

Syllabus
NUCL 6032 – Graduate Radiochemistry
Fall 2019
Tuesday and Thursday from 9:10-10:30 AM

Location: WEB 1450

Instructor: Tara Mastren

Office: MEB 3280B

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Office Hrs: Tues/Thurs 2-3:30 or By Appointment

Prerequisites

Math skills including undergraduate calculus and differential equations. Basic understanding of thermodynamics. Interest in unstable nuclei and its applications. Willingness to work hard and learn

Textbook(s)

1. Radiochemistry and Nuclear Methods of Analysis **(Required)**
Authors: William D. Ehmann and Diane E. Vance
2. Modern Nuclear Chemistry **(Recommended)**
Authors: Walter Loveland, David J. Morrissey, Glenn T. Seaborg
3. Lanthanide and Actinide Chemistry **(Recommended)**
Authors: Simon Cotton

Content and Plan of Action

This is a three credit hour graduate level course. The level of presentations will be such that upper division undergraduates should be able to handle the work.

Topics Covered will include

- Radioactive decay
- Interactions of radioactivity with matter
- Nuclear chemistry
- Nuclear reactions (particle induced/fission)
- Main group chemistry
- Transition metal chemistry
- Lanthanide chemistry
- Actinide chemistry
- Separation chemistry
- Nuclear Fuel Cycle
- Nuclear Medicine
- Environmental Radiochemistry
- Nuclear Forensics (aqueous)

Proposals will be written on one of the following topic areas.

- Actinide/Lanthanide Chemistry
- Nuclear Fuel Cycle
- Nuclear Medicine
- Environmental Radiochemistry
- Nuclear Forensics (aqueous)

Course Objectives

Students will learn about radiochemistry and its application to a variety of different fields. This includes radioactive decay and detection, nuclear structure and its impact on nuclear properties, nuclear reactions, and the inorganic chemistry of the elements. Students will be able to harness the knowledge learned in this class and apply it to many different applications.

Course Outcomes

Following the completion of this course, students are expected to understand radiochemistry and how to apply these skills to real world problems.

Diagnostic Examinations

Three examinations and a final will be given throughout the course. These exams are to test the students' retention of fundamental radiochemistry knowledge. Below are the scheduled dates for the exams. The final exam is cumulative and optional. The grade on the final exam will replace the lowest existing exam grade.

Exam 1: **September 12th**

Exam 2: **October 17th**

Exam 3: **November 19th**

Final Exam: **December 9th 8-10am**

Proposal

Students will choose a topic to write a 3-page proposal on. The topic must be chosen from one of the focus areas listed above. Proposals must adhere to the formatting requirements to receive credit.

Homework

Students will be assigned homework weekly. Homework will be collected at the beginning of class each Tuesday. Homework turned in on Thursday will receive 50% credit. Homework assignments turned in later than Thursday on the week due will not receive credit.

Grading

Diagnostic Examinations – 60%

Proposal – 20%

Homework – 20%

Final grades will be assigned on the following basis:

100.0% to 93.00% = A 92.99% to 90.00% = A-

89.99% to 87.00% = B+ 86.99% to 83.00% = B 82.99% to 80.00% = B-

79.99% to 77.00% = C+ 76.99% to 73.00% = C 72.99% to 70.00% = C-

69.99% to 60.00% = D 59.99% to 0.00% = F

Due to the optional final there will be no make-up examinations.

Americans with Disabilities Act (ADA) Statement

The University of Utah seeks to provide equal access to its programs, services and activities for people with disabilities. If you will need accommodations in the class, reasonable prior notice needs to be given to the Center for Disability Services, 162 Olpin Union Building, 581-5020 (V/TDD). CDS will work with you and the instructor to make arrangements for accommodations. All information in this course can be made available in alternative format with prior notification to the Center for Disability Services.

Safety Statement

“The University of Utah values the safety of all campus community members. To report suspicious activity or to request a courtesy escort, call campus police at 801-585-COPS (801-585-2677). You will receive important emergency alerts and safety messages regarding campus safety via text message. For more information regarding safety and to view available training resources, including helpful videos, visit safeu.utah.edu.”

Wellness Statement

Personal concerns such as stress, anxiety, relationship difficulties, depression, cross-cultural differences, etc., can interfere with a student’s ability to succeed and thrive at the University of Utah. For helpful resources contact the Center for Student Wellness - www.wellness.utah.edu; 801-581-7776.

Veterans Center

If you are a **student veteran**, we want you to know that the U of Utah has a Veterans Support Center on campus. They are located in Room 161 in the Olpin Union Building. Hours: M-F 8-5pm. Please visit their website for more information about what support they offer, a list of ongoing events and links to outside resources: <http://veteranscenter.utah.edu/>. Please also let me know if you need any additional support in this class for any reason.

Learners of English as an Additional/Second Language

If you are an English language learner, please be aware of several resources on campus that will support you with your language development and writing. These resources include: the Department of Linguistics ESL Program (<http://linguistics.utah.edu/esl-program/>); the Writing Center (<http://writingcenter.utah.edu/>); the Writing Program (<http://writing-program.utah.edu/>); the English Language Institute (<http://continue.utah.edu/eli/>). Please let me know if there is any additional support you would like to discuss for this class.

Cheating Policy

Cheating of any kind will not be tolerated. Any assignment or exam that is handed in must be your own work! However, talking with one another to understand the material better is strongly encouraged. Recognizing the distinction between cheating and cooperation is very important.

- If you copy someone else's solution, you are cheating. If you let someone else copy your solution, you are cheating. We will not distinguish between the person who copied a solution and the person whose solution was copied. Both people will be treated as cheaters.
- If someone dictates a solution to you, you are cheating. Everything you hand in must be in your own words, and based on your own understanding of the solution.

- If someone helps you understand the problem during a high-level discussion, you are not cheating. We strongly encourage students to help one another understand the material presented in class, in the book, and general issues relevant to the assignments.
- When taking an exam, you must work independently. Any collaboration during an exam will be considered cheating.
- Any student who is caught cheating will be given an E in the course and referred to the University Student Behavior Committee. Many students think they can get away with cheating and will not be caught. But it is much easier to spot cheaters than you might think! Please don't take that chance. If you're having trouble understanding the material, please let us know and we will be more than happy to help.

If you have any questions about what constitutes cheating, please ask.

The University of Utah Student Code (Sections III and V in particular) has a detailed description on the University policy on cheating.

Drop/Withdraw

Please note the difference between the terms “drop” and “withdraw”. Drop implies that the student will not be held financially responsible and a “W” will not be listed on the transcript. Withdraw means that a “W” will appear on the student’s transcript and tuition will be charged. Please see the College of Engineering guidelines for dropping and withdrawing from a course this Fall. <https://www.coe.utah.edu/semester-guidelines>

More information about the College of Engineering Semester Guidelines for Fall 2018 can be found at <https://www.coe.utah.edu/semester-guidelines>

Week #	Tues	Thurs
1: Aug 19-23	Introduction/Basics Review	Radioactive Decay/Nuclear Stability
2: Aug 26-30	Interactions of ionizing radiation with matter	Detection of Radioactivity
3: Sept 2-6	Radioactive Equilibrium (Bateman Equation)	Nuclear Structure
4: Sept 9-13	Nuclear Structure	Exam 1
5: Sept 16-20	Beta Decay	Gamma Decay
6: Sept 23-27	Alpha Decay	Nuclear Reactions
7: Sept 30-Oct 4	Particle Accelerators	Nuclear Medicine**
8: Oct 7-11	Fall Break	
9: Oct 14-18	Nuclear Medicine	Exam 2
10: Oct 21-25	Fission	Nuclear Reactors
11: Oct 28-Nov 1	Nuclear Fuel Cycle	Environmental Radiochemistry
12: Nov 4-8	Nuclear Forensics	Nuclear Forensics
13: Nov 11-15	Main Group Chemistry	Transition Metal Chemistry
14: Nov 18-22	Exam 3	Intro to <i>f</i> -element Chemistry
15: Nov 25-29	Lanthanide Chemistry***	Thanksgiving Break

16: Dec 2-6	Actinide Chemistry	Actinide\Heavy Element Chemistry
17: Dec 9-13	Final Exam December 9th 8-10am	

****Proposal Topics Due**

*****Proposals Due**