Chem 497 and 499
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Undergraduate Research and Honors Projects

I. Chemistry degree undergraduate research courses

Undergraduate research is offered through three courses: 3150:497, 3150:499, and 9871:499 (given by the Department of Polymer Science). BS and BA in chemistry students and those in the BS in Biochemistry program may take 3150:499 (one or two credits a semester, up to eight credits) as elective courses. Honors students are required to sign up for two credits of 3150:497 (up to eight credits are allowed) during their last semester of research as their Senior Honors Project. Students taking the BS with Polymer Option are required to take a total of three credits of 9871:499 as part of their degree requirements. You may take these courses only with department permission. (BS with Polymer Option students must consult with the Department of Polymer Science.). Except for the restriction on Chem 497 mentioned above, the two courses may be taken at any time during your degree program, at least in principle. To get a good research experience it is usually best to sign up for at least two semesters of research. A significant part of the first semester may involve training in research techniques and therefore, actual research is more likely to be done during the second semester.

II. How to sign up for undergraduate research

II.A. Find a research advisor

You must find your own *research* advisor. This person does not have to be the same as your *academic* advisor. The web sites for the Departments of Chemistry and Polymer Science provide information on the research interests of each faculty member and such information is also available at the *Directory of Graduate Research*.
http://www.uakron.edu/colleges/artsci/depts/chemistry/faculty-staff/
http://www2.uakron.edu/cpspe/faculty.asp
http://dgr.rints.com/ (free from UA computers or via UA VPN)
The research descriptions should help narrow down your choices to one or two faculty members. Don't hesitate to ask a faculty member for an appointment, even if you don't know her/him. Understand that faculty members expect students to initiate such conversations. Ask about the nature of the research project you will be assigned. Different projects require different skill sets, so you should inquire whether your current skills are acceptable for the project. (Most undergraduates don't know enough chemistry to develop their own research project.) There are a number of other topics that should be discussed. When signing up for a course that has a variable number of credits (3150:499), you should ask your potential advisor what his/her expectations are for the number of credits you plan to take. (A rough guide is that the amount of time you put into a two credit Advanced Laboratory course, both inside and outside the lab, should be similar to the amount of time you spend on two credits of research.) Also inquire whether your advisor wants you to write more reports than the minimum number described in section on grading (III.B.).

II.B. Register for the course

After the above arrangements have been made, the staff in the first floor KNCL

chemistry office will register you for 3150:497 or 3150:499. Consult the Department of Polymer Science for directions on how to sign up for 9871:499.

II.C. Additional considerations for Honors students

Honors students may combine work done in 3150:499 or 9871:499 with work done in 3150:497 for their Honors Project. An advantage of taking Chem 499 is that it may be taken for one or two credits. Honors students must submit a proposal and choose a committee during the semester *before* they begin 3150:497. These additional requirements are listed at the following web site.
http://www3.uakron.edu/honors/curriculum_sr_honors.html

The Polymer Department does not have an Honors Project course (yet). All Honors students enrolled in the BS with Polymer option will do their Honors project under chemistry course 3150:497 but will do their research in the Polymer Department. Please notify the Honors advisor, currently Prof. Tessier, so she can make the additional arrangements.

III. How are grades assigned for undergraduate research?

III.A. Your performance in research.

Your research advisor and any graduate students or postdocs in the research group will note your attendance, effort, attitude, etc.

III.B. One or more reports on your research

You will write one or more thorough reports on your research according to the timeline described below. This is usually the most important part of the grade. *General guidelines* for the writing are given at the following web site:
http://portal.acs.org/portal/fileFetch/C/CTP_005606/pdf/CTP_005606.pdf
Because these directions are so general, some specific directions to writing reports are given in a separate handout entitled *Research Reports*. *Do not submit a report for grading without having followed the directions in the handout.* You should plan on completing the first draft of the report *at least one week before the end of the semester*. Your advisor will work with you to help you revise the report to bring it up to the required level. It is not unusual to have two draft reports before writing the final version. It is expected that your paper will not be plagiarized. A copy of all your *graded* reports should be given to the Department of Chemistry main office (KNCL 103), even if you are taking 9871:499 in the Polymer Department. You are required to turn in a report at the end of each year and at the end of your last semester of research. If, for example, your research takes place during the fall, spring and summer, then you would receive IP (in progress) grades for the fall and spring semesters. After you turn in your report at the end of the summer, the IP grades would be changed to letter grades. *Please remind your research advisor and the staff in the Department of Chemistry that you have IP grades that need to be changed to a letter grade*. Otherwise, there could be a delay in obtaining your degree if there are IP grades in your transcript after the date you wish to graduate. Note that your research advisor may require more frequent reporting.

III.C Additional grading considerations for Honors students in 3150:497

Honors students have to attach a special cover sheet to their report and their report must be read and accepted by their committee members. The additional requirements are listed at the following web site.
http://www3.uakron.edu/honors/curriculum_sr_honors.html

The committee members sign the sheet once they have accepted the Honors project. Therefore, Honors students should be more prompt in submitting in their first draft to their research advisor. The research advisor is the expert in the field of study and is most qualified to review the document and determine whether it is flawed. **AFTER** the advisor has signed (or is willing to sign) the cover sheet, then you can submit it to the rest of your committee. Give all members of your committee sufficient time to read and critique your project. In principle, *any* committee member has the right to require that you rewrite your report, if it is deficient. (The Honor Chemistry Advisor, Prof. Tessier, has done this *many* times.) Ask your research advisor to do a thorough job with the editing so that this does not happen to you, especially if you plan to graduate that semester. If you obtain extensions from the Honors College on the due date of your project, be sure to *ask all* your committee members, by phone or Email, whether the change fits *their* schedules. *You must respect* the right of the committee members to plan their end-of-semester activities. If the new due date conflicts with a committee member's schedule, you may have to replace that member with another.

III.C. Additional considerations for ALL BS with Polymer option students

Though you are doing research in the Department of Polymer Science in the College of Polymer Science and Engineering, your degree will be given by the Department of Chemistry in the College of Arts and Sciences. *In addition to* submitting your report to members of the Department of Polymer Science, a *graded* copy of your report must be turned into the Department of Chemistry, if you wish to have an ACS accredited degree.

IV. Other research-related activities

Your research advisor may also encourage you to attend group meetings or present your research at a group meeting or at a conference as a talk or poster presentation. If you work is at a very high level, you could get a publication on your work. Though these activities are not required, it is highly recommended that you take advantage of such opportunities. Make sure to report such activities on your resume and in graduate school applications.

VI. Ethics in chemistry and academic honesty

VI.A. General ethics

A professional chemist should conduct him/herself in an ethical manner and such behavior is expected of all research students. Fraud, plagiarism, falsification, fabrication, bias, selective deletion of undesirable data, conflict of interest, lack of acknowledgement, disrespect, dishonesty, mistreatment of laboratory animals, and lack of concern for the environment or for safety are some of the unethical behaviors that occur in the field of chemistry. The ACS Chemist's Code of Conduct (see web site below) defines such behavior. A number of web sites discuss ethics and provide guidance in how to act in various situations. "Green chemistry" is the term used for chemistry that is done with concern for the environment.

✧ UA Student Misconduct
http://www.uakron.edu/studentlife/sja/SJAdef.php

✧ ACS Ethical and Professional Guidelines
http://portal.acs.org/portal/acs/corg/content?_nfpb=true&_pageLabel=PP_TRANSITIONMAIN&node_id=1095&use_sec=false&sec_url_var=region1
✧ Case studies on ethics in chemistry
http://chemcases.com/
✧ "On Being a Scientist" – a 1995 report by the Committee on Science Engineering and Public Policy representing the National Academy of Sciences, the National Academy of Engineering and the Institute of Medicine
http://bob.nap.edu/readingroom/books/obas/
✧ UA Department of Environmental Health and Safety
http://www.healthandsafety.uakron.edu/
✧ ACS safety sites (free downloads of safety booklets at the second site)
http://membership.acs.org/c/ccs/
http://membership.acs.org/c/ccs/publications.htm
✧ MSDS (Material Safety Data Sheets) sources
http://ull.chemistry.uakron.edu/erd/
http://www.ilpi.com/msds/index.html
http://hazard.com/msds/
✧ Chemistry and Engineering News safety letters (published by ACS)
http://pubs.acs.org/cen/safety/index.html
✧ NIOSH (National Institute for Occupational Safety and Health) Pocket Guide to Chemical Hazards
http://www.cdc.gov/niosh/npg/
✧ ACS Green Chemistry Institute
http://portal.acs.org/portal/acs/corg/content?_nfpb=true&_pageLabel=PP_SUPERARTICLE&node_id=1415&use_sec=false&sec_url_var=region1

VI.B. Plagiarism

Plagiarism is a particularly important ethical concern in Chem 499 or 497 because a written report comprises a large part of the grading. This ethical concern is discussed in the handout entitled *Research Reports.*

VII. Career and professional school information

Prof. Tessier can lend you a copy of the ACS book *Careers for Chemists*. The research experience can help you decide the field of chemistry in which you would like to find permanent employment or may inspire you to attend graduate school. Information on chemistry careers and graduate schools can be obtained at the following web sites.

✧ ACS career resources information
http://portal.acs.org/portal/acs/corg/content?_nfpb=true&_pageLabel=PP_CAREERS&node_id=87&use_sec=false&sec_url_var=region1
✧ Ann Bolek's (Physical Science Bibliographer at UA's Science and Engineering Library) Career Information for Chemists
http://gozips.uakron.edu/~bolek/chem-career.html
✧ Directory of Graduate Research (free from UA computers or via UA VPN)
http://dgr.rints.com/
✧ UA career services

http://www3.uakron.edu/ascareer/
http://www.uakron.edu/counseling/career.php