

**CHEM F434 Chemistry Capstone Laboratory Syllabus**  
**University of Alaska Fairbanks, Fall 2019**

**Course Information:**

Chemistry F434, Chemistry Capstone Laboratory, 3.0 Credits

Lecture: Reichardt 204

Laboratory: Reichardt 241

Co-requisite: CHEM F331, Physical Chemistry I

Pre-requisites: ENGL F111X; ENGL F211X or ENGL F213X; CHEM F212; CHEM F202

**Meeting Times:**

Monday 1-2 pm Reichardt 204, 6:00-9:00 pm Reichardt 241

Tues 6:00-9:00 pm, Reichardt 241

**Instructor:**

Thomas Green, Professor of Chemistry

Reichardt 174, Phone: 474-1559, Email: [tkgreen@alaska.edu](mailto:tkgreen@alaska.edu)

Office Hours: Tues 1-3 pm, Wed 1-2 pm

**Course Materials Required:** Lab notebook for recording experimental data and results. Experiment procedures and handouts will be available on Blackboard.

**Required Reading:** *Write like a Chemist*, Robinson and Stoller, Oxford University Press, 2008. This text can be purchased or accessed in electronic form on the UAF Library website.

**Course Description:** A capstone laboratory course with three major components: 1) experiments related to concepts learned in physical, analytical, organic and inorganic chemistry courses emphasizing kinetics, spectroscopy and thermodynamics; 2) computer use in problem solving, data analysis and word processing; and 3) technical writing with emphasis on preparation of papers for publication. Special fees apply. Prerequisites: ENGL F111X; ENGL F211X or ENGL F213X; CHEM F212; CHEM F202 or permission of instructor. Co-requisites: CHEM F331. (1+6).

**Course Goals:**

1. Gain experience in designing experiments and developing safe/efficient lab practices.
2. Enhance your skills in quantitative analysis of experimental data.
3. Develop your scientific writing and presentation skills.
4. Enhance your instrumental skills, especially spectroscopy and chromatography
5. Gain skills in reading and reviewing primary literature in chemistry.
6. Enhance your skills in computational chemistry using Gaussian.

In this course, the quality of the experimental data is equally important as your understanding, interpretation, and communication of the results.

Each lecture period will include a review of the lab, an overview of the background material, and discussion. Lab sessions will include independent and group work on specified experiments. Students are expected to come to lab prepared to execute lab work. The final experiment of the semester will be an independent project, developed in conjunction with the instructor and teaching assistant. Based on this

project, you will present a 10 minute PowerPoint presentation with 2 minutes of questions (12 minutes total). Students will also present a poster at the end of the semester at the Departmental Poster Session.

Lab reports should be submitted as single editable documents via email. Draft lab reports are required to be submitted to the instructor. Draft lab reports are typically due one week after the experiment is completed. The instructor will routinely post due dates.

**Learning Outcomes:** This lab will reinforce concepts and analytical skills in physical/analytical/organic/inorganic chemistry through experiments, data analysis, and development of detailed lab reports.

**Grades: 800 pts total**

- Notebook (100 pts): Entries (description, data, observations, calculations, etc.) for each lab. Before you can start the lab, a list of all chemicals, supplies, and equipment to be used in the lab must be written in your notebook. Please tape or staple into your notebook plots, data tables, and other materials you generated electronically.
- Each lab report will require a written report that will be graded as follows:

Written portion (format, grammar, ability to express scientific ideas and results)	50 pts
Raw data (precision and accuracy)	10 pts
Data analysis and calculations (depth of discussion)	20 pts
Presentation of data (figures, tables, and corresponding captions)	20 pts

- Final Project Presentation (100 pts): Oral presentation grade will be based on the following:

Quality and content of the slides	60%
Presentation quality	20%
Ability to address questions	20%

- ACS Diagnostic of Undergraduate Chemistry Knowledge (DUCK) Exam (100 pts)

Notebook	100 pts
Lab Reports	500 pts
Presentation	100 pts
DUCK Exam	100 pts
<b>Total</b>	<b>800 pts</b>

- **Letter Grades:**

90-100%	A
80-89%	B
70-79%	C
60-69%	D
<60%	F

### Lab Policies:

- Lab time is a premium, and you are expected to spend the lab time performing the lab rather than figuring out how to do the lab (please come to lab prepared).
- You must follow all safety procedures and instrument operating protocols specified for the lab – this includes using correct PPE, being familiar with the SDS information for all materials used, being familiar with correct containment and spill procedures, and developing/following SOPs for all methods and instrumentation used.
- Late reports are penalized 5% per day up to 1 week and then not accepted. (continued)
- You will often be asked to work with another student in pairs. You are expected to contribute equally with your partner in carrying out the experiment. Each student is required to complete and submit a lab report.
- Cleaning up your work space is required! Points will be deducted for failure to wash your dishes and clean your bench after lab is complete.

**Lab Schedule** – see Blackboard for specific experimental procedures and background.

Experiment	Dates	Concepts/techniques
1. Safety, Asymmetric Synthesis (100 pts)	Week 1; August 26 Week 2; Sept 3 Week 3; Sept 9,10	Organometallic chemistry, diastereomers, NMR, chiral auxiliaries, WebMO
2. Synthesis of metal-organic cage in water (100 pts)	Week 4; Sept 16,17 Week 5; Sept 23,24	DOSY NMR, Self-Assembly, Guest Capture
3. Synthesis and characterization of conductive/fluorescent polymers (100 pts)	Week 6; Sept 30, Oct 1 Week 7; Oct 7,8 Week 8; Oct 14,15	GC/MS, NMR, UV-vis, and fluorescence spectroscopy
4. Enzymatic reduction of Fluoroketoesters (100 pts).	Week 9; Oct 21,22 Week 10; Oct 28,29	Chiral synthesis, <sup>19</sup> F NMR, dynamic kinetic resolution, stereochemistry by NMR.
5. Special project (100 pts) and oral/poster presentation (100 pts)	Week 11; Nov 4, 5 Week 12; Nov 11, 12 Week 13; Nov 18,19 Week 14; Nov 25,26 Week 15; Dec 2,3	To be determined...

**Disabilities Services:** The Office of Disability Services implements the Americans with Disabilities Act (ADA) and insures that UAF students have equal access to the campus and course materials. Students with documented disabilities who may need reasonable academic accommodations should discuss these with me during the first two weeks of class. I will work with the Office of Disabilities Services (\*208 WHIT, 474-5655) to provide reasonable accommodation to students with disabilities. You will need to provide documentation of your disability to Disability Services.

### Veteran Support Services:

Walter Cray is the Veterans Service Officer at the Veterans Resource Center, 111 Eielson Building. 474-2475. ([wecrary@alaska.edu](mailto:wecrary@alaska.edu)) Fairbanks Vet Center 456-4238. VA Community Based Outpatient Clinic at Ft. Wainwright is 361-6370.

**Amending this Syllabus:** Amendments and changes to the syllabus, including evaluation and grading mechanisms, are possible. The instructor must initiate any changes. Changes to the grading and evaluation scheme can be made before the add/drop date without a vote, but after that date must be voted on by the entire class and approved only with unanimous vote of all students present in class on the day the issue is decided. The lecture schedule and reading assignments (Daily Schedule) will not require a vote and may be altered at the instructor's discretion. This Daily Schedule can be found on Blackboard. Grading changes that unilaterally and equitably improve all students' grades will not require a vote. Once approved, amendments will be distributed in writing to all students via Blackboard.