



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

Document Code

## SEMESTER LEARNING PLAN

<b>Courses</b>	<b>CODE</b>	<b>Course Family</b>	<b>Credit Weight</b>	<b>SEMESTER</b>	<b>Compilation Date</b>																																											
General Chemistry	4420102163		T=2   P=0   ECTS=3.18	1	July 17, 2024																																											
<b>AUTHORIZATION</b>	<b>SP Developer</b>		<b>Course Cluster Coordinator</b>		<b>Study Program Coordinator</b>																																											
	.....		.....		Prof. Dr. Raden Sulaiman, M.Si.																																											
<b>Learning model</b>	Project Based Learning																																															
<b>Program Learning Outcomes (PLO)</b>	PLO study program that is charged to the course																																															
	Program Objectives (PO)																																															
	PLO-PO Matrix																																															
		P.O																																														
<b>PO Matrix at the end of each learning stage (Sub-PO)</b>																																																
		<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 5%;"></td> <td colspan="16" style="text-align: center; border-bottom: 1px solid black;">Week</td> </tr> <tr> <td style="border-right: 1px solid black; border-bottom: 1px solid black;">P.O</td> <td style="border-right: 1px solid black; border-bottom: 1px solid black;">1</td> <td style="border-right: 1px solid black; border-bottom: 1px solid black;">2</td> <td style="border-right: 1px solid black; border-bottom: 1px solid black;">3</td> <td style="border-right: 1px solid black; border-bottom: 1px solid black;">4</td> <td style="border-right: 1px solid black; border-bottom: 1px solid black;">5</td> <td style="border-right: 1px solid black; border-bottom: 1px solid black;">6</td> <td style="border-right: 1px solid black; border-bottom: 1px solid black;">7</td> <td style="border-right: 1px solid black; border-bottom: 1px solid black;">8</td> <td style="border-right: 1px solid black; border-bottom: 1px solid black;">9</td> <td style="border-right: 1px solid black; border-bottom: 1px solid black;">10</td> <td style="border-right: 1px solid black; border-bottom: 1px solid black;">11</td> <td style="border-right: 1px solid black; border-bottom: 1px solid black;">12</td> <td style="border-right: 1px solid black; border-bottom: 1px solid black;">13</td> <td style="border-right: 1px solid black; border-bottom: 1px solid black;">14</td> <td style="border-right: 1px solid black; border-bottom: 1px solid black;">15</td> <td style="border-bottom: 1px solid black;">16</td> </tr> </table>															Week																P.O	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	Week																																															
P.O	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16																																
<b>Short Course Description</b>	Study of basic concepts: Scientific Method, Properties of Matter, Stoichiometry, Periodic System of Elements, Chemical Bonds, Energetics, Forms of Substances, Solutions, Colloids, Carbon Chemistry, Green Chemistry and Chemicals in Everyday Life as well as laboratory activities appropriate through discussions, assignments, and practicums.																																															
<b>References</b>	<b>Main :</b>																																															
	<ol style="list-style-type: none"> <li>1. Tim Kimia Umum. 2013. Kimia Umum .Surabaya: Jurusan Kimia FMIPA Unesa.</li> <li>2. Brady and Humiston. 2004. General Chemistry, Principles and Structures. 4th. New York: John Willey and Sons.</li> <li>3. Chang, Raymond. 2005. General Chemistry The Essential Concepts Third Edition. USA: McGraw Hill.</li> </ol>																																															
<b>Supporting lecturer</b>	<b>Supporters:</b>																																															
	Dr. I Gusti Made Sanjaya, M.Si. Prof. Dr. Tukiran, M.Si. Samik, S.Si., M.Si. Mirwa Adiprahara Anggarani, S.Si., M.Si. Dr. Ratih Dewi Saputri, S.Si., M.Si.																																															
<b>Week-</b>	<b>Final abilities of each learning stage (Sub-PO)</b>	<b>Evaluation</b>		<b>Help Learning, Learning methods, Student Assignments, [ Estimated time ]</b>		<b>Learning materials [ References ]</b>	<b>Assessment Weight (%)</b>																																									
		<b>Indicator</b>	<b>Criteria &amp; Form</b>	<b>Offline ( offline )</b>	<b>Online ( online )</b>																																											
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)																																									

1	Understanding chemistry as the result of scientific activities that study matter with universal properties	<ol style="list-style-type: none"> <li>1. Explain the steps of the scientific method</li> <li>2. Explain the differences between extensive and intensive properties</li> <li>3. Explain the differences between chemical and physical properties, elements, compounds and mixtures</li> </ol>	<p><b>Criteria:</b></p> <ol style="list-style-type: none"> <li>1.1. Participation during lectures, carried out through observation (weight 2)</li> <li>2.2. The Mid-Semester Examination (UTS) is carried out by assessing all relevant indicators through a written examination, with a weight of (2)</li> <li>3.3. Assignment value for working on questions, writing papers and practical work (weight 2)</li> <li>4.4. The Final Semester Examination (UAS) is carried out by assessing all relevant indicators through a written examination, with a weighting of (3)</li> <li>5. The final NA is (participation value x2) (assignment value x 3) (UTS value)</li> </ol>	<ol style="list-style-type: none"> <li>1. Discussion</li> <li>2. Question and answer</li> <li>3. Learning strategy concept map</li> </ol> <p>3 X 50</p>			0%
2	Understand the things that underlie stoichiometry, namely: basic laws of chemistry, atoms and molecules, the concept of moles and Avogadro's constant, compound formulas, chemical reactions and molarity and equivalence	<ol style="list-style-type: none"> <li>1. Explain the basic laws of chemistry</li> <li>2. Explain the differences between atoms, molecules and the mole concept</li> <li>3. Apply Avogadro's constant and compound formulas</li> <li>4. Apply chemical reactions and balance, molarity and equivalence in practice questions</li> </ol>	<p><b>Criteria:</b></p> <ol style="list-style-type: none"> <li>1.1. Participation during lectures, carried out through observation (weight 2)</li> <li>2.2. The Mid-Semester Examination (UTS) is carried out by assessing all relevant indicators through a written examination, with a weight of (2)</li> <li>3.3. Assignment value for working on questions, writing papers and practical work (weight 2)</li> <li>4.4. The Final Semester Examination (UAS) is carried out by assessing all relevant indicators through a written examination, with a weighting of (3)</li> <li>5. The final NA is (participation value x2) (assignment value x 3) (UTS value)</li> </ol>	<ol style="list-style-type: none"> <li>1. Discussion</li> <li>2. Assignments</li> <li>3. Concept map learning strategies</li> <li>4. Practicum</li> </ol> <p>3 X 50</p>			0%

3	Understand the things that underlie stoichiometry, namely: basic laws of chemistry, atoms and molecules, the concept of moles and Avogadro's constant, compound formulas, chemical reactions and molarity and equivalence	1. Explain the basic laws of chemistry 2. Explain the differences between atoms, molecules and the mole concept 3. Apply Avogadro's constant and compound formulas 4. Apply chemical reactions and balance, molarity and equivalence in practice questions	<b>Criteria:</b> 1.1. Participation during lectures, carried out through observation (weight 2) 2.2. The Mid-Semester Examination (UTS) is carried out by assessing all relevant indicators through a written examination, with a weight of (2) 3.3. Assignment value for working on questions, writing papers and practical work (weight 2) 4.4. The Final Semester Examination (UAS) is carried out by assessing all relevant indicators through a written examination, with a weighting of (3) 5. The final NA is (participation value x2) (1. assignment value x 3) (UTS value x 2) UAS value (3) divided by 10	1. Discussion 2. Assignments 3. Concept map learning strategies 4. Practicum 3 X 50			0%
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4	Understand the development, use and basis of the periodic system and its relationship to the electronic configuration of elements and periodic properties	1. Explain the development of the Periodic System of Elements and the relationship between electron configurations. 2. Analyze various periodic properties	<b>Criteria:</b> 1.1. Participation during lectures, carried out through observation (weight 2) 2.2. The Mid-Semester Examination (UTS) is carried out by assessing all relevant indicators through a written examination, with a weight of (2) 3.3. Assignment value for working on questions, writing papers and practical work (weight 2) 4.4. The Final Semester Examination (UAS) is carried out by assessing all relevant indicators through a written examination, with a weighting of (3) 5.5. The final NA is (participation value x2) (assignment value x 3) (UTS value x 2) UAS value (3) divided by 10	1. Discussion 2. Question and answer 3. Assignment 3 X 50			0%
5	Decide the relationship between chemical bonds and chemical forces to explain knowledge according to the study program.	1. Explain the role of electrons in chemical bonds, 2. Explain examples of ionic bonds, covalent bonds, bond energy, molecular structure and other chemical bonds (van der Waals, hydrogen bonds, metallic bonds)	<b>Criteria:</b> 1.1. Participation during lectures, carried out through observation (weight 2) 2.2. The Mid-Semester Examination (UTS) is carried out by assessing all relevant indicators through a written examination, with a weight of (2) 3.3. Assignment value for working on questions, writing papers and practical work (weight 2) 4.4. The Final Semester Examination (UAS) is carried out by assessing all relevant indicators through a written examination, with a weighting of (3) 5.5. The final NA is (participation value x2) (assignment value x 3) (UTS value x 2) UAS value (3) divided by 10	1. Discussion 2. Concept map learning strategy 3. Assignment 3 X 50			0%

6	Understand the terms, laws of thermodynamics, and determine the occurrence of reactions thermodynamically	1. Explain the differences between system, environment, state function, adiabatic process, isotherm process, work, heat capacity, etc.). 2. Explain the First Law of Thermodynamics, Hess's Law, Bond Energy, Thermochemistry, Second Law of Thermodynamics, Entropy, Free Energy.	<b>Criteria:</b> 1.1. Participation during lectures, carried out through observation (weight 2) 2.2. The Mid-Semester Examination (UTS) is carried out by assessing all relevant indicators through a written examination, with a weight of (2) 3.3. Assignment value for working on questions, writing papers and practical work (weight 2) 4.4. The Final Semester Examination (UAS) is carried out by assessing all relevant indicators through a written examination, with a weighting of (3) 5.5. The final NA is (participation value x2) (assignment value x 3) (UTS value x 2) UAS value (3) divided by 10	1. Discussion 2. Question and answer 3. Practice questions 3 X 50			0%
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7	Understand the terms, laws of thermodynamics, and determine the occurrence of reactions thermodynamically	1. Explain the differences between system, environment, state function, adiabatic process, isotherm process, work, heat capacity, etc.). 2. Explain the First Law of Thermodynamics, Hess's Law, Bond Energy, Thermochemistry, Second Law of Thermodynamics, Entropy, Free Energy.	<b>Criteria:</b> 1.1. Participation during lectures, carried out through observation (weight 2) 2.2. The Mid-Semester Examination (UTS) is carried out by assessing all relevant indicators through a written examination, with a weight of (2) 3.3. Assignment value for working on questions, writing papers and practical work (weight 2) 4.4. The Final Semester Examination (UAS) is carried out by assessing all relevant indicators through a written examination, with a weighting of (3) 5.5. The final NA is (participation value x2) (assignment value x 3) (UTS value x 2) UAS value (3) divided by 10	1.Discussion 2.Assignment 3.Practicum 3 X 50			0%
8	Meetings 1-7	Meetings 1-7	<b>Criteria:</b> 1.1. Participation during lectures, carried out through observation (weight 2) 2.2. The Mid-Semester Examination (UTS) is carried out by assessing all relevant indicators through a written examination, with a weight of (2) 3.3. Assignment value for working on questions, writing papers and practical work (weight 2) 4.4. The Final Semester Examination (UAS) is carried out by assessing all relevant indicators through a written examination, with a weighting of (3) 5.5. The final NA is (participation value x2) (assignment value x 3) (UTS value x 2) UAS value (3) divided by 10	- 1 X 1			0%

9	Understand the states of matter in the form of gases and liquids along with the applicable laws and the state of crystalline solids	1. Analyze the properties of gases, liquids and solids 2. Explain crystalline solids 3. Explain changes in state of matter and phase diagrams	<b>Criteria:</b> 1.1. Participation during lectures, carried out through observation (weight 2) 2.2. The Mid-Semester Examination (UTS) is carried out by assessing all relevant indicators through a written examination, with a weight of (2) 3.3. Assignment value for working on questions, writing papers and practical work (weight 2) 4.4. The Final Semester Examination (UAS) is carried out by assessing all relevant indicators through a written examination, with a weighting of (3) 5.5. The final NA is (participation value x2) (assignment value x 3) (UTS value x 2) UAS value (3) divided by 10	1. Discussion 2. Question and answer 3. Practice questions 3 X 50			0%
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10	Understand several aspects of solutions and apply them in quantitative terms	<p>1. Compare the properties of electrolyte and non-electrolyte solutions. 2. Distinguish several colligative properties of solutions. 3. Differentiate acid-base theory. 4. Calculate the pH of the solution. 5. Explain hydrolysis and buffer solutions. 6. Determine the pH indicator path. 7. Perform acid-base titration</p>	<p><b>Criteria:</b></p> <p>1.1. Participation during lectures, carried out through observation (weight 2)</p> <p>2.2. The Mid-Semester Examination (UTS) is carried out by assessing all relevant indicators through a written examination, with a weight of (2)</p> <p>3.3. Assignment value for working on questions, writing papers and practical work (weight 2)</p> <p>4.4. The Final Semester Examination (UAS) is carried out by assessing all relevant indicators through a written examination, with a weighting of (3)</p> <p>5.5. The final NA is (participation value x2) (assignment value x 3) (UTS value x 2) UAS value (3) divided by 10</p>	<p>1. Discussion 2. Question and answer 3. Practice questions 4. Practicum 3 X 50</p>		0%
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11	Understand several aspects of solutions and apply them in quantitative terms	<p>1. Compare the properties of electrolyte and non-electrolyte solutions. 2. Distinguish several colligative properties of solutions. 3. Differentiate acid-base theory 4. Calculate the pH of the solution. 5. Explain hydrolysis and buffer solutions. 6. Determine the pH indicator path. 7. Perform acid-base titration</p>	<p><b>Criteria:</b></p> <p>1.1. Participation during lectures, carried out through observation (weight 2)</p> <p>2.2. The Mid-Semester Examination (UTS) is carried out by assessing all relevant indicators through a written examination, with a weight of (2)</p> <p>3.3. Assignment value for working on questions, writing papers and practical work (weight 2)</p> <p>4.4. The Final Semester Examination (UAS) is carried out by assessing all relevant indicators through a written examination, with a weighting of (3)</p> <p>5.5. The final NA is (participation value x2) (assignment value x 3) (UTS value x 2) UAS value (3) divided by 10</p>	<p>1. Discussion 2. Question and answer 3. Practice questions 4. Practicum 3 X 50</p>		0%
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12	Understand the principles underlying colloid systems and relate them to everyday symptoms	<ol style="list-style-type: none"> <li>1. Explain dispersion systems</li> <li>2. Differentiate types of colloids</li> <li>3. Differentiate the preparation of colloids</li> <li>4. Describe the uses of colloids</li> </ol>	<p><b>Criteria:</b></p> <ol style="list-style-type: none"> <li>1.1. Participation during lectures, carried out through observation (weight 2)</li> <li>2.2. The Mid-Semester Examination (UTS) is carried out by assessing all relevant indicators through a written examination, with a weight of (2)</li> <li>3.3. Assignment value for working on questions, writing papers and practical work (weight 2)</li> <li>4.4. The Final Semester Examination (UAS) is carried out by assessing all relevant indicators through a written examination, with a weighting of (3)</li> <li>5.5. The final NA is (participation value x2) (assignment value x 3) (UTS value x 2) UAS value (3) divided by 10</li> </ol>	<ol style="list-style-type: none"> <li>1. Discussion</li> <li>2. Question and answer</li> <li>3. Practice questions</li> <li>4. Practicum 3 X 50</li> </ol>		0%
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13	Understand carbon chemistry, and relate it to everyday life	<p>1. Explain the characteristics of the carbon atom</p> <p>2. Explain the classification and characteristics of organic compounds</p> <p>3. Analyze the characteristics of each type of hydrocarbon (saturated, unsaturated, aromatic and substituted)</p>	<p><b>Criteria:</b></p> <p>1.1. Participation during lectures, carried out through observation (weight 2)</p> <p>2.2. The Mid-Semester Examination (UTS) is carried out by assessing all relevant indicators through a written examination, with a weight of (2)</p> <p>3.3. Assignment value for working on questions, writing papers and practical work (weight 2)</p> <p>4.4. The Final Semester Examination (UAS) is carried out by assessing all relevant indicators through a written examination, with a weighting of (3)</p> <p>5.5. The final NA is (participation value x2) (assignment value x 3) (UTS value x 2) UAS value (3) divided by 10</p>	<p>1. Discussion</p> <p>2. Question and answer</p> <p>3. Practice questions</p> <p>3 X 50</p>			0%
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14	Understand the principles that support green chemistry	1. Explain the principles that support green chemistry 2. Analyze examples of green chemistry applications that can be accessed via the internet	<b>Criteria:</b> 1.1. Participation during lectures, carried out through observation (weight 2) 2.2. The Mid-Semester Examination (UTS) is carried out by assessing all relevant indicators through a written examination, with a weight of (2) 3.3. Assignment value for working on questions, writing papers and practical work (weight 2) 4.4. The Final Semester Examination (UAS) is carried out by assessing all relevant indicators through a written examination, with a weighting of (3) 5.5. The final NA is (participation value x2) (assignment value x 3) (UTS value x 2) UAS value (3) divided by 10	1. Discussion 2. Question and answer 3. Practice questions 3 X 50			0%
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15	Understand everyday chemicals so that you can make decisions regarding their relevance to knowledge according to your study program.	1. Analyze the characteristics of household chemicals. 2. Analyze the characteristics of chemicals in food. Explain addictive and psychotropic substances	<b>Criteria:</b> 1.1. Participation during lectures, carried out through observation (weight 2) 2.2. The Mid-Semester Examination (UTS) is carried out by assessing all relevant indicators through a written examination, with a weight of (2) 3.3. Assignment value for working on questions, writing papers and practical work (weight 2) 4.4. The Final Semester Examination (UAS) is carried out by assessing all relevant indicators through a written examination, with a weighting of (3) 5.5. The final NA is (participation value x2) (assignment value x 3) (UTS value x 2) UAS value (3) divided by 10	1. Discussion 2. Question and answer 3. Practice questions 3 X 50			0%
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16	Meeting 9-15	Meeting 9-15	<b>Criteria:</b> 1.1. Participation during lectures, carried out through observation (weight 2) 2.2. The Mid-Semester Examination (UTS) is carried out by assessing all relevant indicators through a written examination, with a weight of (2) 3.3. Assignment value for working on questions, writing papers and practical work (weight 2) 4.4. The Final Semester Examination (UAS) is carried out by assessing all relevant indicators through a written examination, with a weighting of (3) 5.5. The final NA is (participation value x2) (assignment value x 3) (UTS value x 2) UAS value (3) divided by 10	- 2 X 50			0%
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**Evaluation Percentage Recap: Project Based Learning**

No	Evaluation	Percentage
		0%

**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** abilities in the process and student learning outcomes are specific and measurable statements that identify the abilities 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.**

