



CHEM 300: Undergraduate Research in Chemistry Loyola University Chicago Syllabus

Course Description

This course allows students to obtain course credit in chemistry while gaining experience in scientific research with a chemistry faculty member. Though projects vary, the intent is for the student to develop their own original research component within the faculty member's topic area and emphasis (i.e. analytical chemistry, biochemistry, etc.). Ultimately, the goal of this course is to have students apply chemistry content knowledge in original research project areas as an avenue for preparing their skills for ongoing work as a graduate student or researcher in the chemical industries.

Undergraduate researchers seek and request enrollment in CHEM 300 with individual faculty members. Each student and their faculty mentor decide and agree upon a project and work expectations through a CHEM 300 contract agreement (see below) before enrollment. Students have the option of taking 1-3 CHEM 300 credits within any given semester. The number of credits taken is negotiated with each faculty member, but is usually comparable to 6-8 hours of weekly work per credit hour. A final research product, in the form of an oral, poster, or written presentation is expected.

Course capacity for enrollment varies by research mentor and type of research project. Because this involves a laboratory experience, a chemistry lab fee will apply to this course.

Though this course does not fulfill required chemistry elective credit for chemistry and biochemistry majors, it is highly recommend to those majors as important preparation for their future graduate and/or professional careers. This course does qualify for experiential learning credit in the University.

Course Learning Outcomes

As a result of the experiences in this course, students should:

- engage with the preexisting theoretical and experimental research base (e.g. literature) relevant to their selected research content area;
- decide on and practice thoughtful experimental designs and methodologies;
- utilize appropriate protocols for collecting data;
- compile and summarize research results and make valid claims based on evidence;
- minimize and account for error and their effects on data analysis and conclusions, and;
- complete a final presentation in the form of a poster or oral presentation, or written manuscript.

Pre-requisites

Faculty mentor approval and consent by the Chemistry Department Chair

Course Expectations & Assessments

Communication, selection and agreement with chemistry faculty member

Undergraduate researchers must seek and request enrollment in CHEM 300 from the individual faculty member with whom the student wishes to research. The student and the faculty member decide on the topic, outline, work expectations, and number of credits for the project across the semester of enrollment and complete and sign a CHEM 300 Undergraduate Research Contract Form (included at the end of this syllabus). Agreement forms may be obtained from the department office, and the completed form (signed by the student, instructor, and chairperson) must be deposited in the chemistry department office before the student can register for this course. Enrollment in CHEM 300 must be completed before the end of the registration change period of the semester in which the student wishes to research.

Research Documentation

Accurate documentation of research practices and data is critical to a good project. Student researchers are expected to follow accepted protocols for documenting their research events, and any changes they may choose to make to research designs. Such documentation is typically in the form of keeping science research journal notebooks (pencil and paper or electronic versions).

Regular meetings, communication, updates, and reports during the semester

Based on the agreement between the student researcher and faculty member, regular meetings, communication, updates, and reporting on the progress of the research project is to be established and followed during the semester. These events and communications should serve to check if expectations are being met as outlined in the research agreement, and more importantly, that the research is making progress.

Final Research Presentation

Each undergraduate researcher is expected to complete some type of end-of-semester presentation of their research project, even if it may be an ongoing project into other semesters. This product can be a final written research report, the preparation of a poster or oral presentation on the research, or even a draft manuscript for publication.

Academic Honesty

In conducting and documenting research and preparing final synthesis products, students must follow appropriate and accepted practices and protocols for honoring intellectual rights and property. The final synthesis product is to be related to research conducted within the semester enrolled and must be an original product, not an assignment that was or will be submitted for another course.

For Loyola's webpage on Academic Integrity please see

http://luc.edu/academics/catalog/undergrad/reg_academicintegrity.shtml

Course Evaluation

Students are assigned grades based on their performance and abilities in meeting the obligations and expectations outline in the individual faculty member-student agreement form. Grades will be distributed according to the following:

Research documentation and regular updates	60-80%
Final Research Presentation	20-40%
<hr/>	
Total	100%

Grades will be assigned according to the following qualities:

- A** The student demonstrated a consistent commitment and interest in the research. He or she showed initiative and creativity in developing the research project and worked autonomously to conduct it. Research documentation was regularly thorough, accurate, and complete. Communication avenues and reports were reliable and accurate. Final research presentation demonstrated a clear emerging professional quality.
- B** The student demonstrated a consistent commitment and interest in the research. He or she showed initiative and creativity in developing the research project and worked well with regular support to conduct it. Research documentation was mostly thorough, accurate, and complete, but had a few mistakes or errors. Communication avenues and reports were reliable and accurate. Final research presentation demonstrated an above average quality for an undergraduate student.
- C** The student demonstrated a commitment and interest in the research. He or she was able to conduct research but needed regular support and guidance. Research documentation was thorough, accurate, and complete, but had mistakes or errors. Communication avenues and reports were mostly reliable and accurate, but gaps occurred. Final research presentation demonstrated an average quality for an undergraduate student.
- D** The student's commitment and interest in the research was a bit vague. He or she struggled to conduct research and needed regular support and guidance. Research documentation was irregular and contained errors. Communication avenues and reports had significant gaps. Final research presentation demonstrated an below average quality for an undergraduate student.
- F** The student's commitment and interest in the research was not detectable. He or she struggled to conduct research and did not complete it. Research documentation was irregular and contained errors. Communication avenues and reports had significant gaps. Final research presentation was either not completed or very poor in quality.

CHEMISTRY 300

UNDERGRADUATE RESEARCH CONTRACT-FORM

To be filled in by the student, signed by the preceptor, and filed in the Chemistry Department office **BEFORE** registration for CHEM 300 can occur.

Student Name: _____ Date: _____

Local Address: _____ ID #: _____

Local Phone #: _____ Year in School: _____

I wish to register for _____ credit hours in Chemistry 300, during the _____ semester of 20____(year), in order to work under the direction of Professor _____ on
(preceptor)
the following project: (Briefly list the title and objective of the research project)

It will be necessary for me to (list new skills to be acquired, hours/week available to undertake this project, and work to be performed):

The preceptor will evaluate my contribution to this project by (written/oral exam, weekly, monthly meetings/conferences, etc.):

I understand that my grade in this class will depend entirely on my efforts spent on this project.

Signed: _____ Date: _____
(student)

Signed: _____ Date: _____
(preceptor)

NOTE TO STUDENT: After this contract is complete and all signatures are obtained bring it to the Chemistry Department Office FH-125 to register.