UNESA	**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
Biotechnology	4620103225		T=3 P=0 ECTS=4.77	4	May 10, 2023

AUTHORIZATION	SP Developer	Course Cluster Coordinator	Study Program Coordinator
	Dr. Nur Ducha, S.Si M.Si	Dr. Nur Ducha, S.Si M.Si	Dr. H. Sunu Kuntjoro, S.Si., M.Si.

Learning model	**Case Studies**	
Program Learning Outcomes (PLO)	**PLO study program that is charged to the course**	
	PLO-5	Able to communicate scientific ideas, both orally and in writing using appropriate communication media according to the target, as a means of lifelong learning for academic self-development.
	PLO-7	Able to work independently and collaboratively, as well as responsibly, in completing various tasks in class, in the laboratory and in the field.
	PLO-11	Able to apply transferable skills in biology to develop ecopreneurship (eco-innovation, eco-opportunity, eco-commitment)
	Program Objectives (PO)	
	PO - 1	Able to demonstrate knowledge of biology at the molecular, cell and organism level and its interactions with the environment CPL-P2 Able to demonstrate the ability to apply biological concepts and environmental issues with relevant technology in natural resource management
	PLO-PO Matrix	

P.O	PLO-5	PLO-7	PLO-11
PO-1			

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																

Short Course Description	This course studies the scope of biotechnology in animals, microorganism biotechnology, plant biotechnology and the use of biotechnology in various areas of life through discussions, presentations and project assignments to plan and carry out various biotechnology practices as the implementation of concepts related to biotechnology based on ecopreneurship.

References

Main :

1. Referensi : Clark, D.P.,& Pazdernik, N.J. 2012. Biotechnology . USA: APCell Press.
2. Freshney. 2000. Animal Cell Culture. New York: Academic Press.
3. Gordon Ian. 2004. Reproductive Technology in Farm Animal . CABI Publishing. London.
4. Ratnasari, E. &Isnawati. 2011. Handout Bioteknologi. Surabaya: Jurusan Biologi FMIPA UNESA
5. Smith, J. E. 2011. Biotechnology. 5th Edition. Cambridge, UK: Cambridge University Press.3.
6. Thieman, W.J., and M.A.Palladino. 2012. Introduction to Biotechnology. San FranciscoUSA.: Pearson Education, Inc .
7. Ducha Nur, Ratnasari Evie, Isnawati. 2018. Bioteknologi. Surabaya : Unesa University Press

Supporters:

1. 1. Ducha Nur, Rahayu Dwi Anggorowati, Budijastuti Widowati. 2023. Effects of α-tocopherol addition to Brahman bull chilled semen on sperm quality, lipid peroxidation, membrane integrity and DNA integrity. Iranian Journal Veterinary,Science and Technology.
2. 2. Ducha Nur. Budijastuti Widowati, Kuswanti Nur. 2020. Study of Soya Addition in Tris Base Extender on the Quality of Senduro Goat Spermatozoa and Membrane Integrity on Storage Temperature 4-5°C. MSCEIS Conference, EAI.
3. 3. Ducha Nur, Budijastuti Widowati, Rahayu Dwi Anggorowati. 2021. Senduro Goat Semen Characteristics as A Candidate for Low Temperature Storage . E3S Web of Conference, 328, 08010, ICST 2021

Supporting lecturer	Dra. Evie Ratnasari, M.Si. Dr. Isnawati, M.Si. Dr. Nur Ducha, 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 basic principles of biotechnology	a. Explain the meaning of biotechnology b. Explain the relationship between science and the aspects that must be present in biotechnology c. Comparing traditional and modern biotechnology in animals d. Demonstrate an independent and honest attitude in conducting questions and answers and discussions e. Planning a biotechnology product based on ecopreneurship	**Criteria:** 1.1. Practical papers and reports, including 30% practical value 2.2. Activeness in discussions and presentations, including 20% participation value 3.3. UTS questions are material from the 1st to 7th meeting, UTS value is 20% 4.4. UAS questions are material from the 9th to 15th meeting, UAS score is 30% **Form of Assessment** : Participatory Activities	Guided Discussion & Discovery by means of students being given the Biotechnology module, guided by structured questions related to important concepts appropriate to achieving sub-CPMK which is done by discussing in their groups, then a presentation to carry out a formative evaluation of the acquisition of concepts and achievement of sub-CPMK 2 X 50	Carrying out the same method as offline learning activities, but carried out using zoom meetings via SiDia at SSO Unesa (discussions are carried out via breakout rooms created for each group, lecturers surf from one room to another to guide activities per group 2 x 50	**Material:** Definition and scope of biotechnology **References:** *Ducha Nur, Ratnasari Evie, Isnawati. 2018. Biotechnology. Surabaya: Unesa University Press*	5%
2	Understand the scope of microbial biotechnology	1. Describe the scope of conventional microbial biotechnology 2. Describe the scope of modern microbial biotechnology 3. Compare conventional and modern microbial biotechnology 4. Demonstrate an honest and independent attitude in creating a resume of the differences between conventional and modern microbial biotechnology	**Criteria:** 1.1. Practical papers and reports, including 30% practical value 2.2. Activeness in discussions and presentations, including 20% participation value 3.3. UTS questions are material from the 1st to 7th meeting, UTS value is 20% 4.4. UAS questions are material from the 9th to 15th meeting, UAS score is 30% **Forms of Assessment** : Participatory Activities, Project Results Assessment / Product Assessment	Guided Discussion & Discovery by means of students being given the Biotechnology module and asked to study the Chapter Scope of Microbial Biotechnology, guided by structured questions related to important concepts appropriate to achieving sub-CPMK which is done by discussing in their groups, then a presentation to carry out formative evaluation of the concept acquisition and achievement of sub -CPMK 2 X 50	Carrying out the same method as offline learning activities, but carried out using zoom meetings via SiDia at SSO Unesa (discussions are carried out via breakout rooms created for each group, lecturers surf from one room to another to guide activities per group 2 x 50	**Material:** Biotechnology in the field of microbes and its scope **Reference:** *Ratnasari, E. & Isnawati. 2011. Biotechnology Handout. Surabaya: Biology Department, FMIPA UNESA*	5%

3	Understanding microbial biotechnology in the food sector	1. Explain the scope of microbial biotechnology in the food sector. 2. Skilled in planning various fermented food/beverage products using local natural materials based on ecopreneurship. 3. Skilled in making various fermented food and beverage products using local natural ingredients based on ecopreneurship. 4. Comparing conventional and modern microbial biotechnology in the food sector. Demonstrating an honest and independent attitude in making reports on the results of making fermented food and beverage products in the form of research articles.	**Criteria:** 1.1. Practical papers and reports, including 30% practical value 2.2. Activeness in discussions and presentations, including 20% participation value 3.3. UTS questions are material from the 1st to 7th meeting, UTS value is 20% 4.4. UAS questions are material from the 9th to 15th meeting, UAS score is 30% **Form of Assessment** : Project Results Assessment / Product Assessment	students take the PjBL learning steps 1. Determine the main problems related to fermented food/drinks that will be developed/produced in experimental research packaging 2. Design a project for making experimental fermented food and drinks by making a TOR 3. Design a project implementation schedule 4. Implementation project on making fermented food/drinks and research into lab and organoleptic tests (carried out outside of face-to-face lectures 2 X 50	1. Follow syntax 1 of PjBL, namely solving problems related to making fermented food/drinks that will be made by joining the SiDia Unesa zoom meeting room 2. Synchronous (when providing information related to project design and presentations) and asynchronous (when working independently to make food project designs /fermented drinks he makes) according to the situation and conditions by utilizing SiDia Unesa. 3. Synchronous (when providing information related to preparing project schedules and presentations) and asynchronous (when working independently to prepare project schedules) according to the situation and conditions by utilizing SiDia Unesa. 4. Monitoring project implementation in online learning is carried out by observing documentation made by students during project implementation such as videos, photos and log books made by students implementing the project 2 x 50	**Material:** Biotechnology in the food sector, design and production of food/drinks based on the fermentation process. **References:** *Ratnasari, E. & Isnawati. 2011. Biotechnology Handout. Surabaya: Biology Department, FMIPA UNESA*	10%
4	Understanding microbial biotechnology in the health sector	1. Explain the basic principles of using microbes to produce human health products. 2. Describe how to increase the efficiency of microbial work in producing human health products. 3. Develop a scheme for the stages of vaccine production. 4. Demonstrate an honest and independent attitude in carrying out the task of writing a paper related to the example. - examples of health products produced by microbes that have been used in everyday life	**Criteria:** 1.1. Practical papers and reports, including 30% practical value 2.2. Activeness in discussions and presentations, including 20% participation value 3.3. UTS questions are material from the 1st to 7th meeting, UTS value is 20% 4.4. UAS questions are material from the 9th to 15th meeting, UAS score is 30% **Forms of Assessment** : Participatory Activities, Project Results Assessment / Product Assessment, Portfolio Assessment	continuing the syntax of PjBL, namely: 1. Evaluating project implementation activities that have been carried out, which is dominated by self-evaluation activities on the products made and suggesting ways to improve and improve their quality 2 X 50	Synchronous (when providing information regarding ways to carry out self-evaluations and presentations) and asynchronous (when working independently to evaluate products and inventory ideas for improvements) according to the situation and conditions by utilizing SiDia Unesa.	**Material:** Microbial Biotechnology in the health sector **References:** *Ratnasari, E. & Isnawati. 2011. Biotechnology Handout. Surabaya: Biology Department, FMIPA UNESA*	10%

5	Understanding the use of microbial biotechnology in the environmental field	.1. Explain the basic principles of using microbes to produce human health products. 2. Describe how to increase the efficiency of microbial work in producing human health products. 3. Develop a scheme for the stages of vaccine production. 4. Demonstrate an honest and independent attitude in carrying out the task of writing a paper related to examples. health products produced by microbes that have been used in everyday life Describe the working principles of microbes in cleaning pollutants in the environment 2. Describe how to increase the efficiency of microbial work in cleaning pollutants in the environment 3. Compare conventional and modern microbial biotechnology 4. Demonstrate an honest and honest attitude independently in carrying out assignments to write papers related to examples of microbes that have been used to clean various types of pollutants in the environment	**Criteria:** 1.1. Practical papers and reports, including 30% practical value 2.2. Activeness in discussions and presentations, including 20% participation value 3.3. UTS questions are material from the 1st to 7th meeting, UTS value is 20% 4.4. UAS questions are material from the 9th to 15th meeting, UAS score is 30% **Forms of Assessment** : Participatory Activities, Practice/Performance, Tests	Guided Discussion & Discovery by means of students being given the Biotechnology module and asked to study the Chapter Scope of Microbial Biotechnology, guided by structured questions related to important concepts appropriate to achieving sub-CPMK which is done by discussing in their groups, then a presentation to carry out formative evaluation of the concept acquisition and achievement of sub -CPMK 2 X 50	Carrying out the same method as offline learning activities, but carried out with zoom meetings via SiDia at SSO Unesa (discussions are carried out via breakout rooms created for each group, lecturers surf from one room to another to guide activities per group	**Material:** Microbial Biotechnology in the environmental sector and its use in life. **Reference:** *Ratnasari, E. & Isnawati. 2011. Biotechnology Handout. Surabaya: Biology Department, FMIPA UNESA*	5%
6	Understand the basic principles of plant biotechnology and tissue culture, secondary metabolites and in vitro production methods	1. Explain the development of plant biotechnology 2. Explain the principles and methods of plant tissue culture techniques 3. Explain the meaning of secondary metabolites 4. Give examples of secondary metabolites 5. Explain how to produce secondary metabolites in vitro 6. Explain the factors that influence the production of secondary metabolites	**Criteria:** 1.1. Practical papers and reports, including 30% practical value 2.2. Activeness in discussions and presentations, including 20% participation value 3.3. UTS questions are material from the 1st to 7th meeting, UTS value is 20% 4.4. UAS questions are material from the 9th to 15th meeting, UAS score is 30% **Forms of Assessment** : Participatory Activities, Practice/Performance, Tests	1. Discussion 2. Carrying out assignments in LKM 2 X 50		**Material:** plant biotechnology and tissue culture, secondary metabolites and in vitro production methods. **References:** *Ducha Nur, Ratnasari Evie, Isnawati. 2018. Biotechnology. Surabaya: Unesa University Press* **Material:** plant biotechnology and tissue culture, secondary metabolites and in vitro production methods. **Reference:** *Smith, JE 2011. Biotechnology. 5th Edition. Cambridge, UK: Cambridge University Press.3.*	5%

7	Understand haploid plants and methods for making anther cultures	1. Explain the meaning of haploid plants 2. Explain the method of making anther culture 3. Analyze the factors that influence anther culture 4. Calculate the right chemicals according to the required media composition 5. Carry out sterilization, isolation and inoculation procedures for anther culture	**Criteria:** 1. 1. Practical papers and reports, including 30% practical value 2. 2. Activeness in discussions and presentations, including 20% participation value 3. 3. UTS questions are material from the 1st to 7th meeting, UTS value is 20% 4. 4. UAS questions are material from the 9th to 15th meeting, UAS score is 30% **Form of Assessment** : Participatory Activities, Tests	1. Discussion 2. Anther culture practicum 3. Preparing a practicum report 4. Presentation of practicum results 2 X 50		**Material:** haploid plants and methods for making anther cultures **References:** *Ratnasari, E. & Isnawati. 2011. Biotechnology Handout. Surabaya: Biology Department, FMIPA UNESA* **Material:** haploid plants and methods for making anther cultures **References:** *Thieman, WJ, and MAPalladino. 2012. Introduction to Biotechnology. San FranciscoUSA.: Pearson Education, Inc .*	5%
8	Meetings 1-7	Meetings 1-7	**Criteria:** 1. 1. Practical papers and reports, including 30% practical value 2. 2. Activeness in discussions and presentations, including 20% participation value 3. 3. UTS questions are material from the 1st to 7th meeting, UTS value is 20% 4. 4. UAS questions are material from the 9th to 15th meeting, UAS score is 30% **Form of Assessment** : Test	Midterm Exam 2 X 50			10%

9	Understanding biotransformation and VCO	a. Explain the meaning of biotransformation and its relationship to plant tissue culture b. Explain the benefits and manufacture of virgin coconut oil c. Explain the method of making VCO d. Skilled in making VCO from a mixture of coconut milk and local natural ingredients based on ecopreneurship.	**Criteria:** 1.1. Practical papers and reports, including 30% practical value 2.2. Activeness in discussions and presentations, including 20% participation value 3.3. UTS questions are material from the 1st to 7th meeting, UTS value is 20% 4.4. UAS questions are material from the 9th to 15th meeting, UAS score is 30% **Forms of Assessment** : Participatory Activities, Project Results Assessment / Product Assessment	students take PjBL learning steps for VCO making activities 1. Determine the main problems related to diseases that are a problem in society which can be overcome by using secondary metabolites found in VCO 2. Students will produce VCO with selected materials for each group in experimental research packaging 2 3. Designing a VCO manufacturing project experimentally by creating a TOR 3. Designing a project implementation schedule 4. Implementing a VCO manufacturing project and organoleptic tests (carried out outside of face-to-face lectures) 2 X 50.	1. Follow syntax 1 of PjBL, namely solving problems related to the manufacture of Virgin Coconut Oil (VCO) which will be made by joining the SiDia Unesa zoom meeting room 2. Synchronous (when providing information related to project design and presentations) and asynchronous (when working independently to make the design the VCOi project he created) according to the situation and conditions by utilizing SiDia Unesa. 3. Synchronous (when providing information related to preparing project schedules and presentations) and asynchronous (when working independently to prepare project schedules) according to the situation and conditions by utilizing SiDia Unesa. 4. Monitoring project implementation in online learning is carried out by observing documentation made by students during project implementation such as videos, photos and log books made by students implementing the project 2 x 50	**Material:** Plant biotechnology material regarding secondary metabolites and their utilization through the manufacture of Virgin Coconut Oil (VCO). **References:** *Ducha Nur, Ratnasari Evie, Isnawati. 2018. Biotechnology. Surabaya: Unesa University Press* **Material:** Plant biotechnology material regarding secondary metabolites and their utilization through the production of secondary metabolites by biotransformation using the KJT system **.** *Reference: Clark, DP, & Pazdernik, NJ 2012. Biotechnology. USA: APCell Press.*	5%
10	Understanding protoplast fusion in plants in vitro	1. Analyze the image to answer the meaning of protoplast. Describe the stages of one protoplast fusion technique Give examples of the use of plants resulting from protoplast fusion based on literature studies Choose the type of protoplast fusion technique to be applied to two different types of plants Evaluate the advantages and disadvantages of various protoplast fusion techniques Design an experiment to determine the factors that influence the yield of the resulting protoplast fusion and speed of protoplast fusion 2. Demonstrate an honest and independent attitude during the learning process using LPPD	**Criteria:** 1.1. Practical papers and reports, including 30% practical value 2.2. Activeness in discussions and presentations, including 20% participation value 3.3. UTS questions are material from the 1st to 7th meeting, UTS value is 20% 4.4. UAS questions are material from the 9th to 15th meeting, UAS score is 30% **Form of Assessment** : Project Results Assessment / Product Assessment	1. Discussion 2. Carrying out assignments in LKM 3. Assignment to design a simple experiment related to protoplast fusion 2 X 50		**Material:** protoplast fusion in plants in vitro **References:** *Ratnasari, E. & Isnawati. 2011. Biotechnology Handout. Surabaya: Biology Department, FMIPA UNESA* **Material:** protoplast fusion in plants in vitro **Reference:** *Smith, JE 2011. Biotechnology. 5th Edition. Cambridge, UK: Cambridge University Press.3.* **Material:** protoplast fusion in plants in vitro **References:** *Ducha Nur, Ratnasari Evie, Isnawati. 2018. Biotechnology. Surabaya: Unesa University Press*	10%

11	Understand the method of making anther culture	1.a. Explain the scope of animal biotechnology 2.b. Comparing traditional and modern biotechnology in animals	**Criteria:** 1.1. Paper preparation assignment, including 30% practical value 2.2. Activeness in discussions and presentations, including 20% participation value 3.3. UTS questions are material from the 1st to 7th meeting, UTS value is 20% 4.4. UAS questions are material from the 9th to 15th meeting, UAS score is 30% **Forms of Assessment** : Participatory Activities, Project Results Assessment / Product Assessment, Tests	Discussion, question and answer, lecture 2 X 50		**Material:** Scope of animal biotechnology, traditional biotechnology, modern biotechnology **Reference:** *Smith, JE 2011. Biotechnology. 5th Edition. Cambridge, UK: Cambridge University Press.3.*	5%
12	Understand the scope of animal biotechnology and spermatozoa storage technology	1.a. Provide reasons for implementing sperm storage technology 2.b. Analyzing the formula for cement thinning media for storage at low temperatures 3.c. Look for alternative materials from the natural environment	**Criteria:** 1.1. Practical papers and reports, including 30% practical value 2.2. Activeness in discussions and presentations, including 20% participation value 3.3. UTS questions are material from the 1st to 7th meeting, UTS value is 20% 4.4. UAS questions are material from the 9th to 15th meeting, UAS score is 30% **Form of Assessment** : Project Results Assessment / Product Assessment	1. Applying Project Base Learning (PjBL) based learning 2. Students independently study the Sperm Storage Technology material that has been sent by the lecturer 3. Students are given the opportunity to ask questions about material that they do not understand well 4. Students present a simple summary of the research plan to be carried out related to the application of 2 X 50 sperm storage technology	1. Applying Project Base Learning (PjBL) based learning 2. Students independently study the Sperm Storage Technology material that has been sent by the lecturer 3. Students are given the opportunity to ask questions about material that they do not understand well 4. Students present a simple summary of the research plan to be carried out related to the application of sperm storage technology		10%
13	Understand Artificial Insemination technology	a. Describe the meaning of Artificial Insemination (AI) technology b. Create a historical scheme for the development of IB in the world c. Determine the advantages/benefits of implementing AI for animals and humans d. Develop a scheme for IB implementation stages e. Demonstrate an independent and honest attitude in conducting questions and answers and discussions	**Criteria:** 1.1. Practical papers and reports, including 30% practical value 2.2. Activeness in discussions and presentations, including 20% participation value 3.3. UTS questions are material from the 1st to 7th meeting, UTS value is 20% 4.4. UAS questions are material from the 9th to 15th meeting, UAS score is 30% **Form of Assessment** : Project Results Assessment / Product Assessment	Questions and answers, Discussion, Project assignments 2 X 50			5%

14	Understand in vitro fertilization (IVF) and cloning technology	a. Explain the main reasons for applying IVF technology to humans and animals b. Develop a scheme of stages in IVF or cloning technology c. Comparing the differences between IVF and cloning technology d. Demonstrate an independent and honest attitude in carrying out discussions related to IVF technology and cloning	**Criteria:** 1.1. Practical papers and reports, including 30% practical value 2.2. Activeness in discussions and presentations, including 20% participation value 3.3. UTS questions are material from the 1st to 7th meeting, UTS value is 20% 4.4. UAS questions are material from the 9th to 15th meeting, UAS score is 30% **Form of Assessment** : Project Results Assessment / Product Assessment	Ask Java Discussion 2 X 50			5%
15	Understand transgenic technology and the formation of monoclonal antibodies	a. Explain transgenic methods in animals b. Give examples of transgenic animals c. Determine the benefits of developing transgenic animals for humans. Make a scheme of the stages of the monoclonal antibody technology method	**Criteria:** 1.1. Practical papers and reports, including 30% practical value 2.2. Activeness in discussions and presentations, including 20% participation value 3.3. UTS questions are material from the 1st to 7th meeting, UTS value is 20% 4.4. UAS questions are material from the 9th to 15th meeting, UAS score is 30% **Form of Assessment** : Project Results Assessment / Product Assessment	Questions and answers Discussion 2 X 50			5%
16							0%

Evaluation Percentage Recap: Case Study

No	Evaluation	Percentage
1.	Participatory Activities	20.84%
2.	Project Results Assessment / Product Assessment	55%
3.	Portfolio Assessment	3.33%
4.	Practice / Performance	3.34%
5.	Test	17.51%
		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.