Course materials
The following materials are required for the course and can be obtained from the UAF Department of Chemistry and Biochemistry:

- Bound laboratory notebook, web browser link: 488 website

The following materials are optional and may assist the student in their studies:

- The ACS Style Guide: A Manual for Authors and Editors 2nd Ed. by Dodd

Who should take this course?
Undergraduate research is the best way to get immersed in chemistry! 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.

This course offers 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. The department maintains exciting research groups and research topics broadly span many areas of chemistry. A substantial level of chemistry or biochemistry background is assumed. We recommend that the student should at least have taken some lab course(s) past or concurrent with the 100-level, although ultimately it is 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

Course expectations and outcomes
Students will learn how current chemistry and biochemistry studies are conducted through direct research experience. In addition to conducting the research, students will present their research and write a comprehensive report of the quality expected 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 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.

Grading
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. More than 3 credits per semester generally will not be approved. 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.

Your grade in the course is assigned by the instructor 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.

Points and Letter Grades:

<table>
<thead>
<tr>
<th>Points</th>
<th>Percentage Range</th>
<th>Letter Grade</th>
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<tbody>
<tr>
<td>Progress presentations</td>
<td>70</td>
<td>100 - 90%</td>
</tr>
<tr>
<td>Semester poster</td>
<td>15</td>
<td>89 - 80%</td>
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<tr>
<td>Semester research paper</td>
<td>40</td>
<td>79 - 70%</td>
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<tr>
<td>69 - 60%</td>
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<tr>
<td>59% or less</td>
<td>F</td>
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Total 125

- Progress presentations (70 points) – Each week, you should meet with your mentor to discuss progress in research. Roughly every other week you will report this progress in class. You need to present significant research progress (background literature research, things you have tried, whether successful or not) at these meetings and in class. To allow for illness, travel, or other problems, you will be allowed to “skip” reporting approximately three opportunities. However, you must present results during at least seven class meetings to get full credit on your research participation aspect of the course. The amount of research you present must
be judged by your mentor and instructor 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 receive 70 points for this grading component.

- Semester research paper (40 points) – Each semester a final written report in journal format is required. The journal template is available online. The report follows the format of a manuscript to be submitted to a research journal. Early in the semester discuss the an appropriate journal with your mentor for any needed changes to the format. Early in the semester you will 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 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 reports as examples of the work done in the class. We also plan to post the reports on the department’s web server.

- Semester poster (15 points) – Each semester students must present a poster showcasing their work at the end of the semester. This will occur at the department end of semester potluck/poster session. If you are a continuing student, a new poster summarizing your most recent work (that of the current semester) is required. The poster size is 36” x 36”, which will be printed with department funds. A larger size may be appropriate if the poster will be presented at a scientific meeting.

**Additional coursework details**

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 include 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 on the 3rd Friday of the semester as a hard copy in the instructor’s mailbox or by emailing a PDF file to criceman@alaska.edu. Please also send a copy to your mentor. This statement should be written in consultation with your research mentor. Please visit the faculty web pages at http://www.uaf.edu/chem/faculty for more information about faculty and their research areas.

Continuing students must hand in a half-page statement outlining the semester’s proposed research. If the procedures or materials of your ongoing project are different in the current semester than the previous, indicate this at the bottom of the page and get the signatures of your research professor and Emily Reiter. This will provide 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.

Research-style notebooks must be obtained from the Department of Chemistry and Biochemistry by all students. 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. Printouts or other forms of data such as NMR spectra should contain cross-references to pages in the notebook. Digital data (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.

At the end of each semester, all students must complete the 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 that the lab space is generally neat.

Absences
Students must 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.

Safety
All research students must complete laboratory safety training. This will involve several powerpoint training presentations (with quizzes that you must pass), attending 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 departments Laboratory Safety Coordinator in 192 Reichardt or e.reiter@alaska.edu or 474-6748, to arrange for training before beginning your project. Ms. Reiter will require that you give her a brief written statement describing your project, especially emphasizing the safety and environmental aspects of the project.

While Ms. Reiter 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 as someone else may be doing so.
• Do not eat or drink in the lab.
• Do not rush or attempt a procedure without the necessary training.
• Familiarize yourself with the potential hazards of materials you are using.

Remember to use common sense! This is a learning experience, so do not hesitate to ask for assistance.
Ethical considerations
The Chemistry and Biochemistry Department Policy on Cheating states the following:

Any student caught cheating will be assigned a course grade of F. The student’s academic advisor will be notified of this failing grade and the student will not be allowed to drop the course.

Examples of cheating include, but are not limited to:

- Falsifying results while presenting reports or presentations
- Using another student’s work while writing lab reports

Students must also adhere to UAF policies, the student code of conduct as well as the University of Alaska Honor Code which states in part:

Students will not collaborate on any quizzes, in-class exams, or take-home exams that will contribute to their grade in a course, unless permission is granted by the instructor of the course. Only those materials permitted by the instructor may be used to assist in quizzes and examinations.

Students will not represent the work of others as their own. A student will attribute the source of information not original with himself or herself (direct quotes or paraphrases) in compositions, theses, and other reports. No work submitted for one course may be submitted for credit in another course without the explicit approval of both instructors. Violations of the Honor Code will result in a failing grade for the assignment and, ordinarily, for the course in which the violation occurred. Moreover, violation of the Honor Code may result in suspension or expulsion.

Disabilities
Students with a physical or learning disability are required to identify themselves to the Disability Services office, 474-7043, located in the Center for Health and Counseling. The student must provide documentation of the disability. Disability Services will then notify the instructor of special arrangements for taking tests, working homework assignments and doing lab work.
Student name: __________________________
UAF email address: __________________________ @alaska.edu

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

Catherine Cahill __________________________ Date: __________________________
Kelly Drew __________________________ Date: __________________________
Lawrence Duffy __________________________ Date: __________________________
Kriya Dunlap __________________________ Date: __________________________
Brian Edmonds __________________________ Date: __________________________
Thomas Green __________________________ Date: __________________________
Sarah Hayes __________________________ Date: __________________________
Fenton Heirtzler __________________________ Date: __________________________
William Howard __________________________ Date: __________________________
Christopher Iceman __________________________ Date: __________________________
Thomas Kuhn __________________________ Date: __________________________
Brian Rasley __________________________ Date: __________________________
Marvin Schulte __________________________ 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: __________________________
Mentor print name __________________________ Credit hours: ______

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

Emily Reiter __________________________ Date: __________________________

University of Alaska Fairbanks
Department of Chemistry and Biochemistry
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: