Chem 488 Undergraduate Research  
Spring 2013

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Contact: 474-6748,  
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Catalog description. “Advanced research topics from outside the usual undergraduate laboratory offerings. The student will be required to make a presentation and turn in a final report. Research areas range from atmospheric chemistry to molecular biology. A substantial level of chemistry or biochemistry background is assumed”.

(This usually means the student should at least have taken some lab course(s) past the 100-level, although ultimately it up to the individual professor whether a student is sufficiently qualified to do a research project in his or her lab. Research projects for freshmen and sophomores can also be done as Special Project 197/297/397 etc.)

Students! Before you begin working in a research lab you must complete lab safety training. Contact Emily Reiter (e.reiter@alaska.edu or 474-6748) for more information.

To do:
1. Attend organization meeting at first class, or by arrangement with instructor
2. Visit three profs and discuss their possible projects
3. Choose one project with the approval of the professor.
4. Write up a half-page description of the project and a description of potential hazards.
5. Get signatures from your new research mentor, and Emily Reiter
6. Make copies for yourself, and hand in the two pages in Simpson's mailbox, room 194
7. Pick up a lab book from 194, and start to work!
8. Participate in the weekly research group meetings.

General. Involvement in research can be an important ingredient in a successful and satisfying undergraduate program in chemistry or biochemistry. This course was established to give undergraduates a chance to participate in ongoing research projects in departmental laboratories, to discuss possible projects with department faculty, carry out the research, write a research report, and present a poster.

Expected Student Learning Outcomes. Students learn how current chemistry and biochemistry studies are conducted through direct research experience. In addition to conducting the research, students present their research and write a comprehensive report of the quality expected of by ACS for a graduating chemistry or biochemistry major.

American Chemical Society Definition of Undergraduate Research: The ACS Committee on Professional Training (CPT) approves our programs and defines undergraduate research in their guidelines (http://www.uaf.edu/files/chem/CPT-BS-Guidelines2008.pdf) as:

The research project should be envisioned as a component of a publication in a peer-reviewed journal. It should be well-defined, stand a reasonable chance of completion in the available time, apply and develop an understanding of in-depth concepts, use a variety of instrumentation, promote awareness of advanced safety practices, and be grounded in the primary chemical literature.

Research can satisfy up to four semester credit hours or six quarter credit hours of the in-depth course requirement for student certification and can account for up to 180 of the required 400 laboratory hours. A student using research to meet the ACS certification requirements must prepare a well-written, comprehensive, and well-documented research report including safety considerations. Although oral presentations, poster presentations, and journal article coauthorship are valuable, they do not substitute for the student writing a comprehensive report.
Number of credits. Credits are assigned at the beginning of the semester when students enroll, but may be subject to change as the result of consultation between the student and professor. One credit of 488 is reserved generally for library or small computational projects. In general, 2 credits provides an absolute minimum amount of time to accomplish a laboratory project; the usual lab-based project will require about 3 credits per semester. Each credit of 488 corresponds to an average weekly minimum of 3 hours working productively in the lab, plus one to two hours planning, interpretation, notebook writing, and reading outside of lab.

Finding a project. New 488 students, or those working with a different professor, must meet with at least three faculty members (see last page) to discuss possible projects, and select a research mentor. The signatures of the three faculty members must be obtained on the attached form. Also, write up a half-page statement outlining the proposed research project, including one reference, and a description of possible hazards associated with the project. This should be submitted by 5 PM of the 3rd Friday of the semester as a hard copy in the department chair’s mailbox, or by email a PDF file to wrsimpson@alaska.edu. Please also send a copy to your mentor. This statement should be written in consultation with your research mentor. For more information about faculty and their research areas, visit the faculty web pages at http://www.uaf.edu/chem/faculty

Continuing students. Each semester 488 students must hand in a half-page statement outlining that semester’s proposed research. If the procedures or materials of your ongoing project are different this semester than last, also note that at the bottom of the page, and get the signatures of your research professor and Emily Reiter. We need continuous documentation that you and your research professor are aware of the potential hazards of carrying out this research project in his or her lab.

Weekly meetings. Each week, our class will meet to discuss progress in research. If you are not able to make the normal time, we will arrange for a group of the class to determine a second meeting time based upon your schedules. Depending upon when we can schedule, there will be at least twelve such weekly meetings. You need to present significant research progress (background literature research, things you have tried, whether successful or not) at around half of these meetings. To allow for illness, travel, or other problems, you will be allowed to "pass" during weeks when research progress was low. However, you must present results during at least seven of these meetings to get full credit on your research participation aspect of the course. The amount of research you present must be judged by the professor (Simpson) to be appropriate for the number of credits you are signed up for (e.g. we expect more for somebody taking the course for three credits than from somebody taking two credits). Each presentation will be graded promptly as "acceptable" or "insufficient", with acceptable being 10 points, and insufficient as 0 points. Because seven such reports are required, you can get 70 points for this grading component.

Required semester report. Each semester a final written report in journal format is required. The report should follow the format of a manuscript to be submitted to a research journal. Early in the semester discuss the appropriate journal format with your mentor. Midway through the semester is not too early to begin writing the report using data obtained to date, describing the research background, and methods. Copies of the report are to be handed in to both your mentor and the instructor (Simpson) no later than 5 PM on the last day of final exams for that semester.

Your report is a public document, and we plan on showing it as examples of the work done in the class. We plan to post the reports on the department’s web server.

Poster. Each semester, research students must present a poster at the end-of-the-semester departmental potluck/poster session. If you are a continuing student, a poster describing your most recent results is required. The usual size is 36” x 36”, which will be printed with departmental funds. A larger size may be appropriate if the student will be presenting a poster at a regional or national conference.

Grades. Your grade in the course is assigned by the instructor (Simpson) in consultation with your research mentor. The grade is based on the amount and quality of the research done, and the quality of the report and poster. Discuss grading with your research mentor early in the semester
to find out how he or she defines satisfactory progress on, or completion of, a research project. The components of the grade are described in the table below.

<table>
<thead>
<tr>
<th>Grade component</th>
<th>Points</th>
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<tbody>
<tr>
<td>Progress Presentations (10 pts each, 7 required)</td>
<td>70</td>
</tr>
<tr>
<td>Poster</td>
<td>15</td>
</tr>
<tr>
<td>Semester Research Paper</td>
<td>40</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>125</strong></td>
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</tbody>
</table>

The grading scale is straight letter grades with no +/-.

**Attendance.** Establish a regular schedule of attendance in the lab in consultation with your mentor. You may also be asked to attend a regular research discussion with your mentor, and/or group meetings, which are informal research or literature discussion sessions held every so often during the semester. In addition to our class's weekly meetings (described above), regular attendance in the research lab, and at research meetings or group meetings, is required.

**Notebook.** Research-style notebooks must be obtained from the Department of Chemistry and Biochemistry. Do not purchase your own. Keep complete notes of data, procedures, and results using neat handwriting. The lab notebook may be taken home for report writing, but must ultimately remain in the lab or be turned in to the research mentor.

**New-Digital data.** Collections of other forms of data such as NMR spectra should contain cross-references to pages in the notebook. The digital data itself (IR spectra files, NMR spectra files, Gaussian log and checkpoint files, HyperChem .hin files, Excel spreadsheets, the report in .doc format, etc) should be burned on a CD, labeled, and handed in at the end of each semester.

**Safety.** All research students must complete laboratory safety training. This will involve several powerpoint training presentations (with quizzes that you must pass), the “Lab Safety and You” presentation given at the beginning of the semester, and one-on-one training session tailored to your project and the lab(s) in which you will be working. Contact Emily Reiter, the department’s Laboratory Safety Coordinator in 194A Reichardt or e.reiter@alaska.edu or 474-6748, to arrange for training before beginning your project. Emily will require that you give her a brief written statement describing your project, especially emphasizing the safety and environmental aspects of the project.

**Safety tips.** While Emily will provide a thorough review of safety issues, and you will hopefully have gained safety knowledge in previous lab courses, here we emphasize several important points. Lab work must be carried out with all due caution. Do not work alone. Wear safety glasses at all times in the lab, even if you are not actually performing an experiment (someone else may be doing so!). Do not eat or drink in the lab. Do not rush. Do not attempt a procedure without the necessary training. Familiarize yourself with the potential hazards of materials you are using. Use common sense. This is a learning experience, so do not be bashful about asking for assistance.

**Students with disabilities.** For students with documented disabilities, we will work with the Office of Disabilities Services (*208 WHIT, 474-5655) to provide reasonable accommodation. If this situation applies, you must discuss accommodation plans with the course instructor (Simpson) and your chosen mentor by 5 PM of the 3rd Friday of the semester.

**End of semester Lab Inspection Checklist.** At the end of each semester, all students must complete Lab Inspection Checklist with the research mentor or Emily Reiter. The checklist will emphasize checking that all chemicals are properly stored, glassware has been washed and put away, and the lab space is generally neat.
Student Name ____________________________________________
UAF email address ____________________________@alaska.edu

Return this page with three or more signatures to Simpson’s mailbox in Reichardt 194 no later than the 3rd Friday of the semester. Include a half-page description of the proposed research project.

Cathy Cahill ......... Date: 
Kelly Drew ......... Date: 
Lawrence Duffy .. Date: 
Kriya Dunlap .... Date: 
Brian Edmonds ... Date: 
Cheryl Frye......... Date: 
Thomas Green .... Date: 
Sarah Hayes ....... Date: 
Fenton Heitzler .. Date: 
William Howard.. Date: 
Chris Iceman....... Date: 
Thomas Kuhn ..... Date: 
Brian Rasley ....... Date: 
William Simpson Date: 
Thomas Trainor .. Date: 

I have agreed to serve as research mentor for the above student. A brief description of the proposed research, along with a statement of possible laboratory hazards associated with the project, is attached.

Mentor Signature

Date: __________________________
Number of Credit hours _________
Mentor Print name

The above student has completed his or her safety training and is approved for working on this project

Date _______________________
Emily Reiter
Name __________________________  Semester __________________________
Mentor __________________________

Description of proposed research:

Lead-in literature reference:

Overview of planned laboratory procedures and materials, including descriptions of potentially hazardous procedures or materials.
488 Laboratory Check-Out List

Name ________________________
Advisor ________________________  Lab Space(s) Used ________________________

Check out performed by ________________________ on__/___/_____
Approved by PI? ________________________ on__/___/_____

<table>
<thead>
<tr>
<th>Task</th>
<th>Checked</th>
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<tbody>
<tr>
<td>Desk/office area cleared: books, files, personal materials</td>
<td></td>
</tr>
<tr>
<td>Comments:</td>
<td></td>
</tr>
<tr>
<td>Turned in your lab notebook/copies of data/data files</td>
<td></td>
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<tr>
<td>Benchtop/work area cleared</td>
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<tr>
<td>Comments:</td>
<td></td>
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<tr>
<td>Chemicals or solutions remaining—clearly labeled</td>
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<tr>
<td>Comments:</td>
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<tr>
<td>Samples or items in refrigerator or freezer in lab and/or in department</td>
<td></td>
</tr>
<tr>
<td>Comments:</td>
<td></td>
</tr>
<tr>
<td>Waste bottles remaining</td>
<td></td>
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<tr>
<td>Comments:</td>
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<tr>
<td>Dishes cleaned and returned.</td>
<td></td>
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<tr>
<td>Comments:</td>
<td></td>
</tr>
<tr>
<td>Fume hoods empty and clean</td>
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<td>Comments:</td>
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<tr>
<td>Equipment borrowed from stockroom or other labs? Returned?</td>
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<td>Comments:</td>
<td></td>
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<tr>
<td>Chemicals borrowed or used up from stockroom or other labs?</td>
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<tr>
<td>Comments:</td>
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<tr>
<td>Gas cylinders returned stockroom?</td>
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<td>Comments:</td>
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<tr>
<td>Instruments cleaned and in good working order, no samples or waste remaining.</td>
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<tr>
<td>Comments:</td>
<td></td>
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<tr>
<td>Notice any damaged/defective/non-working equipment? List below.</td>
<td></td>
</tr>
<tr>
<td>Notice any potential problems? Do you have comments or concerns? List below.</td>
<td></td>
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</tbody>
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