



**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
Science, Environment, Technology and Society	8420103138		T=3 P=0 ECTS=4.77	5	July 18, 2024
<b>AUTHORIZATION</b>	<b>SP Developer</b>		<b>Course Cluster Coordinator</b>		<b>Study Program Coordinator</b>
	.....		.....		Prof. Dr. Erman, M.Pd.

<b>Learning model</b>	<b>Project Based Learning</b>
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<b>Program Learning Outcomes (PLO)</b>	<b>PLO study program that is charged to the course</b>															
	<b>PLO-5</b>	Demonstrate scientific, critical, and innovative attitudes in integrated science learning, laboratory activities, and professional-related tasks														
	<b>PLO-11</b>	Design and conduct research about learning of integrated science, and acquire, analyze, and interpret the research data														
	<b>Program Objectives (PO)</b>															
	<b>PO - 1</b>	Utilizing science and technology to identify environmental problems or community issues, and develop inventions/innovations based on science, environment, technology and society.														
	<b>PO - 2</b>	Master science concepts to find various alternative solutions to environmental problems or community issues, and develop inventions/innovations based on science, environment, technology and society														
	<b>PO - 3</b>	Make strategic decisions based on the results of observations and theoretical studies to choose solutions to environmental problems or community issues, and develop inventions/innovations based on science, environment, technology and society														
	<b>PO - 4</b>	Responsible for tasks presented in the form of PKMAI/PKM-GT proposals, reports and articles.														
	<b>PLO-PO Matrix</b>															
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P.O	PLO-5	PLO-11														
PO-1																
PO-2																
PO-3																
PO-4																

<b>PO Matrix at the end of each learning stage (Sub-PO)</b>																																																																																																						
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<b>Short Course Description</b>	Studying environmental problems or community issues through identification, finding alternative solutions, and developing inventions/innovations based on science, environment, technology, and society in the form of project assignments, preparation of reports, and PKM-AI/PKM-GT proposals
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<b>References</b>	<b>Main :</b>
	<ol style="list-style-type: none"> <li>1. Ristek, 2012. 104 Inovasi Indonesia. Jakarta: Business Innovation Center (BIC).</li> <li>2. William Linda D. 2005. Environmental Science. USA: Mc Graw Hill.</li> <li>3. Winarsih, 2015. Peran Mahasiswa dalam Pembangunan Berkelanjutan. Kumpulan Handout.</li> <li>4. Koul, O. &amp; Dhaliwal, D. S (Ed). 2002. Microbial Biopesticides . New York: Taylor &amp; Francis.</li> <li>5. Mousdale, D.M. 2008. Biofuels: Biotechnology, Chemistry, and Sustainable Development. New York: Taylor &amp; Francis.</li> </ol>
	<b>Supporters:</b>

Supporting lecturer		Dra. Martini, M.Pd. Dr. Dyah Astriani, S.Pd., M.Pd. Dr. Hasan Subekti, S.Pd., M.Pd. Laily Rosdiana, S.Pd., M.Pd. Fikky Dian Roqobih, S.Pd., M.Pd.					
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	Utilizing science and technology to identify environmental problems or community issues.	1.Explains creative attitudes and behavior in terms of process, personal, environmental and product aspects. 2. Identify environmental problems or community issues	<b>Criteria:</b> 1.4: Assignments are written using the latest journal sources for the last 5 years, at least 5 journals 2.3: Assignments are written using the latest journal sources from the last 5 years, at least 3 journals 3.2: Assignments are written using the latest journal sources from the last 5 years, at least 2 journals 4.1: Assignments are written using the latest journal sources for the last 5 years, at least 1 journal  <b>Form of Assessment</b> : Project Results Assessment / Product Assessment	Presentations, discussions and assignments (practice) 3 X 50		<b>Material:</b> Identify environmental problems or community issues. <b>References:</b> <i>Research and Technology, 2012. 104 Indonesian Innovations. Jakarta: Business Innovation Center (BIC).</i>	5%
2	Utilizing science and technology to develop inventions/innovations based on science, environment, technology and society. Mastering science concepts for the development of inventions/innovations based on science, environment, technology and society.	1.Explain the meaning of waste 2.Classifying waste based on its properties (biodegradable and non-biodegradable). 3.Classifying waste based on its effects/influence on human health and the environment.	<b>Criteria:</b> Attached to the assessment instrument and rubric  <b>Form of Assessment</b> : Participatory Activities	Assignments, presentations and discussions 3 X 50		<b>Material:</b> Definition of waste, types of waste and their impact on health <b>Reference:</b> <i>William Linda D. 2005. Environmental Science. USA: McGraw Hill.</i>	10%
3	Utilizing science and technology to develop inventions/innovations based on science, environment, technology and society. Mastering science concepts for the development of inventions/innovations based on science, environment, technology and society.	1.Explain the meaning of reduce, reuse, recycle. 2.Provide an example of 3R waste management.	<b>Criteria:</b> Attached to the assessment instrument and rubric	Assignments, presentations and discussions 3 X 50		<b>Material:</b> Principles of 3R waste management <b>Reference:</b> <i>William Linda D. 2005. Environmental Science. USA: McGraw Hill.</i>	10%

4	Mastering science concepts for the development of inventions/innovations based on science, environment, technology and society. Making strategic decisions based on data and information obtained for the development of inventions/innovations based on science, environment, technology and society.	<ol style="list-style-type: none"> <li>1.Explain the use of non-oil and gas resources as alternative energy sources.</li> <li>2.Provide examples of technology that can produce energy from non-oil and gas resources, such as waste.</li> <li>3.Analyzing simple alternative energy producing technology designs.</li> <li>4.Convey ideas about the idea of creating alternative energy source technology based on the modification of existing technology as an energy conservation effort.</li> </ol>	<p><b>Criteria:</b> Attached to the assessment instrument and rubric</p> <p><b>Form of Assessment :</b> Participatory Activities</p>	Interview and Discussion 3 X 50		<p><b>Material:</b> Technology that converts waste into alternative energy sources</p> <p><b>Reference:</b> <i>Winarsih, 2015. The Role of Students in Sustainable Development. Collection of Handouts.</i></p>	10%
5	Utilizing science and technology to develop inventions/innovations based on science, environment, technology and society. Mastering science concepts for the development of inventions/innovations based on science, environment, technology and society. Make strategic decisions based on data and information obtained for the development of science, environment, technology and society-based inventions/innovations.	<ol style="list-style-type: none"> <li>1.Explain the function of plants as biopesticides for agricultural pests.</li> <li>2.Explain the advantages and disadvantages of using biopesticides compared to factory-made pesticides.</li> <li>3.Provide examples of plants that can be used as biopesticides.</li> <li>4.Explain efforts to increase the toxicity of biopesticides.</li> </ol>	<p><b>Criteria:</b> Attached to the assessment instrument and rubric</p>	Structured discussions and assignments 3 X 50		<p><b>Material:</b> Biopesticides and their ecological benefits</p> <p><b>References:</b> <i>Koul, O. &amp; Dhaliwal, D. S (Ed). 2002. Microbial Biopesticides. New York: Taylor &amp; Francis.</i></p>	10%
6	Utilizing science and technology to develop inventions/innovations based on science, environment, technology and society. Mastering science concepts for the development of inventions/innovations based on science, environment, technology and society. Taking strategic decisions based on data and information obtained for the development of inventions /innovation based on science, environment, technology and society. Responsible for the tasks presented	<ol style="list-style-type: none"> <li>1.Develop environmental management ideas (waste utilization) into proposal form.</li> <li>2.Present proposals</li> </ol>	<p><b>Criteria:</b></p> <ol style="list-style-type: none"> <li>1.4: If the proposal is written in accordance with the PKM proposal systematics and uses up to date journal literature of at least 3</li> <li>2.3: If the proposal is written in accordance with the PKM proposal systematics and uses at least 2 up to date journal literature</li> <li>3.2: If the proposal is written in accordance with the PKM proposal systematics and uses at least 1 up to date journal literature</li> <li>4.1: If the proposal is written in accordance with the PKM proposal systematics but does not use up to date journal literature</li> </ol> <p><b>Form of Assessment :</b> Participatory Activities</p>	3 X 50		<p><b>Material:</b> Innovative ideas in waste management</p> <p><b>Reference:</b> <i>Winarsih, 2015. The Role of Students in Sustainable Development. Collection of Handouts.</i></p>	10%

7	Utilizing science and technology to develop inventions/innovations based on science, environment, technology and society. Mastering science concepts for the development of inventions/innovations based on science, environment, technology and society. Taking strategic decisions based on data and information obtained for the development of inventions /innovation based on science, environment, technology and society. Responsible for the tasks presented	1.Develop environmental management ideas (waste utilization) into proposal form. 2.Present proposals	<b>Criteria:</b> 1.4: If the proposal is written in accordance with the PKM proposal systematics and uses up to date journal literature of at least 3 2.3: If the proposal is written in accordance with the PKM proposal systematics and uses at least 2 up to date journal literature 3.2: If the proposal is written in accordance with the PKM proposal systematics and uses at least 1 up to date journal literature 4.1: If the proposal is written in accordance with the PKM proposal systematics but does not use up to date journal literature	presentation and discussion 3 X 50		<b>Material:</b> Innovative ideas in environmental management <b>Reference:</b> <i>Research and Technology, 2012. 104 Indonesian Innovations. Jakarta: Business Innovation Center (BIC).</i>	10%
8				3 X 50			0%
9	Utilizing science and technology to develop inventions/innovations based on science, environment, technology and society. Mastering science concepts for the development of inventions/innovations based on science, environment, technology and society. Taking strategic decisions based on data and information obtained for the development of inventions /innovation based on science, environment, technology and society. Responsible for the tasks presented	1. Identify problems in the surrounding environment 2. Conduct literature reviews regarding solutions to solve problems 3. Designing innovative environmental management works based on science, environment, technology and society 4. Prepare project reports resulting from innovative work designs in the form of scientific articles 5. Present the results of innovative work designs in front of the class	<b>Criteria:</b> 1.4: If the proposal is written in accordance with the PKM proposal systematics and uses up to date journal literature of at least 3 2.3: If the proposal is written in accordance with the PKM proposal systematics and uses at least 2 up to date journal literature 3.2: If the proposal is written in accordance with the PKM proposal systematics and uses at least 1 up to date journal literature 4.1: If the proposal is written in accordance with the PKM proposal systematics but does not use up to date journal literature  <b>Form of Assessment :</b> Project Results Assessment / Product Assessment	Presentation, discussion and observation 3 X 50		<b>Material:</b> Design of students' innovative work in environmental management <b>Reference:</b> <i>Ristek, 2012. 104 Indonesian Innovations. Jakarta: Business Innovation Center (BIC).</i>	10%

10	Utilizing science and technology to develop inventions/innovations based on science, environment, technology and society. Mastering science concepts for the development of inventions/innovations based on science, environment, technology and society. Taking strategic decisions based on data and information obtained for the development of inventions /innovation based on science, environment, technology and society. Responsible for the tasks presented	<ol style="list-style-type: none"> <li>1. Identify problems in the surrounding environment</li> <li>2. Conduct literature reviews regarding solutions to solve problems</li> <li>3. Designing innovative environmental management works based on science, environment, technology and society</li> <li>4. Prepare project reports resulting from innovative work designs in the form of scientific articles</li> <li>5. Present the results of innovative work designs in front of the class</li> </ol>	<p><b>Criteria:</b></p> <ol style="list-style-type: none"> <li>1.4: If the proposal is written in accordance with the PKM proposal systematics and uses up to date journal literature of at least 3</li> <li>2.3: If the proposal is written in accordance with the PKM proposal systematics and uses at least 2 up to date journal literature</li> <li>3.2: If the proposal is written in accordance with the PKM proposal systematics and uses at least 1 up to date journal literature</li> <li>4.1: If the proposal is written in accordance with the PKM proposal systematics but does not use up to date journal literature</li> </ol> <p><b>Form of Assessment :</b> Project Results Assessment / Product Assessment</p>	Presentation, discussion and observation 3 X 50		<p><b>Material:</b> Design of students' innovative work in environmental management <b>Reference:</b> <i>Ristek, 2012. 104 Indonesian Innovations. Jakarta: Business Innovation Center (BIC).</i></p> <hr/> <p><b>Material:</b> Design of innovative student work in environmental management <b>Reference:</b> <i>Mousdale, DM 2008. Biofuels: Biotechnology, Chemistry, and Sustainable Development. New York: Taylor &amp; Francis.</i></p>	10%
11	Utilizing science and technology to develop inventions/innovations based on science, environment, technology and society. Mastering science concepts for the development of inventions/innovations based on science, environment, technology and society. Taking strategic decisions based on data and information obtained for the development of inventions /innovation based on science, environment, technology and society. Responsible for the tasks presented	<ol style="list-style-type: none"> <li>1. Identify problems in the surrounding environment</li> <li>2. Conduct literature reviews regarding solutions to solve problems</li> <li>3. Designing innovative environmental management works based on science, environment, technology and society</li> <li>4. Prepare project reports resulting from innovative work designs in the form of scientific articles</li> <li>5. Present the results of innovative work designs in front of the class</li> </ol>	<p><b>Criteria:</b></p> <ol style="list-style-type: none"> <li>1.4: If the proposal is written in accordance with the PKM proposal systematics and uses up to date journal literature of at least 3</li> <li>2.3: If the proposal is written in accordance with the PKM proposal systematics and uses at least 2 up to date journal literature</li> <li>3.2: If the proposal is written in accordance with the PKM proposal systematics and uses at least 1 up to date journal literature</li> <li>4.1: If the proposal is written in accordance with the PKM proposal systematics but does not use up to date journal literature</li> </ol> <p><b>Form of Assessment :</b> Project Results Assessment / Product Assessment</p>	Presentation, discussion and observation 3 X 50		<p><b>Material:</b> Design of students' innovative work in environmental management <b>Reference:</b> <i>Ristek, 2012. 104 Indonesian Innovations. Jakarta: Business Innovation Center (BIC).</i></p> <hr/> <p><b>Material:</b> Design of innovative student work in environmental management <b>Reference:</b> <i>Mousdale, DM 2008. Biofuels: Biotechnology, Chemistry, and Sustainable Development. New York: Taylor &amp; Francis.</i></p> <hr/> <p><b>Material:</b> Design of innovative student work in environmental management <b>Reference:</b> <i>William Linda D. 2005. Environmental Science. USA: McGraw Hill.</i></p>	5%

12	Utilizing science and technology to develop inventions/innovations based on science, environment, technology and society. Mastering science concepts for the development of inventions/innovations based on science, environment, technology and society. Taking strategic decisions based on data and information obtained for the development of inventions /innovation based on science, environment, technology and society. Responsible for the tasks presented	<ol style="list-style-type: none"> <li>1. Identify problems in the surrounding environment</li> <li>2. Conduct literature reviews regarding solutions to solve problems</li> <li>3. Designing innovative environmental management works based on science, environment, technology and society</li> <li>4. Prepare project reports resulting from innovative work designs in the form of scientific articles</li> <li>5. Present the results of innovative work designs in front of the class</li> </ol>	<p><b>Criteria:</b></p> <ol style="list-style-type: none"> <li>1.4: If the proposal is written in accordance with the PKM proposal systematics and uses up to date journal literature of at least 3</li> <li>2.3: If the proposal is written in accordance with the PKM proposal systematics and uses at least 2 up to date journal literature</li> <li>3.2: If the proposal is written in accordance with the PKM proposal systematics and uses at least 1 up to date journal literature</li> <li>4.1: If the proposal is written in accordance with the PKM proposal systematics but does not use up to date journal literature</li> </ol> <p><b>Form of Assessment :</b> Project Results Assessment / Product Assessment</p>	Presentation, discussion and observation 3 X 50		<p><b>Material:</b> Design of students' innovative work in environmental management <b>Reference:</b> <i>Ristek, 2012. 104 Indonesian Innovations. Jakarta: Business Innovation Center (BIC).</i></p> <hr/> <p><b>Material:</b> Design of innovative student work in environmental management <b>Reference:</b> <i>Mousdale, DM 2008. Biofuels: Biotechnology, Chemistry, and Sustainable Development. New York: Taylor &amp; Francis.</i></p> <hr/> <p><b>Material:</b> Design of innovative student work in environmental management <b>Reference:</b> <i>William Linda D. 2005. Environmental Science. USA: McGraw Hill.</i></p>	10%
13	Utilizing science and technology to develop inventions/innovations based on science, environment, technology and society. Mastering science concepts for the development of inventions/innovations based on science, environment, technology and society. Taking strategic decisions based on data and information obtained for the development of inventions /innovation based on science, environment, technology and society. Responsible for the tasks presented	<ol style="list-style-type: none"> <li>1. Presenting invention/innovation products (works) based on science, environment, technology and society in class discussions.</li> <li>2. Produce PKM-AI/PKM-GT articles that are ready to be submitted.</li> <li>3. Presenting invention/innovation products (works) based on science, environment, technology and society at faculty level exhibitions.</li> </ol>	<p><b>Criteria:</b></p> <ol style="list-style-type: none"> <li>1.4: If the proposal is written in accordance with the PKM proposal systematics and uses up to date journal literature of at least 3</li> <li>2.3: If the proposal is written in accordance with the PKM proposal systematics and uses at least 2 up to date journal literature</li> <li>3.2: If the proposal is written in accordance with the PKM proposal systematics and uses at least 1 up to date journal literature</li> <li>4.1: If the proposal is written in accordance with the PKM proposal systematics but does not use up to date journal literature</li> </ol> <p><b>Form of Assessment :</b> Project Results Assessment / Product Assessment</p>	Presentation and discussion 3 X 50		<p><b>Material:</b> students' innovative work in sustainable development. <b>References:</b> <i>Winarsih, 2015. The Role of Students in Sustainable Development. Collection of Handouts.</i></p>	10%

14	Utilizing science and technology to develop inventions/innovations based on science, environment, technology and society. Mastering science concepts for the development of inventions/innovations based on science, environment, technology and society. Taking strategic decisions based on data and information obtained for the development of inventions /innovation based on science, environment, technology and society. Responsible for the tasks presented	<ol style="list-style-type: none"> <li>1. Presenting invention/innovation products (works) based on science, environment, technology and society in class discussions.</li> <li>2. Produce PKM-AI/PKM-GT articles that are ready to be submitted.</li> <li>3. Presenting invention/innovation products (works) based on science, environment, technology and society at faculty level exhibitions.</li> </ol>	<p><b>Criteria:</b></p> <ol style="list-style-type: none"> <li>1.4: If the proposal is written in accordance with the PKM proposal systematics and uses up to date journal literature of at least 3</li> <li>2.3: If the proposal is written in accordance with the PKM proposal systematics and uses at least 2 up to date journal literature</li> <li>3.2: If the proposal is written in accordance with the PKM proposal systematics and uses at least 1 up to date journal literature</li> <li>4.1: If the proposal is written in accordance with the PKM proposal systematics but does not use up to date journal literature</li> </ol> <p><b>Form of Assessment :</b> Practice / Performance</p>	Presentation and discussion 3 X 50		<p><b>Material:</b> students' innovative work in sustainable development. <b>References:</b> William Linda D. 2005. <i>Environmental Science. USA: McGraw Hill.</i></p>	10%
15	Utilizing science and technology to develop inventions/innovations based on science, environment, technology and society. Mastering science concepts for the development of inventions/innovations based on science, environment, technology and society. Taking strategic decisions based on data and information obtained for the development of inventions /innovation based on science, environment, technology and society. Responsible for the tasks presented	<ol style="list-style-type: none"> <li>1. Presenting invention/innovation products (works) based on science, environment, technology and society in class discussions.</li> <li>2. Produce PKM-AI/PKM-GT articles that are ready to be submitted.</li> <li>3. Presenting invention/innovation products (works) based on science, environment, technology and society at faculty level exhibitions.</li> </ol>	<p><b>Criteria:</b></p> <ol style="list-style-type: none"> <li>1.4: If the proposal is written in accordance with the PKM proposal systematics and uses up to date journal literature of at least 3</li> <li>2.3: If the proposal is written in accordance with the PKM proposal systematics and uses at least 2 up to date journal literature</li> <li>3.2: If the proposal is written in accordance with the PKM proposal systematics and uses at least 1 up to date journal literature</li> <li>4.1: If the proposal is written in accordance with the PKM proposal systematics but does not use up to date journal literature</li> </ol> <p><b>Form of Assessment :</b> Project Results Assessment / Product Assessment</p>	Presentation and discussion 3 X 50		<p><b>Material:</b> students' innovative work in sustainable development. <b>References:</b> <i>Research and Technology, 2012. 104 Indonesian Innovations. Jakarta: Business Innovation Center (BIC).</i></p>	10%
16							0%

**Evaluation Percentage Recap: Project Based Learning**

No	Evaluation	Percentage
1.	Participatory Activities	30%
2.	Project Results Assessment / Product Assessment	60%
3.	Practice / Performance	10%
		100%

**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.