

Chemistry 396AI Fall 2020

Research Methods

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Office hours: Mon: 10-11am, Tues: 8-9pm, Wed 3-4pm; Thurs: 11-12am
Class hours: Tues 2:30pm – 3:50 pm Zoom links in Class Bb



Course Description: Introduction to the principles, methods, and communication of chemical and biochemical research. Techniques for searching the chemical/biochemical literature, hypothesis development, experiment design, reading chemical/biochemical literature and understanding the creative research process, proposal development, research ethics and integrity, and professional development are included.

Required text: None. Readings will be posted to the course Blackboard site.

Prerequisites: Chem 152/152L and declared Chemistry or Biochemistry major.

Learning Outcomes: This course, which is designed for chemistry and biochemistry majors involved in research, focuses on the skills required by successful researchers. In this course you will learn how to:

- Search, read and use the primary scientific literature.
- Understand application of the scientific method to research questions including hypothesis development and the design of experiments.
- Apply research methodology towards the collection, analysis, and interpretation of data.
- Recognize common ethical issues that impact scientific research.
- Approach your future successfully as a scientist.

Advanced Integration Learning Outcomes: This course also satisfies the Advanced Integration Core requirement with the following outcomes:

- SLO #3 Synthesis: Students will draw meaningful connections between diverse perspectives in a way that enhances the overall body of knowledge presented. We want them to be able to demonstrate that the whole (an integrated body of knowledge) is greater than the sum of its parts.
- SLO #4 Application: Students will apply an integrated body of knowledge that they have developed by synthesizing diverse perspectives and/or skills to address a carefully formulated issue, problem, hypothesis, question, activity, or practice relevant to any mode of inquiry, executed in a form appropriate to any particular academic discipline.

Attendance Policy: Attendance is **EXPECTED** at all class sessions. Please notify your instructor as soon as possible if unavoidable circumstances arise.

Academic Integrity Policy: All students are expected to know & abide by USD's Academic Integrity Policy. A summary of this policy is available on the university website, and can be found at the following link: <http://www.sandiego.edu/associatedstudents/branches/vice-president/academics/academic-resources.php>.

Media Device Policy: Unless we are purposely using computers or tablets in class to search the literature, etc., you may not use media devices such as cell phones, computers, etc. during class for personal use. In general, working on anything other than the task at hand during class will count against class participation.

Grading:

Seminar Summaries 60 pts

You are required to attend at least three (3) of the Chemistry & Biochemistry seminars during the semester and submit summaries. Talks are scheduled on Tuesday Evenings at 7PM Pacific via Zoom (found on class Bb page). during Torero hours (12:15 – 1:15pm). *Seminar summaries must be turned in electronically through the Bb site no later than 1 week (7 days) after the seminar.*

General Participation 60 pts

You will be evaluated on your preparation and participation for the course. A portion of in-class time will be centered on discussions about materials that you will read prior to class. You are expected to engage in the discussions during class. A portion of class participation will also come from handouts assigned in class and activities.

Quizzes and Assignments 100 pts

Quizzes and assignments will be assigned and completed on Blackboard throughout the semester, and must be completed on time to be adequately prepared for class discussion on a variety of topics. You will have 20 minutes to complete the quiz once opened, and you must complete the quiz by the due date. Assignments will also be submitted via Bb with specific instructions for each assignment. **Late quizzes will not be accepted for a grade.**

Advanced Integration Project 75 pts

You and your research team will choose one of three possible areas for interdisciplinary integration (see Advanced Integration palette, last page of this syllabus): 1) social justice; 2) sustainability; 3) economic impact; or 4) scientific communication, as it relates to the research proposal/proposed scientific research. You may choose a format that best fits your project (written paper, blog post, video/TED talk, poster, or infographic). The AI project will give you the opportunity to dig into the big picture and background of your chosen broad proposal area. Additional details will be provided in class.

Research Proposal 300 pts

With a group of 3-4 students, you will write a formal proposal for original research in chemistry or biochemistry based on a COVID related theme. As part of this proposal, you are expected to perform a complete search of the chemical/biochemical literature to write the background section of the proposal. You will work with your group to complete a proposal outline. With your group, you will complete a research proposal as detailed by provided guidelines. You will also complete a peer review of 2-3 research proposals and present your summaries at a funding panel.

Oral Presentations 285 pts

Over the course of the semester you will give 3 group oral presentations. **AI Presentation:** You will present your chosen AI project to the class. You may be creative in how you present your AI product (PowerPoint summary of a paper, video, discussion of an infographic). Interaction with your audience/class engagement is encouraged! You will need to turn in a reference list of articles/sources that helped you create your AI product. Presentation time: 10 minutes. **Research Ethics and Integrity Presentations:** You will present an example of an ethical dilemma in research (which will be assigned to you). Again, be creative with your presentation, and involve the rest of the class! Presentation time: 15 minutes. **Research Proposal Presentations:** You will present your research proposal to the class. We will discuss the expected structure of this presentation in class well before the due date. Presentation time: 20 minutes. In each case, a portion of your score will come from peer evaluation of your presentation and/or product/proposal preparation.

Tentative grade cutoffs are as follows: A \geq 90% B \geq 80% C \geq 70% D \geq 60%. The + and – of each cutoff will be set as the top 2% and bottom 2%, respectively.

Assignment Schedule:

Seminars	Due Date	Points
Seminar summary sheet	TBD	3 x 20 pts. ea.
	<i>Subtotal</i>	60
Reading Quizzes and Assignments		
Mind Map	Aug 25	20
COVID and the Media Worksheet	Sept 1	20
Quiz 1 (Procko Video)	Sept 8	20
Quiz 2 (Peer Review Readings)	Sept 29	20
Quiz 3 (Ethics)	Oct 20	20
	<i>Subtotal</i>	100
Class Participation		
Class Participation Points 1	Sept 1	10
Class Participation Points 2	Sept 15	10
Class Participation Points 3	Sept 22	10
Class Participation Points 4	Oct 6	10
Class Participation Points 5	Nov 10	10
Class Participation Office Hour	Schedule	10
	<i>Subtotal</i>	60
Advanced Integration		
Final "product"	Nov 3	75
	<i>Sub-total</i>	75
Research Proposal		
Primary Literature	Sept 15	25
Preliminary Hypothesis	Sept 29	25
Outline	Oct 20	50
Final Proposal Due	Nov 10	150
Peer Review of Proposals	Nov 15	50
	<i>Sub-total</i>	300
Presentations		
Flash / Mini Presentation on Big Research	Sept 15	25
Figure Presentation	Oct 13	10
AI Presentation	Nov 3	100
Research Proposal Presentation	Nov 17	150
	<i>Sub-total</i>	285
Total Points		880

Tentative Schedule

The schedule is tentative and may change based on the pace of the class.

Week	Date	Activity Description	Notes	Deadlines
1	Aug 18	Introduction & what is research? Introduction to COVID	Elevator Speech Presentation	
2	Aug 25	The scientific literature: types of publications & search engines. Science and literature/social media in current events	Searching lit, How is science viewed by public?	COVID Mind Map
3	Sept 1	What is the genesis of a research idea (Creativity and Serendipity)? Careers in Chem & Biochem I	Guest speaker & Procko Video Class Participation Points 1	COVID in the Media Worksheet
4	Sept 8	Reading scientific literature: Communicating ideas, hypothesis development & expt. Design I	<u>Sept 8 Seminar 7 PM</u>	Quiz 1 (Procko Video)
5	Sept 15	Presenting scientific literature: Communicating ideas, hypothesis development & expt. Design II	Class Participation Points 2	Seminar Sheet Due
6	Sept 22	What is a research proposal & how is it written?	CV – Resume Draft Class Participation Points 3	
7	Sept 29	How to publish: Process and Peer Review	<u>Sept 29 Seminar 7 PM</u>	Quiz 2 (Peer Review)
8	Oct 6	Outlining your research proposal	Class Participation Points 4	Seminar Sheet Due CV – Resume Draft Due
9	Oct 13	Research ethics and integrity		
10	Oct 20	Professional career planning and development	<u>Oct 20 Seminar 7 PM</u>	Quiz 3 (Ethics)
11	Oct 27	Funding agencies – How funding reviews are conducted	Class Participation Points (office hr)	Seminar Sheet Due
12	Nov 3	AI presentation and discussion	Early deadline to allow for practice	AI Product Due Nov 1
13	Nov 10	Discussion of funding panels & What do you want to know?	<u>Nov 10 Seminar 7 PM</u> Class Participation Points 5	Proposal Due
Finals	Nov 17	Group presentations: Research Proposal 2:00pm-4:00pm	Presentations During Final Exam Period; Submit Electronic Slides Before Class	Any remaining Seminar Sheet Due Final Proposal Due, Peer group eval due

CHEM396: Research Methods *Advanced Integration Experience*

One of the key outputs of Chemistry 396 is an original research proposal written by a team of student on a topic selected from Whiteside's 2015 "Reinventing Chemistry" article. To satisfy the Advanced Integration Core requirement, a student team will select one of the following areas for additional exploration, synthesis, and application of knowledge from different disciplines to the topic area of the proposed research.

RESEARCH PROPOSAL

Social justice: The team will discuss how an issue related to the research proposal does/does not benefit broader society. Possible integration areas: SS, B

Communicating science to the public: The team will communicate an issue related to their proposed research to a general, non-science audience. Possible integration areas, SS, H

Sustainable research: The team will address one or more impacts of an issue related to the proposal topic on environmental, economic, social, cultural impacts of natural resources, including a plan to develop practices that conserve these resources if pursued over generations. Possible integration areas, SS, B

Economic impact: The team will investigate the potential economic impact of issues related to their proposal area. Possible integration areas: B

FORMATS

Unless otherwise noted, a team may choose among the following formats for presentation of the AI project:

- Written paper
- Video
- Poster
- Infographic
- Blog
- Podcast

INTEGRATION AREAS

- SS social sciences (psychology, sociology, political science, ethnic studies, communication studies, etc.)
- B business (business administration, economics, etc.)
- H humanities (English, languages, history, art, etc.)