UNIVERSITAS NEGERI YOGYAKARTA
FACULTY OF MATHEMATICS AND NATURAL SCIENCES
DEPARTMENT OF CHEMISTRY
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Module name:	Radioanalysis
Module level if applicable:	Undergraduate
Code:	KMA 6244
Sub-heading, if applicable:	-
Classes, if applicable:	-
Semester:	6th
Module coordinator:	Sunarto, M.Si.
Lecturer(s):	Sulistyani, M.Si.
Language:	Bahasa Indonesia
Classification within the curriculum:	Elective Course
Teaching format / class hours per week during the semester:	Lectures: 100 minutes lectures, 120 structured activities and 120 individual studyper week
Workload:	Total workload of the activity is 90,67 hours per semester which consists of 100 minutes lectures, 120 structured activities and 120 individual studyper week for 16 weeks
Credit points:	2 SKS (3 ECTS)
Prerequisites course(s):	-
Course Outcomes	After taking this course, the students have ability to: CO1. Able to demonstrate an independent and responsible attitude in working on structured tasks and independent assignments CO2. Able to explain the understanding of radioactivity, types of radionuclides and their decay modes. CO3. Able to explain how to measure radioactivity, including by using a gas-filled detectors, scintillation detectors, semiconductor detectors, and spectrometry. CO4. Able to describe the hot-atom chemistry, including the szilard-chalmers process, chemical effects of radioactive decay, and chemistry of recoil atoms. CO5. Able to explain the application of radionuclides in the analytical field, including: Neutron Activation Analysis (NAA), activation by charged particle, activation by photon, isotope dilution analysis, radiometric methods, radionuclides as radiation sources in X-Ray Fluorescence Analysis (XFA). CO6. Able to explain the application of radionuclides in engineering and industry including radiotracer techniques, absorption and scattering of radiation, and radiation-induced reactions.
Content:	This course discusses the chemical properties of the radioactive nuclide, its measurement of radioactivity, and its use in the analytical field. The subject of radioanalysis

<table>
<tr><td></td><td>covers the concepts of radioactivity, measurement of radioactivity, hot-atom chemistry, application of radionuclides in the analytical field, applications of radionuclides in engineering and industry.</td></tr>
<tr><td>Study/exam achievements:</td><td>The final mark will be weight as follow:

<table>
<tr><th>No</th><th>CO</th><th>Assessment Object</th><th>Assessment Technique</th><th>Weight</th></tr>
<tr><td>1</td><td>CO1,
CO2,
CO3,
CO4,
CO5,
CO6.</td><td>Assignment
Quiz
Midterm Exam
Final Exam</td><td>Presentation / written test</td><td>20%
20%
30%
30%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
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</td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, handouts, PPT slides, and stationaries.</td></tr>
<tr><td>Reference:</td><td>Handbooks

Walter DL, David JM and Glenn TS. (2017). Modern nuclear chemistry. 2nd edition. USA: John Wiley & Sons Inc.
Jens Volker Kratz and Karl Heinrich Lieser. (2013). Nuclear and radiochemistry. 3nd edition. Germany: Wiley VCH.
Gregory Choppin, Jan-Olov Liljenzin, Jan Rydberg and Christian Ekberg. (2013). Radiochemistry and nuclear chemistry. Elsevier: Academic Press.
Atilla Vértes et al., (2011). Handbook of nuclear chemistry. 2nd edition. New York: Springer Science.
I Made Sukarna. (2005). Kimia inti. Yogyakarta: Jurusan Pendidikan Kimia FMIPA Universitas Negeri Yogyakarta.
Friedlander G, Kennedy JW, Macias ES, Miller JM. (1981). Nuclear and Radiochemistry. New York: John Wiley & Sons.

Journals

Anumaija Leskinen et al. (2020). Determination of ^{14}C, ^{55}Fe, ^{63}Ni and gamma emitters in activated RPV steel samples: Comparison between calculations and experimental analysis. J. Radioanal. Nucl. Chem. 323. 399-413.
Chunxia Qin, Fang Liu, Tzu-Chen Yen and Xiaoli. (2020). ^{18}F-FGD PET/CT findings of COVID-19; A series of four highly suspected case. Eur J. Nucl. Med. Mol. Imaging. 47. 1281-128.
Ghada S, Abdullah T, Mostafa K, and Atef El-Taher. (2020). Radiological hazard parameters of natural radionuclides for neoproterozoic rocks from Wadi Um Huytat in central eastern desert of Egypt. J. Radioanal. and Nucl. Chem. https://doi.org/10.1007/s10967-020-07262-x.
Pawel Gaca, David Reading, Phillip Warwick. 2019.

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	Application of multiple quench parameters for confirmation of radionuclide identity in radioanalytical quality control. *J. Radioanal. and Nucl. Chem.* **322**. 1383–1390. • Grzegorz S, Jakub P and Tomasz O. (2019). Determination of ^{210}Po in air filters from metallurgic industry. *J. Radioanal. Nucl. Chem.* **322**. 1351-1356. • Krzysztof G, Jerzy WM, Renata K and Kamil B. (2019). Low-background, digital gamma ray spectrometer with BEGe detector and active shield: commissioning, optimization and software development. *J. Radioanal. Nucl. Chem.* **322**. 1311-1321. • Michel Koole et al., (2019). 18F-JNJ- 64413739, A novel PET ligand for P2X7 ion channel: Radiation dosimetry, kinetic modeling, test-retest variability, and occupancy of the P2X7 antagonist JNJ-54175446. *J. Nucl. Med.* **60**. 683-690.

PLO and CO mapping

CO	PLO									
	Attitude	Generic Skills		Knowledge				Specific Skills		
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10
CO1		✓								
CO2					✓					
CO3					✓					
CO4							✓			
CO5									✓	
CO6									✓	