	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
Instrument Calibration and Validation of Analytical Methods	4720102204	Compulsory Study Program Subjects	**T=2**	**P=0**	**ECTS=3.18**	6	July 17, 2024

AUTHORIZATION	SP Developer	Course Cluster Coordinator	Study Program Coordinator
	.....	.....	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	Able to demonstrate a responsible attitude in calibrating and standardizing independently
	PO - 2	Able to make appropriate decisions regarding calibration evaluation and standardization of implementation of analytical methods and chemical laboratory instruments
	PO - 3	Able to standardize and calibrate by utilizing various data sources according to process and quality standards
	PLO-PO Matrix	

P.O
PO-1
PO-2
PO-3

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
PO-1																
PO-2																
PO-3																

Short Course Description	This course provides students with experience in understanding the procedures and implementation of calibration and standardization of chemical analysis methods and chemical laboratory instruments including factors that influence the calibration and standardization of chemical analysis methods and chemical laboratory instruments, measuring factor threshold values. Studies in measurement technology and metrology, calibration, comparison of measurement values provided by the device under test with calibration standards and their accuracy. Standardize accuracy measurement devices to national or international standards held by metrology bodies.	
References	**Main :**	

	1. Ewing G.W, 1981, Instrumental Methods Of Chemical Analysis, International Student Edition, Tokyo: McGraw-Hill Kogakusha Ltd 2. Harvey,D. 2000. Modern Analytical Chemistry. Int. Ed. Singapore: Mc.Graw Hill 3. [3] Sawyer, Heineman, and Beebe,1984, Chemistry Experiments for Instrumental Methods, New York : John Wiley & Sons
	Supporters:
Supporting lecturer	Prof. Dr. Pirim Setiarso, M.Si. Prof. Dr. Titik Taufikurohmah, S.Si., M.Si.

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			**Form of Assessment** : Participatory Activities		Ceiling zoom 2 x 50		0%
2			**Criteria:** 2P 3T 2Uts 3Uas/10 **Form of Assessment** : Participatory Activities		2 x 50 zoom platform	**Material:** Assignment to read data **References:** *Ewing GW, 1981, Instrumental Methods Of Chemical Analysis, International Student Edition, Tokyo: McGraw-Hill Kogakusha Ltd*	5%
3			**Criteria:** Written test **Form of Assessment** : Participatory Activities		2 x 50 zoom platform	**Material:** Assignment to read data **References:** *Ewing GW, 1981, Instrumental Methods Of Chemical Analysis, International Student Edition, Tokyo: McGraw-Hill Kogakusha Ltd*	5%
4			**Criteria:** Written test **Form of Assessment** : Participatory Activities		2 x 50 zoom platform	**Material:** Data processing **References:** *Harvey, D. 2000. Modern Analytical Chemistry. Int. Ed. Singapore: Mc. Graw Hill*	5%
5			**Form of Assessment** : Participatory Activities		2x 50 Zoom Platform		5%

6			**Form of Assessment** : Participatory Activities		2x50 Zoom Platform	**Material:** Precision measurements **References:** *Harvey,D. 2000. Modern Analytical Chemistry. Int. Ed. Singapore: Mc. Graw Hill*	0%
7			**Form of Assessment** : Participatory Activities		Platform 2x50	**Material:** Accuracy **Bibliography:** *Harvey,D. 2000. Modern Analytical Chemistry. Int. Ed. Singapore: Mc. Graw Hill*	0%
8			**Form of Assessment** : Test		2x50 zoom platform	**Material:** UTS **Bibliography:** *Ewing GW, 1981, Instrumental Methods Of Chemical Analysis, International Student Edition, Tokyo: McGraw-Hill Kogakusha Ltd*	10%
9			**Form of Assessment** : Participatory Activities		2x50 Zoom Platform	**Material:** Calibration **References:** *[3] Sawyer, Heineman, and Beebe, 1984, Chemistry Experiments for Instrumental Methods, New York : John Wiley & Sons*	5%
10			**Form of Assessment** : Participatory Activities		2x50 Zoom Platform		5%
11			**Form of Assessment** : Practice / Performance		2x50 Zoom Platform		5%
12			**Form of Assessment** : Participatory Activities		2x50 Zoom Platform	**Material:** Sample measurements with standard additions **References:** *[3] Sawyer, Heineman, and Beebe, 1984, Chemistry Experiments for Instrumental Methods, New York : John Wiley & Sons*	10%
13			**Form of Assessment** : Participatory Activities		2x50 Zoom Platform		5%

14			**Form of Assessment** : Practice / Performance		2x50 Zoom Platform		5%
15			**Form of Assessment** : Participatory Activities		Zoom platform 2x50		5%
16			**Form of Assessment** : Test		Zoom Platform		30%

Evaluation Percentage Recap: Project Based Learning

No	Evaluation	Percentage
1.	Participatory Activities	50%
2.	Practice / Performance	10%
3.	Test	40%
		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** 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.