



		Universitas Negeri Surabaya Faculty of Mathematics and Natural Sciences Bachelor of Science Education Study Program						Document Code																																											
SEMESTER LEARNING PLAN																																																			
Courses		CODE		Course Family		Credit Weight		SEMESTER	Compilation Date																																										
Biotechnology Basics		8420102029				T=2 P=0 ECTS=3.18		0	July 19, 2024																																										
AUTHORIZATION		SP Developer			Course Cluster Coordinator			Study Program Coordinator																																											
				Prof. Dr. Erman, M.Pd.																																											
Learning model	Project Based Learning																																																		
Program Learning Outcomes (PLO)	PLO study program that is charged to the course																																																		
	Program Objectives (PO)																																																		
	PLO-PO Matrix																																																		
		<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: auto;">P.O</div>																																																	
	PO Matrix at the end of each learning stage (Sub-PO)																																																		
		<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td rowspan="2" style="width: 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	16																
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Short Course Description	This course discusses the study and development of reasoning regarding the principles of biotechnology including fermentation biotechnology, industrial biotechnology, genetic engineering, primary metabolites, secondary metabolites, and tissue culture by integrating an entrepreneurial perspective. Lectures are carried out with modeling, presentations, discussions and practicum.																																																		
References	Main :																																																		
		<ol style="list-style-type: none"> 1. Agbon Eddy C., 2012. Innovations in Biotechnology . Washington DC: InTech. 2. Becker, M. J., Caldwell, G. A., Zachgo, E. A. 1996. Biotechnology: a Laboratory Course . 2nd Edition. New York: Academic Press. 3. Evans, Gareth M. AndJudith c. Furlong. 2003. Environmental Biotechnology Theory and Application. San Francisco: John Wiley & Sons Ltd. 4. Hidayat, N., Masdiana C. Pandaga dan Sri Suhartini. 2006. Mikrobiologi Industri. Yogyakarta: ANDI. 5. Peter, kolchinsky. 2004. Start up The Entrepreneur 19s Guide to A Biotech Startup . New York. Assobiotec. 6. Rai, R. V (Ed). 2016. Advances in Food Biotechnology . India: Wiley Blackwell. 7. Satyanarayana, T. and Gotthard Kunze. 2009. Yeast Biotechnology: Diversity and Applications. New York: Springer. 																																																	
	Supporters:																																																		
Supporting lecturer	Dra. Evie Ratnasari, M.Si. Dr. Hasan Subekti, S.Pd., M.Pd. Aris Rudi Purnomo, S.Si., M.Pd., M.Sc.																																																		
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	Utilize learning resources and ICT-assisted learning media to explore data, collect information, and solve problems to support learning implementation. Master theoretical concepts in the field of biotechnology principles including theory and practice in depth and formulate them in procedural problem solving.	<ol style="list-style-type: none"> 1.Explain the meaning of Biotechnology 2.Reviewing the development of biotechnology 3.Provide examples of the application of biotechnology 4.Explain the meaning of biotechnology based on limitations, processes and results 5.Analyze the development of biotechnology in the 21st century 	Criteria: <ol style="list-style-type: none"> 1.Written test assessment rubric for each question item: 2.The written understanding is not in accordance with the concept provided. Some of the written understanding is in accordance with the concept. The written understanding is in accordance with the concept. The written understanding is in accordance with the concept. The written understanding is in accordance with the concept and students can provide examples related to the concept. 	Student-centered learning approach (student centered learning). Inductive learning strategy Learning method in the form of discussion, observing and analyzing things related to concepts, presentation of assignments, and evaluation of learning outcomes 2 X 50			0%
2	Utilize learning resources and ICT-assisted learning media to explore data, collect information, and solve problems to support learning implementation. Master theoretical concepts in the field of biotechnology principles including theory and practice in depth and formulate them in procedural problem solving.	<ol style="list-style-type: none"> 1.Explain the meaning of fermentation 2.Describe the fermentation process 3.Identifying fermentation media 4.Provide examples of the application of fermentation technology to food production 	Criteria: <ol style="list-style-type: none"> 1.Written test rubric for each question item: 2.Score 1 if the written understanding does not match the concept given 3.Score 2 if some of the understanding written is in accordance with the concept 4.Score 3 if the written understanding is in accordance with the concept 5.Score 4 if the written understanding is in accordance with the concept and the student can provide examples related to the concept 	Student-centered learning approach (student centered learning). Inductive learning strategy Learning method in the form of discussion, observing and analyzing matters related to concepts, presentation of assignments, and evaluation of learning outcomes. 2 X 50			0%
3	Utilize learning resources and ICT-assisted learning media to explore data, collect information, and solve problems to support learning implementation. Master theoretical concepts in the field of biotechnology principles including theory and practice in depth and formulate them in procedural problem solving.	<ol style="list-style-type: none"> 1.Explaining the meaning of food biotechnology, 2.Explaining the Condition of Food Biotechnology in Asia 3.Explaining Food Biotechnology and 4.Explaining Product Safety 	Criteria: <ol style="list-style-type: none"> 1.writing test 2.Score 1 if the written understanding does not match the concept given 3.Score 2 if some of the understanding written is in accordance with the concept 4.Score 3 if the written understanding is in accordance with the concept 5.Score 4 if the written understanding is in accordance with the concept and the student can provide examples related to the concept 	Student-centered learning approach (student centered learning). Inductive learning strategy Learning method in the form of discussion, observing and analyzing matters related to concepts, presentation of assignments, and evaluation of learning outcomes. 2 X 50			0%

4	Utilize learning resources and ICT-assisted learning media to explore data, collect information, and solve problems to support learning implementation. Master theoretical concepts in the field of biotechnology principles including theory and practice in depth and formulate them in procedural problem solving.	Explain the impact of the development of biotechnology from an economic, socio-cultural and religious perspective.	Criteria: 1. writing test 2. Score 1 if the written understanding does not match the concept given 3. Score 2 if some of the understanding written is in accordance with the concept 4. Score 3 if the written understanding is in accordance with the concept 5. Score 4 if the written understanding is in accordance with the concept and the student can provide examples related to the concept	Student-centered learning approach (student centered learning) Inductive learning strategy Learning method in the form of discussion, observing and analyzing things related to concepts, presentation of assignments, and evaluation of learning outcomes. 2 X 50			0%
5	Able to make decisions based on information and data analysis and provide guidance in choosing alternative solutions. Responsible for informing the results of information and data analysis both orally (presentations) and in writing (scientific articles) or posters.	Planning for the practical implementation of food biotechnology	Criteria: Get an A if the student is able to prepare a research design according to the correct scientific method.	Student-centered approach student-centered learning Deductive learning strategy The method used is discussion, practicum, literature search (library and Google Scholar), working on LKM according to procedures that still require students to think critically and actively, and presentation of results 2 X 50			0%
6	Able to make decisions based on information and data analysis and provide guidance in choosing alternative solutions. Responsible for informing the results of information and data analysis both orally (presentations) and in writing (scientific articles) or posters.	Practical implementation of food biotechnology	Criteria: Get an A grade if you carry out research-based practicum while still paying attention to precision, thoroughness and work safety	Student-centered approach (student-centered learning) Deductive learning strategy The methods used are discussions, practicums, literature searches (library and Google Scholar), working on LKM according to procedures that still require students to think critically and actively, and presentation of results 2 X 50			0%

7	Able to make decisions based on information and data analysis and provide guidance in choosing alternative solutions. Responsible for informing the results of information and data analysis both orally (presentations) and in writing (scientific articles) or posters.	Communicate practicum results	Criteria: Students get an A if they can show successful practicum results, show a representative poster (not much writing, reinforced by pictures), and communicate the practicum results orally supported by data and theory.	Student-centered approach (student-centered learning) Deductive learning strategy The method used is discussion, practicum, literature search (library and Google Scholar), working on LKM according to procedures that still require students to think critically and actively, and presentation of results 2 X 50			0%
8				2 X 50			0%
9	Utilize learning resources and ICT-assisted learning media to explore data, collect information, and solve problems to support learning implementation. Master theoretical concepts in the field of biotechnology principles including theory and practice in depth and formulate them in procedural problem solving.	Describe the scope and principles of plant tissue culture by giving examples.	Criteria: 1. writing test 2. Score 1 if the written understanding does not match the concept given 3. Score 2 if some of the understanding written is in accordance with the concept 4. Score 3 if the written understanding is in accordance with the concept 5. Score 4 if the written understanding is in accordance with the concept and the student can provide examples related to the concept	Student-centered approach (student-centered learning) Deductive learning strategy The methods used are discussions, practicums, literature searches (library and Google Scholar), working on LKM according to procedures that still require students to think critically and actively, and presentation of results. 2 X 50			0%

10	Utilize ICT-assisted learning resources and learning media to explore data, collect information and solve problems to support learning implementation. Mastering theoretical concepts in the field of biotechnology principles including theory and practice in depth as well as formulating them in procedural problem solving.	Compile articles resulting from literature studies regarding the development and use of plant tissue culture	Criteria: Get an A if you are able to write an article that highlights the development of plant tissue culture in the last 5 years	Student-centered approach student-centered learning Deductive learning strategy The method used is discussion, practicum, literature search (library and Google Scholar), working on LKM according to procedures that still require students to think critically and actively, and presentation of results 2 X 50			0%
11	Utilize learning resources and ICT-assisted learning media to explore data, collect information, and solve problems to support learning implementation. Master theoretical concepts in the field of biotechnology principles including theory and practice in depth and formulate them in procedural problem solving.	Describe the scope and principles of animal tissue culture by giving examples	Criteria: 1. writing test 2. Score 1 if the written understanding does not match the concept given 3. Score 2 if some of the understanding written is in accordance with the concept 4. Score 3 if the written understanding is in accordance with the concept 5. Score 4 if the written understanding is in accordance with the concept and the student can provide examples related to the concept	Student-centered learning approach (student centered learning). Inductive learning strategy Learning method in the form of discussion, observing and analyzing things related to concepts, presentation of assignments (written results), and evaluation of learning outcomes. 2 X 50			0%
12	Utilize ICT-assisted learning resources and learning media to explore data, collect information and solve problems to support learning implementation. Mastering theoretical concepts in the field of biotechnology principles including theory and practice in depth and formulating them in depth	Identify and apply the concept of secondary metabolites and utilize them in life	Criteria: 1. writing test 2. Score 1 if the written understanding does not match the concept given 3. Score 2 if some of the understanding written is in accordance with the concept 4. Score 3 if the written understanding is in accordance with the concept 5. Score 4 if the written understanding is in accordance with the concept and the student can provide examples related to the concept	Student-centered learning approach (student centered learning). Inductive learning strategy Learning method in the form of discussion, observing and analyzing matters related to concepts, presentation of assignments, and evaluation of learning outcomes. 2 X 50			0%

13	Able to make decisions based on information and data analysis and provide guidance in choosing alternative solutions. Responsible for informing the results of information and data analysis both orally (presentations) and in writing (scientific articles) or posters.	Develop procedures for making virgin coconut oil (VCO) Carry out every point of the procedure for making VCO Produce quality VCO in terms of aroma, taste and color Produce packaging with an attractive design and have clear information	Criteria: Get an A grade if you produce a VCO product that has a clear color, coconut and fruit aroma (if using enzymes from fruit) and a distinctive VCO (coconut) taste and package it attractively.	Student-centered approach student-centered learning Inductive learning strategy The methods used are discussions, practicums, literature searches (library and Google Scholar), working on LKM according to procedures that still require students to think critically and actively, and presentation of results (posters and writing). 2 X 50			0%
14	Utilize ICT-assisted learning resources and learning media to explore data, collect information and solve problems to support learning implementation. Mastering theoretical concepts in the field of biotechnology principles including theory and practice in depth as well as formulating them in procedural problem solving.	1. Describe the principles of monoploid and polyploid plants 2. Method of creating monoploid plants	Criteria: 1. writing test 2. Score 1 if the written understanding does not match the concept given 3. Score 2 if some of the understanding written is in accordance with the concept 4. Score 3 if the written understanding is in accordance with the concept 5. Score 4 if the written understanding is in accordance with the concept and the student can provide examples related to the concept	Student-centered approach student-centered learning Inductive learning strategy The method used is discussion, literature searches (library and Google Scholar), working on LKM according to procedures that still require students to think critically and actively, and presentation of results (posters and writing). 2 X 50			0%

15	Utilize learning resources and ICT-assisted learning media to explore data, collect information, and solve problems to support learning implementation. Master theoretical concepts in the field of biotechnology principles including theory and practice in depth and formulate them in procedural problem solving.	Describe the principles and methods of creating monoplloid and polyploid plants	Criteria: 1. writing test 2. Score 1 if the written understanding does not match the concept given 3. Score 2 if some of the understanding written is in accordance with the concept 4. Score 3 if the written understanding is in accordance with the concept 5. Score 4 if the written understanding is in accordance with the concept and the student can provide examples related to the concept	Student-centered approach student-centered learning Inductive learning strategy The methods used are discussions, literature searches (library and Google Scholar), working on LKM according to procedures that still require students to think critically and actively, and presentation of results (posters and writing). 2 X 50			0%
16				2 X 50			0%

Evaluation Percentage Recap: Project Based Learning

No	Evaluation	Percentage
		0%

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** abilities in the process and student learning outcomes are specific and measurable statements that identify the abilities or performance of student learning outcomes accompanied by evidence.
- Kreteria Penilaian** adalah patokan yang digunakan sebagai ukuran atau tolok ukur ketercapaian pembelajaran dalam penilaian berdasarkan indikator-indikator yang telah ditetapkan. Kreteria penilaian merupakan pedoman bagi penilai agar penilaian konsisten dan tidak bias. Kreteria dapat berupa kuantitatif ataupun kualitatif.
- Bentuk penilaian:** tes dan non-tes.
- Bentuk pembelajaran:** Kuliah, Responsi, Tutorial, Seminar atau yang setara, Praktikum, Praktik Studio, Praktik Bengkel, Praktik Lapangan, Penelitian, Pengabdian Kepada Masyarakat dan/atau bentuk pembelajaran lain yang setara.
- Metode Pembelajaran:** Small Group Discussion, Role-Play & Simulation, Discovery Learning, Self-Directed Learning, Cooperative Learning, Collaborative Learning, Contextual Learning, Project Based Learning, dan metode lainnya yg setara.
- Materi Pembelajaran** adalah rincian atau uraian dari bahan kajian yg dapat disajikan dalam bentuk beberapa pokok dan sub-pokok bahasan.
- Bobot penilaian** adalah prosentasi penilaian terhadap setiap pencapaian sub-PO yang besarnya proposional dengan tingkat kesulitan pencapaian sub-PO tsb., dan totalnya 100%.
- TM=Tatap Muka, PT=Penugasan terstruktur, BM=Belajar mandiri.