	Universitas Negeri Surabaya Faculty of Mathematics and Natural Sciences Undergraduate Physics Study Program	Document Code

SEMESTER LEARNING PLAN

Courses	CODE	Course Family	Credit Weight			SEMESTER	Compilation Date
Sensor System**	4520102197		T=2	P=0	ECTS=3.18	7	July 18, 2024

AUTHORIZATION	SP Developer	Course Cluster Coordinator	Study Program Coordinator
	.....	.....	Prof. Dr. Munasir, S.Si., M.Si.

Learning model	**Project Based Learning**
Program Learning Outcomes (PLO)	**PLO study program that is charged to the course**
	Program Objectives (PO)
	PLO-PO Matrix

	P.O

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	Sensor systems are courses that discuss the basic principles of measuring physical quantities, characteristics of sensors, signal conditioning circuits and sensor interfaces, working principles of sensors (motion sensors: measurement of position, speed, acceleration; optical sensors, thermal sensors, acoustic sensors, and pressure sensors), how to characterize and calibrate the sensor. Learning is carried out using lecture methods, discussions and carrying out activities in the laboratory (the process of collecting data, reporting and presenting the results of laboratory activities).
References	**Main :**

1. Fraden, J . 2003. Handbook of Modern Sensors. Physics, Design and Applications. AIP Press. Wilson, J. S . 2005. Sensor Technology Handbook . Elsevier.
2. Boyes, W . 2003. Instrumentation Reference Book . Third Edition. Elsevier Science.

Supporters:

Supporting lecturer	Drs. Imam Sucahyo, M.Si. Meta Yantidewi, S.Si., 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	Students understand the basic principles of measuring physical quantities.	· Distinguish between transducers and sensors. · Explain the basic principles of measuring physical quantities (electric charge, electric potential, magnetic field, Hall effect, capacitance, resistance, inductance, thermal, and light). · Classify sensors based on their measurement principles.	**Criteria:** Full marks are obtained if students are able to explain the basic principles of physical measurements	· Lecture · Discussion 2 X 50			0%
2	Students understand the basic principles of measuring physical quantities.	· Distinguish between transducers and sensors. · Explain the basic principles of measuring physical quantities (electric charge, electric potential, magnetic field, Hall effect, capacitance, resistance, inductance, thermal, and light). · Classify sensors based on their measurement principles.	**Criteria:** Full marks are obtained if students are able to explain the basic principles of physical measurements	· Lecture · Discussion 2 X 50			0%
3	Students understand the basic principles of measuring physical quantities.	· Distinguish between transducers and sensors. · Explain the basic principles of measuring physical quantities (electric charge, electric potential, magnetic field, Hall effect, capacitance, resistance, inductance, thermal, and light). · Classify sensors based on their measurement principles.	**Criteria:** Full marks are obtained if students are able to explain the basic principles of physical measurements	· Lecture · Discussion 2 X 50			0%
4	Students understand the characteristics of sensors	· Describe the characteristics of the sensor. · Explain the datasheet of a sensor.	**Criteria:** Full marks are obtained if students are able to explain the characteristics of the sensor from the data provided or from the datasheet	· Lecture · Discussion 2 X 50			0%
5	Students have the ability to determine the appropriate signal conditioning circuit for the sensor.	· Explain the various types of signal conditioning circuits. · Design the conditioning circuit required for a sensor based on its characteristics.	**Criteria:** Full marks are obtained if students are able to determine a signal conditioner that suits the sensor's needs	· lecture · discussion · experiment/demonstration 2 X 50			0%

6	Students understand the working principles and application of position, level, speed, acceleration and proximity sensors.	· Describe the working principle of sensors that can be used to determine position, level and proximity · Design a suitable signal conditioning circuit for position, level and proximity sensors	**Criteria:** 1. Full marks are obtained if students are able to find the sensor transfer function 2. Full marks are obtained if students are able to explain the working principles and application of sensors	· lecture · discussion · experiment/demonstration 2 X 50			0%
7	Students understand the working principles and application of position, level, speed, acceleration and proximity sensors.	· Describe the working principle of sensors that can be used to determine position, level and proximity · Design a suitable signal conditioning circuit for position, level and proximity sensors	**Criteria:** 1. Full marks are obtained if students are able to find the sensor transfer function 2. Full marks are obtained if students are able to explain the working principles and application of sensors	· lecture · discussion · experiment/demonstration 2 X 50			0%
8	UTS			2 X 50			0%
9	Students understand the working principles and application of magnetic induction-based sensors	· Explain the working principle of magnetic induction based sensors · Design a suitable signal conditioning circuit for magnetic induction based sensors	**Criteria:** 1. Full marks are obtained if students are able to find the sensor transfer function 2. Full marks are obtained if students are able to explain the working principles and application of sensors	· lecture · discussion · experiment/demonstration 2 X 50			0%
10	Students understand the working principles and application of magnetic induction-based sensors	· Explain the working principle of magnetic induction based sensors · Design a suitable signal conditioning circuit for magnetic induction based sensors	**Criteria:** 1. Full marks are obtained if students are able to find the sensor transfer function 2. Full marks are obtained if students are able to explain the working principles and application of sensors	· lecture · discussion · experiment/demonstration 2 X 50			0%
11	Students understand the working principles and application of thermal sensors	· Explain the working principle of a thermal sensor · Design a suitable signal conditioning circuit for a thermal sensor	**Criteria:** 1. Full marks are obtained if students are able to find the sensor transfer function 2. Full marks are obtained if students are able to explain the working principles and application of sensors	· lecture · discussion · experiment/demonstration 2 X 50			0%

12	Students understand the working principles and application of thermal sensors	· Explain the working principle of a thermal sensor · Design a suitable signal conditioning circuit for a thermal sensor	**Criteria:** 1. Full marks are obtained if students are able to find the sensor transfer function 2. Full marks are obtained if students are able to explain the working principles and application of sensors	· lecture · discussion · experiment/demonstration 2 X 50			0%
13	Students understand the working principles and application of optical sensors	· Explain the working principle of a light sensor · Design a suitable signal conditioning circuit for an optical sensor	**Criteria:** 1. Full marks are obtained if students are able to find the sensor transfer function 2. Full marks are obtained if students are able to explain the working principles and application of sensors	· lecture · discussion · experiment/demonstration 2 X 50			0%
14	Students understand the working principles and application of optical sensors	· Explain the working principle of a light sensor · Design a suitable signal conditioning circuit for an optical sensor	**Criteria:** 1. Full marks are obtained if students are able to find the sensor transfer function 2. Full marks are obtained if students are able to explain the working principles and application of sensors	· lecture · discussion · experiment/demonstration 2 X 50			0%
15	Students understand the working principles and application of pressure and force sensors	· explain the working principle of pressure and force sensors · Design a suitable signal conditioning circuit for pressure and force sensors	**Criteria:** 1. Full marks are obtained if students are able to find the sensor transfer function 2. Full marks are obtained if students are able to explain the working principles and application of sensors	· lecture · discussion · experiment/demonstration 2 X 50			0%
16							0%

Evaluation Percentage Recap: Project Based Learning

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.