



TEACHING INSTRUCTIONAL DESIGN (BRP)

COURSE

DIGITAL SIGNAL PROCESSING

by

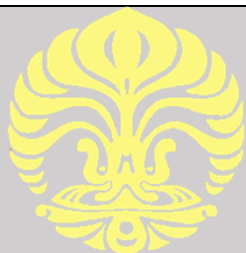
Dr. Santoso

**Undergraduate Program in Physics
Faculty of Mathematics and Natural Sciences**

Universitas Indonesia

Depok

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UNIVERSITAS INDONESIA
FACULTY OF MATHEMATICS AND NATURAL SCIENCES
PHYSICS UNDERGRADUATE STUDY PROGRAM

TEACHING INSTRUCTIONAL DESIGN

Course Name	Sensors and Actuators	Credit(s)	Prerequisite course(s)	Requisite for course(s)	Integration Between Other Courses
Course Code	SCPH603710	2	Electronics 2	-	-
Relation to Curriculum	-				
Semester	5				
Lecturer(s)	Dr. Santoso				
Course Description	Explaining the basic principles of Sensors and Actuators which include Temperature Sensors (Thermistors, Resistance Temperature Sensors, Silicon Resistive Sensors, Thermoelectric Sensors, PN Junction Temperature Sensors, and Optical Temperature Sensors), Mechanical Sensors (Pressure Sensors, Flow Sensors, and Level Sensors), Definitions, Classification and Characteristics of Actuators, Electric Actuators, Stepper Motors, Hydraulic Actuators, and Continuous Drive Actuators.				
Program Learning Outcome (PLO)					
PLO	Applying the concepts of Sensors and Actuators				

PLO	Formulating problems and solving Physics and its application, as well as interdisciplinary problems related to science and mathematics clusters critically, creatively, and innovatively.
PLO	Solving simple scientific problems and presenting them orally and in writing
Course Learning Outcome (CLO)	
CLO	Students are able to explain the technology behind sensors and actuators, precisely select and chose sensors and actuators needed for certain conditions, and apply it for monitoring and measuring physical units (C3) (ELO(s) 3, 5, 6, 7)
Sub-CLO	
Sub-CLO 1	Introduction to the course Sensors and Actuators 1 as well as CL methods (C3)
Sub-CLO 2	Explaining the Definition, Classification and Characteristics of Sensors (C2)
Sub-CLO 3	Explaining the Temperature Sensor (Thermistor and Resistance Temperature Sensors) (C2)
Sub-CLO 4	Explaining the Temperature Sensor (Silicon Resistive Sensors) (C2)
Sub-CLO 5	Explaining the Temperature Sensor (Thermoelectric Sensors) (C2)
Sub-CLO 6	Explaining the Temperature Sensor (PN Junction Temperature Sensors) (C2)
Sub-CLO 7	Explaining the Temperature Sensor (Optical Temperature Sensors) (C2)
Sub-CLO 8	Explaining the Mechanical Sensor (Pressure Sensors) (C2)
Sub-CLO 9	Explaining the Mechanical Sensor (Flow Sensors) (C2)
Sub-CLO 10	Explaining the Mechanical Sensor (Level Sensors) (C2)

Sub-CLO 11	Explaining the Definitions, Classifications, and Characteristics of Actuators (C2)
Sub-CLO 12	Explaining the Stepper Motor (C2)
Sub-CLO 13	Explaining Continuous Drive Actuators (C2)
Study Materials	<ul style="list-style-type: none"> • Temperature Sensors (Thermistors, Resistance Temperature Sensors, Silicon Resistive Sensors, Thermoelectric Sensors, PN Junction Temperature Sensors, and Optical Temperature Sensors) • Mechanical Sensors (Pressure Sensors, Flow Sensors, and Level Sensors) • Definitions, Classification and Characteristics of Actuators • Electric Actuators • Stepper Motors • Hydraulic Actuators • Continuous Drive Actuators
Reading List	<ul style="list-style-type: none"> • https://scele.ui.ac.id/course/view.php?id=7081 enrollment key: • J. G Webster, <i>The Measurement, Instrumentation and Sensors Handbook</i>, A CRC Handbook Published in Cooperation with IEEE Press, 1999 • Fraden, J. , <i>GAIP Handbook of Modern Sensors, Physics, Designs and Applications</i>, J American Institute of Physics, 2004. • Sensors, Volume 5, Magnetic Sensor, W. Gospel, J. Hesse, JN. Zemel, VCH, 1989. • Sensors, Volume 6, Optical Sensor, W. Gospel, J. Hesse, JN. Zemel, VCH, 1992. • Instrumentation Reference Book, Walt Boyes, Butterwort - Heinemann, 2003 • William C. Dunn, <i>Introduction to Instrumentation, Sensors, and Process Control</i>, Artech House, 2006..

Teaching Plan

Week	Sub-CLO	Study Materials [with reference]	Teaching Method [with est. time]	Learning Experiences (*O-E-F)	Sub-CLO Achievement Indicator		Sub-CLO Weight on Course (%)
					General	Specific	
1	1	<ul style="list-style-type: none"> Introduction to the course 	Lecturing Class [Estimated time] 100 minutes	Orientation: Introduction to this week's topic (70%) Feedback: Question and answer with the lecturer (30%)	Explaining the basic teaching methods used in class	Analyze and give feedback towards the basic teaching methods used in class	4%
2	2,3,4,5,6,7	<ul style="list-style-type: none"> 1st Phase of Focus Group Discussion no. 1 [Reference] https://scele.ui.ac.id/course/view.php?id=7081	Collaborative Learning [Estimated time]	Orientation: Introduction to this week's topic (20%)	Each Focus Group is able explore and discuss the individual tasks	Each Focus Group is able to fill in the forms that requires	8%

			100 minutes	<p>Exercise: Listen to lecture (50%)</p> <p>Feedback: Question and answer with the lecturer (30%)</p>	that will be distributed to everyone based on their specific topic	them to discuss the individual tasks that will be distributed to everyone based on their specific topic	
3	2,3,4,5,6,7	<ul style="list-style-type: none"> • 2nd Phase of Focus Group Discussion no. 1 <p>[Reference] https://scele.ui.ac.id/course/view.php?id=7081</p>	<p>Collaborative Learning</p> <p>[Estimated time] 100 minutes</p>	<p>Orientation: Introduction to this week's topic (20%)</p> <p>Exercise: Listen to lecture (50%)</p> <p>Feedback: Question and answer with the lecturer</p>	Each Focus Group member is able to present their individual task to other members of the group	Each Focus Group is able to fill in the forms that requires them to summarize the presentation of each member	8%

				(30%)			
4	2,3,4,5,6,7	<ul style="list-style-type: none"> 1st Phase of Home Group Discussion no. 1 [Reference] https://scele.ui.ac.id/course/view.php?id=7081	Collaborative Learning [Estimated time] 100x2 minutes	Orientation: Introduction to this week's topic (20%) Exercise: Listen to lecture (50%) Feedback: Question and answer with the lecturer (30%)	Each member is able to present the result of the Focus Group Discussion to the Home Group	Each Home Group member is able to fill in the forms the requires them to summarize the presentation of each member	8%
5	2,3,4,5,6,7	<ul style="list-style-type: none"> 2nd Phase of Home Group Discussion no. 1 [Reference] https://scele.ui.ac.id/course/view.php?id=7081	Collaborative Learning [Estimated time] 100x2 minutes	Orientation: Introduction to this week's topic (20%) Exercise: Listen to lecture (50%)	Each member is able to summarize their topic and prepare for the presentation	Each Home Group member is able to fill in the forms the requires them to summarize the materials needed for	8%

				Feedback: Question and answer with the lecturer (30%)		the presentation	
6	2,3,4,5,6,7	<ul style="list-style-type: none"> 1st Presentation [Reference] https://scele.ui.ac.id/course/view.php?id=7081	Collaborative Learning [Estimated time] 100 minutes	Orientation: Introduction to this week's topic (20%) Exercise: Listen to lecture (50%) Feedback: Question and answer with the lecturer (30%)	Able to explain the basic concepts of: a) Definition, Classification, and Characteristics of Sensors b) Temperature Sensors	Other groups are able to criticize and give feedback towards the group presenting	8%
7	2,3,4,5,6,7	<ul style="list-style-type: none"> 2st Presentation [Reference] https://scele.ui.ac.id/course/view.php?id=7081	Collaborative Learning	Orientation: Introduction to this week's topic	Able to explain the basic concepts of:	Other groups are able to criticize and	8%

			[Estimated time] 100 minutes	(20%) Exercise: Listen to lecture (50%) Feedback: Question and answer with the lecturer (30%)	a) Definition, Classification, and Characteristics of Sensors b) Temperature Sensors	give feedback towards the group presenting	
8	Mid Term Exam						
9	8,9,10,11,12,13	<ul style="list-style-type: none"> 1st Phase of Focus Group Discussion no. 2 [Reference] https://scele.ui.ac.id/course/view.php?id=7081	Collaborative Learning [Estimated time] 100 minutes	Orientation: Introduction to this week's topic (20%) Exercise: Listen to lecture (50%) Feedback: Question and answer	Each Focus Group is able to explore and discuss the individual tasks that will be distributed to everyone based on their specific topic	Each Focus Group is able to fill in the forms that requires them to discuss the individual tasks that will be distributed to everyone based on their	8%

				with the lecturer (30%)		specific topic	
10	8,9,10,11,12,13	<ul style="list-style-type: none"> 2nd Phase of Focus Group Discussion no. 2 [Reference] https://scele.ui.ac.id/course/view.php?id=7081	Collaborative Learning [Estimated time] 100 minutes	Orientation: Introduction to this week's topic (20%) Exercise: Listen to lecture (50%) Feedback: Question and answer with the lecturer (30%)	Each Focus Group member is able to present their individual task to other members of the group	Each Focus Group is able to fill in the forms that requires them to summarize the presentation of each member	8%
11	8,9,10,11,12,13	<ul style="list-style-type: none"> 1st Phase of Home Group Discussion no. 2 [Reference] https://scele.ui.ac.id/course/view.php?id=7081	Collaborative Learning [Estimated time] 100x2 minutes	Orientation: Introduction to this week's topic (20%) Exercise:	Each member is able to present the result of the Focus Group Discussion to the Home Group	Each Home Group member is able to fill in the forms the requires them to summarize	8%

				<p>Listen to lecture (50%)</p> <p>Feedback: Question and answer with the lecturer (30%)</p>		the presentation of each member	
12	8,9,10,11,12,13	<ul style="list-style-type: none"> • 2nd Phase of Home Group Discussion no. 2 <p>[Reference] https://scele.ui.ac.id/course/view.php?id=7081</p>	<p>Collaborative Learning</p> <p>[Estimated time] 100x2 minutes</p>	<p>Orientation: Introduction to this week's topic (20%)</p> <p>Exercise: Listen to lecture (50%)</p> <p>Feedback: Question and answer with the lecturer (30%)</p>	Each member is able to summarize their topic and prepare for the presentation	Each Home Group member is able to fill in the forms the requires them to summarize the materials needed for the presentation	8%

13	8,9,10,11,12,13	<ul style="list-style-type: none"> • 1st Presentation [Reference] https://scele.ui.ac.id/course/view.php?id=7081	Collaborative Learning [Estimated time] 100 minutes	Orientation: Introduction to this week's topic (20%) Exercise: Listen to lecture (50%) Feedback: Question and answer with the lecturer (30%)	Able to explain the basic concepts of: a) Mechanical Sensors b) Actuators	Other groups are able to criticize and give feedback towards the group presenting	8%
14	8,9,10,11,12,13	<ul style="list-style-type: none"> • 2st Presentation [Reference] https://scele.ui.ac.id/course/view.php?id=7081	Collaborative Learning [Estimated time] 100 minutes	Orientation: Introduction to this week's topic (20%) Exercise: Listen to lecture (50%)	Able to explain the basic concepts of: a) Mechanical Senosrs b) Acutators	Other groups are able to criticize and give feedback towards the group presenting	8%

				Feedback: Question and answer with the lecturer (30%)			
15	8,9,10,11,12,13	• Reviewing Final Exam Materials	Collaborative Learning [Estimated time] 100 minutes	Orientation: Introduction to this week's topic (20%) Exercise: Listen to lecture (50%) Feedback: Question and answer with the lecturer (30%)	Students are able to participate in answering the exercises prepared by the lecturer to review the materials for the final exam	Students are able to solve and give feedback in answering the exercises prepared by the lecturer to review the materials for the final exam	
16	Final Exam						

Assignment Design

Week	Assignment Name	Sub-CLOs	Assignment	Scope	Working Procedure	Deadline	Outcome
Week	Assignment Name	Sub-CLO	Assignments	Scopes	Working Procedure	Deadline	Outcome
1	Individual and Group Tasks	1	Questions	Teaching Methods	As a group, individually and online	100 minutes	-
2	Individual and Group Tasks	2	Questions	Summarize the main topic Doing tasks Filling out the form	As a group (FG), individually and online	1 week	Form, Student Assignment Sheet
3	Individual and Group Tasks	3	Questions	Summarize the main topic Doing tasks Filling out the form	As a group (FG), individually and online	1 week	Form, Student Assignment Sheet
4	Individual and Group Tasks	4	Questions	Summarize the main topic Doing tasks Filling out the form	As a group (HG), individually and online	1 week	Form, Group Assignment Sheet
5	Individual and Group Tasks	5	Questions	Summarize the main topic Doing tasks Filling out the form	As a group (HG), individually and online	1 week	Student Power Point, Result of Presentation, Form
6	Presentation	6	Questions	Explaining the concepts of:	As a group, individually and online	100 minutes	Student Power Point, Result of Presentation, Form

				a) Definition, Classification and Characteristics of Sensors Temperature Sensors			
7	Presentation	7	Questions	Explaining the concepts of: a) Definition, Classification and Characteristics of Sensors Temperature Sensors	As a group, individually and online	100 minutes	Student Power Point, Result of Presentation, Form
9	Individual and Group Tasks	8	Questions	Summarize the main topic Doing tasks Filling out the form	As a group (FG), individually and online	1 week	Form, Student Assignment Sheet
10	Individual and Group Tasks	10	Questions	Summarize the main topic Doing tasks Filling out the form	As a group (FG), individually and online	1 week	Form, Student Assignment Sheet
11	Individual and Group Tasks	11	Questions	Summarize the main topic Doing tasks Filling out the form	As a group (HG), individually and online	1 week	Form, Group Assignment Sheet
12	Individual and Group Tasks	11	Questions	Summarize the main topic Doing tasks Filling out the form	As a group (HG), individually and online	1 week	Student Power Point, Result of Presentation, Form
13	Presentation	12	Questions	Explaining the concepts of: a) Mechanical Sensors Actuators	As a group, individually and online	100 minutes	Student Power Point, Result of Presentation, Form

14	Presentation	13	Questions	Explaining the concepts of: a) Mechanical Sensors Actuators	As a group, individually and online	100 minutes	Student Power Point, Result of Presentation, Form
15	Reviewing Final Exam Materials	14	Questions	Explaining the concepts of: a) Mechanical Sensors Actuators	As a group, individually and online	100 minutes	

Assessment Criteria

Evaluation Type	Sub-CLO	Assessment Type	Frequency	Evaluation Weight (%)
Forms	2-13	Activity in Scele		20
Student Assignment Sheet	2;3;4;5;6;7; and 8;9;10;11;12;13	Evaluation Form (LTM)	2	20
Papers and Presentation (HG1 and HG2)	2-7 and 8-13	PowerPoint	2	10
Presentation	2-7 and 8-13	LTM	2	10
Mid-Term Exam	2-7	Essay Questions	1	20
Final Exam	8-13	Essay Questions	1	20
Total				100

Conversion of the students final score

Score	Grade	Equivalent
85—100	A	4,00
80—<85	A-	3,70
75—<80	B+	3,30
70—<75	B	3,00
65—<70	B-	2,70
60—<65	C+	2,30
55—<60	C	2,00
40—<55	D	1,00
<40	E	0,00

Rubric(s)

A. Criteria for Presentation

Grade	Quality of Answer
85-90	If the group is able to present their materials logically, fluently and is able to finish their presentation on time while also being able to answer questions being given by other students or the teacher.
75-84	If the group is able to present their materials logically and fluently while also being able to answer questions being given by other students or the teacher but is not able to manage their time properly
65-74	If the group is able to present their materials logically but is not able to logically explain the process of their material
55-64	The group is not able to present their materials fluently nor logically and is not able to manage their time properly
<55	

B. Mid term exam and Final term exam

Grade	Quality of Answer
100	The answers are precise, every definition and main components are included
76-99	The answers precise enough, all definitions and main components that are needed to answer the question are almost precise
51-75	The answers are less precise, the definitions and main components that are needed to answer the question are less precise
26-50	The answers are very unprecise, the definitions and main components that are needed to answer the questions are missing a lot of details
<25	Wrong answer