



Universitas Negeri Surabaya
Faculty of Engineering,
Mechanical Engineering Undergraduate Study Program

Document Code

SEMESTER LEARNING PLAN

Courses	CODE	Course Family	Credit Weight	SEMESTER	Compilation Date																																
Bio Energy	2120102142	Compulsory Study Program Subjects	T=2 P=0 ECTS=3.18	5	July 16, 2024																																
AUTHORIZATION	SP Developer		Course Cluster Coordinator		Study Program Coordinator																																
		Ir. Priyo Heru Adiwibowo, S.T., M.T.																																
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: 50px; height: 20px;">P.O</td></tr> </table>				P.O																															
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	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: 20px;">P.O</td> <td colspan="16" style="text-align: center;">Week</td> </tr> <tr> <td style="width: 20px; height: 20px;">1</td> <td style="width: 20px; height: 20px;">2</td> <td style="width: 20px; height: 20px;">3</td> <td style="width: 20px; height: 20px;">4</td> <td style="width: 20px; height: 20px;">5</td> <td style="width: 20px; height: 20px;">6</td> <td style="width: 20px; height: 20px;">7</td> <td style="width: 20px; height: 20px;">8</td> <td style="width: 20px; height: 20px;">9</td> <td style="width: 20px; height: 20px;">10</td> <td style="width: 20px; height: 20px;">11</td> <td style="width: 20px; height: 20px;">12</td> <td style="width: 20px; height: 20px;">13</td> <td style="width: 20px; height: 20px;">14</td> <td style="width: 20px; height: 20px;">15</td> <td style="width: 20px; height: 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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	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16																					
Short Course Description	Renewable energy is a course that studies renewable energy in the universe. In this course students will study the main topics regarding types of energy and their use. Renewable Energy such as Wind Energy, Water Energy, Solar Energy, Geothermal Energy. Alternative Energy such as Hydroelectricity, Hydrogen Energy, Biomass Energy, as well as Energy Conservation which includes Energy and the Environment, Conservation of Energy Areas, Energy Cultivation, Impact of Energy Policy																																				
References	Main :																																				
	<ol style="list-style-type: none"> 1. Archie W. Culp, Jr., Ph.D., "Principles of Energy Conversion", McGraw-Hill, Ltd., 1979. 2. Dwi Heru Buku Ajar dan Petunjuk Praktikum Bahan Bakar Energi Alternatif FT, Unesa 3. Duffie & Beckmann Solar Engineering of Thermal Processes, Wiley Interscience, 1991. Contaned Energi Indonesia & Energi yg terbarukan & Jkrt. 4. James A. Fay & Dan S. Golomb, "Energy and the Environment", Oxford, 2002. 5. M.M. El-Wakil, "Power Plant Technology", McGraw-Hill, Ltd. 6. Samsul Arifin Bahan Ajar TK&KE : e-Learning: SHARE-ITS http://share.its.ac.id, 2013, TF-ITS. 																																				
	Supporters:																																				
Supporting lecturer	Prof. Dr. Ir. I Wayan Susila, M.T.																																				
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	Explain the types of conventional energy sources, renewable energy and energy utilization	1.1 Able to understand and differentiate between types of energy sources, both conventional energy and renewable energy. 2.1 Able to explain energy utilization.	Criteria: Assessment of the level of student participation in terms of attendance/lectures, practice, activeness in attending lectures (asking questions, paying attention, and being serious), and activeness in group discussion activities and presentations	Introductory Lecture & Brainstorming, Group Discussion, Introductory Lecture & Brainstorming, Group Discussion, 10 X 20			0%																														

2						0%
3	Explain the definition of solar energy, its working system and use	3.1 Know the definition of solar energy. 3.2 Be able to understand the working system and use of solar energy	Criteria: Assessment of the level of student participation in terms of attendance/lectures, practice, activeness in attending lectures (asking questions, paying attention, and being serious), and activeness in group discussion activities and class presentations.	Reading literature and listening to students' explanations Reading literature and listening to students' explanations 10 X 10		0%
4	Explain and analyze the differences between solar thermal and solar photovoltaic types of solar energy	Able to explain and analyze the differences between solar thermal and solar photovoltaic types of solar energy	Criteria: Assessment of the level of student participation in terms of attendance/lectures, practice, activeness in attending lectures (asking questions, paying attention, and being serious), and activeness in group discussion activities and class presentations.	Reading literature and listening to students' explanations, peer discussions 10 X 10		0%
5	Explain the definition of wind energy, working systems, advantages and disadvantages of wind energy, understand the types of wind turbines.	5.1 Able to explain the definition of wind power energy and analyze its working system. 5.2 Know the benefits of wind power energy and analyze its shortcomings. 5.3 Able to explain the types of wind turbines	Criteria: Assessment of the level of student participation, both in terms of attendance/in lectures, practice, activeness in attending lectures (asking questions, paying attention, being serious), activeness/activities in group discussions and presentations	Reading literature and listening to learner explanations Students are divided into several groups and will be given different case studies 10 X 10		0%
6	Explain the definition and analyze hydropower energy, working systems, advantages and disadvantages of hydropower energy, understand the types of water turbines.	6.1 Able to explain the definition of hydropower energy and analyze its working system. 6.2 Understand the benefits of wind energy and analyze its disadvantages. 7.1 Able to explain the types of water turbines 7.2 Able to understand the differences between water turbines, picoen turbines, windmills and flow turbines and their applications	Criteria: Assessment of the level of student participation, both in terms of attendance/in lectures, practice, activeness in attending lectures (asking questions, paying attention, being serious), activeness/activities in group discussions and class presentations	Read literature and listen to learner explanations. Reading literature, counting case examples, and peer discussions. Reading literature and listening to students' explanations Reading literature, counting case examples, and peer discussions 10 X 20		0%
7						0%
8	UTS			10 X 10		0%
9	9.1 Explain the differences between Biogas and biofuel and their benefits, analyze the manufacturing process	9.1 Able to understand the definition and basic concepts of the biogas making process 9.2 Able to understand the definition and basic concepts of the biofuel making process	Criteria: null	Reading literature and listening to students' explanations Reading literature and group discussions 10 X 20		0%
10						0%

11	Explain the differences between Bioethanol and biodiesel and their benefits, analyze the manufacturing process	11.1 Know the differences between bioethanol and biodiesel 11.2 Know the benefits of bioethanol and biodiesel in everyday life 12.1 Be able to analyze the process of making bioethanol and biodiesel	Criteria: null	- Reading literature and listening to students' explanations - Reading literature, counting case examples, peer discussion, and question and answer Reading literature, counting case examples, peer discussion, and question and answer 10 X 20			0%
12							0%
13	Explain the differences between biomass and gasification and their benefits, analyze the manufacturing process	13.1 Know the difference between biomass and gasification 13.2 Understand the benefits of biomass and gasification and be able to analyze the manufacturing process		Reading literature and listening to students' explanations Reading literature, peer discussion, and 10 X 10 questions and answers			0%
14	Analyze the energies that come from waste	14.1 Know the various types of energy that come from waste 14.2 Be able to analyze the use of waste energy 15.1 Be able to analyze and understand the process of processing energy from waste		Reading literature and listening to students' explanations Reading literature, peer discussion, and Q&A Reading literature, counting case examples, peer discussion, and Q&A 10 X 20			0%
15							0%
16							0%

Evaluation Percentage Recap: Case Study

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** 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.
- 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.
- Forms of assessment:** test and non-test.
- 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.
- 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.
- Learning materials** are details or descriptions of study materials which can be presented in the form of several main points and sub-topics.
- 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%.
- TM=Face to face, PT=Structured assignments, BM=Independent study.

