



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																																											
Plant Embryology*	4620102059		T=1	P=1	ECTS=3.18	6	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																																																	
	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-13	Able to demonstrate basic knowledge of cell and molecular biology, organismal biology, ecology and evolution to analyze current biological issues																																																
	Program Objectives (PO)																																																	
	PLO-PO Matrix																																																	
		<table border="1" style="margin: auto;"> <tr> <td style="width: 33%;">P.O</td> <td style="width: 33%;">PLO-7</td> <td style="width: 33%;">PLO-13</td> </tr> </table>			P.O	PLO-7	PLO-13																																											
P.O	PLO-7	PLO-13																																																
PO Matrix at the end of each learning stage (Sub-PO)																																																		
	<table border="1" style="margin: auto;"> <tr> <td rowspan="2" style="width: 10%;">P.O</td> <td colspan="16" style="text-align: center;">Week</td> </tr> <tr> <td style="width: 5%;">1</td> <td style="width: 5%;">2</td> <td style="width: 5%;">3</td> <td style="width: 5%;">4</td> <td style="width: 5%;">5</td> <td style="width: 5%;">6</td> <td style="width: 5%;">7</td> <td style="width: 5%;">8</td> <td style="width: 5%;">9</td> <td style="width: 5%;">10</td> <td style="width: 5%;">11</td> <td style="width: 5%;">12</td> <td style="width: 5%;">13</td> <td style="width: 5%;">14</td> <td style="width: 5%;">15</td> <td style="width: 5%;">16</td> </tr> </table>	P.O	Week																1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16																
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 generational transition in Bryophyta which includes the classes Hapaticopsida, Anthoceroopsida and Bryopsida; Pteridophyta generational transitions include gametogenesis, sporogenesis, and embryogenesis in Psilopsida, Lycopsida, Sphenopsida, and Pteropsida; Transition of Spermatophyta generations, including gametogenesis, sporogenesis, and embryogenesis in Gymnosperms and Angiosperms.																																																	
References	Main :																																																	
	<ol style="list-style-type: none"> 1. Evert RF, Eichhorn SE. 2013. Raven biology of plants, 8th ed . New York: W.H. Freeman. 2. Shivanna KR., Sawhney VK. 2005. Pollen Biotechnology for Crop Production and Improvement . New York: Cambridge University. 3. Maheswari, P. 1975. An Introduction to the Embryology of Angiosperm . New York: McGraw-Hill Book Company. 4. Vashsista, B.R. 1973. Bryophyta . New Delhi: S. Chand & Company LTD. 5. Vashsista, B.R. 1983. Gymnosperm . New Delhi: S. Chand & Company LTD. 6. Vashsista, B.R. 1984. Pteridophyta . New Delhi: S. Chand & Company LTD. 7. Olsen, Odd-Arne. 2007. Endosperm: Developmental and Molecular Biology . New York: Springer. 																																																	
	Supporters:																																																	
Supporting lecturer	Dr. Rinie Pratiwi Puspitawati, M.Si. Ahmad Bashri, S.Pd., 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 and communicate hereditary changes in Bryophyta. Have a responsible, independent and honest attitude towards performance in plant embryology	<ol style="list-style-type: none"> 1. Describe the parts that make up the reproductive organs of Bryophyta. 2. Explain the process of Bryophyta gametogenesis. 3. Write the results of studies on fertilization and embryogenesis of Bryophyta. 4. Communicating the Ontogeny of sporogenesis 5. Be present on time according to the lecture schedule 6. Collect assignments on time 7. Actively express opinions during discussions and presentations 		Discussion and preparation of a paper on the structure and development of male and female gametophytes of Bryophyta. Practicum on the structure and development of male and female gametophytes of Bryophyta. 2 X 50			0%
2	Understand and communicate hereditary changes in Bryophyta. Have a responsible, independent and honest attitude towards performance in plant embryology	<ol style="list-style-type: none"> 1. Describe the parts that make up the reproductive organs of Bryophyta. 2. Explain the process of Bryophyta gametogenesis. 3. Write the results of studies on fertilization and embryogenesis of Bryophyta. 4. Communicating the Ontogeny of sporogenesis 5. Be present on time according to the lecture schedule 6. Collect assignments on time 7. Actively express opinions during discussions and presentations 		Discussion and preparation of a paper on the structure and development of male and female gametophytes of Bryophyta. Practicum on the structure and development of male and female gametophytes of Bryophyta. 2 X 50			0%

3	Understand and communicate hereditary changes in Pteridophyta Have a responsible, independent and honest attitude towards performance in plant embryology	<ol style="list-style-type: none"> 1. Describe the parts that make up the reproductive organs of Pteridophyta. 2. Explain the process of Pteridophyta gametogenesis. 3. Write the results of studies on fertilization and embryogenesis of Pteridophyta. 4. Be present on time according to the lecture schedule 5. Collect assignments on time 6. Actively express opinions during discussions and presentations 		Discussion and preparation of a paper on the structure and development of male and female gametophytes of Pteridophyta Practicum on the structure and development of male and female gametophytes of Pteridophyta 2 X 50			0%
4	Understand and communicate hereditary changes in Pteridophyta Have a responsible, independent and honest attitude towards performance in plant embryology	<ol style="list-style-type: none"> 1. Describe the parts that make up the reproductive organs of Pteridophyta. 2. Explain the process of Pteridophyta gametogenesis. 3. Write the results of studies on fertilization and embryogenesis of Pteridophyta. 4. Be present on time according to the lecture schedule 5. Collect assignments on time 6. Actively express opinions during discussions and presentations 		Discussion and preparation of a paper on the structure and development of male and female gametophytes of Pteridophyta Practicum on the structure and development of male and female gametophytes of Pteridophyta 2 X 50			0%

5	Understand and communicate hereditary changes in Gymnosperm. Have a responsible, independent and honest attitude towards performance in plant embryology.	<ol style="list-style-type: none"> 1. Describe the parts that make up the reproductive organs of Gymnosperm. 2. Explain the process of gametogenesis and sporogenesis of Gymnosperm. 3. Write down the results of studies on gymnosperm fertilization and embryogenesis. 4. Communicates Gymnosperm embryonic development. 5. Be present on time according to the lecture schedule. 6. Collect assignments on time. 7. Actively express opinions during discussions and presentations 		Discussion, preparing problem solving papers related to the structure and development of male and female gametophytes Practical about the structure and development of male and female gametophytes 2 X 50			0%
6	Understand and communicate hereditary changes in Gymnosperm. Have a responsible, independent and honest attitude towards performance in plant embryology.	<ol style="list-style-type: none"> 1. Describe the parts that make up the reproductive organs of Gymnosperm. 2. Explain the process of gametogenesis and sporogenesis of Gymnosperm. 3. Write down the results of studies on gymnosperm fertilization and embryogenesis. 4. Communicates Gymnosperm embryonic development. 5. Be present on time according to the lecture schedule. 6. Collect assignments on time. 7. Actively express opinions during discussions and presentations 		Discussion, preparing problem solving papers related to the structure and development of male and female gametophytes Practical about the structure and development of male and female gametophytes 2 X 50			0%

7	Understand and communicate hereditary changes in Angiosperm. Have a responsible, independent and honest attitude towards performance in plant embryology.	<ol style="list-style-type: none"> 1. Describe the parts that make up the reproductive organs of Angiospermeae 2. Explain the process of Angiospermeae gametogenesis 3. Write the results of studies on fertilization and embryogenesis of Angiospermeae 4. Communicating the Ontogeny of sporogenesis 5. Describe double fertilization in Angiospermeae 6. Be present on time according to the lecture schedule 7. Collect assignments on time 8. Actively express opinions during discussions and presentations 		Discussion, preparing a paper solving problems related to the structure and development of male and female gametophytes of Angiospermeae Practicum on the structure and development of male and female gametophytes of Angiospermeae 2 X 50			0%
8	MIDDLE SEMESTER EXAMINATION Final skills from meeting 1 to meeting 7	Indicators for meeting 1 to meeting 7		Written Exam 2 X 50			0%
9	Understand and communicate hereditary changes in Angiosperm. Have a responsible, independent and honest attitude towards performance in plant embryology.	<ol style="list-style-type: none"> 1. Describe the parts that make up the reproductive organs of Angiospermeae 2. Explain the process of Angiospermeae gametogenesis 3. Write the results of studies on fertilization and embryogenesis of Angiospermeae 4. Communicating the Ontogeny of sporogenesis 5. Describe double fertilization in Angiospermeae 6. Be present on time according to the lecture schedule 7. Collect assignments on time 8. Actively express opinions during discussions and presentations 		Discussion, preparing a paper solving problems related to the structure and development of male and female gametophytes of Angiospermeae Practicum on the structure and development of male and female gametophytes of Angiospermeae 2 X 50			0%

10	Understand and communicate the concept of Angiospermeae embryogenesis. Have a responsible, independent and honest attitude towards performance in plant embryology	<ol style="list-style-type: none"> 1. Describe the components of the Angiospermeae embryo 2. Explain the process of Angiospermeae embryo development 3. Write down the results of studies on various experiments on Angiospermeae embryogenesis 4. Be present on time according to the lecture schedule 5. Collect assignments on time 6. Actively express opinions during discussions and presentations 		Discussion, preparing a paper solving problems related to the development of Angiospermeae embryos Practicum on the structure and development of Angiospermeae embryos 2 X 50			0%
11	Understand and communicate the concept of Angiospermeae embryogenesis. Have a responsible, independent and honest attitude towards performance in plant embryology	<ol style="list-style-type: none"> 1. Describe the components of the Angiospermeae embryo 2. Explain the process of Angiospermeae embryo development 3. Write down the results of studies on various experiments on Angiospermeae embryogenesis 4. Be present on time according to the lecture schedule 5. Collect assignments on time 6. Actively express opinions during discussions and presentations 		Discussion, preparing a paper solving problems related to the development of Angiospermeae embryos Practicum on the structure and development of Angiospermeae embryos 2 X 50			0%
12	Understand and communicate the concept of endosperm. Have a responsible, independent and honest attitude towards performance in plant embryology.	<ol style="list-style-type: none"> 1. Describe the development and types of endosperm. 2. Write down the results of studies on various experiments related to Angiospermeae endosperm 3. Be present on time according to the lecture schedule 4. Collect assignments on time 5. Actively express opinions during discussions and presentations 		Discussion and preparation of a paper about endosperm 2 X 50			0%

13	Understand and communicate the concept of endosperm. Have a responsible, independent and honest attitude towards performance in plant embryology.	<ol style="list-style-type: none"> 1. Describe the development and types of endosperm. 2. Write down the results of studies on various experiments related to Angiospermeae endosperm 3. Be present on time according to the lecture schedule 4. Collect assignments on time 5. Actively express opinions during discussions and presentations 		Discussion and preparation of a paper about endosperm 2 X 50			0%
14	Understand and communicate the concept of apomixis. Have a responsible, independent and honest attitude towards performance in plant embryology.	<ol style="list-style-type: none"> 1. Write down the results of studies related to apomixis 2. Be present on time according to the lecture schedule 3. Collect assignments on time 4. Actively express opinions during discussions and presentations 		Discussion and preparation of a paper on apomixis 2 X 50			0%
15	Understand and communicate the concept of polyembryony. Have a responsible, independent and honest attitude towards performance in plant embryology	<ol style="list-style-type: none"> 1. Write down the results of studies related to polyembryony 2. Be present on time according to the lecture schedule 3. Collect assignments on time 4. Actively express opinions during discussions and presentations 		Discussion and preparation of a paper on polyembryony. 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.