



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																																																																																																				
Surface Chemistry	4720103123	Physical Chemistry	T=3	P=0	ECTS=4.77	5	June 20, 2022																																																																																																				
AUTHORIZATION	SP Developer		Course Cluster Coordinator			Study Program Coordinator																																																																																																					
	Prof. Dr. Harun Nasrudin, M.S; Bertha Yonata, S.Pd.,M.Pd.; Dian Novita, S.T.,M.Pd		Prof. Dr. Suyono, M.Pd.			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	Students are skilled in using tools to carry out viscosity, surface tension, adsorption and colloid analysis. (PLO2) Students have knowledge of surface properties as well as the design and implementation of surface properties (viscosity, surface tension, adsorption and colloids) (PLO4) Students have the ability to communicate the results of viscosity, surface tension, adsorption and colloid analyzes so that they are able to develop a conceptual framework to formulate actions or alternative actions in solving chemical problems in life. (PLO6) Students have the ability to adapt to developments in chemistry by designing, implementing and reporting the results of experiments on viscosity, surface tension, adsorption and colloids.																																																																																																									
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	PLO-PO Matrix																																																																																																										
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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;"> <thead> <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> </thead> <tbody> <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> </tbody> </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																
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Short Course Description	Study of surface properties, capillarity symptoms, surface thermodynamics, adsorption, surfactants, detergents, emulsions, bases and aerosols, chemisorption and catalysts																																																																																																										
References	Main :																																																																																																										
	<ol style="list-style-type: none"> 1. Duncan J.S. 2004. Introduction to Colloid and Surface Chemistry. Butter Worths 2. Adamson dan Gost AP, 1977, Physical Chemistry of Surfaces 6thed. New York : Willey Inter Science. 3. Journal kimia / Chemical society 																																																																																																										

		Supporters:					
Supporting lecturer		Prof. Dr. Harun Nasrudin, M.S. Dian Novita, S.T., M.Pd. Bertha Yonata, 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	Understand fluid viscosity	1.Explain the meaning and scope 2.Explain the various types of viscometers	Criteria: Assessment is carried out on the following aspects: Participation during lectures, carried out through observations (weight 2) UTS and UAS, carried out once by assessing all relevant indicators through written examinations, averaged and given a weight (2) Assignments given a weight (3) NA final score is (participation score x2) (assignment score x 3) (UTS score x 2) UAS score (3) divided by 10	Discussion 3 X 50	Discussion 3 x 50	Material: Viscosity Reference: <i>Duncan JS 2004. Introduction to Colloid and Surface Chemistry. Butter Worths</i> Material: Viscosity Literature: <i>Adamson and Gost AP, 1977, Physical Chemistry of Surfaces 6thed. New York : Willey Inter Science.</i>	0%
2	Understand fluid viscosity	1.Explain the viscosity coefficient 2.Explain the working principle of viscosity 3.Explain the various ways of measuring viscosity 4.Explain the factors that influence viscosity	Criteria: Assessment is carried out on the following aspects: Participation during lectures, carried out through observations (weight 2) UTS and UAS, carried out once by assessing all relevant indicators through written examinations, averaged and given a weight (2) Assignments given a weight (3) NA final score is (participation score x2) (assignment score x 3) (UTS score x 2) UAS score (3) divided by 10	Practice Questions, Presentations and Discussions 3 X 50	Practice Questions, Presentations and Discussions 3 x 50	Material: Viscosity Reference: <i>Duncan JS 2004. Introduction to Colloid and Surface Chemistry. Butter Worths</i> Material: Viscosity Literature: <i>Adamson and Gost AP, 1977, Physical Chemistry of Surfaces 6thed. New York : Willey Inter Science.</i>	0%
3	Understanding the thermodynamic properties of surfaces for surface tension studies	Explain the properties of surfaces in liquid matter	Criteria: Able to explain the surface properties of liquid matter	Discussion 3 X 50	Discussion 3 x 50	Material: Surface Tension Reference: <i>Duncan JS 2004. Introduction to Colloid and Surface Chemistry. Butter Worths</i>	0%
4	Understanding the thermodynamic properties of surfaces for surface tension studies	Explain surface tension	Criteria: Participation during lectures is carried out through observation (weight 2)UTS and UAS, carried out once by assessing all relevant indicators through written examinations, averaged and given a weight (2)Assignments are given a weight (3)The final NA is (participation value x2) (Assignment score x 3) (UTS score x 2) UAS score (3) divided by 10	Discussion, practice questions 3 X 50	Discussion, practice questions 3 x 50	Material: Surface Tension Reference: <i>Duncan JS 2004. Introduction to Colloid and Surface Chemistry. Butter Worths</i>	0%

5	Understanding the thermodynamic properties of surfaces for adsorption studies	Explain the properties of surfaces in solid materials	<p>Criteria: Participation during lectures is carried out through observation (weight 2) UTS and UAS, carried out once by assessing all relevant indicators through written examinations, averaged and given a weight (2) Assignments are given a weight (3) The final NA is (participation value x 2) (Assignment score x 3) (UTS score x 2) UAS score (3) divided by 10</p> <p>Form of Assessment : Participatory Activities</p>	Discussion 3 X 50	Discussion 3 x 50	<p>Material: Adsorption Bibliography: <i>Duncan JS 2004. Introduction to Colloid and Surface Chemistry. Butter Worths</i></p>	0%
6	Understanding the thermodynamic properties of surfaces for adsorption studies	Explain the properties of surfaces in solid materials	<p>Criteria: Able to explain the surface properties of solid materials</p>	Discussion 3 X 50	Discussion 3 x 50	<p>Material: Adsorption Bibliography: <i>Duncan JS 2004. Introduction to Colloid and Surface Chemistry. Butter Worths</i></p>	0%
7	Understand the colloid system and its use in daily life	colloid properties	<p>Criteria: Assessment is carried out on the following aspects: Participation during lectures, carried out through observations (weight 2) UTS and UAS, carried out once by assessing all relevant indicators through written examinations, averaged and given a weight (2) Assignments given a weight (3) NA final score is (participation score x 2) (assignment score x 3) (UTS score x 2) UAS score (3) divided by 10</p> <p>Form of Assessment : Participatory Activities</p>	Discussion, practice questions 3 X 50	Discussion, practice questions 3 x 50	<p>Material: Colloids Reference: <i>Duncan JS 2004. Introduction to Colloid and Surface Chemistry. Butter Worths</i></p> <p>Material: Colloids References: <i>Adamson and Gost AP, 1977, Physical Chemistry of Surfaces 6th ed. New York : Willey Inter Science.</i></p>	0%

8	UTS	<ol style="list-style-type: none"> 1. Definition and scope 2. Various types of viscometers 3. Viscosity coefficient, 4. The working principle of a viscometer 5. Viscosity measurement 6. Factors that influence viscosity 7. Surface properties in surface tension study material 	<p>Criteria:</p> <ol style="list-style-type: none"> 1. Able to explain the meaning and scope 2. Able to explain various types of viscometers 3. Able to explain the viscosity coefficient 4. Able to explain the working principle of a viscometer 5. Able to explain viscosity measurements 6. Able to analyze factors that influence viscosity 7. Able to explain the surface properties of surface tension materials <p>Form of Assessment : Test</p>	Written test 3 X 50	Written test 3 x 50	<p>Material: Viscosity Reference: <i>Duncan JS 2004. Introduction to Colloid and Surface Chemistry. Butter Worths</i></p> <p>Material: Surface Tension Reference: <i>Duncan JS 2004. Introduction to Colloid and Surface Chemistry. Butter Worths</i></p> <p>Material: Adsorption Bibliography: <i>Duncan JS 2004. Introduction to Colloid and Surface Chemistry. Butter Worths</i></p> <p>Material: Colloids Reference: <i>Duncan JS 2004. Introduction to Colloid and Surface Chemistry. Butter Worths</i></p>	20%
9	<ol style="list-style-type: none"> 1. Able to adapt to developments in chemical science through designing, implementing and analyzing the results of viscosity experiments based on phenomena obtained in the surrounding area and a study of scientific literature. 2. Skilled in using tools to carry out viscosity analysis 	<ol style="list-style-type: none"> 1. Explain the working principle of viscosity 2. Carry out various methods of measuring viscosity 3. Analyze the factors that influence viscosity 4. Develop designs and carry out experiments related to viscosity 5. Conduct experiments related to viscosity 	<p>Criteria:</p> <ol style="list-style-type: none"> 1. Able to explain the working principle of viscosity 2. Able to carry out various methods of measuring viscosity 3. Able to analyze factors that influence viscosity 4. Able to prepare designs and carry out experiments related to viscosity 5. Able to carry out experiments related to viscosity <p>Form of Assessment : Practical Assessment</p>	<ol style="list-style-type: none"> 1. Basic questions on the topic of viscosity 2. Design a product plan 3. Develop a manufacturing schedule 4. Monitor product manufacturing <p>3 X 50</p>	<ol style="list-style-type: none"> 1. Basic questions on the topic of viscosity 2. Design a product plan 3. Develop a manufacturing schedule 4. Monitor product manufacturing <p>3 x 50</p>	<p>Material: Viscosity Reference: <i>Duncan JS 2004. Introduction to Colloid and Surface Chemistry. Butter Worths</i></p>	5%
10	<ol style="list-style-type: none"> 1. Able to adapt to developments in chemical science through designing, implementing and analyzing the results of surface tension experiments based on phenomena obtained in the surrounding area and studying scientific literature. 2. Skilled in using tools to carry out surface tension analysis 	<ol style="list-style-type: none"> 1. Develop designs and carry out experiments related to surface tension 2. Conduct experiments related to surface tension 	<p>Criteria:</p> <ol style="list-style-type: none"> 1. Able to prepare designs and carry out experiments related to surface tension 2. Able to carry out experiments related to surface tension <p>Form of Assessment : Practical Assessment</p>	<ol style="list-style-type: none"> 1. Basic questions on the topic of surface tension 2. Design a product plan 3. Develop a manufacturing schedule 4. Monitor product manufacturing <p>3 X 50</p>	<ol style="list-style-type: none"> 1. Basic questions on the topic of surface tension 2. Design a product plan 3. Develop a manufacturing schedule 4. Monitor product manufacturing <p>3 x 50</p>	<p>Material: Surface Tension Reference: <i>Duncan JS 2004. Introduction to Colloid and Surface Chemistry. Butter Worths</i></p>	5%

11	<p>1. Able to adapt to developments in chemical science through designing, implementing and analyzing the results of adsorption experiments based on phenomena obtained in the surrounding area and studying scientific literature.</p> <p>2. Skilled in using tools to carry out adsorption analysis</p>	<p>1. Develop designs and carry out experiments related to adsorption</p> <p>2. Carrying out experiments related to adsorption</p>	<p>Criteria:</p> <p>1. The assessment is carried out on the following aspects:</p> <p>2. Participation during lectures is carried out through observation (weight 2) UTS and UAS, carried out once by assessing all relevant indicators through written examinations, averaged and given a weight (2) Assignments are given a weight (3) The final NA is (participation value x 2) (Assignment score x 3) (UTS score x 2) UAS score (3) divided by 10</p> <p>Form of Assessment : Practical Assessment</p>	<p>1. Basic questions on adsorption topics</p> <p>2. Design a product plan</p> <p>3. Develop a manufacturing schedule</p> <p>4. Monitor product manufacturing 3 X 50</p>	<p>1. Basic questions on adsorption topics</p> <p>2. Design a product plan</p> <p>3. Develop a manufacturing schedule</p> <p>4. Monitor product manufacturing 3 x 50</p>	<p>Material: Adsorption</p> <p>Bibliography: <i>Duncan JS 2004. Introduction to Colloid and Surface Chemistry. Butter Worths</i></p>	5%
12	<p>1. Able to adapt to developments in chemistry through designing, implementing and analyzing the results of colloid experiments based on phenomena obtained in the surrounding area and a study of scientific literature.</p> <p>2. Skilled in using tools in carrying out colloid analysis</p>	<p>1. Able to design and carry out experiments related to colloids</p> <p>2. Carrying out experiments related to colloids</p>	<p>Criteria:</p> <p>1. The assessment is carried out on the following aspects:</p> <p>2. Participation during lectures is carried out through observation (weight 2) UTS and UAS, carried out once by assessing all relevant indicators through written examinations, averaged and given a weight (2) Assignments are given a weight (3) The final NA is (participation value x 2) (Assignment score x 3) (UTS score x 2) UAS score (3) divided by 10</p> <p>Form of Assessment : Practical Assessment</p>	<p>1. Basic questions on colloid topics</p> <p>2. Design a product plan</p> <p>3. Develop a manufacturing schedule</p> <p>4. Monitor product manufacturing 3 X 50</p>	<p>1. Basic questions on colloid topics</p> <p>2. Design a product plan</p> <p>3. Develop a manufacturing schedule</p> <p>4. Monitor product manufacturing 3x 50</p>	<p>Material: Colloids</p> <p>Reference: <i>Duncan JS 2004. Introduction to Colloid and Surface Chemistry. Butter Worths</i></p>	5%

13	Communicate the results of design, implementation and analysis of colloid experimental results based on phenomena obtained in the surroundings and scientific literature studies.	analysis and conclusion of project results related to material viscosity	<p>Criteria:</p> <ol style="list-style-type: none"> 1.The assessment is carried out on the following aspects: 2.Participation during lectures is carried out through observation (weight 2)UTS and UAS, carried out once by assessing all relevant indicators through written examinations, averaged and given a weight (2)Assignments are given a weight (3)The final NA is (participation value x2) (Assignment score x 3) (UTS score x 2) UAS score (3) divided by 10 <p>Form of Assessment : Project Results Assessment / Product Assessment</p>	<ol style="list-style-type: none"> 1. Assessment of the results (assess the outcome) 2. Evaluation of the experience (evaluation the experience) 3 X 50 	<ol style="list-style-type: none"> 1. Assessment of results (assess the outcome) 2. Evaluation of experience (evaluation of the experience) 3 x 50 	<p>Material: Viscosity Reference: <i>Duncan JS 2004. Introduction to Colloid and Surface Chemistry. Butter Worths</i></p>	15%
14	Communicate the results of design, implementation and analysis of surface tension and adsorption experimental results based on phenomena obtained in the surroundings and scientific literature studies.	analysis and conclusion of project results related to surface tension and adsorption materials	<p>Criteria:</p> <p>Able to analyze and conclude project results related to surface tension and adsorption materials</p> <p>Form of Assessment : Project Results Assessment / Product Assessment</p>	<ol style="list-style-type: none"> 1. Assessment of the results (assess the outcome) 2. Evaluation of the experience (evaluation the experience) 3 X 50 	<ol style="list-style-type: none"> 1. Assessment of results (assess the outcome) 2. Evaluation of experience (evaluation of the experience) 3 x 50 	<p>Material: Surface Tension Reference: <i>Duncan JS 2004. Introduction to Colloid and Surface Chemistry. Butter Worths</i></p> <p>Material: Adsorption Bibliography: <i>Duncan JS 2004. Introduction to Colloid and Surface Chemistry. Butter Worths</i></p>	15%
15	Communicate the results of design, implementation and analysis of adsorption experimental results based on phenomena obtained in the surroundings and scientific literature studies.	analysis and conclusion of project results related to colloidal materials	<p>Criteria:</p> <p>Participation during lectures is carried out through observation (weight 2)UTS and UAS, carried out once by assessing all relevant indicators through written examinations, averaged and given a weight (2)Assignments are given a weight (3)The final NA is (participation value x2) (Assignment score x 3) (UTS score x 2) UAS score (3) divided by 10</p> <p>Form of Assessment : Project Results Assessment / Product Assessment</p>	<ol style="list-style-type: none"> 1. Assessment of the results (assess the outcome) 2. Evaluation of the experience (evaluation the experience) 3 X 50 	<ol style="list-style-type: none"> 1. Assessment of results (assess the outcome) 2. Evaluation of experience (evaluation of the experience) 3 x 50 	<p>Material: Colloids Reference: <i>Duncan JS 2004. Introduction to Colloid and Surface Chemistry. Butter Worths</i></p>	15%

16	<p>1. Understanding the thermodynamic properties of surfaces for adsorption studies</p> <p>2. Understand the colloid system and its use in everyday life</p>	<p>1. adsorption properties</p> <p>2. Explain the state of colloids in terms of particle size, type of colloid and its properties</p> <p>3. Explain the kinetic properties of colloids</p> <p>4. Explain the optical properties of colloids</p> <p>5. Explain the stability of colloids</p> <p>6. Mention the uses of colloids in everyday life</p>	<p>Criteria:</p> <p>1. Be able to explain the properties of adsorption</p> <p>2. Able to explain the state of colloids in terms of particle size, type of colloid and its properties</p> <p>3. Be able to explain the kinetic properties of colloids</p> <p>4. Be able to explain the optical properties of colloids</p> <p>5. Be able to explain colloid stability</p> <p>6. Be able to state the uses of colloids in everyday life</p> <p>Form of Assessment : Project Results Assessment / Product Assessment</p>	3 X 50 project presentation	project presentation 3 x 50	<p>Material: viscosity, surface tension, adsorption, and colloids</p> <p>Reference: <i>Duncan JS 2004. Introduction to Colloid and Surface Chemistry. Butter Worths</i></p>	15%
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Evaluation Percentage Recap: Project Based Learning

No	Evaluation	Percentage
1.	Project Results Assessment / Product Assessment	60%
2.	Practical Assessment	20%
3.	Test	20%
		100%

Notes

- 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.
- 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.
- 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.
- 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.
- 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.
- 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.
- Forms of assessment:** test and non-test.
- 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.
- 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.
- Learning materials** are details or descriptions of study materials which can be presented in the form of several main points and sub-topics.
- 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%.
- TM=Face to face, PT=Structured assignments, BM=Independent study.