BIO 393 – Biology 201
 - b. BIO 493/494 – Completion of the Biology Core courses (BIO 211, 221, 231) or concurrent enrollment in the final Core Course.

Course requirements:

1. Work load commensurate with credit hours: for a 1/2-unit course, a student is expected to engage in an average of 7.5 hours of research activity per week; and for a 1-unit course, 15 hours of work per week is expected.
2. Maintenance of a laboratory notebook
3. Attendance at laboratory meetings

4. Attendance at departmental seminars and poster sessions
5. Students who complete a half-course unit of either BIO 393 or BIO 493/494 are expected to turn in their lab notebook for final evaluation. Students who complete 1 or more course units in BIO 393 or BIO 493/494 must submit an appropriate culminating project (see below for details) to both the research mentor and to the Biology Department for archiving.
6. Refer to the BIO 494 syllabus for additional requirements

Distinction between Independent Research I and Independent Research II

The major difference between BIO 393 and BIO 493/494 is a qualitative and developmental distinction about the level of independent intellectual engagement of the student. Students enrolled in BIO 393 are involved in hands-on research experiences under the direction of a research mentor. There is an understanding that for Biology 393, such experiences may vary widely. For example, these may involve collecting extensive field samples, learning techniques, or in depth data analysis. These experiences may not focus on a discrete scientific project, but rather give students an opportunity to engage in hands-on laboratory and/or fieldwork. At this level, excellent student performance is marked by an ability to work independently and display technical independence. Students enrolled in BIO 493/494 are engaged in research that is directed towards an original research project, and this work is completed under the supervision of a research mentor. At this level, student performance is measured against a rubric that indicates that excellent achievement is characterized by both technical and intellectual independence.

At the completion of a full course unit in either BIO 393, 493, or 494, each student will produce a culminating project.

- For BIO 393, the details of this are at the discretion of the research mentor. Examples might include a literature review, production of a final figure appropriate for presentation or publication, or a poster presentation. Any final document must be archived by the Biology Department.
- For BIO 493/494, upon completion of one or more course units, students are required to complete a summative piece of work (refer to syllabus for examples). This requirement is exempt for those students who continue on to BIO495 or BIO496. Also, additional requirements are associated with BIO 494, please refer to syllabus for details.