



Universitas Negeri Surabaya
Faculty of Mathematics and Natural Sciences
Undergraduate Chemistry Study Program

Document
Code

SEMESTER LEARNING PLAN

Courses	CODE	Course Family	Credit Weight			SEMESTER	Compilation Date																																																																																																																					
Core Chemistry and Radiochemistry	4720102103	Study Program Elective Courses	T=2	P=0	ECTS=3.18	4	July 27, 2023																																																																																																																					
AUTHORIZATION	SP Developer		Course Cluster Coordinator			Study Program Coordinator																																																																																																																						
	Samik, S.Si., M.Si; Herry Wijayanto, M.Sc., D.Sc.		Prof. Dr. Nuniek Herdyastuti, M.Si.			Dr. Amaria, M.Si.																																																																																																																						
Learning model	Project Based Learning																																																																																																																											
Program Learning Outcomes (PLO)	PLO study program that is charged to the course																																																																																																																											
	Program Objectives (PO)																																																																																																																											
	PO - 1	Utilizing learning resources and ICT to support learning related to core chemistry and radiochemistry and the implementation of core chemistry in everyday life, scientific approach-oriented learning such as: problem-based learning, inquiry-discovery learning and contextual learning and based learning papers to achieve student competency																																																																																																																										
	PO - 2	Having knowledge about core chemistry and radiochemistry, and the implementation of core chemistry in everyday life, the core chemistry learning process is oriented towards a scientific approach such as: problem based learning, inquiry learning and contextual learning as well as paper/project based learning. study of scientific journals related to the implementation of core chemistry in everyday life																																																																																																																										
	PO - 3	Make decisions in determining the positive and negative impacts regarding the role of radio chemistry in everyday life and be able to make decisions about core chemical learning oriented towards scientific approaches such as: problem based learning, inquiry-discovery learning and contextual learning and based learning papers/projects that are relevant to competencies, subject matter characteristics, and student characteristics.																																																																																																																										
	PO - 4	Have a responsible attitude by implementing ways to overcome the negative impacts of using radio chemistry in everyday life.																																																																																																																										
	PO - 5	Have the ability to collect data from various library sources and trusted references on topics related to core chemistry and radiochemistry, and arrange them in an accurate and critical scientific article																																																																																																																										
	PLO-PO Matrix																																																																																																																											
		<table border="1" style="margin-left: auto; margin-right: auto;"> <tr><td>P.O</td></tr> <tr><td>PO-1</td></tr> <tr><td>PO-2</td></tr> <tr><td>PO-3</td></tr> <tr><td>PO-4</td></tr> <tr><td>PO-5</td></tr> </table>						P.O	PO-1	PO-2	PO-3	PO-4	PO-5																																																																																																															
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PO Matrix at the end of each learning stage (Sub-PO)																																																																																																																												
	<table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <th rowspan="2">P.O</th> <th colspan="16">Week</th> </tr> <tr> <th>1</th><th>2</th><th>3</th><th>4</th><th>5</th><th>6</th><th>7</th><th>8</th><th>9</th><th>10</th><th>11</th><th>12</th><th>13</th><th>14</th><th>15</th><th>16</th> </tr> <tr><td>PO-1</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>PO-2</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>PO-3</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>PO-4</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>PO-5</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> </table>						P.O	Week																1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	PO-1																	PO-2																	PO-3																	PO-4																	PO-5																
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Short Course Description	Study of the ontology, epistemology, and axiology of nuclear chemistry and radiochemistry, atomic structure, atomic nuclei, nuclear stability, nuclear reactions, half-life and age of radioactive elements, thermodynamic stability of atomic nuclei, interaction of nuclear radiation with matter, and the implementation of radiochemistry in everyday life -days such as in the fields of chemistry, medicine, agriculture, food technology and so on.																																																																																																																											
References	Main :																																																																																																																											

1. Arthur, 1981 Konsep Fisika Modern, edisi ke tiga Erlangga, Jakarta.
2. Choppin, Liljenzin, and Rydberg, 2002, Radiochemistry and Nuclear Chemistry, 3rd Edition, Butterworth-Heinemann Press
3. Kratz, Karl Heinrich Lieser, 2012, Nuclear and Radiochemistry: Fundamentals and Applications, 2 Volume Set, Wiley VCH, Verlag GmbH, and Co KgaA, Boschstr, 12 Weinheim, Germany
4. Gregory Choppin, Jan-Olov Liljenzin, Jan Rydberg and Christian Ekberg, 2013, Radiochemistry and Nuclear Chemistry, Fourth Edition ISBN-13: 978-0124058972 ISBN-10: 0124058973
5. Darmawan, Deni, 2019, Teknik Penulisan Karya Tulis Ilmiah, Bandung: Remaja Rosdakarya
6. Buku dan jurnal terbaru lain yang relevan

Supporters:

Supporting lecturer

ISMONO
Samik, S.Si., M.Si.
Herry Wijayanto, S.Pd., M.Sc., D.Sc.

Week-	Final abilities of each learning stage (Sub-PO)	Evaluation		Help Learning, Learning methods, Student Assignments, [Estimated time]		Learning materials [References]	Assessment Weight (%)
		Indicator	Criteria & Form	Offline (offline)	Online (online)		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1	Examining the definition of core chemistry and radiochemistry comprehensively by answering 3 scientific questions (ontology, epistemology, and axiology) complemented by the history of atomic theory and the discovery of radioactivity	<ol style="list-style-type: none"> 1. Defines core chemistry and radiochemistry which contains 3 answers to questions of ontology, epistemology and axiology. 2. Explains the history of atomic theory and the discovery of radioactivity 3. Distinguish between chemical reactions and nuclear reactions 	<p>Criteria: Qualitative</p> <p>Form of Assessment : Practice/Performance, Test</p>	<ol style="list-style-type: none"> 1. Lecture 2. Question and answer 3. Practice questions 2 x 50 minutes 		<p>Material: Defining core chemistry and radiochemistry which contains 3 answers to questions of ontology, epistemology and axiology. Bibliography: <i>Arthur, 1981 Concepts of Modern Physics, third edition Erlangga, Jakarta.</i></p> <hr/> <p>Material: Explaining the history of atomic theory and the discovery of radioactivity. Reference: <i>Choppin, Liljenzin, and Rydberg, 2002, Radiochemistry and Nuclear Chemistry, 3rd Edition, Butterworth-Heinemann Press</i></p> <hr/> <p>Material: Differentiating chemical reactions and nuclear reactions References: <i>Kratz, Karl Heinrich Lieser, 2012, Nuclear and Radiochemistry: Fundamentals and Applications, 2 Volume Set, Wiley VCH, Verlag GmbH, and Co KgaA, Boschstr, 12 Weinheim, Germany</i></p>	7%

2	Interpret the meaning of atomic structure	<ol style="list-style-type: none"> 1.Explain the particles that make up atoms 2.Differentiate the properties of protons, neutrons and electrons. 3.Counting the number of protons, neutrons and electrons in an atom and ion 	<p>Criteria: Quantitative</p> <p>Form of Assessment : Participatory Activities, Tests</p>	<ol style="list-style-type: none"> 1. Lecture 2. Group discussion 3. Question and answer 4. Practice questions 2 x 50 minutes 		<p>Material: Explaining the particles that make up atoms Reference: <i>Arthur, 1981 Concepts of Modern Physics, third edition Erlangga, Jakarta.</i></p> <hr/> <p>Material: Differentiate the properties of protons, neutrons and electrons. References: <i>Choppin, Liljenzin, and Rydberg, 2002, Radiochemistry and Nuclear Chemistry, 3rd Edition, Butterworth-Heinemann Press</i></p> <hr/> <p>Material: Counting the number of protons, neutrons and electrons in an atom and ion. References: <i>Kratz, Karl Heinrich Lieser, 2012, Nuclear and Radiochemistry: Fundamentals and Applications, 2 Volume Set, Wiley VCH, Verlag GmbH, and Co KgaA, Boschstr, 12 Weinheim, Germany</i></p> <hr/> <p>Material: Includes all indicators, as supporting material. Bibliography: <i>Gregory Choppin, Jan-Olov Liljenzin Jan Rydberg and, Christian Ekberg, 2013, Radiochemistry and Nuclear Chemistry, Fourth Edition ISBN-13: 978-0124058972 ISBN-10: 0124058973</i></p>	7%
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3	Explain the atomic nucleus and nuclear stability	<ol style="list-style-type: none"> 1. Distinguish between the terms atomic nucleus, nucleon and nuclide 2. Distinguish between isotopes, isobars, isotones and nuclear isomers 3. Classify stable and radioactive nuclides 4. Understand the factors that influence core stability 	<p>Criteria: Quantitative</p> <p>Form of Assessment : Portfolio Assessment, Test</p>	<ol style="list-style-type: none"> 1. Lecture 2. Question and answer 3. Discussion 4. Practice questions 2 x 50 minutes 		<p>Material: Includes all indicators</p> <p>References: <i>Arthur, 1981 Concepts of Modern Physics, third edition Erlangga, Jakarta.</i></p> <hr/> <p>Material: Includes all indicators</p> <p>References: <i>Choppin, Liljenzin, and Rydberg, 2002, Radiochemistry and Nuclear Chemistry, 3rd Edition, Butterworth-Heinemann Press</i></p> <hr/> <p>Material: Includes all indicators</p> <p>References: <i>Kratz, Karl Heinrich Lieser, 2012, Nuclear and Radiochemistry: Fundamentals and Applications, 2 Volume Set, Wiley VCH, Verlag GmbH, and Co KgaA, Boschstr, 12 Weinheim, Germany</i></p> <hr/> <p>Material: Includes all indicators</p> <p>Bibliography: <i>Gregory Choppin, Jan-Olov Liljenzin Jan Rydberg and, Christian Ekberg, 2013, Radiochemistry and Nuclear Chemistry, Fourth Edition ISBN-13: 978-0124058972 ISBN-10: 0124058973</i></p>	7%
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4	Understand core reactions	<ol style="list-style-type: none"> 1. Distinguish and give examples of nuclear decay reactions and nuclear transmutation reactions 2. Balancing nuclear reactions 3. Classify nuclides based on the stability of the nucleus and the process of its formation in nature 4. Understand how to synthesize transuranium elements 	<p>Criteria: In accordance with the assessment guidebook that applies at Unesa</p> <p>Form of Assessment : Test</p>	<ol style="list-style-type: none"> 1. Lecture 2. Question and answer 3. Solve questions 2 x 50 minutes 	<p>Material: Includes all indicators</p> <p>References: <i>Arthur, 1981 Concepts of Modern Physics, third edition Erlangga, Jakarta.</i></p> <hr/> <p>Material: Includes all indicators</p> <p>References: <i>Choppin, Liljenzin, and Rydberg, 2002, Radiochemistry and Nuclear Chemistry, 3rd Edition, Butterworth-Heinemann Press</i></p> <hr/> <p>Material: Includes all indicators</p> <p>References: <i>Kratz, Karl Heinrich Lieser, 2012, Nuclear and Radiochemistry: Fundamentals and Applications, 2 Volume Set, Wiley VCH, Verlag GmbH, and Co KgaA, Boschstr, 12 Weinheim, Germany</i></p> <hr/> <p>Material: Includes all indicators</p> <p>Bibliography: <i>Gregory Choppin, Jan-Olov Liljenzin Jan Rydberg and, Christian Ekberg, 2013, Radiochemistry and Nuclear Chemistry, Fourth Edition ISBN-13: 978-0124058972 ISBN-10: 0124058973</i></p>	7%
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5	Differentiate the rate of decay of atomic nuclei, half-life, and radioactive series	<ol style="list-style-type: none"> 1. Determine the decay formula from the rate of decay of atomic nuclei 2. Define and calculate half-life 3. Calculating the age of radioactive elements 4. Explain the 4 radioactive series 	<p>Criteria: Quantitative</p> <p>Form of Assessment : Test</p>	<ol style="list-style-type: none"> 1. Lecture 2. Question and answer 3. Solve questions 2 x 50 minutes 		<p>Material: Includes all indicators</p> <p>References: <i>Arthur, 1981 Concepts of Modern Physics, third edition Erlangga, Jakarta.</i></p> <hr/> <p>Material: Includes all indicators</p> <p>References: <i>Choppin, Liljenzin, and Rydberg, 2002, Radiochemistry and Nuclear Chemistry, 3rd Edition, Butterworth-Heinemann Press</i></p> <hr/> <p>Material: Includes all indicators</p> <p>References: <i>Kratz, Karl Heinrich Lieser, 2012, Nuclear and Radiochemistry: Fundamentals and Applications, 2 Volume Set, Wiley VCH, Verlag GmbH, and Co KgaA, Boschstr, 12 Weinheim, Germany</i></p> <hr/> <p>Material: Includes all indicators</p> <p>Bibliography: <i>Gregory Choppin, Jan-Olov Liljenzin Jan Rydberg and, Christian Ekberg, 2013, Radiochemistry and Nuclear Chemistry, Fourth Edition ISBN-13: 978-0124058972 ISBN-10: 0124058973</i></p>	7%
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6	Analyze the interaction of nuclear radiation with matter	<p>1. Shows the difference between ionizing and non-ionizing radiation</p> <p>2. Explain the effects of ionizing and nonionizing radiation on matter</p>	<p>Criteria: Quantitative</p> <p>Form of Assessment : Participatory Activities, Tests</p>	<p>1. Lecture</p> <p>2. Discussion</p> <p>3. Question and answer</p> <p>4. Practice questions 2 x 50 minutes</p>		<p>Material: Includes all indicators</p> <p>References: <i>Arthur, 1981 Concepts of Modern Physics, third edition Erlangga, Jakarta.</i></p> <hr/> <p>Material: Includes all indicators</p> <p>References: <i>Choppin, Liljenzin, and Rydberg, 2002, Radiochemistry and Nuclear Chemistry, 3rd Edition, Butterworth-Heinemann Press</i></p> <hr/> <p>Material: Includes all indicators</p> <p>References: <i>Kratz, Karl Heinrich Lieser, 2012, Nuclear and Radiochemistry: Fundamentals and Applications, 2 Volume Set, Wiley VCH, Verlag GmbH, and Co KgaA, Boschstr, 12 Weinheim, Germany</i></p> <hr/> <p>Material: Includes all indicators</p> <p>Bibliography: <i>Gregory Choppin, Jan-Olov Liljenzin Jan Rydberg and, Christian Ekberg, 2013, Radiochemistry and Nuclear Chemistry, Fourth Edition ISBN-13: 978-0124058972 ISBN-10: 0124058973</i></p>	7%
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7	Analyze the thermodynamic stability of the atomic nucleus	<ol style="list-style-type: none"> 1. Compare the energy produced between chemical reactions and nuclear reactions 2. Calculating mass-energy balance 3. Calculate the binding energy of atomic nuclei 4. Distinguish between nuclear fission and fusion reactions 	<p>Criteria: Quantitative</p> <p>Form of Assessment : Test</p>	<ol style="list-style-type: none"> 1. Lecture 2. Question and answer 3. Practice questions 2 x 50 minutes 		<p>Material: Includes all indicators</p> <p>References: <i>Arthur, 1981 Concepts of Modern Physics, third edition Erlangga, Jakarta.</i></p> <hr/> <p>Material: Includes all indicators</p> <p>References: <i>Choppin, Liljenzin, and Rydberg, 2002, Radiochemistry and Nuclear Chemistry, 3rd Edition, Butterworth-Heinemann Press</i></p> <hr/> <p>Material: Includes all indicators</p> <p>References: <i>Kratz, Karl Heinrich Lieser, 2012, Nuclear and Radiochemistry: Fundamentals and Applications, 2 Volume Set, Wiley VCH, Verlag GmbH, and Co KgaA, Boschstr, 12 Weinheim, Germany</i></p> <hr/> <p>Material: Includes all indicators</p> <p>Bibliography: <i>Gregory Choppin, Jan-Olov Liljenzin Jan Rydberg and, Christian Ekberg, 2013, Radiochemistry and Nuclear Chemistry, Fourth Edition ISBN-13: 978-0124058972 ISBN-10: 0124058973</i></p>	8%
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8	Able to work on and complete Midterm Exam (UTS) questions	Able to solve UTS questions well and correctly	<p>Criteria: In accordance with the assessment guidelines applicable at UNESA</p> <p>Form of Assessment : Test</p>	Work on and complete 2 x 50 minute UTS questions		<p>Material: Includes all indicators References: <i>Arthur, 1981 Concepts of Modern Physics, third edition Erlangga, Jakarta.</i></p> <hr/> <p>Material: Includes all indicators References: <i>Choppin, Liljenzin, and Rydberg, 2002, Radiochemistry and Nuclear Chemistry, 3rd Edition, Butterworth-Heinemann Press</i></p> <hr/> <p>Material: Includes all indicators References: <i>Kratz, Karl Heinrich Lieser, 2012, Nuclear and Radiochemistry: Fundamentals and Applications, 2 Volume Set, Wiley VCH, Verlag GmbH, and Co KgaA, Boschstr, 12 Weinheim, Germany</i></p> <hr/> <p>Material: Includes all indicators Bibliography: <i>Gregory Choppin, Jan-Olov Liljenzin Jan Rydberrg and, Christian Ekberg, 2013, Radiochemistry and Nuclear Chemistry, Fourth Edition ISBN-13: 978-0124058972 ISBN-10: 0124058973</i></p>	0%
9	Compile scientific review articles related to the application of core chemistry and radiochemistry in everyday life such as industry, medicine, agriculture, and so on	<ol style="list-style-type: none"> 1. Able to compile the background of the problem 2. Able to formulate problem formulations 3. Able to formulate research objectives 4. Able to make point drafts from review articles 	<p>Criteria: In accordance with the assessment guidelines that apply at Unesa</p> <p>Form of Assessment : Project Results Assessment / Product Assessment</p>	Discussion, presentation and consultation 2 x 50 minutes		<p>Material: Includes all indicators Literature: <i>Other recent, relevant books and journals</i></p> <hr/> <p>Material: Includes all indicators References: <i>Darmawan, Deni, 2019, Techniques for Writing Scientific Papers, Bandung: Teen Rosdakarya</i></p>	8%

10	Compile scientific review articles related to the application of core chemistry and radiochemistry in everyday life such as industry, medicine, agriculture, and so on	<ol style="list-style-type: none"> 1. Able to compile theoretical studies supporting research 2. Able to compile relevant research results 3. Able to develop a framework for thinking 4. Able to write draft review articles 	<p>Criteria: Quantitative</p> <p>Form of Assessment : Project Results Assessment / Product Assessment</p>	Discussion, presentation and consultation 2 x 50 minutes		<p>Material: Includes all indicators Literature: <i>Other recent, relevant books and journals</i></p> <hr/> <p>Material: Includes all indicators References: <i>Darmawan, Deni, 2019, Techniques for Writing Scientific Papers, Bandung: Teen Rosdakarya</i></p>	7%
11	Able to compile literature reviews and write draft review articles related to the implementation of radiochemistry in everyday life such as industry, medicine, agriculture, and so on.	<ol style="list-style-type: none"> 1. Able to compile theoretical studies supporting research 2. Able to compile relevant research results 3. Able to develop a framework for thinking 4. Able to write draft review articles 	<p>Criteria: Quantitative</p> <p>Form of Assessment : Project Results Assessment / Product Assessment</p>	Project Based Learning, Discussion, presentation and consultation 2 x 50 minutes		<p>Material: Includes all indicators Literature: <i>Other recent, relevant books and journals</i></p> <hr/> <p>Material: Includes all indicators References: <i>Darmawan, Deni, 2019, Techniques for Writing Scientific Papers, Bandung: Teen Rosdakarya</i></p>	7%
12	Able to compile literature reviews and write draft review articles related to the implementation of radiochemistry in everyday life such as industry, medicine, agriculture, and so on.	<ol style="list-style-type: none"> 1. Able to compile theoretical studies supporting research 2. Able to compile relevant research results 3. Able to develop a framework for thinking 4. Able to write draft review articles 	<p>Criteria: Quantitative</p> <p>Form of Assessment : Project Results Assessment / Product Assessment</p>	Project Based Learning, Discussion, presentation and consultation 2 x 50 minutes		<p>Material: Includes all indicators Literature: <i>Other recent, relevant books and journals</i></p> <hr/> <p>Material: Includes all indicators References: <i>Darmawan, Deni, 2019, Techniques for Writing Scientific Papers, Bandung: Teen Rosdakarya</i></p>	7%
13	Able to compile literature reviews and write draft review articles related to the implementation of radiochemistry in everyday life such as industry, medicine, agriculture, and so on.	<ol style="list-style-type: none"> 1. Able to compile theoretical studies supporting research 2. Able to compile relevant research results 3. Able to develop a framework for thinking 4. Able to write draft review articles 	<p>Criteria: Quantitative</p> <p>Form of Assessment : Project Results Assessment / Product Assessment</p>	Project Based Learning, Discussion, presentation and consultation 2 x 50 minutes		<p>Material: Includes all indicators Literature: <i>Other recent, relevant books and journals</i></p> <hr/> <p>Material: Includes all indicators References: <i>Darmawan, Deni, 2019, Techniques for Writing Scientific Papers, Bandung: Teen Rosdakarya</i></p>	7%

14	Able to compile literature reviews and write draft review articles related to the implementation of radiochemistry in everyday life such as industry, medicine, agriculture, and so on.	<ol style="list-style-type: none"> 1. Able to compile theoretical studies supporting research 2. Able to compile relevant research results 3. Able to develop a framework for thinking 4. Able to write draft review articles 	Criteria: Quantitative Form of Assessment : Project Results Assessment / Product Assessment	Project Based Learning, Discussion, presentation and consultation 2 x 50 minutes	Material: Includes all indicators Literature: <i>Other recent, relevant books and journals</i> <hr/> Material: Includes all indicators References: <i>Darmawan, Deni, 2019, Techniques for Writing Scientific Papers, Bandung: Teen Rosdakarya</i>	7%
15	Able to compile literature reviews and write draft review articles related to the implementation of radiochemistry in everyday life such as industry, medicine, agriculture, and so on.	<ol style="list-style-type: none"> 1. Able to compile theoretical studies supporting research 2. Able to compile relevant research results 3. Able to develop a framework for thinking 4. Able to write draft review articles 5. Prepare accompanying documents for submission of review articles 	Criteria: Quantitative Form of Assessment : Project Results Assessment / Product Assessment	Project Based Learning, Discussion, presentation and consultation 2 x 50 minutes	Material: Includes all indicators Literature: <i>Other recent, relevant books and journals</i> <hr/> Material: Includes all indicators References: <i>Darmawan, Deni, 2019, Techniques for Writing Scientific Papers, Bandung: Teen Rosdakarya</i>	7%
16	UAS	UAS	Criteria: UAS Form of Assessment : Project Results Assessment / Product Assessment	Assistance in selecting the destination journal for publication 2 x 50		0%

Evaluation Percentage Recap: Project Based Learning

No	Evaluation	Percentage
1.	Participatory Activities	7%
2.	Project Results Assessment / Product Assessment	50%
3.	Portfolio Assessment	3.5%
4.	Practice / Performance	3.5%
5.	Test	36%
		100%

Notes

1. **Learning Outcomes of Study Program Graduates (PLO - Study Program)** are the abilities possessed by each Study Program graduate which are the internalization of attitudes, mastery of knowledge and skills according to the level of their study program obtained through the learning process.
2. **The PLO imposed on courses** are several learning outcomes of study program graduates (CPL-Study Program) which are used for the formation/development of a course consisting of aspects of attitude, general skills, special skills and knowledge.
3. **Program Objectives (PO)** are abilities that are specifically described from the PLO assigned to a course, and are specific to the study material or learning materials for that course.
4. **Subject Sub-PO (Sub-PO)** is a capability that is specifically described from the PO that can be measured or observed and is the final ability that is planned at each learning stage, and is specific to the learning material of the course.
5. **Indicators for assessing** ability in the process and student learning outcomes are specific and measurable statements that identify the ability or performance of student learning outcomes accompanied by evidence.
6. **Assessment Criteria** are benchmarks used as a measure or measure of learning achievement in assessments based on predetermined indicators. Assessment criteria are guidelines for assessors so that assessments are consistent and unbiased. Criteria can be quantitative or qualitative.
7. **Forms of assessment:** test and non-test.
8. **Forms of learning:** Lecture, Response, Tutorial, Seminar or equivalent, Practicum, Studio Practice, Workshop Practice, Field Practice, Research, Community Service and/or other equivalent forms of learning.
9. **Learning Methods:** Small Group Discussion, Role-Play & Simulation, Discovery Learning, Self-Directed Learning, Cooperative Learning, Collaborative Learning, Contextual Learning, Project Based Learning, and other equivalent methods.

10. **Learning materials** are details or descriptions of study materials which can be presented in the form of several main points and sub-topics.
11. **The assessment weight** is the percentage of assessment of each sub-PO achievement whose size is proportional to the level of difficulty of achieving that sub-PO, and the total is 100%.
12. TM=Face to face, PT=Structured assignments, BM=Independent study.