	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	8320302048	Study Program Elective Courses	T=2	P=0	ECTS=3.18	2	January 17, 2023

AUTHORIZATION	SP Developer	Course Cluster Coordinator	Study Program Coordinator
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Learning model	**Case Studies**	
Program Learning Outcomes (PLO)	**PLO study program that is charged to the course**	
	PLO-5	Have social competence and personality competence in mechanical engineering education
	PLO-7	Have an understanding of technopreneurship in the field of automotive/production technology
	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)	
	PLO-PO Matrix	

P.O	PLO-5	PLO-7	PLO-8	PLO-10

PO Matrix at the end of each learning stage (Sub-PO)

P.O	Week															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

Short Course Description	This Automotive Electrical Course is one of the mandatory courses that must be taken by students of the Mechanical Engineering Education Study Program who are taking an automotive concentration in the second semester. The weight of this course is 2 credits of theoretical learning with face-to-face learning for 2 x 50 minutes. In general, the material studied in the Automotive Electrical course includes 6 learning stages, namely: 1. Battery 2. Body Electrical 3. Conventional Ignition System 4. Electronic Ignition System 5. Starter System 6. Charging System	
References	**Main :**	

1. Grummy, A.W. 2003. Kelistrikan Otomotif Seri A . Upress.
2. Grummy, A.W. 2004. Kelistrikan Otomotif Seri B . Upress
3. Toyota Motor Sales. Automotive Electronics and Resource Site . USA
4. Bosch, Robert. 2004. Automotive Electrics and Automotive Electronics : 4th edition. Germany.
5. Denton, Tom. 2018. Automobile Electrical and Electronic Systems . London.
6. Stone, Richard and Ball, Jeffrey, K. 2004. Automotive Engineering Fundamentals . USA.
7. Erjavec, Jack and Thompson, Rob. 2015. Automotive Technology A Systems Approach 6th Edition. USA

Supporters:	
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 analyze the actual condition of the battery	1. Students correctly explain the function of the battery 2. Students correctly mention the battery construction 3. Students correctly explain the charging and discharging reactions in batteries	**Criteria:** according to the assessment rubric **Form of Assessment** : Participatory Activities, Tests	Lectures, questions and answers, discussions 2 X 50	Lectures, questions and answers, discussions 2 X 50	**Material:** Battery Construction **Reference:** *Grummy, AW 2003. Automotive Electrical Series A. Upress.* **Material:** Battery **Reference:** *Denton, Tom. 2018. Automobile Electrical and Electronic Systems. London.*	5%
2	Students are able to describe how to maintain and analyze the condition of the battery	Students are able to describe the steps for carrying out maintenance and analyzing the condition of the battery	**Criteria:** according to the assessment rubric **Form of Assessment** : Participatory Activities, Tests	Lectures, questions and answers, discussions 2 X 50	Lectures, questions and answers, discussions 2 X 50	**Material:** Battery maintenance and inspection **Reference:** *Grummy, AW 2003. Automotive Electrical Series A. Upress.* **Material:** Battery maintenance and inspection **References:** *Erjavec, Jack and Thompson, Rob. 2015. Automotive Technology A Systems Approach 6th Edition. USA*	5%
3	Students are able to describe conventional type starter systems	1. Students are correct in defining the principles of conventional type starter motors 2. Students correctly classify the types and components of conventional starter motors 3. Students are correct in analyzing the condition of conventional type starter motors 4. Students were right in concluding the condition of the conventional type starter motor	**Criteria:** according to the assessment rubric **Form of Assessment** : Participatory Activities, Tests	Lectures, questions and answers, discussions. 2 X 50	Lectures, questions and answers, discussions. 2 X 50	**Material:** Starter Motor Principles **Reference:** *Grummy, AW 2003. Automotive Electrical Series A. Upress.* **Material:** Starter Motor Principles **Reference:** *Bosch, Robert. 2004. Automotive Electrics and Automotive Electronics : 4th edition. Germany.* **Material:** Inspection and maintenance of conventional type starter motors **References:** *Erjavec, Jack and Thompson, Rob. 2015. Automotive Technology A Systems Approach 6th Edition. USA*	5%

4	Students are able to explain the reduction type starter system	1. Students are correct in defining the principle of a reduction type starter motor 2. Students correctly classify the types and components of reduction type starter motors 3. Students are right in analyzing the condition of the reduction type starter motor 4. Students are right in concluding the condition of the reduction type starter motor	**Criteria:** according to the assessment rubric **Form of Assessment** : Participatory Activities, Tests	Lectures, questions and answers, discussions. 2 X 50	Lectures, questions and answers, discussions. 2 X 50	**Material:** Starter Motor Principles **Reference:** *Grummy, AW 2003. Automotive Electrical Series A. Upress.* **Material:** Starter Motor Principles **Reference:** *Bosch, Robert. 2004. Automotive Electrics and Automotive Electronics : 4th edition. Germany.* **Material:** Inspection and maintenance of reduction type starter motors **References:** *Erjavec, Jack and Thompson, Rob. 2015. Automotive Technology A Systems Approach 6th Edition. USA*	5%
5	Students are able to explain conventional ignition systems	1. Students are correct in defining the conventional ignition system 2. Students are precise in explaining the components and how a conventional ignition system works	**Criteria:** according to the assessment rubric **Form of Assessment** : Participatory Activities, Tests	Lectures, questions and answers, discussions. 2 X 50	Lectures, questions and answers, discussions. 2 X 50	**Material:** Conventional Ignition Systems **Reference:** *Grummy, AW 2003. Automotive Electrical Series A. Upress.* **Material:** Conventional Ignition Systems **Reference:** *Denton, Tom. 2018. Automobile Electrical and Electronic Systems. London.*	5%
6	Students are able to explain about electronic ignition systems	1. Students are correct in defining the electronic ignition system 2. Students are precise in explaining the components and how the electronic ignition system works	**Criteria:** according to the assessment rubric **Form of Assessment** : Participatory Activities, Tests	Lectures, questions and answers, discussions 2 X 50	Lectures, questions and answers, discussions 2 X 50	**Material:** Electronic Ignition Systems **Reference:** *Grummy, AW 2003. Automotive Electrical Series A. Upress.* **Material:** Electronic Ignition Systems **Reference:** *Denton, Tom. 2018. Automobile Electrical and Electronic Systems. London.*	5%

7	Students are able to describe maintenance and analyze the condition of the electronic ignition system	1. Students are correct in describing the maintenance steps for conventional ignition systems 2. Students are correct in explaining the standard conditions for conventional ignition systems	**Criteria:** according to the assessment rubric **Form of Assessment** : Participatory Activities, Tests	Lectures, questions and answers, discussions 2 X 50	Lectures, questions and answers, discussions 2 X 50	**Material:** Maintenance and inspection of electronic ignition systems **References:** *Erjavec, Jack and Thompson, Rob. 2015. Automotive Technology A Systems Approach 6th Edition. USA* **Material:** Maintenance and inspection of electronic ignition systems **References:** *Stone, Richard and Ball, Jeffrey, K. 2004. Automotive Engineering Fundamentals. USA.*	5%
8	UTS (Mid Semester Exam)	UTS (Mid Semester Exam)	**Criteria:** according to the assessment rubric **Form of Assessment** : Participatory Activities, Tests	Test 2 X 50	2 X 50 test	**Material:** Material 1-7 **Reference:** *Toyota Motor Sales. Automotive Electronics and Resource Site. USA*	15%
9	Students are able to explain the charging system	1. Students are right in defining the charging system 2. Students are precise in explaining the components and how the charging system works	**Criteria:** according to the assessment rubric **Form of Assessment** : Participatory Activities, Tests	Lectures, questions and answers, discussions 2 X 50	Lectures, questions and answers, discussions 2 X 50	**Material:** Charging system **Reference:** *Grummy, AW 2003. Automotive Electrical Series A. Upress.* **Material:** **Library** Charging System : *Bosch, Robert. 2004. Automotive Electrics and Automotive Electronics : 4th edition. Germany.*	5%

10	Students are able to describe how to maintain and analyze the condition of the charging system	1. Students are correct in describing the steps for maintaining the charging system 2. Students are correct in explaining the standard conditions for charging systems	**Criteria:** according to the assessment rubric **Form of Assessment** : Participatory Activities, Tests	Lectures, questions and answers, discussions 2 X 50	Lectures, questions and answers, discussions 2 X 50	**Material:** Inspection and maintenance of charging systems **References:** *Grummy, AW 2004. Automotive Electrical Series B . Upress* **Material:** Inspection and maintenance of charging systems **References:** *Erjavec, Jack and Thompson, Rob. 2015. Automotive Technology A Systems Approach 6th Edition. USA*	5%
11	Students are able to describe how to maintain and analyze the condition of the safety system	Students are precise in explaining maintenance and analyzing the condition of the safety system	**Criteria:** according to the assessment rubric **Form of Assessment** : Participatory Activities, Tests	Lectures, questions and answers, discussions 2 X 50	Lectures, questions and answers, discussions 2 X 50	**Material:** Safety systems **Reference:** *Grummy, AW 2004. Automotive Electrical Series B. Upress* **Material:** Security systems **References:** *Denton, Tom. 2018. Automobile Electrical and Electronic Systems. London.*	5%
12	Students are able to create horn wiring diagrams, maintain and analyze the condition of the horn system	1. Students are correct in explaining the function of the horn 2. Students are correct in making horn schematics/wiring 3. Students are precise in explaining how to maintain and analyze the condition of the horn system	**Criteria:** according to the assessment rubric **Form of Assessment** : Participatory Activities	Lectures, questions and answers, discussions. 2 X 50	Lectures, questions and answers, discussions. 2 X 50	**Material:** Body Electrical **Reference:** *Grummy, AW 2003. Automotive Electrical Series A. Upress.* **Material:** Body Electricity **Reference:** *Denton, Tom. 2018. Automobile Electrical and Electronic Systems. London.*	5%

13	Students are able to create wiring diagrams, maintain and analyze the condition of lighting systems	1. Students are precise in explaining the functions and types of lighting systems 2. Students are precise in making lighting system schematics/wiring 3. Students are precise in explaining how to maintain and analyze the condition of the lighting system	**Criteria:** according to the assessment rubric **Form of Assessment** : Participatory Activities, Tests	Lectures, questions and answers, discussions 2 X 50	Lectures, questions and answers, discussions 2 X 50	**Material:** Body Electrical Systems **Reference:** *Grummy, AW 2003. Automotive Electrical Series A. Upress.* **Material:** Body Electrical Systems **References:** *Denton, Tom. 2018. Automobile Electrical and Electronic Systems. London.*	5%
14	Students are able to describe maintenance and analyze the condition of the windshield wiper system, central lock and power windows	1. Students are precise in explaining how to maintain and analyzing the condition of the windshield wiper system, central lock and power windows 2. Students are precise in explaining the functions and types of accessories in vehicles 3. Students are precise in making schematics/wiring accessories (wipper/windshield wiper, central lock, and power windows)	**Criteria:** according to the assessment rubric **Form of Assessment** : Participatory Activities, Tests	Lectures, questions and answers, discussions. 2 X 50	Lectures, questions and answers, discussions. 2 X 50	**Material:** Body Electricity **Reference:** *Denton, Tom. 2018. Automobile Electrical and Electronic Systems. London.* **Material:** Body Electricity **References:** *Erjavec, Jack and Thompson, Rob. 2015. Automotive Technology A Systems Approach 6th Edition. USA*	5%
15	Students are able to analyze the Engine Management System circuit	1. Students are right in defining the Engine Management System 2. Students are right in explaining EMS in machine electricity	**Criteria:** according to the assessment rubric **Form of Assessment** : Participatory Activities, Tests	Lectures, questions and answers, discussions. 2 X 50	Lectures, questions and answers, discussions. 2 X 50	**Material:** Body Electricity **Reference:** *Stone, Richard and Ball, Jeffrey, K. 2004. Automotive Engineering Fundamentals. USA.* **Material:** Body Electricity **References:** *Erjavec, Jack and Thompson, Rob. 2015. Automotive Technology A Systems Approach 6th Edition. USA*	5%
16	UAS (Final Semester Exam)	Can carry out maintenance and analyze the condition of the electronic fuel injection (EFI) electrical system	**Criteria:** according to the assessment rubric **Form of Assessment** : Participatory Activities	2 X 50 test	2 X 50 test	**Material:** All material **Library:** *Toyota Motor Sales. Automotive Electronics and Resource Site. USA*	25%

Evaluation Percentage Recap: Case Study

No	Evaluation	Percentage
1.	Participatory Activities	70%
2.	Test	40%
		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** 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.
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.