CHEM 694: Chemical Research Mentoring

Course Name:	CHEM 694: Chemical Research Mentoring, 2 credits
Prerequisites:	Graduate standing is scientific discipline
Lecture/ Lab:	Monday 2:15-6:15, REIC 138
Discussion:	

Instructor:	Dr. Sarah Hayes
Office:	Reichardt 188
Phone:	907-474-7118
Email:	s.hayes @alaska.edu
Office Hours:	**TBD,** By appointment, or drop by when my door is open

Blackboard Link:	http://classes.uaf.edu
Course website:	http://chemresearch.community.uaf.edu
Required materials:	On Being A Scientist: A Guide to Responsible Conduct in Research, 3rd ed. The National Academies Press: Washington DC. ISBN: 978-0-309-11970-2

Catalogue Course Description: This course provides graduate students the opportunity to mentor undergraduates in chemical research within a structured environment, from developing a research idea to executing a small research project. The focus of this course is to refine mentoring skills that contribute to the professional development of maturing chemical professionals.

Expanded Course Description: This course is paired with CHEM 294 (Introduction to Chemical Research) and provides graduate students in scientific disciplines the opportunity to mentor undergraduates in chemical research within a structured environment. Graduate students mentor mid-level undergraduate students (enrolled in CHEM 294) in all phases of planning and executing an independent research project. Students in this course will mentor undergraduates in developing a research idea, reviewing topical primary literature, posing a testable hypothesis, planning an experiment, and executing a small research project. The focus of this course is to refine mentoring skills that contribute to the professional development of maturing colleagues. Mentoring skills are an important part of professional training regardless of your future career path.

Course Goals: Students will mentor undergraduate students in developing and testing a hypothesis to develop mentoring skills. Through teaching research relevant skills, students will refine their own understanding of the research process.

Student Learning Outcomes: After successfully completing this course, students will:

- Refine their understanding of the process of designing and executing a research project, including the process of proposal writing.
- Develop and deliver a 1-hr lecture on a topic of their choice with instructor support.
- Receive formal mentoring training, including reflecting on their motivations for mentoring, articulating a mentoring philosophy, and examining elements of good mentoring.
- Develop strategies for recognizing and resolving challenging situations in positive ways

- Survey some tools and resources available for both mentors and mentees to facilitate clear communication and foster strong relationships
- Gain experience with mentoring undergraduate students in developing an independent research project with the support of instructor and peers.

Instructional Methods: Students will each be assigned 1-3 undergraduate students (depending on enrollment in CHEM 294 and student interests) to mentor in developing and executing a research project. The emphasis of this course is on planning a research project and students will also be responsible for presenting lectures to CHEM 294 students providing information on topics relevant to project planning.

Example CHEM 294 Student Projects: Student project topics will vary based on the expertise of graduate students and vary each semester.

- Investigation of toxic metals present in mine tailings as a function of particle size, which affects transportability, solubility, and bioaccessibility. This would involve drying soils, size separation using sieves and settling rate in water. Each size fraction could then be analyzed for elemental composition using bulk X-ray Fluorescence by preparing a pressed pellet.
- Investigation of chemical moieties present in size fractionated aerosol particulate samples by acid digestion and subsequent analysis by Inductively Coupled Plasma- Mass Spectrometry. Determining the size fractions metals are associated with is a critical component of determining the distance traveled by particulate matter.

Course Evaluation:

There are **500 total points available** in this class. Grades are assigned as follows: 500-450 A, 450-400 B, 400-350 C, etc.

Assignment	**Points**
Participating in mentoring discussion group	100
Lab rotation plan, execution, and reflection	100
Feedback on mentee assignments	50
Lecture	200
Mentoring evaluation	50
Total	**500**

Mentoring discussion group- Students will participate in weekly mentoring discussion group based on the Howard Hughes Medical Institute short course entitled "Entering Mentoring."

Lab rotation activity- Students will design and execute an informative and engaging lab-based activity for CHEM 294 students to participate in their research project. Students are encouraged to select an experiment that involves using an interesting instrument (fluorescence microscope, GC-MS, etc). Afterwards, students will perform reflection activities.

Lecture- Students will use materials provided to design and deliver one lesson on a research topic of their selection from the topics covered in the course.

Feedback on mentee writing- Students will review undergraduate assignments and provide substantive comments, both positive and negative, and concrete suggestions for improvement. Assignments that will be reviewed include: literature review, project plan, research proposal.

Mentoring Evaluation- An overall evaluation of mentoring skills will be provided through mentee and course evaluations, and self-reflection. Students will submit a written self-reflection, then meet with the instructor to go over written comments from mentees at the end of the semester.

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Points associated with the Lab Rotation, Lecture, and Mentoring Evaluations will be assigned by the instructor, with based on of student preparation for the activity (materials submitted by CHEM 694 students), delivery of activity either based on instructor judgment or directed evaluations from undergraduates in CHEM 294, and on the basis of student self-evaluations.

Course Policies:

Classroom Behavior and Late work - Students are expected to conduct themselves in a professional manner at all times. Disrespect of the classroom learning environment, instructors or mentees, and fellow students will not be tolerated! Late work is not accepted in an effort to keep the entire class moving though the projects efficiently. Continued attendance to class indicates each student agrees to the policies set forth in this syllabus.

Instructor-Initiated Withdrawals- Any time up to and including Friday, March 13, the instructor has the right to withdraw a student that "...has not participated substantially in the course."

Honor code and Academic integrity- Students are expected to conduct themselves in accordance with the UAF Honor code. The Chemistry Department policy states: *Any student caught cheating will be assigned a course grade of F. The students' academic advisor will be notified of this failing grade and the student will not be allowed to drop the course.*

Disability Services- I will work with the Office of Disabilities Services (208 Whitaker Bldg, 474-5655) to provide reasonable accommodation to students with disabilities. It is the student's responsibility to make an appointment with me to discuss appropriate accommodations within the first two weeks of the first class meeting. A letter from disabilities services must be provided for discussion at that time.

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

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Tentative Schedule

Date	Week	Task(s)		
		Lecture (M 2:15-3:15)	**Lab (M 3:15-6:15)**	**Mentoring (TBD)**
Jan 25	1	Introduction and course details	Class and mentor research introductions; **294: Undergraduate Experience Poll**	
Feb 1	2	Introduction to the research process **694: Lab rotations plan**	294: Safety training 694: Mentoring training	Intro to mentoring
Feb 8	3	Project funding	Lab rotations 1	Expectations and communication
Feb 15	4	Ethics & Keeping records **294: ID funding target & template** **694: Bring notebooks as example**	Lab rotations 2 **294: Mentor preferences** **694: Bring Review Paper**	What is a mentor?
Feb 22	5	Surveying primary literature **294: Review article summary** **294: Lab rotation feedback**	Literature search 1 **694: Lab rotations self reflection**	Scientific Ethics
Feb 29	6	Stating a testable hypothesis **294: Annotated Bibliography (3 articles)**	Literature search 2	Challenging situations
Mar 7	7	Experimental design **294: updated Annotated Bibliography** **294: Literature Review**	Planning experiments 1 **694: brainstorming notes (after lab)**	Addressing problems
Mar 14-18		Spring Break		
Mar 21	8	Writing procedures **294: Project Idea** **694: Bring a procedure example**	Planning experiments 2 **694: Lit review feedback**	Diversity
Mar 28	9	Other proposal components **294: Research Project Plans** **294: notes on funded proposal**	294: Discussion with instructor **694: Research Project Plan feedback**	Evaluating progress
Apr 4	10	What is science?	Experiments	Elements of good mentoring
Apr 11	11	Statistical analysis of data	Experiments	Helping students communicate
Apr 18	12	Ethics of scientific research **294: research proposal**	Peer review and proposal revision **294/694: peer review of proposal drafts**	Sharing philosophies
Apr 25	13	Science and society **294: Final proposal**	Develop presentations	Teaching science
May 2	14	Careers in Science **294: Final presentations**	Practice presentations with mentors **294/694: course evaluations**	
May 3 3:15-5:15 pm		Final Exam: **CHEM 294 student presentations** **694: Mentor exit interviews**		