	Universitas Negeri Surabaya Faculty of Mathematics and Natural Sciences Biology Undergraduate Study Program	Document Code

SEMESTER LEARNING PLAN

Courses	CODE	Course Family	Credit Weight			SEMESTER	Compilation Date
Molecular Biology Analysis Techniques	4620102186	Compulsory Study Program Subjects	T=2	P=0	ECTS=3.18	4	July 17, 2024

AUTHORIZATION	SP Developer	Course Cluster Coordinator	Study Program Coordinator
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Learning model	**Project Based Learning**	
Program Learning Outcomes (PLO)	**PLO study program which is charged to the course**	
	PLO-6	Able to apply logical, critical, systematic and innovative thinking in the context of developing or implementing science and/or technology according to their field of expertise.
	PLO-9	Able to work independently in the laboratory and develop relevant skills by applying bioethics and work safety
	Program Objectives (PO)	
	PLO-PO Matrix	

P.O	PLO-6	PLO-9

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

Short Course Description	This course discusses basic molecular biology techniques which include isolation of DNA, RNA and proteins; electrophoretic visualization techniques and spectrophotometric analysis; electrophoresis, polymerase chain reaction (PCR), sequencing, gene editing, blotting techniques, and application of molecular biology analysis techniques in various fields of life. The material is presented in the form of theory, mini projects, and presentations	
References	**Main :**	

1. Ausubel FM, Brent R, Kingston RE, Moore DD, Seidman JG, Smith JA, and Struhl K. 1995. Short Protocols in Molecular Biology. New York: Wiley
2. Fatchiyah, Arumingtyas, E.L., Widyarti, S. dan Rahayu, S. 2011. Dasar-dasar Analisis Biologi Molekuler . Jakarta: Penerbit Erlangga
3. Lodish, H., Berk, A., Matsudaira, P., Kaiser, C.A., Krieger, M., Scott, M.P., Zipursky, L. and Darnell, J. 2004. Molecular Cell Biology. Boston: W.H. Freeman
4. Yuwono, T. 2006. Biologi Molekuler. Penerbit Erlangga. Jakarta

Supporters:	
Supporting lecturer	Dr. Isnawati, M.Si. Lisa Lisdiana, S.Si., M.Si., Ph.D. Erlix Rakhmad Purnama, S.Si., M.Si. Dwi Anggorowati Rahayu, 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 techniques for isolating DNA, RNA and protein genetic material	1. Explain the DNA isolation technique which includes extraction, purification and precipitation stages 2. Explain the RNA isolation technique which includes extraction, purification and precipitation stages 3. Explain the protein isolation technique which includes the extraction, purification and precipitation stages	**Criteria:** 1. Participation 20% 2. UTS 20% **Form of Assessment** : Participatory Activities	Discussion 2 X 50			5%
2	Understand visualization techniques and analysis of genetic material isolation results	1. Explains visualization techniques using agarose gel electrophoresis 2. Explains visualization techniques using PAGE electrophoresis 3. Explain quantitative analysis techniques using a spectrophotometer	**Criteria:** 1. Duty 30% 2. Participation 20% 3. UTS 20% **Form of Assessment** : Project Results Assessment / Product Assessment	Discussion and structured assignments 2 X 50			5%
3	Understand DNA amplification techniques	1. Explain the Polymerase Chain Reaction (PCR) technique as a DNA amplification method 2. Details the components of PCR and their functions 3. Explain the stages in PCR 4. Explain the types of PCR and related data analysis 5. Able to design primers for use in PCR techniques	**Criteria:** 1. UTS 20% 2. Participation 20% 3. Duty 30% **Form of Assessment** : Project Results Assessment / Product Assessment	Lectures, discussions, assignments 2 X 50			5%
4	Understand sequencing techniques and analysis	1. Explain the concept of sequencing and its development 2. Explain the stages in sequencing 3. Explain the types of sequencing 4. Explain sequencing data analysis	**Criteria:** 1. Participation 20% 2. UTS 20% **Form of Assessment** : Project Results Assessment / Product Assessment	Lectures and discussions 2 X 50			5%
5	Understanding gene editing technology using CRISPR	1. Explain the history of the development of gene editing using CRISPR 2. Explain the concept of CRISPR 3. Exemplifying CRISPR applications in various research fields	**Criteria:** 1. Participation 20% 2. UTS 20% **Form of Assessment** : Project Results Assessment / Product Assessment	Lectures and discussions 2 X 50			5%

6	Understanding in silico bioprospecting methods	1. Understanding in silico bioprospecting methods 2. Skilled in doing data mining from databases 3. Skilled in using various applications for in silico analysis related to bioprospecting	**Criteria:** 1. UTS 20% 2. Participation 20% **Form of Assessment** : Project Results Assessment / Product Assessment	Discussion and practice 2 X 50			5%
7	Understand blotting analysis techniques	1. Explain the principles of blotting techniques 2. Describes the western blotting technique 3. Describes the northern blotting technique 4. Describes the southern blotting technique	**Criteria:** Participation 20%UTS 20% **Form of Assessment** : Project Results Assessment / Product Assessment	Lectures and discussions 2 X 50			5%
8	UTS		**Form of Assessment** : Participatory Activities, Tests	Written test 2 X 50			10%
9	Understand phylogenetic and networking analysis techniques	1. Explain the basic principles of phylogenetic and networking analysis 2. Skilled in using various applications for phylogenetic analysis and networking	**Criteria:** 1. Duty 30% 2. Participation 20% 3. UAS 30% **Form of Assessment** : Project Results Assessment / Product Assessment	Lecture and practice 2 X 50			5%
10	Skilled in performing DNA isolation and visualization techniques		**Criteria:** 1. Participation 20% 2. Duty 30% **Forms of Assessment** : Participatory Activities, Project Results Assessment / Product Assessment, Practical Assessment	Practice and discussion 2 X 50			5%
11			**Criteria:** 1. Duty 30% 2. UAS 30% 3. Participation 20% **Form of Assessment** : Project Results Assessment / Product Assessment	Lectures and discussions 2 X 50			5%
12			**Criteria:** 1. Duty 30% 2. Participation 20% 3. UAS 30% **Form of Assessment** : Project Results Assessment / Product Assessment	Lectures and discussions 2 X 50			5%

13	Understand the application of in silico molecular biology analysis techniques in various research	1. Able to synthesize in silico research plans related to molecular biology 2. Skilled in carrying out in silico research related to molecular biology 3. Skilled in translating in silico research results related to molecular biology into scientific articles	**Criteria:** Duty 30% **Form of Assessment** : Project Results Assessment / Product Assessment	Assignment 6 X 50			5%
14	Understand the application of in silico molecular biology analysis techniques in various research	1. Able to synthesize in silico research plans related to molecular biology 2. Skilled in carrying out in silico research related to molecular biology 3. Skilled in translating in silico research results related to molecular biology into scientific articles	**Criteria:** Duty 30% **Form of Assessment** : Participatory Activities	Assignment 6 X 50			9%
15	Understand the application of in silico molecular biology analysis techniques in various research	1. Able to synthesize in silico research plans related to molecular biology 2. Skilled in carrying out in silico research related to molecular biology 3. Skilled in translating in silico research results related to molecular biology into scientific articles	**Criteria:** Duty 30% **Form of Assessment** : Participatory Activities, Practical Assessment	Assignment 6 X 50			10%
16			**Criteria:** UAS 30% **Form of Assessment** : Participatory Activities	Test 2 X 50			10%

Evaluation Percentage Recap: Project Based Learning

No	Evaluation	Percentage
1.	Participatory Activities	35.67%
2.	Project Results Assessment / Product Assessment	51.67%
3.	Practical Assessment	6.67%
4.	Test	5%
		99.01%

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.