

Procedures for CH4990, Undergraduate Research in Chemistry

Why should a student consider CH4990?

The Department of Chemistry encourages undergraduate students to become involved in a research project under the direction of a faculty member. Whether you are planning to go to graduate school or pursue a career upon graduation, one of the factors that often gives our students an edge is the opportunity to engage in research and become familiar with the state-of-the-art instrumentation used in chemistry research today. A majority of our students conduct undergraduate research with faculty members.

We have all of the basic instrumentation necessary for conducting research in chemistry. Many of our major instruments (Nuclear Magnetic Resonance spectrometers and Mass spectrometers) have been recently upgraded. When students are enrolled in undergraduate research, they have access to all the instrumentation necessary for their research. A description of our research instrumentation can be found at <http://www.chemistry.mtu.edu/pages/facilities/instruments.php>

Some CH4990 students have been listed as co-authors on peer-reviewed publications and have given presentations at conferences. This definitely makes a resume or Graduate School application stand out! Additionally, letters of recommendation from research advisors mean much more to potential employers or graduate schools than those from professors who are only instructors.

In addition to CH4990, many of our students have had excellent research experiences at other institutions, usually during the summer, through Research Experience for Undergraduates (REU) programs sponsored by the National Science Foundation at various universities. For a listing of current REU's, see http://www.nsf.gov/home/crssprgm/reu/reu_search.cfm

When should a student begin CH4990?

Students often consider CH4990 after they have completed foundational chemistry courses at the beginning of their junior year. However, students are welcome to begin collaborating on a research project at any time and there have been some enterprising students who have even arranged to begin a research project during their freshman year or the summer prior to beginning the freshman year.

CH4990 requires considerable initiative on the part of the student both in arranging the collaboration with a particular faculty member and in carrying out the collaboration. It is best to start exploring possible arrangements the term before you intend to register.

For how many terms should a student enroll in CH4990?

For the research experience to be meaningful, students must enroll in CH4990 for 2 semesters and for a minimum of 6 total credits. Students may enroll in CH4990 as often as they wish, but a maximum of 12 credits of CH4990 may be applied toward the 128 credits needed for graduation.

Students must file a CH4990 form each semester to enroll in CH4990 if involved in a project lasting more than one semester.

Student

Meet with Faculty

The student should consider the research interest of the faculty as described on the Department web site

<http://www.chemistry.mtu.edu/pages/faculty/index.php> and make appointments for meetings.

Your meetings with faculty to discuss possible research projects are an opportunity for you to get to know what projects are in progress and planned for the future, possible projects that you could become involved in, the time involved and any other questions or topics that will provide the information you need to make a decision about your undergraduate research experience. The meetings are a chance to get to know the faculty member and their work on a personal level.

Arrange CH4990

The mechanism for setting up an undergraduate research experience is the course, CH4990. It is best to begin this process the semester before you plan to begin your research work so that you can register for CH4990 at the same time as you register for your other classes.

Reach agreement on the research project for the term with your professor and complete the CH4990 Undergraduate Research in Chemistry form. Each credit is equivalent to at least 3 hours a week of actual work for a 14 week term. The usual number of credits per term is 3-6.

Make a copy the CH4990 form for the student, the professor and for the Department file (Lois Blau).

Take the original CH4990 form to the Office of Records & Registration to complete the enrollment in the course.

Preparation for research project

Review all safety procedures before beginning work in the lab.

Maintain a laboratory notebook.

Recommended Text: **Writing the Laboratory Notebook**, Kanare, Howard M., *American Chemical Society*, Washington, DC, 1985

This book describes among other things the reasons for notekeeping, organizing and writing the notebook with examples, and provides photographs from laboratory notebooks of famous scientists.

A copy of this book is available in Room 717 and the Department office.

Research Report

Submit a Research Report following either the "Guidelines for Preparing a Research Report" or the research advisor's specifications before a grade can be issued.

The American Chemical Society (ACS), as part of the accreditation process of the Chemistry Department, requires us to send them copies of CH4990 research reports written by the students. This is to ensure that the quality of undergraduate research projects at MTU meet ACS standards. **It is essential that the student submits a professional report following the Guidelines or the research advisor's specifications!** It is most effective if the student reviews the Guidelines before, during and after the research project. Refer to:

The ACS Style Guide, Dodd, J.S., Ed; *American Chemical Society*, Washington, DC, 1997. Copy available in Room 717 and Department office.

The student may also wish to make an appointment at the MTU Writing Center before submitting their report to their research advisor.

<http://www.hu.mtu.edu/wc/>

Students who take CH4990 are required to write a report on their research and give an oral presentation as part of CH4910, Senior Seminar in in Chemistry II.

Grading

- Ongoing project – Each semester the research advisor completes the CH4990 grade sheet with "P" for progress.
- Completed project – **Student cannot graduate until "P" grades are replaced by a letter grade.** (A's are not automatic).

Professor

Discuss research projects with students.

Sign the CH4990 Undergraduate Research in Chemistry form.

Review the "Guidelines for Preparing a Research Report" or their own specifications with the student.

Provide safety training specific to laboratory and project.

Provide on-going consultation, supervision and collaboration as student progresses in the project.

Grading

- Ongoing project – Each semester the professor completes the CH4990 grade sheet with "P" for progress.
- Completed project – **Student cannot graduate until "P" grades are replaced by a letter grade.**

Grade student (A-F). (A's are not automatic)

Professor calls the Office of Student Records & Registration (x7-2319) to obtain a change-of-grade card for each semester the student enrolled in CH4990 for the project.

Upon receipt, the professor assigns a letter grade, signs the card(s) and attaches the change-of-grade card(s) to the Cover Page and Report. This should all be given to the Chemistry Department Coordinator.

Distribution of Copies:

- Advisor – Original completed Cover Page and report
- Department Coordinator – Copy of completed Cover Page and report