



Nuclear & Radiation Chemistry

Course Code	Course Num.	Course Name	Credit Hours	Lec	Lab	Tut	Prerequisites
CHM	415	Nuclear & Radiation Chemistry	2	2	0	0	CHM 313

Objectives:

Students should be able to:

- Improve their knowledge of the basic information of Radiation and Nuclear chemistry; requirements, methods of preparation, uses of Radioelements.
- Be aware of the contributions of chemistry to society
- Improve their knowledge of types of radioactive decay, natural decay series, nuclear models, nuclear properties, Mass energy, relationships, nuclear reactions, rates of radioactive decay, interaction of radiation with matter.
- Improve their knowledge of instrumentation and Introduction to health - physical applications in nuclear and radiochemistry.

Syllabus:

Introduction, Nuclear binding energy, Mass defect and binding energy, The average binding energy per nucleon.

Radioactivity, Nuclear emissions, Nuclear transformations, The kinetics of radioactive decay, Units of radioactivity, Artificial isotopes, Bombardment of nuclei by high-energy α -particles and neutrons, Bombardment of nuclei by 'slow' neutrons.

Nuclear fission, The fission of uranium, The production of energy by nuclear fission, Nuclear reprocessing, Syntheses of transuranium elements, The separation of radioactive isotopes.

Chemical separation, The Szilard-Chalmers effect, Nuclear fusion, Applications of isotopes, Infrared (IR) spectroscopy, Kinetic isotope effects, Radiocarbon dating, Analytical applications, Sources of ^2H and ^{13}C , Deuterium: electrolytic separation of isotopes.

Carbon-13: chemical enrichment, Multinuclear NMR spectroscopy in inorganic chemistry, Which nuclei are suitable for NMR spectroscopic studies?

Chemical shift ranges, Spin-spin coupling, Stereochemically non-rigid species, Exchange processes in solution, Mo^{99} ssbauer spectroscopy in inorganic chemistry, The technique of Mo^{99} ssbauer spectroscopy, What can isomer shift data tell us?

Textbook:

Catherine E. Housecroft and Alan G. Sharpe, Inorganic Chemistry. 2nd ED. Pearson Education Limited, Essex CM20 2JE, England, 2005 (ISBN: 0130-39913-2)

References:

Atkins, P., and Overton, T., Rourke, J., Weller, M., Armstrong, F. and Hagerman, M. Inorganic Chemistry. 5th Ed. New York, NY: W.H. Freeman and Company, 2010 (ISBN: 978-1-42-921820-7)

