



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

Document Code

SEMESTER LEARNING PLAN

Courses	CODE	Course Family	Credit Weight			SEMESTER	Compilation Date																																																	
Automotive Electrical Practice	8320302150	Study Program Elective Courses	T=0	P=2	ECTS=3.18	3	April 25, 2023																																																	
AUTHORIZATION		SP Developer	Course Cluster Coordinator			Study Program Coordinator																																																		
		Heru Arizal, S.Pd., M.M., M.Pd.	Heru Arizal, S.Pd., M.M., M.Pd.			Ir. Wahyu Dwi Kurniawan, S.Pd., M.Pd.																																																		
Learning model	Case Studies																																																							
Program Learning Outcomes (PLO)	PLO study program which is charged to the course																																																							
	PLO-5	Have social competence and personality competence in mechanical engineering education																																																						
	PLO-8	Able to carry out maintenance and repairs in the automotive engineering field (automotive concentration) or able to operate various production equipment and machines in the manufacturing sector (production concentration)																																																						
	PLO-10	Have an understanding of mathematics and basic mechanical engineering																																																						
	Program Objectives (PO)																																																							
	PO - 1	Students have the knowledge, skills, attitudes about how to inspect, repair and maintain batteries and electrical systems in vehicles																																																						
	PLO-PO Matrix																																																							
		<table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>P.O</td> <td>PLO-5</td> <td>PLO-8</td> <td>PLO-10</td> <td></td> <td></td> <td></td> </tr> <tr> <td>PO-1</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </table>						P.O	PLO-5	PLO-8	PLO-10				PO-1																																									
	P.O	PLO-5	PLO-8	PLO-10																																																				
	PO-1																																																							
PO Matrix at the end of each learning stage (Sub-PO)																																																								
	<table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td rowspan="2">P.O</td> <td colspan="16">Week</td> </tr> <tr> <td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td><td>13</td><td>14</td><td>15</td><td>16</td> </tr> <tr> <td>PO-1</td> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> </table>						P.O	Week																1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	PO-1																
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PO-1																																																								
Short Course Description	In this course students will gain the knowledge, skills and attitudes needed to diagnose, maintain and repair electrical systems in vehicles. This subject includes AKI (Battery), Starter System, Ignition System, Charging System, Lighting System (Brake Lights, Reversing Lights, Fog Lights, Turn Signals, City Lights, Head Lamps), Horn System, Windshield Wiper/Wipper, Power Windows, Central Lock, Engine Management System																																																							
References	Main :																																																							
	<ol style="list-style-type: none"> 1. A. Grummy W. 2013. Panduan Praktikum Kelistrikan Otomotif . Surabaya: FT-Unesa. 2. Crumbliss. Manual book of Generator/Alternator and Starter tester. 																																																							
	Supporters:																																																							
<ol style="list-style-type: none"> 1. Toyota Motor Corp. Pedoman Reparasi mesin seri K . 2. Halderman, James D. 2017. Automotive Electricity and Electronic Fifth Edition. USA 3. Kevin R. Sullivan. Understanding the alternator . California: San Bruno. 4. Motoplat CV-282 L. Manual book of Coil and condensor tester . 5. Toyota Motor Sales. Automotive Electronics and Resource Site . USA 6. Daryanto. 2006. Reparasi dan Overhaul Kelistrikan Mesin Mobil. Jakarta: Bumi Aksara 7. Erjavec, Jack and Thompson, Rob. 2015. Automotive Technology A Systems Approach 6th Edition. USA 																																																								
Supporting lecturer	Dr. A. Grummy Wailanduw, M.Pd., M.T. Heru Arizal, S.Pd., M.M., 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	Students are able to describe electricity and electrical applications in the automotive field	1.Students are able to explain the occurrence of electricity 2.Students are able to describe electricity in the automotive sector	Criteria: Student activity Form of Assessment : Participatory Activities	Lectures, questions and answers, and discussions 4 X 50		Material: Basics of electricity Reference: <i>Toyota Motor Sales. Automotive Electronics and Resource Site. USA</i> Material: Basics of electricity Reference: <i>Halderman, James D. 2017. Automotive Electricity and Electronic Fifth Edition. USA</i>	5%
2	Students are able to analyze the condition of the battery/AKI	1.Able to carry out BJ examination of battery fluid 2.Able to check the battery without load 3.Able to check the battery with a load 4.Able to analyze battery condition	Criteria: 1.Practical Assessment: a) Work procedures, b) Collaboration in groups, c) Work safety and use of tools 2.Portfolio: a) Conformity to the report format, b) Observation and measurement results, c) Analysis results, d) Conclusion results 3.Student activity Forms of Assessment : Participatory Activities, Portfolio Assessment, Practical Assessment	Lectures, questions and answers, discussions, demonstrations, direct practice 4 X 50		Material: Battery Inspection References: <i>A. Grummy W. 2013. Automotive Electrical Practical Guide. Surabaya: FT-Unesa.</i> Material: Battery Inspection References: <i>Halderman, James D. 2017. Automotive Electricity and Electronic Fifth Edition. USA</i> Material: Battery Check Reference: <i>Daryanto. 2006. Car Engine Electrical Repair and Overhaul. Jakarta: Bumi Literacy</i>	6%
3	Students are able to determine the condition and repair a starter motor	Students are able to determine the condition of the starter motor	Criteria: 1.Practical Assessment: a) Work procedures, b) Collaboration in groups, c) Work safety and use of tools 2.Portfolio: a) Conformity to the report format, b) Observation and measurement results, c) Analysis results, d) Conclusion results 3.Student activity Forms of Assessment : Participatory Activities, Portfolio Assessment, Practical Assessment	Lectures, questions and answers, discussions, direct practice 4 X 50		Material: Inspection of the starter motor References: <i>A. Grummy W. 2013. Automotive Electrical Practical Guide. Surabaya: FT-Unesa.</i> Material: Checking the starter motor References: <i>Halderman, James D. 2017. Automotive Electricity and Electronic Fifth Edition. USA</i> Material: Checking the starter motor Reference: <i>Daryanto. 2006. Car Engine Electrical Repair and Overhaul. Jakarta: Bumi Literacy</i>	6%
4	Students are able to measure starter motor power	Students are able to measure starter motor power	Criteria: 1.Practical Assessment: a) Work procedures, b) Collaboration in groups, c) Work safety and use of tools 2.Student activity Form of Assessment : Participatory Activities, Practical Assessment	Lectures, questions and answers, discussions, direct practice 4 X 50		Material: Measuring starter motor power References: <i>A. Grummy W. 2013. Automotive Electrical Practical Guide. Surabaya: FT-Unesa.</i>	6%

5	Students are able to determine the location of the voltage drop and make repairs to the starter system	Students are able to determine the location of the voltage drop in the starter circuit	<p>Criteria:</p> <ol style="list-style-type: none"> 1.Student activity 2.Portfolio: a) Conformity to the report format, b) Observation and measurement results, c) Analysis results, d) Conclusion results <p>Form of Assessment : Participatory Activities, Portfolio Assessment</p>	Lectures, questions and answers, discussions, direct practice 4 X 50		<p>Material: Drop Voltage of Stater Motor Circuits Reference: A. Grummy W. 2013. <i>Automotive Electrical Practical Guide. Surabaya: FT-Unesa.</i></p>	6%
6	Students are able to analyze and repair components in the ignition system	Students are able to analyze and repair ignition system components	<p>Criteria:</p> <ol style="list-style-type: none"> 1.Student activity 2.Practical Assessment: a) Work procedures, b) Collaboration in groups, c) Work safety and use of tools 3.Portfolio: a) Conformity to the report format, b) Observation and measurement results, c) Analysis results, d) Conclusion results <p>Forms of Assessment : Participatory Activities, Portfolio Assessment, Practical Assessment</p>	Lectures, questions and answers, discussions, direct practice 4 X 50		<p>Material: Examination of Conventional Ignition Systems References: Halderman, James D. 2017. <i>Automotive Electricity and Electronic Fifth Edition. USA</i></p> <hr/> <p>Material: Ignition System Inspection References: A. Grummy W. 2013. <i>Automotive Electrical Practical Guide. Surabaya: FT-Unesa.</i></p> <hr/> <p>Material: Ignition System Inspection Bibliography: Halderman, James D. 2017. <i>Automotive Electricity and Electronic Fifth Edition. USA</i></p> <hr/> <p>Material: Ignition System Inspection Reference: Daryanto. 2006. <i>Car Engine Electrical Repair and Overhaul. Jakarta: Bumi Literacy</i></p>	6%
7	Students are able to determine the location of the voltage drop and make repairs to the ignition system	Students are able to determine the location of the voltage drop and make repairs to the ignition system	<p>Criteria:</p> <ol style="list-style-type: none"> 1.Student activity 2.Practical Assessment: a) Work procedures, b) Collaboration in groups, c) Work safety and use of tools 3.Portfolio: a) Conformity to the report format, b) Observation and measurement results, c) Analysis results, d) Conclusion results <p>Forms of Assessment : Participatory Activities, Portfolio Assessment, Practical Assessment</p>	Lectures, questions and answers, discussions, direct practice 4 X 50		<p>Material: Drop Voltage for Conventional Ignition System Circuits Reference: A. Grummy W. 2013. <i>Automotive Electrical Practical Guide. Surabaya: FT-Unesa.</i></p>	6%

8	UTS	Students are able to take performance tests	<p>Criteria: In accordance with the assessment rubric</p> <p>Form of Assessment : Practice / Performance</p>	Implementation of the 4 X 50 Midterm Exam		<p>Material: Inspection of Alternator Components References: <i>Halderman, James D. 2017. Automotive Electricity and Electronic Fifth Edition. USA</i></p> <p>Material: Inspection of Alternator Components Library: <i>Crumbliss. Manual book of Generator/Alternator and Starter tester.</i></p>	7%
9	Students are able to analyze and repair alternators	<p>1. Students are able to determine the condition of the alternator</p> <p>2. Students are able to repair alternators</p>	<p>Criteria: 1. Student activity 2. Practical Assessment: a) Work procedures, b) Collaboration in groups, c) Work safety and use of tools 3. Portfolio: a) Conformity to the report format, b) Observation and measurement results, c) Analysis results, d) Conclusion results</p> <p>Forms of Assessment : Participatory Activities, Portfolio Assessment, Practical Assessment</p>	Lectures, questions and answers, discussions, direct practice 4 X 50		<p>Material: Alternator Component Inspection Reference: A. <i>Grummy W. 2013. Automotive Electrical Practical Guide. Surabaya: FT-Unesa.</i></p> <p>Material: Inspection of Alternator Components References: <i>Halderman, James D. 2017. Automotive Electricity and Electronic Fifth Edition. USA</i></p> <p>Material: Inspection of Alternator Components Library: <i>Crumbliss. Manual book of Generator/Alternator and Starter tester.</i></p>	6%
10	Students are able to measure the output of the alternator	Students are able to measure the output of the alternator	<p>Criteria: 1. Student activity 2. Practical Assessment: a) Work procedures, b) Collaboration in groups, c) Work safety and use of tools</p> <p>Form of Assessment : Participatory Activities, Practical Assessment</p>	Lectures, questions and answers, discussions, direct practice 4 X 50		<p>Material: Alternator Output Measurement Reference: A. <i>Grummy W. 2013. Automotive Electrical Practical Guide. Surabaya: FT-Unesa.</i></p> <p>Material: Alternator Output Measurement Reference: <i>Crumbliss. Manual book of Generator/Alternator and Starter tester.</i></p>	6%
11	Students are able to assemble the external regulator on the alternator charging system	Students are able to assemble the external regulator on the alternator charging system	<p>Criteria: 1. Student activity 2. Practical Assessment: a) Work procedures, b) Collaboration in groups, c) Work safety and use of tools</p> <p>Form of Assessment : Participatory Activities, Practical Assessment</p>	Lectures, questions and answers, discussions, direct practice 4 X 50		<p>Material: Assembling a Charging System Literature: A. <i>Grummy W. 2013. Automotive Electrical Practical Guide. Surabaya: FT-Unesa.</i></p> <p>Material: Assembling a Charging System Literature: <i>Halderman, James D. 2017. Automotive Electricity and Electronic Fifth Edition. USA</i></p> <p>Material: Library Filling System : <i>Erjavec, Jack and Thompson, Rob. 2015. Automotive Technology A Systems Approach 6th Edition. USA</i></p>	6%

12	Students are able to assemble brake lights, reverse lights, turn signals and horns	Students are able to assemble brake lights, reverse lights, turn signal lights and horns according to the SOP	<p>Criteria:</p> <p>1.Student activity 2.Practical Assessment: a) Work procedures, b) Collaboration in groups, c) Work safety and use of tools</p> <p>Form of Assessment : Participatory Activities, Practical Assessment</p>	Lectures, questions and answers, discussions, direct practice 4 X 50		<p>Material: Assembling brake lights, reverse lights, turn signals/turn signals Reference: A. Grummy W. 2013. <i>Automotive Electrical Practical Guide. Surabaya: FT-Unesa.</i></p> <hr/> <p>Material: assembling brake lights, reverse lights, turn signals and horns Reference: A. Grummy W. 2013. <i>Automotive Electrical Practical Guide. Surabaya: FT-Unesa.</i></p>	6%
13	Students are able to assemble lighting systems for city lights, head and fog lights	Students are able to assemble lighting systems for city lights, head and fog lights	<p>Criteria:</p> <p>1.Student activity 2.Practical Assessment: a) Work procedures, b) Collaboration in groups, c) Work safety and use of tools</p> <p>Form of Assessment : Participatory Activities, Practical Assessment</p>	Lectures, questions and answers, discussions, direct practice 4 X 50		<p>Material: Assembling city lights and heads Reference: A. Grummy W. 2013. <i>Automotive Electrical Practical Guide. Surabaya: FT-Unesa.</i></p> <hr/> <p>Material: Assembling city lights, head and fog lights References: A. Grummy W. 2013. <i>Automotive Electrical Practical Guide. Surabaya: FT-Unesa.</i></p>	6%
14	Students are able to assemble power windows, wipers and central locks	Students are able to assemble power windows, wipers and central locks	<p>Criteria:</p> <p>1.Student activity 2.Practical Assessment: a) Work procedures, b) Collaboration in groups, c) Work safety and use of tools</p> <p>Form of Assessment : Participatory Activities, Practical Assessment</p>	Lectures, questions and answers, discussions, direct practice 4 X 50		<p>Material: Assembling wipers, central locks and power windows References: A. Grummy W. 2013. <i>Automotive Electrical Practical Guide. Surabaya: FT-Unesa.</i></p> <hr/> <p>Material: Assembling wipers, central locking and power windows Reference: Halderman, James D. 2017. <i>Automotive Electricity and Electronic Fifth Edition. USA</i></p>	6%
15	Students are able to analyze the Engine Management System circuit	Students are able to analyze the Engine Management System circuit	<p>Criteria: Student activity</p> <p>Form of Assessment : Participatory Activities</p>	Lectures, questions and answers, discussions, direct practice 4 X 50		<p>Material: Engine management system circuit analysis Reference: Halderman, James D. 2017. <i>Automotive Electricity and Electronic Fifth Edition. USA</i></p>	6%
16	UAS (Final Semester Exam)	Students are able to take performance tests	<p>Criteria: In accordance with the assessment rubric</p> <p>Form of Assessment : Practice / Performance</p>	UAS (Final Semester Examination) 4 X 50			10%

Evaluation Percentage Recap: Case Study

No	Evaluation	Percentage
1.	Participatory Activities	42%
2.	Portfolio Assessment	13%
3.	Practical Assessment	28%
4.	Practice / Performance	17%

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.