



Indiana University

Course: CHEM-T 570 Nuclear Chemistry

Format: Online

Date: June 24, 2019-August 3, 2019

Instructor: Dr. Matthew Marmorino, [mmarmor@iusb.edu](mailto:mmarmor@iusb.edu)

### **Course Description**

This course covers fundamental concepts and applications of nuclear chemistry and radiochemistry. Topics covered may include nuclide types (origin and distribution on the Earth), nuclide stability (quantum structure and binding energy), nuclear reactions (radioactive decay, fusion, and fission), applications of nuclear phenomena (nuclear power plants, radioisotope dating, tracers, analytical techniques), and hazards (accidents at nuclear power plants and the biological effects of radiation).

### **Learning Outcomes**

Upon completion of this course, students will be able to:

- Predict the stability of isotopes and describe their likely decay modes and the mass-energy conversion that accompanies the decay
- Explain the operation of a nuclear power plant and how its fuel is derived and its waste is treated
- Discuss models of the nucleus of an atom and assess nuclide stability based on the models
- Describe how radionuclides affect chemical reactions and how they can be used to study chemical reactions
- Detail the origin of the elements and the distribution of radioelements on the Earth
- Evaluate current research and communicate an understanding of the scientific literature in nuclear chemistry
- Use examples and ideas from nuclear chemistry to illustrate concepts (or present as applications) of fundamental chemistry found in a freshman college course.

### **Learning Materials**

Required purchase: *Radiochemistry and Nuclear Chemistry, 4th Edition* by Gregory Choppin, Jan-Olov Liljenzin, Jan Rydberg, Christian Ekberg Publisher: Academic Press; 4 edition (October 8, 2013) ISBN-10: 0124058973 ISBN-13: 978-0124058972

Freely available from university libraries as an e-text: *Nuclear and Radiochemistry, 2 Volume Set: Fundamentals and Applications 3rd Edition* by Jens-Volker Kratz (Author), Karl Heinrich Lieser (Author) Publisher: Wiley-VCH; 3 edition (December 4, 2013) ISBN-10: 3527329013 ISBN-13: 978-3527329014

### **Assessment**

Homework: 10%

Quizzes: 30%

Midterm: 20%

Final exam: 20%

Analysis of scientific literature: 20%