TEACHING INSTRUCTIONAL DESIGN (BRP)

COURSE

COMPUTER-BASED DATA ACQUISITION

by

Dr. Prawito Prajitno

Undergraduate Program in Physics
Faculty of Mathematics and Natural Sciences
Universitas Indonesia
Depok
November 2016

PREFACE

Teaching Instructional Design (BRP) of Computer-Based Data Acquisition was arranged to be used as a reference for the course of Computer-Based Data Acquisition in the undergraduate Physics program in FMIPA UI that is followed by the students taking a specialization on instrumentational physics in the 5th semester with the requirement of that student has taken the Electronics 2 course in the previous term. In this course, students will learn a range of basic techniques in instrumentation for data acquisition using computers, specifically using the software called LabVIEW or other programming languages. This BRP is hoped to be used as a reference in the learning process for both teachers and students as a part of the course with hopes that the contents in this course can be delivered appropriately.

Depok, 23rd of November 2016

Dr. Prawito Prajitno

I. General Information

1.	Name of Program / Study Level	:	Physics / Undergraduate
2.	Course Name	:	Computer-Based Data Acquisition
3.	Course Code	:	SCFI604714
4.	Semester	:	5
5.	Credit	:	2 credits
6.	Teaching Method(s)	:	Interactive classes, Lecturing classes, question-based learning, self-directed study, discussion, individual tasks, and written exams.
7.	Prerequisite course(s)	:	Electronics 2
8.	Requisite for course(s)	:	None
9.	Integration Between Other Courses	:	None
10.	Lecturer(s)	:	Dr. Prawito Prajitno
11.	Course Description	:	After finishing this course, Physics students under the specialization of instrumentational physics in the 5^{th} 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.

II. Course Learning Outcome (CLO) and Sub-CLOs

A. 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)

B. Sub-CLOs

1. Able to apply (C3) basic instrumentation techniques for data acquisition using computers.
2. Able to explain (C2) the basics of programming using LabVIEW for data acquisition.
3. Able to explain (C2) the inputs and outputs of computer systems for data acquisition.
4. Able to apply (C3) basic instrumentation concepts for signal conditioning in while acquiring data.
5. Able to explain (C2) the mechanics of communication using computer systems for data acquisition.
6. Able to apply (C3) basic instrumentation techniques for designing a system for acquiring data.

III. Teaching Plan

Week	Sub-CLO	Study Materials	Teaching Method	Time Required	Learning Experiences (*O-E-F)	Sub-CLO Weight on Course (%)	Sub-CLO Achievement Indicator	References
1	**Introduction to the course**							
2	1	Introducing data acquisition systems based on computers	Interactive teaching, question-based learning, self-directed study, discussion	100 minutes	20% O, 60% E, 20% F	8.33	Able to explain basic instrumentation concepts for data acquisition using computers	Cotfas, P.A., Cotfas, D.T., Ursutiu, D. and Samoila, C., NI ELVIS Computer-Based Instrumentation, NTS, 2012.
3	1	Data acquisition systems based on computers	Interactive teaching, question-based learning, self-directed study, discussion	100 minutes	20% O, 60% E, 20% F	8.33	Able to explain basic instrumentation concepts for data acquisition using computers	Cotfas, P.A., Cotfas, D.T., Ursutiu, D. and Samoila, C., NI ELVIS Computer-Based Instrumentation, NTS, 2012.
4	2	Introduction to LabVIEW	Interactive teaching, question-based learning, self-directed study, discussion	100 minutes	20% O, 60% E, 20% F	8.33	Able to explain the program of LabVIEW for data acquisition	Travis, J., and Kring, J. *LabVIEW for Everyone*, 3rd Ed., Prentice Hall, 2006
5	2	Programming LabVIEW	Interactive teaching, question-based learning, self-directed study, discussion	100 minutes	20% O, 60% E, 20% F	8.33	Able to explain the program of LabVIEW for data acquisition	Travis, J., and Kring, J. *LabVIEW for Everyone*, 3rd Ed., Prentice Hall, 2006
6	3	Inputs in the computer system	Interactive teaching, question-based learning, self-directed study, discussion	100 minutes	20% O, 60% E, 20% F	8.33	Able to explain the inputs for a computer for data acquisition	Cotfas, P.A., Cotfas, D.T., Ursutiu, D. and Samoila, C., NI ELVIS Computer-Based Instrumentation, NTS, 2012.

7	3	Outputs of the computer system	Interactive teaching, question-based learning, self-directed study, discussion	100 minutes	20% O, 60% E, 20% F	8.33	Able to explain the outputs of a computer for data acquisition	Cotfas, P.A., Cotfas, D.T., Ursutiu, D. and Samoila, C., NI ELVIS Computer-Based Instrumentation, NTS, 2012.
8	**Mid Term Exam**							
9	4	Techniques of signal conditioning	Interactive teaching, question-based learning, self-directed study, discussion	100 minutes	20% O, 60% E, 20% F	5.55	Able to explain the techniques of signal conditioning for data acquisition	Sumathi, S. and Surekha, P., *LabVIEW based Advanced Instrumentation Systems*, Springer, 2007.
10	4	Signal conversion (ADC)	Interactive teaching, question-based learning, self-directed study, discussion	100 minutes	20% O, 60% E, 20% F	5.55	Able to explain the concept of Analog to Digital signal conversion for data acquisition	Sumathi, S. and Surekha, P., *LabVIEW based Advanced Instrumentation Systems*, Springer, 2007.
11	4	Signal conversion (DAC)	Interactive teaching, question-based learning, self-directed study, discussion	100 minutes	20% O, 60% E, 20% F	5.55	Able to explain the concept of Digital to Analog signal conversion for data acquisition	Sumathi, S. and Surekha, P., *LabVIEW based Advanced Instrumentation Systems*, Springer, 2007.
12	5	Serial data communication systems	Interactive teaching, question-based learning, self-directed study, discussion	100 minutes	20% O, 60% E, 20% F	8.33	Able to explain the principals of data communication via computers for data acquisition	Sumathi, S. and Surekha, P., *LabVIEW based Advanced Instrumentation Systems*, Springer, 2007.

13	5	Parallel data communication systems	Interactive teaching, question-based learning, self-directed study, discussion	100 minutes	20% O, 60% E, 20% F	8.33	Able to explain the principals of data communication via computers for data acquisition	Sumathi, S. and Surekha, P., *LabVIEW based Advanced Instrumentation Systems*, Springer, 2007.
14	6	Simple examples of designing acquisition techniques 1	Interactive teaching, question-based learning, self-directed study, discussion	100 minutes	20% O, 60% E, 20% F	8.33	Able to apply basic instrumentation techniques for designing a system for data acquisition	Sumathi, S. and Surekha, P., *LabVIEW based Advanced Instrumentation Systems*, Springer, 2007.
15	6	Simple examples of designing acquisition techniques 2	Interactive teaching, question-based learning, self-directed study, discussion	100 minutes	20% O, 60% E, 20% F	8.33	Able to apply basic instrumentation techniques for designing a system for data acquisition	Sumathi, S. and Surekha, P., *LabVIEW based Advanced Instrumentation Systems*, Springer, 2007.
16	**Final Exam**							

*) O : Orientation
E : Exercise
F : Feedback

References:

1. Cotfas, P.A., Cotfas, D.T., Ursutiu, D. and Samoila, C., NI ELVIS Computer-Based Instrumentation, NTS, 2012.
2. Travis, J., and Kring, J. LabVIEW for Everyone, 3rd Ed., Prentice Hall, 2006
3. Sumathi, S. and Surekha, P., LabVIEW based Advanced Instrumentation Systems, Springer, 2007.

IV. Assignment Design

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 • Inputs and Outputs of a computer system	Answering the midterm exam in EMAS	100 minutes	The answers are submitted in the platform EMAS
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

V. Assessment Criteria (Learning Outcome Evaluation)

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**

VI. Rubric(s)

A. Criterions for 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. Criterions for the Mid-Term Exam and Final Exam

1) Able to explain and give an opinion in finishing the questions (25%)
2) Able to apply the basic concepts that have been studied throughout the term in finishing the questions (35%)
3) Able to construct a finishing answer with a good structure and explanation towards the answer (30%)
4) Able to use the correct units and important figures (10%)