

		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																																
Biochemistry		4620102025			T=2	P=0	ECTS=3.18	3 July 17, 2024																																
AUTHORIZATION		SP Developer			Course Cluster Coordinator		Study Program Coordinator																																	
			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																																							
	Program Objectives (PO)																																							
	PLO-PO Matrix																																							
	<table border="1" style="margin: auto;"> <tr> <td style="width: 100px; height: 30px;"></td> <td style="width: 100px; text-align: center;">P.O</td> </tr> </table>									P.O																														
	P.O																																							
	PO Matrix at the end of each learning stage (Sub-PO)																																							
	<table border="1" style="margin: auto;"> <tr> <td rowspan="2" style="width: 50px; height: 30px;">P.O</td> <td colspan="16" style="text-align: center;">Week</td> </tr> <tr> <td style="width: 20px;">1</td> <td style="width: 20px;">2</td> <td style="width: 20px;">3</td> <td style="width: 20px;">4</td> <td style="width: 20px;">5</td> <td style="width: 20px;">6</td> <td style="width: 20px;">7</td> <td style="width: 20px;">8</td> <td style="width: 20px;">9</td> <td style="width: 20px;">10</td> <td style="width: 20px;">11</td> <td style="width: 20px;">12</td> <td style="width: 20px;">13</td> <td style="width: 20px;">14</td> <td style="width: 20px;">15</td> <td style="width: 20px;">16</td> </tr> </table>								P.O	Week																1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
P.O	Week																																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16																								
Short Course Description	This course includes a discussion of organic compounds such as carbohydrates, proteins, lipids and nucleic acids and the metabolic processes (catabolism and anabolism) of these organic compounds in the bodies of living creatures, disorders that arise if there are abnormalities related to the supply and metabolism of these compounds. Other compounds that are important for life processes, such as water, vitamins and minerals are also discussed in this course. This course also discusses enzymes which are important biological catalysts and hormones which are part of the coordination system of living things which are composed of chemical compounds. This course also facilitates students to gain practical experience in identifying organic compounds. Students' attitudes to be honest, work carefully, be careful are trained and developed in this course.																																							
References	Main :																																							
	1. Referensi : 1. Arbiyanto, P. 1933. <i>Biokimia (Konsep-Konsep Dasar)</i> . DIKTI. 2. Eubanks, P.L., Middlecamp, H. C., Pienta, J. N., Heltzel, E. C., Weaver, C. G. 2006. Chemistry in context. Published The Mc Graw-Hill Companies, Inc-Newyork 3. Isnawati. 2010. <i>Biokimia</i> . Surabaya: Unesa Press. 4. Lehninger, AL. 1992. <i>Biochemistry</i> . New York: Worth Publishing Inc. 5. Rahayu, Y.S. Biochemistry. Surabaya: Unesa Press. 6. Strayer, I. 1973. <i>Biochemistry</i> . New York: W.H. Freeman & Co.																																							
	Supporters:																																							
Supporting lecturer	Dra. Evie Ratnasari, M.Si. Prof.Dr. Yuni Sri Rahayu, M.Si. Dr. Isnawati, 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 structure and function of carbohydrates	1. Describe the structure of carbohydrates 2. Describe the function of carbohydrates		Discussion, presentation and practicum 2 X 50			0%																																	

2	Understand carbohydrate metabolism and the abnormalities that arise if there are abnormalities	1. Describe carbohydrate catabolism 2. Describe carbohydrate anabolism 3. Describe the disorders that arise related to abnormalities in carbohydrate metabolism		Discussion and presentation 2 X 50			0%
3	Describe carbohydrate catabolism, related diseases and apply these concepts to solve problems related to carbohydrate metabolism in everyday life	a. Explain the process of glycolysis and its regulation b. Explain the Krebs' cycle and its organization c. Explain the electron transfer chain and its regulation d. Give examples of diseases related to carbohydrate metabolism, how to prevent and treat them	Criteria: 1.Criteria: 2.Indicators are achieved through assignments and presentations	Presentations, active discussions, structured and independent assignments 2 X 50			0%
4	Describe the structure and function of proteins	1.Explain the structure of various types of amino acids and proteins 2.Explain the function of various types of protein in the body 3.Demonstrate the polymerization of various types of proteins from their constituent amino acid monomers	Criteria: 1.Criteria: 2.Indicators are achieved through assignments and presentations	Read and underline important concepts related to protein structure and function. Demonstrate the polymerization process of various types of proteins based on 2 X 50 amino acid monomers			0%
5	Describe the process of protein synthesis	a. Explain the process of gene expression (transcription and translation) in the process of protein formation b. Explain the process of forming non-essential amino acids from essential amino acids c. Explain the process of synthesizing amino acids from carbohydrate materials/compounds between carbohydrate catabolism	Criteria: Indicators are achieved through assignments and presentations	Face to face: 2x50 minutes Independent: Study protein anabolism in various sources. Structured: Create a PPT and present the results 2 X 50			0%
6	Describe protein catabolism, related diseases and apply these concepts to solve problems related to protein metabolism in everyday life	a. Explain the process of protein catabolism b. Give examples of diseases related to protein metabolism, prevention and treatment	Criteria: 1.Criteria: 2.Indicators are achieved through assignments and presentations	Face to face: discussion and presentation Independent: 2x60 minutes Read and discover the concept of protein catabolism and its relationship to carbohydrate catabolism. Structured: 2x60 minutes Make a resume in the form of a scheme of the relationship between protein catabolism and carbohydrate catabolism 2 X 50			0%

7	Describe the role of water, vitamins and minerals for organisms, related diseases and apply these concepts to solve problems related to water, vitamins and minerals in everyday life	a. Explain the function of water in organism metabolism b. Explain the structure, properties, sources of obtaining various types of vitamins and their functions for organisms c. Explain the function, properties, sources of obtaining various types of minerals d. Give examples of diseases caused by vitamin and mineral deficiencies, their prevention and cure	Criteria: Indicators are achieved through assignments and presentations	Face to face: discussion and presentation Independent: 2x60 minutes Read and underline important concepts related to structure, properties, function, sources of water, vitamins and minerals and deficiency diseases, prevention and treatment. Structured: 2x60 minutes Create a resume of 2 X 50 reading results			0%
8	UTS	UTS	Criteria: UTS	UTS 2 X 50			0%
9	Describe the structure and function of nucleic acids	a. Describe the structure of DNA b. Describe the structure of RNA c. Identify the differences between DNA and RNA d. Explain the function of DNA and RNA	Criteria: 1.Criteria: 2.Indicators are achieved through assignments and presentations	Face to face: active discussion and presentation Independent: 2x60 minutes Read and underline important concepts related to the structure and function of DNA and RNA. Demonstrate the polymerization process of DNA and RNA its constituent nucleotide monomers Structured: 2x60 minutes Make a resume of your own reading/study results 2 X 50			0%
10	Describe nucleic acid metabolism, related diseases and apply these concepts to solve problems related to nucleic acids and everyday life	a. Explain the anabolism of nucleic acids b. Explain the catabolism of nucleic acids c. Give examples of diseases related to nucleic acid metabolism, prevention and treatment	Criteria: 1.Criteria: 2.Indicators are achieved through assignments and presentations	Face to face: active discussions and presentations Independent: 2x60 minutes Study anabolism and catabolism of nucleic acids Structured: 2x60 minutes Make a PPT and present the results of independent learning related to nucleic acid metabolism 2 X 50			0%

11	Describe the structure and function of lipids	<ol style="list-style-type: none"> 1.Explain the structure of various types of fatty acids and lipids 2.Explain the function of various types of lipids in organisms 3.Demonstrate the preparation of various types of lipids from their constituent components 	Criteria: <ol style="list-style-type: none"> 1.Criteria: 2.Indicators are achieved through assignments and presentations 	Face to face: active discussion and presentation Independent: 2x60 minutes Read and underline important concepts related to the structure and function of lipids. Demonstrate the process of preparing various types of lipids from their constituent components Practical: 2x60 minutes Identify various types of fats in various types of food ingredients Structured: 2x60 minutes Make a practical report 2 X 50			0%
12	Describe lipid anabolism	<ol style="list-style-type: none"> a. Explain the process of formation of saturated fatty acids and unsaturated fatty acids b. Explain the formation of fatty acids from carbohydrates c. Inventory and calculate the compounds produced and needed in the fatty acid formation process 	Criteria: <ol style="list-style-type: none"> 1.Criteria: 2.Indicators are achieved through assignments and presentations 	Face to face: presentation, active discussion Independent: 2x60 minutes Study the anabolism of fatty acids and various types of pilides in various sources. Structured: 2x60 minutes Make a PPT and present the results of independent learning related to lipid anabolism 2 X 50			0%
13	Describe lipid catabolism, related diseases and apply these concepts to solve problems related to lipid metabolism in everyday life	<ol style="list-style-type: none"> a. Explain the process of lipid catabolism b. Inventory and calculate the amount of ATP produced from the catabolism process of various types of lipids c. Linking lipid metabolism with protein and carbohydrate metabolism d. Give examples of diseases related to lipid metabolism, prevention and treatment 	Criteria: <ol style="list-style-type: none"> 1.Criteria: 2.Indicators are achieved through assignments and presentations 	Face to face: Independent presentation and discussion: 2x60 minutes Read and discover the concept of lipid catabolism and its relationship to protein and carbohydrate metabolism. Structured: 2x60 minutes Make a resume in the form of a scheme of the relationship between lipid, protein and carbohydrate metabolism 2 X 50			0%

14	Describe concepts related to enzymes, factors that influence enzyme work, enzyme-related diseases and apply these concepts to solve problems in everyday life related to the work of enzymes in the body	a. Explain the meaning, structure, function and properties of enzymes b. Determine the classification of enzymes. c. Explain the mechanism of action of enzymes d. Explain the factors that influence enzyme work e. Describe the obstacles to enzyme action f. Create a schematic of enzyme systems in various metabolic pathways g. Give examples of isoenzymes	Criteria: 1.Criteria: 2.Indicators are achieved through structured task assignments	Face to face: Active discussion and presentation Independent: 2x60 minutes Reading and in groups and writing down the results of a journal review of research results on enzymes and their role Structured: 2x60 minutes Making a report on the results of a literature review on enzymes and their role 2 X 50			0%
15	Describe concepts related to hormones, hormonal diseases, how to prevent and treat them based on the application of the biochemical concept of hormones	a. Explain the meaning, properties, functions and compounds that make up various types of hormone groups b. Explain the organization of hormone action in the human body c. Explain the types of hormones and their functions d. Explain the mechanism of action of hormones e. Describe hormonal deficiency, symptoms, prevention and treatment	Criteria: 1.Criteria: 2.Indicators are achieved through structured task assignments	Face to face: discussion and presentation Independent: 2x60 minutes Read and work in groups and write down the results of a journal review of research results on hormones and their role Structured: 2x60 minutes Make a report on the results of a literature review on hormones and their role 2 X 50			0%
16							0%

Evaluation Percentage Recap: Case Study

No	Evaluation	Percentage
		0%

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.