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

SEMESTER LEARNING PLAN

Courses	CODE	Course Family	Credit Weight			SEMESTER	Compilation Date
Cell and Molecular Biology	8420503054		T=3	P=0	ECTS=4.77	4	July 18, 2024

AUTHORIZATION	SP Developer	Course Cluster Coordinator	Study Program Coordinator
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Learning model	**Case Studies**

Program Learning Outcomes (PLO)

PLO study program which is charged to the course

PLO-8	Able to make decisions based on data/information in order to complete tasks as part of his responsibilities in the work he has done

Program Objectives (PO)

PLO-PO Matrix

P.O	PLO-8

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 studies the scope of Cell and Molecular Biology, techniques for studying cells, prokaryotic and eukaryotic cells (characteristics and differences), structure and function of the plasma membrane (composition, structure and function of membrane proteins, membrane lipids and fluidity, membrane transport), aerobic and mitochondrial respiration (mitochondrial structure and function, role of mitochondria in the formation of ATP, proton translocation and proton motive force, oxidative metabolism in mitochondria, peroxisomes), structure and function of endomembranes (nucleus, endoplasmic reticulum, Golgi bodies, vesicles, lysosomes, vacuoles) , cytoskeleton and cell movement (microtubules, intermediate filaments, microfilaments, cell movement), photosynthesis and chloroplasts (chloroplast structure and function, photosynthetic metabolism, photosynthetic units, photophosphorylation), cell interactions with the environment (extracellular matrix and cell junctions), cell genetic substance (genes, genome, DNA and chromosomes, RNA and transcriptome, protein and proteome), gene expression (transcription, post transcriptional process, translation, post-translational process, gene expression in eukaryotic and prokaryotic cells), regulation of gene expression, cell signaling and signal transduction, cell cycle and cell death (cell cycle, mitosis, meiosis, apoptosis, and necrosis), proliferation and cancer cells, as well as Cell and Molecular Biology applications in various fields. This material is delivered through lectures, presentations and assignments.

References

Main :

1. Albert B et al. 2015. Molecular Biology of the Cell Sixth edition. New York: Garland Science.
2. Lodish H et al. 2016. Molecular Cell Biology Eighth edition. New York: WH Freeman.

Supporters:

Supporting lecturer

Prof. Dr. Mahanani Tri Asri, M.Si.
Dr. Isnawati, M.Si.
Lisa Lisdiana, S.Si., M.Si., Ph.D.
Erlix Rakhmad Purnama, S.Si., M.Si.
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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 concept of cells and their position in an organism	1. Explain the scope of cell and molecular biology and its relationship to other scientific disciplines 2. Understand techniques for studying cells 3. Analyze the similarities and differences between the structure and function of prokaryotic and eukaryotic cells	**Criteria:** Participation assessment and Midterm Examination **Form of Assessment** : Participatory Activities, Tests	Lecturers facilitate student-centered learning through discussion activities related to teaching material concepts. The facilities provided and which students can use for learning and discussion include videos and teaching modules, which end with a presentation as a 3 X 50 formative assessment	Students join GM at GC, watch videos available at GC, read modules to discover important concepts, then make presentations for formative assessment	**Material:** Cell types and their position in organisms **References:** *Albert B et al. 2015. Molecular Biology of the Cell Sixth edition. New York: Garland Science.* **Material:** prokaryotic cells and eukaryotic cells, characteristics and influence of their structure on growth and development **References:** *Lodish H et al. 2016. Molecular Cell Biology Eighth edition. New York: WH Freeman.*	5%
2	Understand the structure and function of the plasma membrane as well as membrane transport mechanisms	1. Details the components that make up the plasma membrane 2. Explain the structure, function and properties of the plasma membrane 3. Comparing plasma membrane models 4. Explain the function and types of membrane transport 5. Explain the mechanism of membrane transport	**Criteria:** UTS **Form of Assessment** : Participatory Activities	Pay attention to modules and videos prepared by lecturers, discuss in groups to find important concepts and present discussion results as a form of formative assessment 2 X 50	gather in the GM/GC/zoom room, look at the module and watch the video, then have a group discussion in the breakout room, then make a presentation in the main room as a form of formative assessment 2 x 50	**Material:** Structure and function of the plasma membrane and transport across the membrane **References:** *Albert B et al. 2015. Molecular Biology of the Cell Sixth edition. New York: Garland Science.* **Material:** chemical components in certain materials resulting in reduced quality. **Reference:** *Albert B et al. 2015. Molecular Biology of the Cell Sixth edition. New York: Garland Science.*	5%
3	Understand the structure and function of mitochondria, as well as the mechanisms of aerobic respiration	1. Explain the theory of endosymbiosis for mitochondria 2. Explain the structure and function of the parts of mitochondria 3. Explain proton translocation, proton motive force, and ATP formation	**Criteria:** UTS **Form of Assessment** : Participatory Activities, Tests	examine learning resources in the form of teaching modules and PPT slides, discuss with friends and present the results of their work as a form of formative assessment 3 X 50	examine learning resources in the form of teaching modules and PPT slides, discuss with friends and present the results of their work as a form of formative assessment		5%

4	Understand the structure and function of the endomembrane system	1. Explain the structure and function of the endomembrane system 2. Examples of cell organelles that have an endomembrane system 3. Explain the structure, function and role of cell organelles	**Criteria:** Assessment of activities during discussions and Mid-Semester Exam Assessment **Form of Assessment** : Participatory Activities	Lecture and examine learning resources in the form of teaching modules and PPT slides, discuss with friends and present the results of their work as a form of formative assessment 3 X 50	examine learning resources in the form of teaching modules and PPT slides, discuss with friends and present the results of their work as a form of formative assessment	**Material:** Endomembrane system **References:** *Lodish H et al. 2016. Molecular Cell Biology Eighth edition. New York: WH Freeman.*	5%
5	Understand the structure and function of the cytoskeleton	1. Distinguish between various components that make up the cytoskeleton 2. Explain the structure and function of each type of cytoskeleton 3. Explain the mechanism of cell movement	**Criteria:** Assessment of activities during discussions and Mid-Semester Exam Assessment **Form of Assessment** : Participatory Activities	examining the modules, PPT slides and learning resources provided, discussing in study groups and presentations as a form of formative assessment 2 X 50	examining the modules, PPT slides and learning resources provided, discussing in study groups in breakout rooms and presentations in the main meeting room as a form of formative assessment 2 x 50	**Material:** cytoskeleton, constituent components, role and mechanism of action **Reference:** *Albert B et al. 2015. Molecular Biology of the Cell Sixth edition. New York: Garland Science.*	5%
6	Understand the structure and function of chloroplasts, as well as the mechanism of photosynthesis	1. Explain the theory of endosymbiosis for chloroplasts 2. Explain the structure and function of the parts of chloroplasts 3. Explain the mechanism of phosphorylation	**Criteria:** Assessment of activities during discussions and Mid-Semester Exam Assessment **Form of Assessment** : Participatory Activities, Tests	study modules, PPT slides and videos related to chloroplasts and the photosynthesis process, discuss in groups to discover important concepts and make presentations as a form of formative assessment 2 X 50	study modules, PPT slides and videos related to chloroplasts and the photosynthesis process, discuss in groups in the breakout room to discover important concepts and make presentations in the main zoom/GM/GC room as a form of formative assessment 2 x50	**Material:** Chloroplasts and chemical reactions of photosynthesis **References:** *Lodish H et al. 2016. Molecular Cell Biology Eighth edition. New York: WH Freeman.*	5%
7	Understand the extracellular matrix and cell junctions	1. Explain the meaning of extracellular matrix and cell junctions 2. Explain the structure of the extracellular matrix and cell junctions 3. Explain the function of the extracellular matrix and cell junctions 4. Details the various types of extracellular matrix and cell junctions	**Criteria:** UTS **Form of Assessment** : Participatory Activities	Observe PPT slides and teaching modules by discussing in groups, followed by presentation of group work results as a form of formative assessment 2 X 50	Observe PPT slides and teaching modules by discussing in groups in the breakout room, followed by presentation of group work results in the main room as a form of formative assessment 2 x 5	**Material:** extracellular matrix and cell junctions **References:** *Albert B et al. 2015. Molecular Biology of the Cell Sixth edition. New York: Garland Science.*	5%
8				Test 2 X 50			0%

9	Understand the genetic substances contained in cells	1. Explain the structure and function of each genetic substance 2. Explain the meaning of genome, transcriptome, and proteome and their applications 3. Compare gene organization in eukaryotes and prokaryotes	**Criteria:** UAS **Forms of Assessment** : Participatory Activities, Project Results Assessment / Product Assessment, Tests	studying PPT slides and modules related to cell genetic material and ending with a presentation as a form of formative evaluation, also reviewing articles about genetic substance disorders which will be collected as a 3 X 50 product	studying PPT slides and modules related to cell genetic material and ending with a presentation as a form of formative evaluation in virtual space via zoom/GM/GC, also reviewing articles about genetic substance disorders that will be collected as products carried out independently asynchronously	**Material:** Genetic material, expression of genetic material, its organization in prokaryotic cells and eukaryotic cells **References:** *Lodish H et al. 2016. Molecular Cell Biology Eighth edition. New York: WH Freeman.*	30%
10	Understand the process of gene expression in prokaryotic and eukaryotic cells	1. Details the stages of transcription 2. Explain the function of each transcription component 3. Detailing the stages of translation 4. Explain the function of each translation component 5. Comparing the process of gene expression in prokaryotic cells and eukaryotic cells	**Criteria:** UAS **Forms of Assessment** : Participatory Activities, Project Results Assessment / Product Assessment, Tests	analysis of discourse related to the differences and similarities in gene expression in prokaryotes and eukaryotes and their effects on the growth and development of the organism that owns the cells, the results of the analysis are collected as an assignment and presented as a form of formative assessment 2 X 50	Discourse analysis related to the differences and similarities in gene expression in prokaryotes and eukaryotes and their effects on the growth and development of the organism that owns the cells is carried out asynchronously, the results of the analysis are collected as assignments and presented as a form of formative assessment 2 x 50	**Material:** gene expression in eukaryotes and prokaryotes **References:** *Albert B et al. 2015. Molecular Biology of the Cell Sixth edition. New York: Garland Science.*	0%
11	Understanding gene regulation in eukaryotes and prokaryotes	1. Describe the regulatory sequence in the structure of prokaryotic and eukaryotic genes 2. Explain the mechanisms of gene expression and regulation in prokaryotes and eukaryotes	**Criteria:** UAS **Form of Assessment** : Test	reviewing the module and PPT slides to find key concepts and presentation of results as a form of 3 X 50 formative test	reviewing modules and PPT slides to independently discover key asynchronous concepts and presenting the results in a virtual space as a form of formative test		5%
12	Understand the concepts and mechanisms of communication between cells	1. Explain the concept of communication between cells 2. Explain the types of communication between cells 3. Analyzing the mechanism of a cellular process based on cell level communication	**Criteria:** UAS **Form of Assessment** : Participatory Activities	examine modules and videos in groups, present the results of group work as a formative assessment, review articles related to inter-cell communication disorders and submit them as assignment products 3 X 50	reviewing modules and videos in groups, presenting the results of group work as a form of formative assessment in virtual space, reviewing articles related to communication disorders between cells and submitting them as assignment products independently, asynchronously		5%
13	Understand concepts related to the cell cycle and cell death	1. Explain the cell cycle 2. Distinguish between mitosis and meiosis 3. Explain cell death 4. Differentiate between apoptosis and necrosis	**Criteria:** UAS	Lectures and discussions 3 X 50			0%

14	Understand the concept of proliferation and cancer cells	1. Explain the concept of cell proliferation 2. Explain the meaning of cancer 3. Explain angiogenesis, invasion and metastasis of cancer	**Criteria:** presentation of the results of the article study **Form of Assessment** : Participatory Activities	reviewing articles related to cancer and presentation of 3 X 50 results	reviewing cancer-related articles independently asynchronously and presenting results online in the zoom/GM/GC virtual room	**Material:** cancer, causes and treatment **References:** *Lodish H et al. 2016. Molecular Cell Biology Eighth edition. New York: WH Freeman.*	5%
15	Understand the applications of Cell and Molecular Biology in various fields	1. Explain the role of Cell and Molecular Biology in various fields 2. Provide examples of research in the field of Cell and Molecular Biology	**Criteria:** Task **Form of Assessment** : Participatory Activities	Presentation and discussion related to articles on the application of cell and molecular biology in various fields of life 3 X 50	Presentations and discussions related to articles on cell and molecular biology applications in various fields of life were carried out in the Zoom/GM/GC virtual room	**Material:** Use of molecular cell biology in various areas of life **References:** *Albert B et al. 2015. Molecular Biology of the Cell Sixth edition. New York: Garland Science.*	5%
16				3 X 50 test			0%

Evaluation Percentage Recap: Case Study

No	Evaluation	Percentage
1.	Participatory Activities	52.5%
2.	Project Results Assessment / Product Assessment	10%
3.	Test	22.5%
		85%

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.