

**INDIANA UNIVERSITY, SUMMER 2021**  
**CHEM-T 570 NUCLEAR CHEMISTRY**  
**6/7/2021 – 7/31/2021**

**Course Description**

This course covers fundamental concepts and applications of nuclear chemistry and radiochemistry. Topics covered may include nuclide types (stellar origin and distribution), nuclide stability (quantum structure and binding energy), types of nuclear reactions (radioactive decay, fusion, and fission), kinetics of radioactive decay (secular equilibrium, transient equilibrium), isotope effect (chemical equilibrium, phase equilibrium) and applications of radioelements (nuclear power, medical uses, technological uses).

**Learning Outcomes**

After completing this course, students will be able to:

1. **Predict** the stability of isotopes and describe their likely decay modes.
2. **Quantify** mass-energy conversions that accompany nuclear reactions.
3. **Apply** appropriate approximations to specific types of successive radioactive decay.
4. **Describe** how isotopes affect chemical and phase equilibria.
5. **Communicate**, with specific examples, the importance and practical application of radioelements and some of the more uncommon heavier elements.
6. **Illustrate** concepts of traditional chemistry in a freshman college course using nuclear structure and phenomena.

**Course Contents**

Origin of Nuclear Science  
Elementary Particles  
Nuclei, Isotopes, and Isotope Separation  
Nuclear Mass Stability  
Unstable Nuclei and Radioactive Decay  
Origin of the Universe and Nucleosynthesis  
Radioisotope dating

**Professor Information**

Matthew G. Marmorino, [mmarmor@iusb.edu](mailto:mmarmor@iusb.edu)  
(574) 520-4254, virtual summer office hours TBD

**Learning Materials**

Radiochemistry and Nuclear Chemistry (4th Edition), by Gregory Choppin, Jan-Olov Liljenzin, Jan Rydberg, Christian Ekberg, Academic Press. *This book may be available online through university libraries – so please check before purchasing a copy.*

**Assessment**

Homework	50%
Quizzes/Tests	30%
Projects	20%

**IU Policies**

- You must maintain a 3.0 GPA if you intend to earn an IU graduate certificate or IU graduate degree.
- Completion of this IU course will result in a permanent record of your grade and enrollment (including an "F" grade or a "W" for withdrawal) on an official Indiana University transcript. Grades recorded on the

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official Indiana University transcript are a part of the student's official academic record at Indiana University and are considered in the computing of grade point average and credits taken and/or earned.

- Although the STEM Teach grant covers tuition and course fees, any additional charges you incur through Indiana University (transcript fees, parking fines, etc.) are your responsibility. STEM Teach staff will contact all registered students with instructions on purchasing the textbook(s) if necessary and provide the process for textbook reimbursement up to a certain amount.