



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										
Microbial Genetics*	4620102082	Study Program Elective Courses	T=2	P=0	ECTS=3.18	7	April 28, 2023										
AUTHORIZATION		SP Developer	Course Cluster Coordinator			Study Program Coordinator											
		Guntur Trimulyono, S.Si., M.Sc.	Prof. Dr. Mahanani Tri Asri, M.Si.			Dr. H. Sunu Kuntjoro, S.Si., M.Si.											
Learning model	Project Based Learning																
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)															
	PLO-13	Able to demonstrate basic knowledge of cell and molecular biology, organismal biology, ecology and evolution to analyze current biological issues															
	Program Objectives (PO)																
	PO - 1	Able to master basic knowledge about microbial genetics to analyze current issues in various fields of life related to microbial genetics															
	PO - 2	Able to apply skills in the field of microbial genetic studies that can be transferred to develop ecopreneurship (eco-innovation, eco-opportunity, eco-commitment)															
	PO - 3	Able to communicate scientific ideas related to the study of microbial genetics, both orally and in writing using appropriate communication media according to the target, as a means of lifelong learning for academic self-development															
	PO - 4	Able to work independently, responsibly, both as an individual and in a group, and able to work together															
	PLO-PO Matrix																
			P.O	PLO-5	PLO-7	PLO-11	PLO-13										
		PO-1															
		PO-2															
		PO-3															
	PO-4																
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																
Short Course Description	This course discusses the study of genetic material in microbes which includes: structure of genetic material, replication of genetic material, gene structure, gene expression, regulation of gene expression, transfer of genetic material, changes in genetic material, and genetic engineering. Lecture activities are carried out in a student-centered learning manner with discussions, presentations and assignments.																
References	Main :																
	<ol style="list-style-type: none"> 1. Dale, J.W. dan S.F. Park. 2004. Molecular Genetics of Bacteria. Chichester: John Wiley & Sons Ltd. 2. Madigan, M.T., Martinko, J.M., Stahl, D.A. and Clark, D.P.. 2012. Biology of Microorganism. Boston: Pearson. 3. Tortora, G.J., Funke, B.R. dan Case, C.L. 2007. Microbiology An Introduction. San Fransisco: Addison Wesley Longman, Inc. 4. Schleif, R. 1993. Genetics and Molecular Biology Second Edition. Baltimore and London: The Johns Hopkins University Press. 																
	Supporters:																

	1. Del Duca, S., Vassallo, A., Mengoni, A., Fani, R. 2022. Microbial Genetics and Evolution. <i>Microorganisms</i> 2022, 10, 1274. https://doi.org/10.3390/microorganisms10071274 .						
Supporting lecturer	MUSLIMIN IBRAHIM Prof. Dr. Mahanani Tri Asri, M.Si. Guntur Trimulyono, S.Si., M.Sc. Lisa Lisdiana, S.Si., M.Si., Ph.D.						
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	Mastering basic knowledge related to the history of the discovery of genetic material, the definition and scope of studying microbial genetics	1.Explain the history of the discovery of genetic material 2.Explain the definition and scope of studying microbial genetics	Criteria: Accuracy and mastery according to assessment indicators (assessment rubric) Form of Assessment : Participatory Activities	Lectures and discussions 2 X 50	Lectures and discussions 2 X 50	Material: History of the discovery of genetic material References: <i>Madigan, MT, Martinko, JM, Stahl, DA and Clark, DP. 2012. Biology of Microorganisms. Boston: Pearson.</i> Material: Definition and scope in studying microbial genetics References: <i>Dale, JW and SF Park. 2004. Molecular Genetics of Bacteria. Chichester: John Wiley & Sons Ltd.</i> Material: Microbial Genetics and Evolution Bibliography: <i>Del Duca, S., Vassallo, A., Mengoni, A., Fani, R. 2022. Microbial Genetics and Evolution. Microorganisms 2022, 10, 1274. https://doi.org/.../microorganisms10071274.</i>	4%
2	Master basic knowledge related to genetic material in microbes	1.Explain the terms in studying genetic material in microbes (genes, chromosomes, DNA, RNA, genome) 2.Explain the structure of DNA and chromosomes	Criteria: Accuracy and mastery according to assessment indicators (assessment rubric) Form of Assessment : Participatory Activities	Lectures and discussions 2 X 50	Lectures and discussions 2 X 50	Material: 1. Terms in studying genetic material in microbes (genes, chromosomes, DNA, RNA, genome), 2. Structure of DNA and chromosomes References: <i>Tortora, GJ, Funke, BR and Case, CL 2007. Microbiology An Introduction. San Francisco: Addison Wesley Longman, Inc.</i>	4%

3	Mastering basic knowledge related to nucleic acids and their organization in the genomes of eukaryotic and prokaryotic microbes, as well as viruses	1.Explains nucleic acids in eukaryotic and prokaryotic microbes, as well as viruses 2.Explain the organization of nucleic acids in the genomes of eukaryotic and prokaryotic microbes, as well as viruses	Criteria: Accuracy and mastery according to assessment indicators (assessment rubric) Form of Assessment : Participatory Activities	Cased-based learning and peer-interaction 2 X 50	Cased-based learning and peer-interaction 2 X 50	Material: 1. Explain nucleic acids in eukaryotic and prokaryotic microbes, as well as viruses, 2. Explain the organization of nucleic acids in the genomes of eukaryotic and prokaryotic microbes, as well as viruses. References: Dale, JW and SF Park. 2004. <i>Molecular Genetics of Bacteria</i> . Chichester: John Wiley & Sons Ltd. Material: 1. Explaining nucleic acids in eukaryotic and prokaryotic microbes, as well as viruses, 2. Explaining the organization of nucleic acids in the genomes of eukaryotic and prokaryotic microbes, as well as viruses. References: Tortora, GJ, Funke, BR and Case, CL 2007. <i>Microbiology An Introduction</i> . San Francisco: Addison Wesley Longman, Inc. Material: 1. Explaining nucleic acids in eukaryotic and prokaryotic microbes, as well as viruses, 2. Explaining the organization of nucleic acids in the genomes of eukaryotic and prokaryotic microbes, as well as viruses. Reference: Schleif, R. 1993. <i>Genetics and Molecular Biology Second Edition</i> . Baltimore and London: The Johns Hopkins University Press.	4%
4	Understanding the mechanisms of replication of genetic material in microbes	1.Explain research related to the mechanism of DNA replication 2.Explain the process and stages of DNA replication in a semi-conservative way	Criteria: Accuracy and mastery according to assessment indicators (assessment rubric) Form of Assessment : Participatory Activities	Cased-based learning and peer-interaction 2 X 50	Cased-based learning and peer-interaction 2 X 50	Material: DNA Replication Bibliography: Dale, JW & Park, SF 2010. <i>Molecular Genetics of Bacteria 5th Edition</i> . Chichester: John Wiley & Sons Ltd.	4%
5	Mastering basic knowledge related to DNA repair	Explain the mechanism of DNA repair	Criteria: Accuracy and mastery according to assessment indicators (assessment rubric) Form of Assessment : Participatory Activities	Cased-based learning and peer-interaction 2 X 50	Cased-based learning and peer-interaction 2 X 50	Material: Mutations, DNA damage and DNA repair References: Dale, JW & Park, SF 2010. <i>Molecular Genetics of Bacteria 5th Edition</i> . Chichester: John Wiley & Sons Ltd. Material: DNA repair mechanisms References: Dale, JW & Park, SF 2010. <i>Molecular Genetics of Bacteria 5th Edition</i> . Chichester: John Wiley & Sons Ltd.	4%

6	Mastering basic knowledge related to gene expression in microbes (transcription; translation; protein synthesis mechanisms)	1.Explain gene expression in microbes (transcription; translation; protein synthesis mechanisms) 2.Describe the differences in gene expression in prokaryotic and eukaryotic microbes	Criteria: Accuracy and mastery according to assessment indicators (assessment rubric) Form of Assessment : Project Results Assessment / Product Assessment	Cased-based learning and peer-interaction 2 X 50	Cased-based learning and peer-interaction 2 X 50	Material: Gene expression mechanisms in microbes (transcription; translation; protein synthesis mechanisms) References: <i>Madigan, MT, Martinko, JM, Stahl, DA & Clark, DP. 2012. Biology of Microorganisms. Boston: Pearson.</i> Material: Gene expression in microbes (transcription; translation; protein synthesis mechanisms) References: <i>Madigan, MT, Martinko, JM, Stahl, DA & Clark, DP. 2012. Biology of Microorganisms. Boston: Pearson.</i>	10%
7	Understanding the regulatory mechanisms of gene expression in microbes (Operons)	1.Explain the mechanisms of regulating gene expression in eukaryotic microbes 2.Explain the mechanism of regulation of gene expression in prokaryotic microbes (operons)	Criteria: Accuracy and mastery according to assessment indicators (assessment rubric) Form of Assessment : Participatory Activities	Cased-based learning and peer-interaction 2 X 50	Cased-based learning and peer-interaction 2 X 50	Material: Mechanisms for regulating gene expression in microbes (Operons) References: <i>Dale, JW & Park, SF 2010. Molecular Genetics of Bacteria 5th Edition. Chichester: John Wiley & Sons Ltd.</i>	5%
8	UTS meeting materials 1-7	Sub-CPMK 1 to 7	Criteria: Accuracy and mastery according to the UTS assessment indicators (assessment rubric). Form of Assessment : Test	Mid-Semester Evaluation/Mid-Semester Examination (UTS) 2 X 50	Mid-Semester Evaluation/Mid-Semester Examination (UTS) 2 X 50		10%
9	Understand mutations in microbes, mutagens, and how to detect mutations (Amesh test; replica plating)	1.Explain the meaning of mutation 2.Describe the causes of mutations 3.Explain the mechanism by which mutations occur 4.Explain the various types of mutations 5.Explain how to detect mutations	Criteria: Accuracy and mastery according to assessment indicators (assessment rubric) Form of Assessment : Participatory Activities	Cased-based learning and peer-interaction 2 X 50	Cased-based learning and peer-interaction 2 X 50	Material: 1. Understanding mutations, 2. Causes of mutations, 3. Mechanisms of mutations, 4. Types of mutations, 5. How to detect mutations References: <i>Dale, JW and SF Park. 2004. Molecular Genetics of Bacteria. Chichester: John Wiley & Sons Ltd.</i>	5%
10	Master basic knowledge about plasmids (extrachromosomal DNA)	1.Describe the characteristics of bacteria determined by plasmids 2.Explain the nature of plasmid molecules 3.Explain the stability of plasmids	Criteria: Accuracy and mastery according to assessment indicators (assessment rubric) Form of Assessment : Participatory Activities	Cased-based learning and peer-interaction 2 X 50	Cased-based learning and peer-interaction 2 X 50	Material: Plasmids References: <i>Dale, JW & Park, SF 2010. Molecular Genetics of Bacteria 5th Edition. Chichester: John Wiley & Sons Ltd.</i>	5%
11	Understanding the mechanisms of gene transfer: transformation	Explaining the mechanism of gene transfer: transformation	Criteria: Accuracy and mastery according to assessment indicators (assessment rubric) Form of Assessment : Participatory Activities	Cased-based learning and peer-interaction 2 X 50	Cased-based learning and peer-interaction 2 X 50	Material: Transformation Literature: <i>Dale, JW and SF Park. 2004. Molecular Genetics of Bacteria. Chichester: John Wiley & Sons Ltd.</i>	5%

12	Understanding gene transfer mechanisms: conjugation	Explain the mechanism of gene transfer: conjugation	Criteria: Accuracy and mastery according to assessment indicators (assessment rubric) Form of Assessment : Participatory Activities	Cased-based learning and peer-interaction 2 X 50	Cased-based learning and peer-interaction 2 X 50	Material: Bibliographic Conjugation : Dale, JW and SF Park. 2004. <i>Molecular Genetics of Bacteria</i> . Chichester: John Wiley & Sons Ltd.	5%
13	Understanding the mechanism of gene transfer: transduction	Explain the mechanism of gene transfer: transduction	Criteria: Accuracy and mastery according to assessment indicators (assessment rubric) Form of Assessment : Participatory Activities	Cased-based learning and peer-interaction 2 X 50	Cased-based learning and peer-interaction 2 X 50	Material: Transduction Reader: Dale, JW and SF Park. 2004. <i>Molecular Genetics of Bacteria</i> . Chichester: John Wiley & Sons Ltd.	5%
14	Understanding genetic modification by exploiting the potential of microbes	1.Explains genetic modification by exploiting the potential of microbes 2.Describe the role of genetic modification	Criteria: Accuracy and mastery according to assessment indicators (assessment rubric) Form of Assessment : Project Results Assessment / Product Assessment	Cased-based learning and peer-interaction 2 X 50	Cased-based learning and peer-interaction 2 X 50	Material: Genetic modification by exploiting microbial potential. References: Dale, JW and SF Park. 2004. <i>Molecular Genetics of Bacteria</i> . Chichester: John Wiley & Sons Ltd. Material: Genetic modification by exploiting the potential of microbes References: Schleif, R. 1993. <i>Genetics and Molecular Biology Second Edition</i> . Baltimore and London: The Johns Hopkins University Press.	10%
15	Master basic knowledge about gene mapping	1.Explain the gene map in microbes 2.Presents the role of genetic modification in microbes	Criteria: Accuracy and mastery according to assessment indicators (assessment rubric) Form of Assessment : Participatory Activities	Cased-based learning and peer-interaction 2 X 50	Cased-based learning and peer-interaction 2 X 50	Material: Gene map Bibliography: Dale, JW and SF Park. 2004. <i>Molecular Genetics of Bacteria</i> . Chichester: John Wiley & Sons Ltd.	5%
16		Sub-CPMK 1 to 14	Criteria: Accuracy and mastery according to the UAS assessment indicators (assessment rubric). Form of Assessment : Test	Final Semester Evaluation/Final Semester Examination (UAS) 2 X 50	Final Semester Evaluation/Final Semester Examination (UAS) 2 X 50		15%

Evaluation Percentage Recap: Project Based Learning

No	Evaluation	Percentage
1.	Participatory Activities	55%
2.	Project Results Assessment / Product Assessment	20%
3.	Test	25%
		100%

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.

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.