| | Universitas Negeri Surabaya<br>Faculty of Mathematics and Natural Sciences Natural Sciences Education Undergraduate Study Program | Document Code |
|---|---|---|

# SEMESTER LEARNING PLAN

| Courses | CODE | Course Family | Credit Weight | | | SEMESTER | Compilation Date |
|---|---|---|---|---|---|---|---|
| Solution | 8420103081 | | T=3 | P=0 | ECTS=4.77 | 5 | July 17, 2024 |

| AUTHORIZATION | SP Developer | Course Cluster Coordinator | Study Program Coordinator |
|---|---|---|---|
| | ..... | ..... | Prof. Dr. Erman, M.Pd. |

| | |
|---|---|
| **Learning model** | **Project Based Learning** |
| **Program Learning Outcomes (PLO)** | **PLO study program which is charged to the course** |
| | **Program Objectives (PO)** |
| | **PLO-PO Matrix** |

| P.O |
|---|

**PO Matrix at the end of each learning stage (Sub-PO)**

| P.O | Week | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |

| | |
|---|---|
| **Short Course Description** | This course discusses the concept of solutions, concentration, electrical properties, acids and bases, buffer solutions and their application in life, hydrolysis, colligative properties and the use of colloids in life through theoretical studies and also practice by exploring more sources of information through existing information media. Presented in the form of theory and practice. |
| **References** | **Main :** |


1. Atkins, S.P.W. 1995. Physical Chemistry.Oxford : ELBS Oxford University Press.
2. Barrow Gordon M. 1996.Physical Chemistry.Sixth edition. New York : Mc Graw-Hill.
3. Merril, 1995.Chemistry. New York Colombus Ohiop California : Glencao Mc Graw Hill.
4. National Geographic Sosiety.2005.The Nature of Matter. New York: Glencoe Mc Graw Hill.
5. Soren prip beier &Peter dybdallhede. 2010. Essential of Chemistry 2ndedition.Soren prip beier Peter dybdallhede&Ventus publishing


| | |
|---|---|
| **Supporters:** | |
| **Supporting lecturer** | Prof.Dr. Wahono Widodo, M.Si.<br>Dr. Siti Nurul Hidayati, S.Pd., M.Pd.<br>Beni Setiawan, S.Pd., M.Pd., Ph.D.<br>Wahyu Budi Sabtiawan, S.Si., M.Pd.,M.Sc.<br>Ernita Vika Aulia, S.Pd., M.Pd. |

| 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** | Able to utilize and explore deeper sources of information through existing information media to better understand the concept of solutions and dissolution. Understand the process of dissolution and solubility and the factors that influence them. Can make solutions from solids and also carry out dilution. Responsible for results of the experiments carried out. | 1. Explain the meaning of solution.<br>2. Understand the dissolution and solubility processes and the factors that influence them.<br>3. Can make solutions with various concentrations.<br>4. Can dilute the solution. | **Criteria:**<br>Students can explain the meaning of a solution.<br>Students can understand the process of dissolution and solubility and the factors that influence it.<br>Students can make solutions with various concentrations.<br>Students can dilute solutions.<br><br>**Form of Assessment** : Participatory Activities | Student-centered learning approach (student-centered learning) Deductive learning method Strategy Lectures, discussions, presentations 3 X 50 | | | 10% |
| **2** | Able to utilize and explore deeper sources of information through existing information media to better understand the concept of solutions and dissolution. Understand the process of dissolution and solubility and the factors that influence them. Can make solutions from solids and also carry out dilution. Responsible for results of the experiments carried out. | 1. Explain the meaning of solution.<br>2. Understand the dissolution and solubility processes and the factors that influence them.<br>3. Can make solutions with various concentrations.<br>4. Can dilute the solution. | **Criteria:**<br>Students can explain the meaning of a solution.<br>Students can understand the process of dissolution and solubility and the factors that influence it.<br>Students can make solutions with various concentrations.<br>Students can dilute solutions.<br><br>**Form of Assessment** : Practice / Performance | Student-centered learning approach (student-centered learning) Deductive learning method Strategy Lectures, discussions, presentations 3 X 50 | | | 10% |
| **3** | Able to utilize and explore deeper sources of information through existing information media to better understand the concept of solutions and dissolution. Understand the process of dissolution and solubility and the factors that influence them. Can make solutions from solids and also carry out dilution. Responsible for results of the experiments carried out. | 1. Explain the meaning of solution.<br>2. Understand the dissolution and solubility processes and the factors that influence them.<br>3. Can make solutions with various concentrations.<br>4. Can dilute the solution. | **Criteria:**<br>Students can explain the meaning of a solution.<br>Students can understand the process of dissolution and solubility and the factors that influence it.<br>Students can make solutions with various concentrations.<br>Students can dilute solutions.<br><br>**Form of Assessment** : Practical Assessment | Student-centered learning approach (student-centered learning) Deductive learning method Strategy Lectures, discussions, presentations 3 X 50 | | | 10% |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **4** | Able to utilize existing science and technology to better understand Rould's law, electrolyte and non-electrolyte solutions. Understand Roult's Law, the properties of electrolyte and non-electrolyte solutions. Able to analyze the colligative properties of solutions through experiments. Understand Responsible for the results of experiments carried out. Able to present the results experiments carried out. | 1. Understand Roult's Law, the properties of electrolyte and non-electrolyte solutions.<br>2. Analyze the colligative properties of solutions through experiments.<br>3. Present experimental results reports. | **Criteria:**<br>Students can understand Roult's Law, the properties of electrolyte and non-electrolyte solutions. Students can analyze the colligative properties of solutions through experiments. Students can present reports on experimental results.<br><br>**Form of Assessment** : Participatory Activities | Student-centered learning approach (student-centered learning) Deductive learning method Strategy Lectures, discussions, presentations 3 X 50 | | | 10% |
| **5** | Able to utilize existing science and technology to better understand Rould's law, electrolyte and non-electrolyte solutions. Understand Roult's Law, the properties of electrolyte and non-electrolyte solutions. Able to analyze the colligative properties of solutions through experiments. Understand Responsible for the results of experiments carried out. Able to present the results experiments carried out. | 1. Understand Roult's Law, the properties of electrolyte and non-electrolyte solutions.<br>2. Analyze the colligative properties of solutions through experiments.<br>3. Present experimental results reports. | **Criteria:**<br>Students can understand Roult's Law, the properties of electrolyte and non-electrolyte solutions. Students can analyze the colligative properties of solutions through experiments. Students can present reports on experimental results.<br><br>**Form of Assessment** : Participatory Activities | Student-centered learning approach (student-centered learning) Deductive learning method Strategy Lectures, discussions, presentations 3 X 50 | | | 10% |
| **6** | Able to utilize existing science and technology to better understand Rould's law, electrolyte and non-electrolyte solutions. Understand Roult's Law, the properties of electrolyte and non-electrolyte solutions. Able to analyze the colligative properties of solutions through experiments. Understand Responsible for the results of experiments carried out. Able to present the results experiments carried out. | 1. Understand Roult's Law, the properties of electrolyte and non-electrolyte solutions.<br>2. Analyze the colligative properties of solutions through experiments.<br>3. Present experimental results reports. | **Criteria:**<br>Students can understand Roult's Law, the properties of electrolyte and non-electrolyte solutions. Students can analyze the colligative properties of solutions through experiments. Students can present reports on experimental results.<br><br>**Form of Assessment** : Practical Assessment | Student-centered learning approach (student-centered learning) Deductive learning method Strategy Lectures, discussions, presentations 3 X 50 | | | 10% |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **7** | Able to utilize existing science and technology to better understand Rould's law, electrolyte and non-electrolyte solutions. Understand Roult's Law, the properties of electrolyte and non-electrolyte solutions. Able to analyze the colligative properties of solutions through experiments. Understand Responsible for the results of experiments carried out. Able to present the results experiments carried out. | 1. Understand Roult's Law, the properties of electrolyte and non-electrolyte solutions.<br>2. Analyze the colligative properties of solutions through experiments.<br>3. Present experimental results reports. | **Criteria:**<br>Students can understand Roult's Law, the properties of electrolyte and non-electrolyte solutions. Students can analyze the colligative properties of solutions through experiments. Students can present reports on experimental results. | Student-centered learning approach (student-centered learning) Deductive learning method Strategy Lectures, discussions, presentations 3 X 50 | | | 0% |
| **8** | Midterm exam | The indicators achieved are the indicators for the 1st Meeting to the 7th Meeting | **Criteria:**<br>According to the rubric<br><br>**Form of Assessment** :<br>Test | Midterm Exam 3 X 50 | | | 10% |
| **9** | Able to utilize existing science and technology to better understand the concepts of acidity, hydrolysis and titration. Understand the concepts of acidity, hydrolysis and titration and solubility products. Able to analyze the use of buffer solutions in life. | 1. Explain acid-base reactions<br>2. Calculate the pH of hydrolysis<br>3. Explain the effect of adding the same ion<br>4. Calculating the pH of the buffer solution<br>5. Create a titration curve<br>6. Calculate the solubility product | **Criteria:**<br>Students can explain acid base reactions Students can calculate the pH of hydrolysis Students can explain the effect of adding the same ion Students can calculate the pH of buffer solutions Students can make a titration curve Students can calculate the solubility product<br><br>**Form of Assessment** :<br>Participatory Activities | Student-centered learning approach (student-centered learning) Deductive learning method Strategy Lectures, discussions, presentations 3 X 50 | | | 10% |
| **10** | Able to utilize existing science and technology to better understand the concepts of acidity, hydrolysis and titration. Understand the concepts of acidity, hydrolysis and titration and solubility products. Able to analyze the use of buffer solutions in life. | 1. Explain acid-base reactions<br>2. Calculate the pH of hydrolysis<br>3. Explain the effect of adding the same ion<br>4. Calculating the pH of the buffer solution<br>5. Create a titration curve<br>6. Calculate the solubility product | **Criteria:**<br>Students can explain acid base reactions Students can calculate the pH of hydrolysis Students can explain the effect of adding the same ion Students can calculate the pH of buffer solutions Students can make a titration curve Students can calculate the solubility product<br><br>**Form of Assessment** :<br>Participatory Activities | Student-centered learning approach (student-centered learning) Deductive learning method Strategy Lectures, discussions, presentations 3 X 50 | | | 10% |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **11** | Able to utilize existing science and technology to better understand the concepts of acidity, hydrolysis and titration. Understand the concepts of acidity, hydrolysis and titration and solubility products. Able to analyze the use of buffer solutions in life. | 1. Explain acid-base reactions<br>2. Calculate the pH of hydrolysis<br>3. Explain the effect of adding the same ion<br>4. Calculating the pH of the buffer solution<br>5. Create a titration curve<br>6. Calculate the solubility product | **Criteria:**<br>Students can explain acid base reactions Students can calculate the pH of hydrolysis Students can explain the effect of adding the same ion Students can calculate the pH of buffer solutions Students can make a titration curve Students can calculate the solubility product<br><br>**Form of Assessment** : Practical Assessment | Student-centered learning approach (student-centered learning) Deductive learning method Strategy Lectures, discussions, presentations 3 X 50 | | | 10% |
| **12** | Able to utilize existing science and technology to better understand the concepts of acidity, hydrolysis and titration. Understand the concepts of acidity, hydrolysis and titration and solubility products. Able to analyze the use of buffer solutions in life. | 1. Explain acid-base reactions<br>2. Calculate the pH of hydrolysis<br>3. Explain the effect of adding the same ion<br>4. Calculating the pH of the buffer solution<br>5. Create a titration curve<br>6. Calculate the solubility product | **Criteria:**<br>Students can explain acid base reactions Students can calculate the pH of hydrolysis Students can explain the effect of adding the same ion Students can calculate the pH of buffer solutions Students can make a titration curve Students can calculate the solubility product | Student-centered learning approach (student-centered learning) Deductive learning method Strategy Lectures, discussions, presentations 3 X 50 | | | 0% |
| **13** | Able to utilize existing science and technology to better understand colloids in life. Understand the concept of colloid dispersion, Able to make colloids in a simple way. Able to present the results of colloid analysis in life. | 1. Explain the dispersion system.<br>2. Classify colloids based on the dispersed phase and dispersion.<br>3. Explain how to make and purify colloids.<br>4. Explain the use of colloids in everyday life. | **Criteria:**<br>Students can explain the dispersion system. Students can classify colloids based on the dispersed phase and dispersion. Students can explain how to make and purify colloids. Students can explain the use of colloids in everyday life.<br><br>**Form of Assessment** : Participatory Activities | Student-centered learning approach (student-centered learning) Deductive learning method Strategy Lectures, discussions, presentations 3 X 50 | | | 0% |
| **14** | Able to utilize existing science and technology to better understand colloids in life. Understand the concept of colloid dispersion, Able to make colloids in a simple way. Able to present the results of colloid analysis in life. | 1. Explain the dispersion system.<br>2. Classify colloids based on the dispersed phase and dispersion.<br>3. Explain how to make and purify colloids.<br>4. Explain the use of colloids in everyday life. | **Criteria:**<br>Students can explain the dispersion system. Students can classify colloids based on the dispersed phase and dispersion. Students can explain how to make and purify colloids. Students can explain the use of colloids in everyday life. | Student-centered learning approach (student-centered learning) Deductive learning method Strategy Lectures, discussions, presentations 3 X 50 | | | 0% |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **15** | Able to utilize existing science and technology to better understand colloids in life. Understand the concept of colloid dispersion, Able to make colloids in a simple way. Able to present the results of colloid analysis in life. | 1. Explain the dispersion system.<br>2. Classify colloids based on the dispersed phase and dispersion.<br>3. Explain how to make and purify colloids.<br>4. Explain the use of colloids in everyday life. | **Criteria:**<br>Students can explain the dispersion system. Students can classify colloids based on the dispersed phase and dispersion. Students can explain how to make and purify colloids. Students can explain the use of colloids in everyday life. | Student-centered learning approach (student-centered learning) Deductive learning method Strategy Lectures, discussions, presentations 3 X 50 | | | 0% |
| **16** | | | | | | | 0% |

**Evaluation Percentage Recap: Project Based Learning**

| No | Evaluation | Percentage |
|---|---|---|
| 1. | Participatory Activities | 50% |
| 2. | Practical Assessment | 30% |
| 3. | Practice / Performance | 10% |
| 4. | Test | 10% |
| | | 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** 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.