



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

Document
Code

SEMESTER LEARNING PLAN

Courses	CODE	Course Family	Credit Weight	SEMESTER	Compilation Date																																																																																																				
Basics of Chemical Separation	8420403300	Analytical Chemistry	T=2 P=0 ECTS=3.18	3	June 20, 2022																																																																																																				
AUTHORIZATION	SP Developer		Course Cluster Coordinator		Study Program Coordinator																																																																																																				
	Rusmini S.Pd., M.Si.		Dr. Maria Monica Sianita, M.Si.		Prof. Dr. Utiya Azizah, M.Pd.																																																																																																				
Learning model	Case Studies																																																																																																								
Program Learning Outcomes (PLO)	PLO study program which is charged to the course																																																																																																								
	PLO-11	Able to demonstrate knowledge related to theoretical concepts about structure, dynamics and energy, as well as basic principles of separation, analysis, synthesis and characterization of chemicals (CPL 1)																																																																																																							
	Program Objectives (PO)																																																																																																								
	PO - 1	Students have knowledge of the concept of chemical separation techniques in terms of chemical structure, energetics and chemical analysis including distillation, extraction, chromatography, electroanalysis and membrane techniques.																																																																																																							
	PO - 2	Students are skilled in using tools to carry out chemical separation techniques including distillation, extraction, chromatography, electroanalysis and membrane techniques																																																																																																							
	PO - 3	Students have the ability to collaborate and be responsible in carrying out chemical separations including distillation, extraction, chromatography, electroanalysis and membrane techniques																																																																																																							
	PO - 4	Students have the ability to communicate analysis of chemical separation results including distillation, extraction, chromatography, electroanalysis and membrane techniques																																																																																																							
	PLO-PO Matrix																																																																																																								
		<table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th style="width: 10%;">P.O</th> <th style="width: 10%;">PLO-11</th> <th colspan="4"></th> </tr> </thead> <tbody> <tr><td>PO-1</td><td></td><td></td><td></td><td></td></tr> <tr><td>PO-2</td><td></td><td></td><td></td><td></td></tr> <tr><td>PO-3</td><td></td><td></td><td></td><td></td></tr> <tr><td>PO-4</td><td></td><td></td><td></td><td></td></tr> </tbody> </table>				P.O	PLO-11					PO-1					PO-2					PO-3					PO-4																																																																														
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Short Course Description	Study of chemical separation techniques in terms of chemical structure, energetics and chemical analysis including distillation, extraction, chromatography, membrane and electroanalysis techniques followed by supporting laboratory activities so that students are able to master related concepts, are skilled in using tools, are able to work together and be responsible and can communicate their knowledge and skills scientifically.																																																																																																								
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	<ol style="list-style-type: none"> 1. Day, Underwood, Ray 2002. Kimia Analisis Kuantitatif (terjemahan). Jakarta: Erlangga 2. Harvey, D.2000. Modern Analytical Chemistry . Int.Ed. Singapore: Mc Graw Hill 3. Pecksook, et al. 1976. Modern Methods of Analytical Chemistry 2nd. New York: John Wiley and Sons 4. Soebagio, Budiasih, E, Ibnu, S, Widarti, H.R, Munzil. 2001. Kimia Analitik II (Common Book). Malang: IMSTEP – JICA FMIPA Universitas Negeri Malang 																																																																																																								
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Supporting lecturer	Prof. Dr. Pirim Setiarso, M.Si. Dr. Maria Monica Sianita Basukiwardojo, M.Si. Prof. Dr. Utiya Azizah, M.Pd. Dr. Sukarmin, M.Pd. Rusmini, S.Pd., M.Si. Prof. Dr. Nita Kusumawati, S.Si., M.Sc. Dr. Rosalina Eka Permatasari, 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 the purpose, benefits, and basics of separation in general and understand the basic concepts of distillation, single distillation, multilevel (fractional) distillation, and be able to carry out separation by distillation	Mention the objectives, benefits and classify the basics of separation and explain the basic concepts of distillation and single distillation	Criteria: attached Form of Assessment : Participatory Activities	Lectures, questions and answers, assignments, 2 X 50		Material: distillation References: <i>Soebagio, Budiasih, E, Ibnu, S, Widarti, HR, Munzil. 2001. Analytical Chemistry II (Common Book). Malang: IMSTEP – JICA FMIPA State University of Malang</i>	5%
2	Understand the purpose, benefits, and basics of separation in general and understand the basic concepts of distillation, single distillation, multilevel (fractional) distillation, and be able to carry out separation by distillation	Mention the objectives, benefits and classify the basics of separation and explain the basic concepts of distillation and single distillation	Criteria: attached	Lectures, questions and answers, assignments, 2 X 50		Material: distillation References: <i>Soebagio, Budiasih, E, Ibnu, S, Widarti, HR, Munzil. 2001. Analytical Chemistry II (Common Book). Malang: IMSTEP – JICA FMIPA State University of Malang</i>	5%
3	Understand the basic calculations in extraction, successive extraction. Extraction of metal ions by chelation, Craig extraction, and skilled separation by extraction	Explain the basic concepts of extraction, sequential extraction and metal ion extraction	Criteria: attached Forms of Assessment : Participatory Activities, Project Results Assessment / Product Assessment	Lectures, questions and answers, assignments, demonstrations, 2 X 50		Material: extraction Bibliography: <i>Soebagio, Budiasih, E, Ibnu, S, Widarti, HR, Munzil. 2001. Analytical Chemistry II (Common Book). Malang: IMSTEP – JICA FMIPA State University of Malang</i> Material: extraction Bibliography: Day, Underwood, Ray 2002. Quantitative Analytical Chemistry (translation). Jakarta: Erlangga	5%
4	Understand the basic calculations in extraction, successive extraction. Extraction of metal ions by chelation, Craig extraction, and skilled separation by extraction	Explain the basic concepts of extraction, sequential extraction and metal ion extraction	Criteria: attached Form of Assessment : Participatory Activities	Lectures, questions and answers, assignments, demonstrations, 2 X 50		Material: extraction Bibliography: <i>Soebagio, Budiasih, E, Ibnu, S, Widarti, HR, Munzil. 2001. Analytical Chemistry II (Common Book). Malang: IMSTEP – JICA FMIPA State University of Malang</i> Material: extraction Bibliography: Day, Underwood, Ray 2002. Quantitative Analytical Chemistry (translation). Jakarta: Erlangga	5%

5	Understand the basic concepts of chromatography, chromatography classification, chromatography analysis techniques and be skilled in carrying out separations using chromatography	Explain the classification of chromatography and chromatographic analysis techniques	Criteria: attached Form of Assessment : Participatory Activities	Lectures, questions and answers, assignments, practice questions 2 X 50		Material: chromatography References: Day, Underwood, Ray 2002. <i>Quantitative Analytical Chemistry (translation)</i> . Jakarta: Erlangga Material: chromatography Reference: Harvey, D.2000. <i>Modern Analytical Chemistry. Int. Ed. Singapore: McGraw Hill</i>	5%
6	Understand the basic concepts of chromatography, chromatography classification, chromatography analysis techniques and be skilled in carrying out separations using chromatography	Explain the classification of chromatography and chromatographic analysis techniques	Criteria: attached Form of Assessment : Participatory Activities	Lectures, questions and answers, assignments, practice questions 2 X 50		Material: chromatography References: Day, Underwood, Ray 2002. <i>Quantitative Analytical Chemistry (translation)</i> . Jakarta: Erlangga Material: chromatography Reference: Harvey, D.2000. <i>Modern Analytical Chemistry. Int. Ed. Singapore: McGraw Hill</i>	10%
7	Carry out separation by means of distillation, extraction and chromatography	Skilled in carrying out separations by means of distillation, extraction and chromatography	Criteria: attached Form of Assessment : Participatory Activities	Practical work on distillation, extraction and chromatography 5 X 50		Material: extraction distillation and chromatography References: Day, Underwood, Ray 2002. <i>Quantitative Analytical Chemistry (translation)</i> . Jakarta: Erlangga Material: extraction distillation and chromatography References: Soebagio, Budiasih, E, Ibnu, S, Widarti, HR, Munzil. 2001. <i>Analytical Chemistry II (Common Book)</i> . Malang: IMSTEP – JICA FMIPA State University of Malang Material: extraction distillation and chromatography References: Harvey, D.2000. <i>Modern Analytical Chemistry. Int. Ed. Singapore: McGraw Hill</i>	10%

8	UTS	meeting indicators 1-7	<p>Criteria: attached</p> <p>Form of Assessment : Project Results Assessment / Product Assessment, Test</p>	written test 2 X 50		<p>Material: extraction distillation and chromatography References: Day, Underwood, Ray 2002. <i>Quantitative Analytical Chemistry (translation)</i>. Jakarta: Erlangga</p> <p>Material: extraction distillation and chromatography References: Harvey, D.2000. <i>Modern Analytical Chemistry</i>. Int. Ed. Singapore: McGraw Hill</p> <p>Material: extraction distillation and chromatography References: Pecksok, et al. 1976. <i>Modern Methods of Analytical Chemistry 2nd</i>. New York: John Wiley and Sons</p> <p>Material: extraction distillation and chromatography References: Soebagio, Budiasih, E, Ibnu, S, Widarti, HR, Munzil. 2001. <i>Analytical Chemistry II (Common Book)</i>. Malang: IMSTEP – JICA FMIPA State University of Malang</p>	15%
9	Understand the basics of separation by means of electroanalysis, and be skilled in carrying out separations by means of electroanalysis	Explain the basic concepts of electroanalysis	<p>Criteria: attached</p> <p>Form of Assessment : Participatory Activities</p>	Lecture, question and answer 2 X 50		<p>Material: electroanalysis References: Pecksok, et al. 1976. <i>Modern Methods of Analytical Chemistry 2nd</i>. New York: John Wiley and Sons</p>	0%
10	Understand the basics of separation by means of electroanalysis, and be skilled in carrying out separations by means of electroanalysis	Explain the basic concepts of electrogravimetry	<p>Criteria: attached</p> <p>Forms of Assessment : Participatory Activities, Project Results Assessment / Product Assessment</p>	Lecture, question and answer, assignment 2 X 50		<p>Material: electrogravimetry References: Pecksok, et al. 1976. <i>Modern Methods of Analytical Chemistry 2nd</i>. New York: John Wiley and Sons</p>	0%
11	Understand the basics of separation by means of electroanalysis, and be skilled in carrying out separations by means of electroanalysis	Skilled in carrying out separations using electroanalysis	<p>Criteria: attached</p> <p>Form of Assessment : Practical Assessment</p>	2 X 50 electrogravimetry practicum		<p>Material: electrogravimetry References: Pecksok, et al. 1976. <i>Modern Methods of Analytical Chemistry 2nd</i>. New York: John Wiley and Sons</p>	5%

12	Understand the basics of membrane separation and be skilled at carrying out membrane separation	Understand the basic concepts of membranes, types of membranes and their applications	Criteria: attached Form of Assessment : Participatory Activities	Lectures, discussions, questions and answers 2 X 50		Material: membrane Bibliography: 10. N. Kusumawati, AB Santoso, SC Wibawa, P. Setiarso, S. Muslim. 2020. Development of a new polymer membrane: Polyvinylidene fluoride/polyetherimide blend membrane. <i>Inter J Adv Sci Eng Inform Tech.</i> 10(6): pp. 2547-2559 Material: membrane References: N. Kusumawati, P. Setiarso, AB Santoso, SC Wibawa, S. Muslim. 2019. The Development of PVDF/PEI blended membrane: Effect of stirring time on membrane characteristics and performance. <i>RASAYAN J Chem.</i> 12(2): pp. 975-986.	5%
13	Understand the basics of membrane separation and be skilled at carrying out membrane separation	Understand the basic concepts of membranes, types of membranes and their applications	Criteria: attached Form of Assessment : Participatory Activities	Lectures, discussions, questions and answers 2 X 50		Material: membrane Bibliography: 10. N. Kusumawati, AB Santoso, SC Wibawa, P. Setiarso, S. Muslim. 2020. Development of a new polymer membrane: Polyvinylidene fluoride/polyetherimide blend membrane. <i>Inter J Adv Sci Eng Inform Tech.</i> 10(6): pp. 2547-2559 Material: membrane References: N. Kusumawati, P. Setiarso, AB Santoso, SC Wibawa, S. Muslim. 2019. The Development of PVDF/PEI blended membrane: Effect of stirring time on membrane characteristics and performance. <i>RASAYAN J Chem.</i> 12(2): pp. 975-986.	5%
14	Understand the basics of membrane separation and be skilled at carrying out membrane separation	Understand the basic concepts of membranes, types of membranes and their applications	Criteria: attached Form of Assessment : Participatory Activities	Lectures, discussions, questions and answers 2 X 50		Material: membrane Bibliography: 10. N. Kusumawati, AB Santoso, SC Wibawa, P. Setiarso, S. Muslim. 2020. Development of a new polymer membrane: Polyvinylidene fluoride/polyetherimide blend membrane. <i>Inter J Adv Sci Eng Inform Tech.</i> 10(6): pp. 2547-2559 Material: membrane References: N. Kusumawati, P. Setiarso, AB Santoso, SC Wibawa, S. Muslim. 2019. The Development of PVDF/PEI blended membrane: Effect of stirring time on membrane characteristics and performance. <i>RASAYAN J Chem.</i> 12(2): pp. 975-986.	5%

15	Understand the basics of membrane separation and be skilled at carrying out membrane separation	Skilled in preparing synthetic membranes as well as carrying out separation and analysis of separation results using membranes	Criteria: attached Forms of Assessment : Participatory Activities, Project Results Assessment / Product Assessment, Practical Assessment	practicum 2 X 50		Material: membrane References: N. Kusumawati, P. Setiarso, AB Santoso, SC Wibawa, S. Muslim. 2019. <i>The Development of PVDF/PEI blended membrane: Effect of stirring time on membrane characteristics and performance.</i> RASAYAN J Chem. 12(2): pp. 975-986. Material: membrane References: Soebagio, Budiasih, E, Ibnu, S, Widarti, HR, Munzil. 2001. <i>Analytical Chemistry II (Common Book).</i> Malang: IMSTEP – JICA FMIPA State University of Malang	10%
16	UAS	meeting indicators 9-15	Criteria: attached Form of Assessment : Test	2 X 50 test			15%

Evaluation Percentage Recap: Case Study

No	Evaluation	Percentage
1.	Participatory Activities	55.83%
2.	Project Results Assessment / Product Assessment	13.33%
3.	Practical Assessment	8.33%
4.	Test	22.5%
		99.99%

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.