



Universitas Negeri Surabaya
Faculty of Engineering,
Mechanical Engineering Undergraduate Study Program

Document Code

SEMESTER LEARNING PLAN

Courses	CODE	Course Family	Credit Weight	SEMESTER	Compilation Date																																												
Engineering Chemistry	2120102032		T=2 P=0 ECTS=3.18	1	July 18, 2024																																												
AUTHORIZATION	SP Developer		Course Cluster Coordinator		Study Program Coordinator																																												
		Ir. Priyo Heru Adiwibowo, S.T., M.T.																																												
Learning model	Project Based Learning																																																
Program Learning Outcomes (PLO)	PLO study program that is charged to the course																																																
	Program Objectives (PO)																																																
	PLO-PO Matrix																																																
		<table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td style="width: 10%; text-align: center;">P.O</td> <td colspan="15"></td> </tr> </table>					P.O																																										
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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> <td rowspan="2" style="width: 5%; text-align: center;">P.O</td> <td colspan="16" style="text-align: center;">Week</td> </tr> <tr> <td style="width: 5%; text-align: center;">1</td> <td style="width: 5%; text-align: center;">2</td> <td style="width: 5%; text-align: center;">3</td> <td style="width: 5%; text-align: center;">4</td> <td style="width: 5%; text-align: center;">5</td> <td style="width: 5%; text-align: center;">6</td> <td style="width: 5%; text-align: center;">7</td> <td style="width: 5%; text-align: center;">8</td> <td style="width: 5%; text-align: center;">9</td> <td style="width: 5%; text-align: center;">10</td> <td style="width: 5%; text-align: center;">11</td> <td style="width: 5%; text-align: center;">12</td> <td style="width: 5%; text-align: center;">13</td> <td style="width: 5%; text-align: center;">14</td> <td style="width: 5%; text-align: center;">15</td> <td style="width: 5%; text-align: center;">16</td> </tr> </table>															P.O	Week																1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
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Short Course Description	Understand the basics of chemical engineering knowledge related to the field of mechanical engineering. Properties of liquid and gas fuels; Combustion processes with theoretical and excessive air; Analysis methods for Proximate and Ultimate solid fuels; Combustion process mechanisms; Water pollution, solid, dissolved and insoluble substances; Water sources for industry and their handling; Hardness and handling; Acidity and Alkalinity. The process of removing gas from boiler filling water; The result of the presence of certain substances in the steam boiler filling water is that it causes an overflow.																																																
References	Main :																																																
	<ol style="list-style-type: none"> 1. Petrucci, Ralph H., dkk. 2011. General Chemistry: Principles and Modern Application. 10th ed. Pearson Prentice Hall: USA; 2. Laird, Brian B. 2009. University of Chemistry. New York: McGraw-Hill 3. Whitten KW, et. al. General Chemistry London, Saunders College 4. Ir. Dwi Heru Sutjahjo, MT. Buku Ajar Kimia Teknik 5. Drs. Hiskia Achmad. Wujud Zat dan Keseimbangan Kimia; 																																																
	Supporters:																																																
Supporting lecturer	Prof. Dr. Ir. Aisyah Endah Palupi, M.Pd. Dr. Mohammad Effendy, S.T., M.T.																																																
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 differentiate types of matter and differentiate between physical changes and chemical changes properly and correctly	<ol style="list-style-type: none"> 1.Explain the relationship between chemistry in everyday life 2.explain the steps of the scientific method 3.classify materials 4.explain the meaning of energy and types of energy 5.explain physical and chemical changes 6.explain the differences between atoms, molecules, elements, compounds, ions and mixtures and examples 	Criteria: According to the Assessment Rubric	Lectures, discussions, questions and answers, exercises and assignments 2 X 50			0%
2	Understand atomic structure	<ol style="list-style-type: none"> 1.Explain the discovery of the particles that make up atoms (electrons, neutrons and protons) 2.Explains the development of atomic models (Thomson, Rutheford, Bohr and Quantum Mechanics atomic models) 3.Explain and write electron configurations 	Criteria: According to the Assessment Rubric	Lectures, discussions, questions and answers, exercises and assignments 2 X 50			0%
3	Understand the periodic system of elements	<ol style="list-style-type: none"> 1.Explains the development of the grouping of 13 elements 2.Analyze groups, periods and electron configurations on the periodic table 3.Explains several periodic variations in the properties of 13 elements 	Criteria: According to the Assessment Rubric	Lectures, discussions, questions and answers, exercises and assignments 2 X 50			0%

4	Describe the occurrence of chemical bonds (ionic and covalent bonds)	<ol style="list-style-type: none"> 1.Explain stable electron configurations 2.Explain the process of forming ionic bonds and examples of compounds 3.Compare the process of forming covalent bonds and examples of compounds. . 4.Explain bond polarity and its relationship to electronegativity 5.Explain molecular polarity. 6.Predict the types of bonds that occur in various compounds 7.Compare the physical properties of ionic compounds with covalent compounds 	Criteria: According to the Assessment Rubric	Lectures, discussions, questions and answers, exercises and assignments 2 X 50			0%
5	Describe the occurrence of chemical bonds (metal bonds, hydrogen and several types of chemical forces)	<ol style="list-style-type: none"> 1.Explain the process of forming metallic bonds 2.Explain the differences between the physical properties of metals and non-metals 3.Explain hydrogen bonds and their properties 4.Describe several types of chemical forces 5.Provide the molecular formula and name 	Criteria: According to the Assessment Rubric	Lectures, discussions, questions and answers, exercises and assignments 2 X 50			0%
6	Understand the basic concepts of stoichiometry	<ol style="list-style-type: none"> 1.Explain the basic laws of chemistry 2.Explain molecular weight and formula weight 3.Explain the concept of mole 4.Explain the relationship between mass percent composition and chemical formula and vice versa 	Criteria: According to the Assessment Rubric	Lectures, discussions, questions and answers, exercises and assignments 2 X 50			0%

7	Understand the basic concepts of stoichiometry	<ol style="list-style-type: none"> Analyze elements by experimentally determining carbon, hydrogen and oxygen Write and balance 13 chemical reactions Calculate stoichiometry by using chemical formulas as conversion factors Explain and determine the limiting reagent Explain and determine the percent yield of a reaction 	Criteria: According to the Assessment Rubric	Lectures, discussions, questions and answers, exercises and assignments 2 X 50		0%
8	U.S.S	U.S.S	Criteria: According to the Assessment Rubric	USS 2X50		0%
9	Understand the basic concepts of Electrochemistry	<ol style="list-style-type: none"> Explain the basic concepts of electrochemistry Determine the oxidation number of an element of a molecule Balancing redox reaction equations Explain redox reactions in galvanic cells 	Criteria: According to the Assessment Rubric	Presentations, Lectures, discussions, questions and answers, exercises and assignments 2 X 50		0%
10	Understanding the Concept of Cell Potential	<ol style="list-style-type: none"> Explain the meaning of cell potential. Explain the meaning of standard electrode potential Explain how to determine standard electrode potential Explain the voltaic series Calculate the cell potential value 	Criteria: According to the Assessment Rubric	Lectures, discussions, questions and answers, exercises and assignments 2 X 50		0%
11	Understanding the Concept of Electrolysis Cells	<ol style="list-style-type: none"> Explain the meaning of an electrolysis cell Explain the relationship between cell electrode potential and Gibbs free energy and equilibrium constant Explain the corrosion process Explains the 13-day application of electrochemistry in daily life, including metal plating and metal refining 	Criteria: According to the Assessment Rubric	Presentations, discussions, questions and answers, exercises and assignments 2 X 50		0%

12	Understand the grouping of hydrocarbon compounds and explain petroleum processes	<ol style="list-style-type: none"> 1. Describe the peculiarities of carbon atoms in forming hydrocarbon compounds 2. Classify hydrocarbon compounds 3. Describe the process of petroleum formation 4. Explains the technique for separating petroleum into 13 fractions and their uses 	Criteria: According to the Assessment Rubric	Presentations, discussions, questions and answers, exercises and assignments 2 X 50			0%
13	Understand the classification and characteristics of fuel	<ol style="list-style-type: none"> 1. Explain the classification of fuels 2. Explain the properties and characteristics of fuel 3. Explain several things about fuel performance evaluation 	Criteria: According to the Assessment Rubric	Presentations, discussions, questions and answers, exercises and assignments 2 X 50			0%
14	Understand the basic concepts of polymers	<ol style="list-style-type: none"> 1. Explain the meaning of polymer 2. Explain the classification of polymers based on monomer type, origin, properties and uses 3. Distinguish between addition polymerization and condensation polymerization 	Criteria: According to the Assessment Rubric	Lectures, discussions, questions and answers, exercises and assignments 2 X 50			0%
15	Explain the benefits and impacts of using polymers	<ol style="list-style-type: none"> 1. Explain the benefits of polymers in life 2. Explain the impact of using polymers 	Criteria: According to the Assessment Rubric	Lectures, discussions, questions and answers, exercises and assignments 2 X 50			0%
16	Understand all course material	UAS	Criteria: According to the Assessment Rubric	UAS 2 X 50			0%

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** 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.