UNIVERSITAS NEGERI YOGYAKARTA
FACULTY OF MATHEMATICS AND NATURAL SCIENCES
DEPARTMENT OF CHEMISTRY EDUCATION
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Bachelor of Education in Chemistry **MODULE HANDBOOK**

Module name:	**Nuclear Chemistry**
Module level, if applicable:	Undergraduate
Code:	KIM 6214
Sub-heading, if applicable:	-
Classes, if applicable:	2
Semester:	7^{th}
Module coordinator:	Prof. Dr. Endang Widjajanti, LFX
Lecturer(s):	**Sulistyani, S.Si.,M.Si.**
Language:	Indonesia and English
Classification within the curriculum:	Compulsory Subject
Teaching format / class hours per week during the semester:	Lectures: 100 minutes lectures, 120 minutes structured activities and 120 minutes individual study per week
Workload:	Total workload of the activity is 136 hours per semester which consist of 100 minutes lectures, 120 minutes structured activities, 120 minutes individual study per week.
Credit points:	2 SKS (3.28 ECTS)
Prerequisites course(s):	-
Course Outcome:	After taking this course, the students are expected: CO1. Being able to show independent attitude and responsibility in carrying out structured and independent tasks. CO2. Able to explain the process of discovering radioactivity and the nature of radioactive rays. CO3. Able to describe experiments on the discovery of atomic nuclei and their natural properties. CO4. Able to explain the alpha, beta, and gamma decay processes, and calculate the rate of decay. CO5. Able to explain the working system of nuclear radiation detectors. CO6. Able to explain nuclear reactions and nuclear reactors. CO7. Able to analyze and predict the stability of an atomic nucleus. CO8. Able to rationalize the interaction of radiation beams when it comes to matter.
Content:	This course discusses changes in nuclear structure due to the reaction in the nucleus (nuclear reaction). Nuclear reaction consists of 2 (two) types, namely nuclear decay (radioactivity) and nuclear bombardment reaction. Lecture emphasizes the mastery of lecture material logically and scientifically and the ability to use scientific methods to solve problems faced by students.

<table>
<tr>
<td></td>
<td>The course consists of:
• The Discovery of Radioactivity
• Nuclear Structure and Its Characteristics
• Stability of Nuclear
• Qualitatively and Quantitatively Radioactivity
• The Interaction of Radiation with Matter
• Nuclear Radiation Detector
• Nuclear Reaction</td>
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<td>Study / exam achievements:</td>
<td>Attitude assessment is carried out at each meeting by observation and/or self-assessment techniques using the assumption that basically every student has a good attitude. The student is marked very good or not good attitude if they show it significantly compared to other students in general. The result of attitude assessment is not taken into account in the final grades, but as one of the requirements to pass the course. Students will pass from this course if at least have a good attitude. 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, CO7, CO8.</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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<tr>
<td>Forms of media:</td>
<td>Handout, Board, LCD Projector, Laptop/Computer, Module.</td>
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<tr>
<td>References:</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. 3rd 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
• Kiran KR et al. 2020. Evidences for the use of 14C content in the root exudates as a novel application of radiocarbon labelling for screening iron deficiency tolerance of soybean (Glycine max (L.) Merr.) genotypes. J. Radioanal. Nucl. Chem. https://doi.org/10.1007/s10967-020-07284-5.</td>
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</table>

	• Tárkányi et al., 2020. Investigation of the deuteron induced nuclear reaction cross sections on lutetium up to 50 MeV: Review of production routes for ^{177}Lu, ^{175}Hf, and ^{172}Hf via charged particle activation. **324**. 1405-1421. • Zeljko Ilic et al., 2020. Prompt gamma rays induced by inelastic scattering of fission neutrons on iron. *J. Radioanal. Nucl. Chem.* https://doi.org/10.1007/s10967-020-07271-w • Zsolt Varga et al., 2019. Measurement of production date (age) of nanogram amount of uranium. *J. Radioanal. Nucl. Chem.* **322**. 1585-1591. • 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.

PLO and CO mapping

	PLO					
	Attitude		**Knowledge**	**Specific Skill**	**General Skill**	
	PLO1	**PLO2**	**PLO3**	**PLO4**	**PLO5**	**PLO6**
CO1		√				
CO2			√			
CO3			√			
CO4			√			
CO5			√			
CO6			√			
CO7						√
CO8						√