

New Jersey Institute of Technology
Department of Chemistry & Environmental Science



Guide to Undergraduate Research

Updated 9/07/23

Background

This handbook describes the diverse research areas available in the department of Chemistry & Environmental Science (CES) for undergraduate research and/or Cooperative Education (Co-op.) Its purpose is to provide a basis for expectations of undergraduates pursuing research & independent study with a particular faculty member or a co-op experience. Students should examine the requirements for research or co-ops for each of the options offered in CES as described in this handbook before making a final decision.

CES offers Chem 391 (Research and Independent Study; 3 Credits), Chem 491 (Research and Independent Study I; 3 credits), Chem 492 (Research and Independent Study II; 3 credits) and EVSC 391 to provide undergraduates with research experience in Chemistry and Environmental Science. Depending on the arrangement with the individual faculty advisor/mentor, a lab-based research experience can be up to 9 contact hours per week.

Students considering a career in chemistry, environmental science, forensic science, or related fields should seriously consider enrolling in these courses. For most CES majors, this is a requirement in their senior year. For Chemistry majors, CES does not currently require a Capstone project, but students can take Chem 492 as an Advanced Research/Independent study course and have it count towards their degree. Students can take these Research and Independent study courses for a total of twelve credits that count toward satisfying the elective requirements for the BS degree.

For Forensic Science majors, a Capstone Project **IS** required. This can be satisfied in one of three ways: FRSC 490 (Co-op), FRSC 491 (Research & Independent Study I), or FRSC 495 (Forensic Science Senior Seminar). Prerequisites: Junior/Senior standing and Program Director approval. Specific information for each of these Capstone options is listed below.

Research and Independent Study Options:

Chemistry 391: The first opportunity for an introduction to basic research.

Students typically are eligible for this in their sophomore or junior year. The actual format of the study will depend on the faculty research advisor but typically will include a search of the relevant literature, an introduction to the pertinent experimental and/or computational methods, original research on a particular topic, and participation in research group meetings. Students who contribute significantly to a research project are typically included as co-authors in publications arising from the research. As noted earlier, a lab-based research experience can be up to 9 contact hours per week. Students are encouraged to speak with their faculty members to get a sense of time commitment.

Chem 491: Senior Year Research and Independent Research I

Students are required to sign up for this in their junior or senior year based on their experience. Those students previously enrolled in Chem 391 may want to continue research on a more advanced level with the same advisor and enroll in Chem 491 (Research and Independent Study I) or switch advisors. Chem 491 requires more extensive preparation than Chem 391, including a written summary of the proposed research at the start and a report at the end of the course.

Chem 492: Senior Year Research and Independent Research II

Students may wish to continue further with their research project and enroll in Chem 492, during their last semester at NJIT. Chem 492 is the highest level of research an undergraduate can do. It is the baccalaureate equivalent of doctoral research and requires a written proposal of the proposed project and a written report/presentation submitted to the faculty committee.

EVSC 391: The first opportunity for an introduction to basic research in Environmental Science

Students typically are eligible for this in their sophomore or junior year. This course provides an opportunity to work on a research project under the individual guidance of a member of the department. The actual format of the study will depend on the faculty research advisor but typically will include a search of the relevant literature, original research on a particular topic, and participation in research group meetings. Students who contribute significantly to a research project are typically included as co-authors in publications arising from the research.

Forensic Science Capstone Options:

FRSC 490: Cooperative Education Program (Co-op)

Cooperative Education (Co-op) is an academic program that gives students the opportunity to gain professional work experience before graduation. The Forensic Science co-op work experience should be closely aligned with your Forensic Science track or concentration and will improve your understanding of the relationship between classroom theory and practical application. The co-op needs to be conducted in a forensic science laboratory or a closely related setting such as a Medical Examiner's Office. Once the student has identified a lab/agency/company to complete their co-op, they must submit a 1 page proposal to the Forensic Science Program Director for approval and complete [these instructions](#) from NJIT's [Career Development Services \(CDS\)](#). All deadlines in the CDS instructions above must be followed. Once all approvals are met, the student can register for FRSC 490. A Co-op paper **AND** presentation is required. A minimum of 150 hours must be spent at the co-op and a timesheet signed by your co-op supervisor must be submitted at the end of the semester to the Program Director.

FRSC 491: Research & Independent Study I

Students may elect to conduct a Research & Independent Study Project (FRSC 491; 3 credits) with an NJIT Faculty member. The Capstone Research & Independent Study Project must be a Forensic Science related project in your forensic concentration. A one-page proposal which includes background information, experimental methods, and appropriate literature references must be submitted to the Faculty advisor/mentor AND the FRSC Program Director before the student can register for the FRSC 491 course. A research paper AND presentation is required for this Capstone option. A published research article or presentation at a Professional Forensic Science conference can also be used to satisfy the requirements for this Capstone.

FRSC 495: Forensic Science Senior Seminar

Students may also elect to enroll in a Forensic Science Senior Seminar (FRSC 495) to satisfy the Capstone requirement. Senior Seminars can be offered on different Forensic Science Topics, such as Drone Forensics or Cold Case Investigations. A one-page research proposal must be presented to the faculty member teaching the Senior Seminar and the FRSC Program Director for approval by the third week of the semester. A research paper AND presentation (in addition to any other classroom assignments) is required for this Capstone option.

CHEM 391, 491 or 492, EVSC 391 or FRSC 491

The following guidelines will help students successfully find research opportunities for Chem 391, 491 or 492, EVSC 391 or FRSC 491

1. Read the guidelines for Independent Study found at the back of this handbook.
2. Attend the Fall Research forum and meet with faculty to identify several faculty members whose research interests you.
3. Visit faculty members' research group websites. Make an appointment and talk with the faculty members about their research and about the opportunities for independent undergraduate research in their research groups.
4. Choose a faculty member willing to act as a research supervisor.
5. Fill out an application for independent study (available in the department office), have the faculty member sign the application, and submit the application to the departmental office (T151).

GUIDELINES FOR RESEARCH AND INDEPENDENT STUDY IN CHEMISTRY

Revised Summer 2023

CHEMISTRY 391, INDEPENDENT WORK

3 Credits

Individual research under the supervision of faculty members. Not limited to chemistry, biochemistry, forensic or environmental science majors. Students must make a formal application and receive approval of the instructor and Department before the end of the drop/add period.

NOTE: Chem 391 cannot be used to satisfy the laboratory requirements for chemistry, biochemistry, environmental science or forensic science major. Three credits of Chem 391 can be used to satisfy the Math-Science technical elective requirement for the BS degree for Chemistry, Biochemistry, or Environmental Science.

Prerequisites: Consent of instructor

GUIDELINES

1. See restrictions in the catalog description above.
2. Credit for research not performed in the Chemistry and Environmental Science Department will require the student to register for Independent Study in the Department of the Faculty in whose lab the research is being performed. This requires the written consent of the Undergraduate Program Director. The student can then use these credits to satisfy the Math-Science technical requirement for the BS degree.
3. Stipend and credit for the same work will normally not be allowed.
4. Sophomore or junior standing

EVSC 391, INDEPENDENT WORK

3 Credits

Individual research under the supervision of faculty members. Not limited to chemistry, biochemistry, forensic or environmental science majors. Students must make a formal application and receive approval of the instructor and Department before the end of the drop/add period.

NOTE: EVSC 391 can be used to satisfy the Math-Science technical elective requirement for the BS degree for Chemistry, Biochemistry, or Environmental Science.

Prerequisites: Consent of instructor.

GUIDELINES

1. See restrictions in the catalog description above.
2. Credit for research not performed in the Chemistry and Environmental Science Department will require the student to register for Independent Study in the Department of the Faculty in whose lab the research is being performed. This requires the written consent of the Undergraduate Program Director. The student can then use these credits to satisfy the Math-Science technical requirement for the BS degree.
3. Stipend and credit for the same work will normally not be allowed.

CHEM 491 or FRSC 491, ADVANCED INDEPENDENT WORK

3 credits

Individual research under the direct supervision of faculty members. Requires more extensive preparation than CHEM 391. This research may or may not be performed in the same lab as Chem 391.

[If you are considering a capstone project in CES, you should examine the Guidelines early in your Junior year.]

Before advanced registration, the student must make a formal application and receive approval from the instructor and Department. A written report of work is required.

Prerequisites: 1) Consent of instructor and approval of the Undergraduate Committee Chair or FRSC Program Director for FRSC 491; and 2) Demonstrated potential for independent study.

GUIDELINES:

1. See restrictions in the catalog description above.
2. Credit for research not performed in the CES Department requires written application and justification from study and sponsorship of a CES faculty member who will assign the grade.
3. Stipend and credit for the same work will normally not be allowed.
4. Average of "C" or better in CES courses (Chemistry, EVSC, and FRSC).
5. Junior or Senior standing.

NOTES:

1. Application must be made to the Independent Work and Chemistry/Biochemistry/Forensic Science Advisor of the Department **no later than the end of the add/drop period.**
2. Application forms are available for the Department Office (T151), and **must:**
 - a. list all chemistry and upper division science courses taken to date.
 - b. list the last twelve courses attempted and the grades received.
 - c. present a one page summary of the proposed project which includes background information, experimental methods, and appropriate literature references
 - d. include approval by the faculty member proposed to be the supervisor of the project.
 - e. have a final signature from the Department's Administrator indicating that all the criteria have been met

CHEMISTRY 492, ADVANCED INDEPENDENT WORK (CAPSTONE)

3 credits

Individual research under the direct supervision of faculty members. It must be a continuation of Chem 491 and be performed in the same research lab as Chem 491.

Prerequisites: 1) Consent of instructor and approval of the Undergraduate Committee Chair; and 2) Demonstrated potential for independent study.

GUIDELINES:

1. See restrictions in the catalog description above.
2. Credit for research not performed in the CES Department requires written application and justification from study and sponsorship of a CES faculty member who will assign the grade.
3. Stipend and credit for the same work will normally not be allowed.
4. Average of "C" or better in CES courses (Chemistry, EVSC, and FRSC).
5. Junior or Senior standing.

NOTES:

1. Application must be made to the Independent Work and Chemistry/Biochemistry/Forensic Science Advisor of the Department **no later than the end of the add/drop period.**
2. Application forms are available for the Department Office (T151), and **must:**
 - a. list all chemistry and upper division science courses taken to date.
 - b. list the last twelve courses attempted and the grades received.
 - c. present a one-page summary of the proposed project which includes background information, experimental methods, and appropriate literature references.
 - d. include approval by the faculty member proposed to be the supervisor of the project.
 - e. present a one-page summary of the proposed project, which includes background information, experimental methods, and appropriate literature references.
 - f. include the written report from Chem 491 with approval by the faculty member proposed to be the supervisor of the project.
 - g. have a final signature from the Department's Administrator indicating that all the criteria have been met.