	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
Toxicology	4720102173	Study Program Elective Courses	T=2	P=0	ECTS=3.18	7	January 17, 2023

AUTHORIZATION	SP Developer	Course Cluster Coordinator	Study Program Coordinator
	Dr. Ratih Dewi Saputri, M.Si	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	Able to utilize various learning resources and learning media to support mastery of Toxicology material
	PO - 2	Mastering the concepts of: characteristics, mechanisms and toxic effects, various chemical species in the body, as well as methods of remediation including antidote mechanisms
	PO - 3	Able to solve general and simple problems based on the study of Toxicology theory
	PO - 4	Able to solve toxic problems, especially those related to poisoning, remediation and antidote
	PO - 5	Demonstrate a responsible attitude towards their work in Toxicology learning, independently.
	PLO-PO Matrix	

P.O
PO-1
PO-2
PO-3
PO-4
PO-5

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																
PO-4																
PO-5																

Short Course Description	The study of toxicology, including the characteristics, mechanisms and effects of toxicants, various chemical species in the body, as well as remediation methods including antidote mechanisms.

References

Main :

1. Ramade, F., 1987. Ecotoxicologi. Singapore: John Wiley and Sons.
2. Meyers, F.H., Jawetz, dan A. Goldfien. 1993. Toksikologi: Cara Mengatasi Berbagai Akibat Keracunan. Jakarta: Andes Utama
3. Jurnal/ artikel toxicology
4. Hodgson, E., A TextBook of Modern Toxicology, Fourth Edition. 2010. Wiley, Simultaneously. Canada
5. Dusinska, et al., 2017, Toxicity Test: In vitro and In vivo, Elsevier
6. Kacew, S., Byung-M.L, 2013, Fundamentals, Target Organs, and Risk Assesment, Informa Healtcare

	Supporters:
	1. Saputri, Ratih, et al., 2023, Three novel quinolinone alkaloids from the leeves of Melicope denhamii, Natural Product Research, 37:2, 197-203
Supporting lecturer	Prof. Dr. Leny Yuanita, M.Kes. Prof. Dr. Suyono, M.Pd. Dr. Ratih Dewi Saputri, 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	Understand the scope of toxicology	1. Explain the meaning of toxicants and toxicology 2. Explain the field of environmental toxicology studies 3. Explain the field of economic toxicology studies 4. Explain the field of judicial toxicology studies 5. Explains the penetration of toxicants in an organism	**Criteria:** Assessment of learning outcomes (UTS/UAS) is based on the following criteria: Oral test: weight 20 Written test: weight 80 Written test assessment based on essay and multiple choice weight. Weight range for 1 multiple choice question: 2-3 scores, while essays have 5-10 scores. The final NA is (participation value x2) (assignment value x 3) (UTS value x 2) UAS value (3) divided by 10 **Form of Assessment** : Participatory Activities	Method: Discussion, question and answer, problem solving, and assignment Model: Direct instruction and case study 2 X 50		**Material:** toxicology **Bibliography:** *Ramade, F., 1987. Ecotoxicology. Singapore: John Wiley and Sons.*	5%
2	Understanding counts in toxicology	1. Determine the dose-response relationship 2. Applying statistical concepts and LD50 3. Applying safety limits for levels of a substance for an organism's body 4. Explain the principle of response reversibility 5. Distinguish between the concepts of hypersensitivity and hyposensitivity 6. Explain the concept of response for compounds that are essential for biological systems	**Criteria:** Assessment of learning outcomes (UTS/UAS) is based on the following criteria: Oral test: weight 20 Written test: weight 80 Written test assessment based on essay and multiple choice weight. The weight range for 1 multiple choice question: 2-3 scores, while the essay has 5-10 scores. The final NA is (participation score x2) (assignment score x 3) (UTS score x 2) UAS score (3) divided by 10 **Form of Assessment** : Participatory Activities, Tests	Questions and answers 2 X 50 presentation		**Material:** Dose **Bibliography:** *Meyers, FH, Jawetz, and A. Goldfien. 1993. Toxicology: How to Overcome Various Consequences of Poisoning. Jakarta: Main Andes* **Material:** dose and response relationship **References:** *Saputri, Ratih, et al., 2023, Three novel quinolinone alkaloids from the leeves of Melicope denhamii, Natural Product Research, 37:2, 197-203*	7%

3	Understand the Biological factors that influence toxicity	1. Explains the translocation of chemicals from outside an organism's body into tissues 2. Explain the process of storing chemical substances in organisms 3. Applying an organism's tolerance to chemicals	**Criteria:** Assessment of learning outcomes (UTS/UAS) is based on the following criteria: Oral test: weight 20 Written test: weight 80 Written test assessment based on essay and multiple choice weight. The weight range for 1 multiple choice question: 2-3 scores, while the essay has 5-10 scores. The final NA is (participation score x2) (assignment score x 3) (UTS score x 2) UAS score (3) divided by 10 **Form of Assessment** : Participatory Activities, Tests	Discussion, presentation 2 X 50		**Material:** Translocation of chemical substances **References:** *Ramade, F., 1987. Ecotoxicology. Singapore: John Wiley and Sons.*	5%
4	Understand the chemical factors that influence toxicity	1. Explain the influence of chemical factors on toxicity which is classified as non-specific chemical action. 2. Explain the influence of chemical factors on toxicity which is classified as selective chemical action 3. Explain the effects of ionization and lipid solubility on the translocation of chemical substances 4. Explain the mechanism of biotransformation	**Criteria:** Assessment of learning outcomes (UTS/UAS) is based on the following criteria: Oral test: weight 20 Written test: weight 80 Written test assessment based on essay and multiple choice weight. The weight range for 1 multiple choice question: 2-3 scores, while the essay has 5-10 scores. The final NA is (participation score x2) (assignment score x 3) (UTS score x 2) UAS score (3) divided by 10 **Form of Assessment** : Participatory Activities, Tests	Discussion 2 X 50		**Material:** chemical factors on toxicity **References:** *Hodgson, E., A Textbook of Modern Toxicology, Fourth Edition. 2010. Wiley, Simultaneously. Canada* **Material:** toxicity test **References:** *Dusinska, et al., 2017, Toxicity Test: In vitro and In vivo, Elsevier*	12%
5	Differentiate the influence of route of administration on toxicity	1. Explain the influence of the percutaneous route on toxicity 2. Explain the influence of the inhalation route on toxicity 3. Explain the influence of the oral route on toxicity 4. Explain the influence of the parenteral route on toxicity	**Criteria:** Assessment of learning outcomes (UTS/UAS) is based on the following criteria: Oral test: weight 20 Written test: weight 80 Written test assessment based on essay and multiple choice weight. The weight range for 1 multiple choice question: 2-3 scores, while the essay has 5-10 scores. The final NA is (participation score x2) (assignment score x 3) (UTS score x 2) UAS score (3) divided by 10 **Form of Assessment** : Participatory Activities	Discussion, presentation 2 X 50			5%

6	Understand the genetic factors that influence toxicity	Explain the influence of genetic factors on the toxicity of chemical substances	**Criteria:** Assessment of learning outcomes (UTS/UAS) is based on the following criteria: Oral test: weight 20 Written test: weight 80 Written test assessment based on essay and multiple choice weight. The weight range for 1 multiple choice question: 2-3 scores, while the essay has 5-10 scores. The final NA is (participation score x2) (assignment score x 3) (UTS score x 2) UAS score (3) divided by 10 **Form of Assessment** : Participatory Activities, Tests	Discussion, questions and answers, problem solving, 2 X 50 assignments		**Material:** genetic factors such as cancer **Reference:** *Saputri, Ratih, et al., 2023, Three novel quinolinone alkaloids from the leeves of Melicope denhamii, Natural Product Research, 37:2, 197-203*	5%
7	Understanding the influence of ecological factors on toxicity	1. Explain the influence of intrinsic factors 2. Explain the influence of extrinsic factors	**Criteria:** Assessment of learning outcomes (UTS/UAS) is based on the following criteria: Oral test: weight 20 Written test: weight 80 Written test assessment based on essay and multiple choice weight. The weight range for 1 multiple choice question: 2-3 scores, while for essays 5-10 the final NA score is (participation score x2) (assignment score x 3) (UTS score x 2) UAS score (3) divided by 10 **Form of Assessment** : Participatory Activities, Tests	Discussion, questions and answers, problem solving, 2 X 50 assignments		**Material:** intrinsic and extrinsic factors **References:** *Meyers, FH, Jawetz, and A. Goldfien. 1993. Toxicology: How to Overcome Various Consequences of Poisoning. Jakarta: Main Andes*	10%
8	UTS		**Form of Assessment** : Participatory Activities	Written test in essay form 2 X 50		**Material:** toxicity **References:** *Dusinska, et al., 2017, Toxicity Test: In vitro and In vivo, Elsevier* **Material:** genetic factors **References:** *Saputri, Ratih, et al., 2023, Three novel quinolinone alkaloids from the leeves of Melicope denhamii, Natural Product Research, 37:2, 197-203* **Material:** material 1-7 **Bibliography:** *Hodgson, E., A Textbook of Modern Toxicology, Fourth Edition. 2010. Wiley, Simultaneously. Canada*	0%

9	Understand abnormal responses to chemicals	1. Explains the sensitivity reaction of an organism to chemical substances 2. Explain the mechanism of the immune response to chemicals 3. Explain the process of activating and suppressing immune mechanisms	**Criteria:** Assessment of learning outcomes (UTS/UAS) is based on the following criteria: Oral test: weight 20 Written test: weight 80 Written test assessment based on essay and multiple choice weight. Weight range for 1 multiple choice question: 2-3 scores, while essays have 5-10 scores. The final NA is (participation value x2) (assignment value x 3) (UTS value x 2) UAS value (3) divided by 10	Method: Discussion, question and answer, problem solving, assignment Model: Direct instruction and case study 2 X 50		**Material:** immune response **References:** *Hodgson, E., A Textbook of Modern Toxicology, Fourth Edition. 2010. Wiley, Simultaneously. Canada*	5%
10	Understand the mechanism of toxicity reactions	1. Explain the mechanism of toxicity reactions related to translocation factors (cyclic chlorinated insecticides, fluoroacetate) 2. Explain the mechanism of toxicity reactions related to biotransformation factors (organic phosphate insecticides).	**Criteria:** Assessment of learning outcomes (UTS/UAS) is based on the following criteria: Oral test: weight 20 Written test: weight 80 Written test assessment based on essay and multiple choice weight. The weight range for 1 multiple choice question: 2-3 scores, while the essay has 5-10 scores. The final NA is (participation score x2) (assignment score x 3) (UTS score x 2) UAS score (3) divided by 10 **Form of Assessment** : Participatory Activities	Method: Discussion, question and answer, problem solving, assignment Model: Direct instruction and case study 4 X 50		**Material:** biotransformation **Bibliography:** *Hodgson, E., A Textbook of Modern Toxicology, Fourth Edition. 2010. Wiley, Simultaneously. Canada*	5%
11	Understand the mechanism of toxicity reactions	1. Explain the mechanism of toxicity reactions related to translocation factors (cyclic chlorinated insecticides, fluoroacetate) 2. Explain the mechanism of toxicity reactions related to biotransformation factors (organic phosphate insecticides).	**Criteria:** Assessment of learning outcomes (UTS/UAS) is based on the following criteria: Oral test: weight 20 Written test: weight 80 Written test assessment based on essay and multiple choice weight. The weight range for 1 multiple choice question: 2-3 scores, while the essay has 5-10 scores. The final NA is (participation score x2) (assignment score x 3) (UTS score x 2) UAS score (3) divided by 10 **Form of Assessment** : Participatory Activities	Discussion, presentation, question and answer 4 X 50			10%

12	Analyze the basis of antidote therapy	1. Explain the basics of antidote therapy 2. Explain the procedure for reducing the absorption or translocation of chemical substances in the body of an organism 3. Explain procedures to increase the terminating power of the action of chemical substances 4. Explain the procedure for raising the toxicity threshold	**Criteria:** Assessment of learning outcomes (UTS/UAS) is based on the following criteria: Oral test: weight 20 Written test: weight 80 Written test assessment based on essay and multiple choice weight. The weight range for 1 multiple choice question: 2-3 scores, while the essay has 5-10 scores. The final NA is (participation score x2) (assignment score x 3) (UTS score x 2) UAS score (3) divided by 10 **Form of Assessment** : Participatory Activities	Method: Discussion, question and answer, problem solving, assignment Model: Direct instruction and case study 2 X 50		**Material:** translocation of toxins in organs **References:** *Kacew, S., Byung-ML, 2013, Fundamentals, Target Organs, and Risk Assessment, Informa Healtcare*	10%
13	Understand toxicology testing methods	1. Determine pollutant levels 2. Explain the toxicity tests of a substance for organisms (subchronic and chronic toxicity tests, potentiation tests, teratology tests)	**Criteria:** Assessment of learning outcomes (UTS/UAS) is based on the following criteria: Oral test: weight 20 Written test: weight 80 Written test assessment based on essay and multiple choice weight. The weight range for 1 multiple choice question: 2-3 scores, while the essay has 5-10 scores. The final NA is (participation score x2) (assignment score x 3) (UTS score x 2) UAS score (3) divided by 10 **Form of Assessment** : Participatory Activities, Tests	Discussion, presentation, question and answer 6 X 50		**Material:** toxicity test **Bibliography:** *Hodgson, E., A Textbook of Modern Toxicology, Fourth Edition. 2010. Wiley, Simultaneously. Canada* **Material:** toxicity to organisms **References:** *Kacew, S., Byung-ML, 2013, Fundamentals, Target Organs, and Risk Assessment, Informa Healtcare* **Material:** toxicity testing methods **References:** *Saputri, Ratih, et al., 2023, Three novel quinolinone alkaloids from the leeves of Melicope denhamii, Natural Product Research, 37:2, 197-203*	10%
14	Understand toxicology testing methods	1. Determine pollutant levels 2. Explain the toxicity tests of a substance for organisms (subchronic and chronic toxicity tests, potentiation tests, teratology tests)	**Criteria:** Assessment of learning outcomes (UTS/UAS) is based on the following criteria: Oral test: weight 20 Written test: weight 80 Written test assessment based on essay and multiple choice weight. The weight range for 1 multiple choice question: 2-3 scores, while the essay has 5-10 scores. The final NA is (participation score x2) (assignment score x 3) (UTS score x 2) UAS score (3) divided by 10 **Form of Assessment** : Participatory Activities	Method: Discussion, question and answer, problem solving, assignment Model: Direct instruction and case study 6 X 50		**Material:** test method **References:** *Saputri, Ratih, et al., 2023, Three novel quinolinone alkaloids from the leeves of Melicope denhamii, Natural Product Research, 37:2, 197-203* **Material:** toxicity test **References:** *Kacew, S., Byung-ML, 2013, Fundamentals, Target Organs, and Risk Assessment, Informa Healtcare*	5%

15	Understand toxicology testing methods	1. Determine pollutant levels 2. Explain the toxicity tests of a substance for organisms (subchronic and chronic toxicity tests, potentiation tests, teratology tests)	**Criteria:** Assessment of learning outcomes (UTS/UAS) is based on the following criteria: Oral test: weight 20 Written test: weight 80 Written test assessment based on essay and multiple choice weight. The weight range for 1 multiple choice question: 2-3 scores, while the essay has 5-10 scores. The final NA is (participation score x2) (assignment score x 3) (UTS score x 2) UAS score (3) divided by 10 **Form of Assessment** : Participatory Activities	Method: Discussion, question and answer, problem solving, assignment Model: Project base learning 6 X 50		**Material:** toxicity test **Bibliography:** *Hodgson, E., A Textbook of Modern Toxicology, Fourth Edition. 2010. Wiley, Simultaneously. Canada* **Material:** dose testing **References:** *Saputri, Ratih, et al., 2023, Three novel quinolinone alkaloids from the leeves of Melicope denhamii, Natural Product Research, 37:2, 197-203*	6%
16	UAS		**Form of Assessment** : Participatory Activities	Written Test in essay form 2 X 50		**Material:** toxicity test **References:** *Dusinska, et al., 2017, Toxicity Test: In vitro and In vivo, Elsevier* **Material:** biotransformation and target organs **References:** *Kacew, S., Byung-ML, 2013, Fundamentals, Target Organs, and Risk Assessment, Informa Healtcare*	5%

Evaluation Percentage Recap: Project Based Learning

No	Evaluation	Percentage
1.	Participatory Activities	75.5%
2.	Test	24.5%
		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.