TEACHING INSTRUCTIONAL DESIGN (BRP)

COURSE

EMBEDDED SYSTEM

by

Dr. Prawitno Prajitno

Undergraduate Program in Physics
Faculty of Mathematics and Natural Sciences
Universitas Indonesia
Depok
November 2020

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

TEACHING INSTRUCTIONAL DESIGN

Course Name	Computer-Based Data Acquisition	**Credit(s)**	**Prerequisite course(s)**	**Requisite for course(s)**	**Integration Between Other Courses**
Course Code	SCPH604709	2	Electronics 2	-	-
Relation to Curriculum	-				
Semester	5				
Lecturer(s)	Dr. Prwaito Prajitno				
Course Description	After finishing this course, Physics students under the specialization of instrumentational physics in the 5th semester is able to apply (C3) a range of basic instrumentation techniques for data acquisition using computers through the software of LabVIEW or other programming languages. The language used to interact in this course is in Indonesian.				

Program Learning Outcome (PLO)	
Sub-PLO 1	Describing the fenomenon, findings and both contemporary and current topics in Physics.

Sub-PLO 2	Building a strong perception towards the development of the current development of science and technology related to physics.
Sub-PLO 3	Applying concepts in Physics towards the process of production.
Sub-PLO 4	Applying concepts in Physics in botch society and livelihood.
Sub-PLO 5	Applying the concepts thought form system and instrumentational physics.
Course Learning Outcome (CLO)	
CLO	Students are able to apply (C3) various basic instrumentation techniques for data acquisition using computers through the software of LabVIEW or other programming languages. (ELO(s) 3, 5, 6, 8)
Sub-CLO	
Sub-CLO 1	Able to apply (C3) basic instrumentation techniques for data acquisition using computers.
Sub-CLO 2	Able to explain (C2) the basics of programming using LabVIEW for data acquisition.
Sub-CLO 3	Able to explain (C2) the inputs and outputs of computer systems for data acquisition.
Sub-CLO 4	Able to apply (C3) basic instrumentation concepts for signal conditioning in while acquiring data.
Sub-CLO 5	Able to explain (C2) the mechanics of communication using computer systems for data acquisition.
Sub-CLO 6	Able to apply (C3) basic instrumentation techniques for designing a system for acquiring data.

Study Materials	• Data Acquisition based on computers • Basic applications of LabVIEW • Analog to Digital Converter • Digital to Analog Converter • Serial data communication systems • Parallel data communication systems
Reading List	• Cotfas, P.A., Cotfas, D.T., Ursutiu, D. and Samoila, C., NI ELVIS Computer-Based Instrumentation, NTS, 2012. • Travis, J., and Kring, J. LabVIEW for Everyone, 3rd Ed., Prentice Hall, 2006 • Sumathi, S. and Surekha, P., LabVIEW based Advanced Instrumentation Systems, Springer, 2007.

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	Introduction						
2	1	• Introducing data acquisition systems based on computers [Reference] Cotfas, P.A., Cotfas, D.T., Ursutiu, D. and Samoila, C., NI ELVIS Computer-Based Instrumentation, NTS, 2012.100	Interactive teaching, question-based learning, self-directed study, discussion [Estimated time] 100 minutes	Orientation: Introduction to this week's topic (20%) Exercise: Listen to lecture (60%) Feedback: Question and answer with the lecturer (20%)	Able to explain basic instrumentation concepts for data acquisition using computers	Able to apply basic instrumentation concepts for data acquisition using computers	8.33%
3	1	• Data acquisition systems based on computers	Interactive teaching, question-	Orientation: Introduction to this	Able to explain basic instrumentation concepts for data	Able to apply basic instrumentation concepts for data	8.33%

		[Reference] Cotfas, P.A., Cotfas, D.T., Ursutiu, D. and Samoila, C., NI ELVIS Computer-Based Instrumentation, NTS, 2012.100	based learning, self-directed study, discussion [Estimated time] 100 minutes	week's topica (20%) Exercise: Listen to lecture (60%) Feedback: Question and answer with the lecturer (20%)	acquisition using computers	acquisition using computers	
4	2	• Introduction to LabVIEW [Reference] Cotfas, P.A., Cotfas, D.T., Ursutiu, D. and Samoila, C., NI ELVIS Computer-Based Instrumentation, NTS, 2012.100	Interactive teaching, question-based learning, self-directed study, discussion [Estimated time] 100 minutes	Orientation: Introduction to this week's topic (20%) Exercise: Listen to lecture (60%) Feedback:	Able to explain the program of LabVIEW for data acquisition	Able to apply the program of LabVIEW for data acquisition	8.33%

				Question and answer with the lecturer (20%)			
5	2	• Prgoramming LabVIEW [Reference] Travis, J., and Kring, J. *LabVIEW for Everyone*, 3rd Ed., Prentice Hall, 2006	Interactive teaching, question-based learning, self-directed study, discussion [Estimated time] 100x2 minutes	Orientation: Introduction to this week's topic (20%) Exercise: Listen to lecture (60%) Feedback: Question and answer with the lecturer (20%)	Able to explain the program of LabVIEW for data acquisition	Able to apply the program of LabVIEW for data acquisition	8.33%
6	3	• Inputs in the computer system [Reference] Travis, J., and Kring, J. LabVIEW for Everyone, 3rd Ed., Prentice Hall, 2006	Interactive teaching, question-based learning, self-	Orientation: Introduction to this week's topic (20%)	Able to explain the inputs for a computer for data acquisition	Able to apply the inputs for a computer for data acquisition	8.33%

			directed study, discussion [Estimated time] 100x2 minutes	Exercise: Listen to lecture (60%) Feedback: Question and answer with the lecturer (20%)			
7	3	• Outputs of the computer system [Reference] Cotfas, P.A., Cotfas, D.T., Ursutiu, D. and Samoila, C., NI ELVIS Computer-Based Instrumentation, NTS, 2012.100	Interactive teaching, question-based learning, self-directed study, discussion [Estimated time] 100 minutes	Orientation: Introduction to this week's topic (20%) Exercise: Listen to lecture (60%) Feedback: Question and answer with the lecturer (20%)	Able to explain the outputs of a computer for data acquisition	Able to apply the outputs of a computer for data acquisition	8.33%

8	Mid Term Exam						
9	4	• Techniques of signal conditioning [Reference] Sumathi, S. and Surekha, P., LabVIEW based Advanced Instrumentation Systems, Springer, 2007.	Interactive teaching, question-based learning, self-directed study, discussion [Estimated time] 100 minutes	Orientation: Introduction to this week's topic (20%) Exercise: Listen to lecture (60%) Feedback: Question and answer with the lecturer (20%)	Able to explain the techniques of signal conditioning for data acquisition	Able to apply the techniques of signal conditioning for data acquisition	5.55%
10	4	• Signal conversion (ADC) [Reference] Sumathi, S. and Surekha, P., LabVIEW based Advanced Instrumentation Systems, Springer, 2007.	Interactive teaching, question-based learning, self-directed study, discussion [Estimated time]	Orientation: Introduction to this week's topic (20%) Exercise: Listen to lecture (60%)	Able to explain the concept of Analog to Digital signal conversion for data acquisition	Able to apply the concept of Analog to Digital signal conversion for data acquisition	5.55%

			100 minutes	Feedback: Question and answer with the lecturer (20%)			
11	4	• Signal conversion (DAC) [Reference] Sumathi, S. and Surekha, P., LabVIEW based Advanced Instrumentation Systems, Springer, 2007.	Interactive teaching, question-based learning, self-directed study, discussion [Estimated time] 100x2 minutes	Orientation: Introduction to this week's topic (20%) Exercise: Listen to lecture (60%) Feedback: Question and answer with the lecturer (20%)	Able to explain the concept of Digital to Analog signal conversion for data acquisition	Able to apply the concept of Digital to Analog signal conversion for data acquisition	5.55%
12	5	• Serial data communication systems [Reference]	Interactive teaching, question-based	Orientation: Introduction to this week's topic	Able to explain the principals of data communication via	Able to apply the principals of data communication via	8.33%

		Sumathi, S. and Surekha, P., LabVIEW based Advanced Instrumentation Systems, Springer, 2007.	learning, self-directed study, discussion [Estimated time] 100x2 minutes	(20%) Exercise: Listen to lecture (60%) Feedback: Question and answer with the lecturer (20%)	computers for data acquisition	computers for data acquisition	
13	5	• Parallel data communication systems [Reference] Sumathi, S. and Surekha, P., LabVIEW based Advanced Instrumentation Systems, Springer, 2007.	Interactive teaching, question-based learning, self-directed study, discussion [Estimated time] 100 minutes	Orientation: Introduction to this week's topic (20%) Exercise: Listen to lecture (60%) Feedback: Question and answer	Able to explain the principals of data communication via computers for data acquisition	Able to apply the principals of data communication via computers for data acquisition	8.33%

				with the lecturer (20%)			
14	6	• Simple examples of designing acquisition techniques 1 [Reference] Sumathi, S. and Surekha, P., LabVIEW based Advanced Instrumentation Systems, Springer, 2007.	Interactive teaching, question-based learning, self-directed study, discussion [Estimated time] 100 minutes	Orientation: Introduction to this week's topic (20%) Exercise: Listen to lecture (60%) Feedback: Question and answer with the lecturer (20%)	Able to explain basic instrumentation techniques for designing a system for data acquisition	Able to apply basic instrumentation techniques for designing a system for data acquisition	8.33%
15	6	• Simple examples of designing acquisition techniques 2	Interactive teaching, question-based learning, self-directed study, discussion	Orientation: Introduction to this week's topic (20%) Exercise:	Able to explain basic instrumentation techniques for designing a system for data acquisition	Able to apply basic instrumentation techniques for designing a system for data acquisition	8.33%

			[Estimated time] 100 minutes	Listen to lecture (60%) Feedback: Question and answer with the lecturer (20%)			
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**
2-7, 9-15	Individual Assignments	1-6	Doing assignments	Materials thought in class in that specific week	Individual assignments at home	1 week	The answers are submitted in the platform EMAS
8	Midterm Exam	1-3	Answering questions	• Introduction to data acquisition using computers • Introduction to LabVIEW	Answering the midterm exam in EMAS	100 minutes	The answers are submitted in the platform EMAS

				• Inputs and Outputs of a computer system			
16	Final Exam	4-6	Answering Questions	• ADC and DAC signal conversion • Communication systems of serial and parallel data • Simple examples of designing a data acquisition system	Answering the final exam in EMAS	100 minutes	The answers are submitted in the platform EMAS

Assessment Criteria

Evaluation Type	**Sub-CLO**	**Assessment Type**	**Frequency**	**Evaluation Weight (%)**
Individual Assignments	1-6	Summary or assignments	1 every week	30
Mid-Term Exam	1-3	Exam questions in EMAS UI	1	35
Final Exam	4-6	Exam questions in EMAS UI	1	35
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. Criterions for the Individual Assignments

Grade	Quality of Answer
>90	If the student is able to finish the assignment with atleast 90% of the answers being correct
70-89	If the student is able to finish the assignment while getting between 70% to 89% of the answers correct
60-69	If the student is able to finish the assignment while getting between 60% to 69% of the answers correct
55-59	If the student is able to finish the assignment while getting between 55% to 59% of the answers correct
50-54	If the student is able to finish the assignment while getting between 50% to 54% of the answers correct

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