TEACHING INSTRUCTIONAL DESIGN (BRP)

COURSE

ELECTRONICS LABORATOTY WORK 2

by

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

TEACHING INSTRUCTIONAL DESIGN

Course Name	Electronics Laboratory Work 2	**Credit(s)**	**Prerequisite course(s)**	**Requisite for course(s)**	**Integration Between Other Courses**
Course Code	SCPH601247	1	Electronics 1, Basic Laboratory Work 1	-	-
Relation to Curriculum	Compulsory Course				
Semester	4th				
Lecturer(s)	Drs. Sastra Kusuma Wijaya Ph.D.				
Course Description	*After completing this practicum lecture, physics students in semester 4 are able to analyze (C4) advanced electronic concepts and digital circuits and use (P4) the VHDL programming language in everyday life appropriately to solve (A5) existing problems in accordance with logic applicable computer. The language of instruction used in this course is Indonesian.*				

Program Learning Outcome (PLO)	
PLO	Describe working principle of electronic components.
PLO	Measure the physical quantities of electricity and magnetism.
PLO	Processing experimental data and interpreting the results of the processing carried out.
PLO	Apply the basic concepts of electronics in solving electrical and magnetic physics problems.

PLO	Study the cutting-edge instruments that support postgraduate students' work.
PLO	Apply knowledge of electronics in society and practical life.
PLO	Able work on team
PLO	Have the attitudes and skills that support success at work and in participating in community activities.
Course Learning Outcome (CLO)	
CLO	Students are able to analyze (C4) advanced electronic concepts and digital circuits and use (P4) the VHDL programming language in everyday life appropriately to solve problems (A5)
Sub-CLO(s)	
Sub-CLO 1	Able to analyze (C4) and demonstrate (P2) advanced electronics concepts to solve (A5) problems in everyday life.
Sub-CLO 2	Able to analyze (C4) and demonstrate (P2) the concept of digital circuits to solve (A5) problems in everyday life.
Sub-CLO 3	Able to analyze (C4) and report (P2) the characteristics of digital circuits and the VHDL programming language and make (A2) practical reports according to applicable rules.
Sub-CLO 4	Able to investigate (C3) and use (P4) VHDL programming language to solve (A5) problems in daily life.
Study Materials	• Digital AND, OR, NOT, NOR, and NAND gates • Binary adder digital circuit • Full Adder digital circuit • Digital decoder and encoder circuit • Flip-Flops . digital circuits • Counter digital circuit • IC Digital 555 Timer • Half Adder and Full Adder using VHDL

	• Decoder using VHDL • Seven Segment BCD uses VHDL • Sequential BCD Counter using VHDL • State Machine using VHDL
Reading List	• S. K. Wijaya, D. W. Hastuti, A. Hifzhi, R. Arif, *Buku Penuntun Praktikum Elektronika 2*, 2018. • W. Kleitz, *Digital Electronics, A Practical Approach*, 9th edition, Prentice Hall, 2012. • R. J. Tocci, N.S. Widmer, G.L. Moss, *Digital Systems; Principles and Applications*, Pearson Prentice-Hall, 2015.

I. 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 Course Contracts**						
2	Sub CPMK 1 – 3	• Digital AND, OR, NOT, NOR, and NAND gates [Reference] S. K. Wijaya, D. W. Hastuti, A. Hifzhi, R. Arif, Buku Penuntun Praktikum Elektronika 2, 2018	Practical module simulation using EasyEDA [Est. Time] 200 minutes	**Orientation(20%) :** Read reference material independently **Exercise (20 % & 40 %)** : 1. Working on the pretest and posttest in EMAS 2. Collecting practicum reports at EMAS 3. Discussion of modules at EMAS with groups 4. Make practicum report	Able to report simulation results in the form of practicum reports in accordance with existing rules	Able to use digital circuits as applications in daily life	7,5 %

				Feedback (20%) Laboratory Asisstant Coment			
3	Sub CPMK 1 – 4	• Binary adder and Full adder digital circuit [Reference] S. K. Wijaya, D. W. Hastuti, A. Hifzhi, R. Arif, Buku Penuntun Praktikum Elektronika 2, 2018.	Practical module simulation using EasyEDA [Est. Time] 200 minutes	**Orientation(20%) :** Read reference material independently **Exercise (20 % & 40 %):** 1. Working on the pretest and posttest in EMAS 2. Collecting practicum reports at EMAS 3. Discussion of modules at EMAS with groups 4. Make practicum report **Feedback (20%)** Laboratory Asisstant Coment	Able to report simulation results in the form of practicum reports in accordance with existing rules	Able to use digital circuits as applications in daily life	3,75 %
4	Sub CPMK 1 – 4	• Decoder and Encoder Digital Circuits [Reference] S. K. Wijaya, D. W. Hastuti, A. Hifzhi, R. Arif, Buku Penuntun Praktikum Elektronika 2, 2018.	Practical module simulation using EasyEDA [Est. Time] 200 minutes	**Orientation(20%) :** Read reference material independently **Exercise (20 % & 40 %):** 1. Working on the pretest and posttest in EMAS 2. Collecting practicum reports at EMAS	Able to report simulation results in the form of practicum reports in accordance with existing rules	Able to use digital circuits as applications in daily life	3,75 %

				3. Discussion of modules at EMAS with groups 4. Make practicum report **Feedback (20%)** Laboratory Asisstant Coment			
5	Sub CPMK 1 – 4	• Flip – flops Digital Circuits [Reference] S. K. Wijaya, D. W. Hastuti, A. Hifzhi, R. Arif, Buku Penuntun Praktikum Elektronika 2, 2018.	Practical module simulation using EasyEDA [Est. Time] 200 minutes	**Orientation(20%) :** Read reference material independently **Exercise (20 % & 40 %)** : 1. Working on the pretest and posttest in EMAS 2. Collecting practicum reports at EMAS 3. Discussion of modules at EMAS with groups 4. Make practicum report **Feedback (20%)** Laboratory Asisstant Coment	Able to report simulation results in the form of practicum reports in accordance with existing rules	Able to use digital circuits as applications in daily life	7,5 %
6	Sub CPMK 1 – 4	• Counter Digital Circuits [Reference]	Practical module simulation using EasyEDA [Est. Time]	**Orientation(20%) :** Read reference material independently **Exercise (20 % & 40 %):**	Able to report simulation results in the form of practicum reports in accordance with existing rules	Able to use digital circuits as applications in daily life	7,5 %

		S. K. Wijaya, D. W. Hastuti, A. Hifzhi, R. Arif, Buku Penuntun Praktikum Elektronika 2, 2018	200 minutes	1. Working on the pretest and posttest in EMAS 2. Collecting practicum reports at EMAS 3. Discussion of modules at EMAS with groups 4. Make practicum report **Feedback (20%)** Laboratory Asisstant Coment			
7	Sub CPMK 1 – 4	• IC Digital 555 Timer [Reference] S. K. Wijaya, D. W. Hastuti, A. Hifzhi, R. Arif, Buku Penuntun Praktikum Elektronika 2, 2018	Practical module simulation using EasyEDA [Est. Time] 200 minutes	**Orientation(20%) :** Read reference material independently **Exercise (20 % & 40 %):** 1. Working on the pretest and posttest in EMAS 2. Collecting practicum reports at EMAS 3. Discussion of modules at EMAS with groups 4. Make practicum report **Feedback (20%)** Laboratory Asisstant Coment	Able to report simulation results in the form of practicum reports in accordance with existing rules	Able to use digital circuits as applications in daily life	7,5 %

8	Sub CPMK 1 – 4	• Half Adder dan Full Adder using VHDL [Reference] S. K. Wijaya, D. W. Hastuti, A. Hifzhi, R. Arif, Buku Penuntun Praktikum Elektronika 2, 2018	Practical module simulation using Vivado [Est. Time] 200 minutes	**Orientation(20%) :** Read reference material independently **Exercise (20 % & 40 %):** 1. Working on the pretest and posttest in EMAS 2. Collecting practicum reports at EMAS 3. Discussion of modules at EMAS with groups 4. Make practicum report **Feedback (20%)** Laboratory Asisstant Coment	Able to report simulation results in the form of practicum reports in accordance with existing rules	Able to use the VHDL programming language as an application in everyday life.	6,25 %
9	Sub CPMK 1 – 4	• Decoder using VHDL [Reference] S. K. Wijaya, D. W. Hastuti, A. Hifzhi, R. Arif, Buku Penuntun Praktikum Elektronika 2, 2018	Practical module simulation using Vivado [Est. Time] 200 minutes	**Orientation(20%) :** Read reference material independently **Exercise (20 % & 40 %):** 1. Working on the pretest and posttest in EMAS 2. Collecting practicum reports at EMAS 3. Discussion of modules at EMAS with groups 4. Make practicum report	Able to report simulation results in the form of practicum reports in accordance with existing rules	Able to use the VHDL programming language as an application in everyday life.	6,25 %

				Feedback (20%) Laboratory Asisstant Coment			
10	Sub CPMK 1 – 4	• BCD Seven Segment using VHDL [Reference] S. K. Wijaya, D. W. Hastuti, A. Hifzhi, R. Arif, Buku Penuntun Praktikum Elektronika 2, 2018	Practical module simulation using Vivado [Est. Time] 200 minutes	**Orientation(20%) :** Read reference material independently **Exercise (20 % & 40 %):** 1. Working on the pretest and posttest in EMAS 2. Collecting practicum reports at EMAS 3. Discussion of modules at EMAS with groups 4. Make practicum report **Feedback (20%)** Laboratory Asisstant Coment	Able to report simulation results in the form of practicum reports in accordance with existing rules	Able to use the VHDL programming language as an application in everyday life.	12,5 %
11	Sub CPMK 1 – 4	• Sequential BCD Counter using VHDL [Reference] S. K. Wijaya, D. W. Hastuti, A. Hifzhi, R. Arif, Buku Penuntun Praktikum	Practical module simulation using Vivado [Est. Time] 200 minutes	**Orientation(20%) :** Read reference material independently **Exercise (20 % & 40 %):** 1. Working on the pretest and posttest in EMAS 2. Collecting practicum reports at EMAS	Able to report simulation results in the form of practicum reports in accordance with existing rules	Able to use the VHDL programming language as an application in everyday life.	12,5 %

		Elektronika 2, 2018.		3. Discussion of modules at EMAS with groups 4. Make practicum report **Feedback (20%)** Laboratory Asisstant Coment			
12	Sub CPMK 1 – 4	• State Machine using VHDL [Reference] S. K. Wijaya, D. W. Hastuti, A. Hifzhi, R. Arif, Buku Penuntun Praktikum Elektronika 2, 2018	Practical module simulation using Vivado [Est. Time] 200 minutes	**Orientation(20%) :** Read reference material independently **Exercise (20 % & 40 %):** 1. Working on the pretest and posttest in EMAS 2. Collecting practicum reports at EMAS 3. Discussion of modules at EMAS with groups 4. Make practicum report **Feedback (20%)** Laboratory Asisstant Coment	Able to report simulation results in the form of practicum reports in accordance with existing rules	Able to use the VHDL programming language as an application in everyday life.	12,5 %
13	Sub CPMK 1 – 4	Final Project [Reference] S. K. Wijaya, D. W. Hastuti, A. Hifzhi, R. Arif,	Creating a State Machine as a daily life application using Vivado [Est. Time]	**Orientation(40%) :** 1. Study the material needed for a series of related projects.	Able to report the process of making final project in form of proposals and papers in accordance with existing rules	Able to use VHDL programming language as an application in everyday life.	6,25 %

		Buku Penuntun Praktikum Elektronika 2, 2018	200 minutes	2. Create a series of projects and simulate them in EasyEDA. 3. Make a proposal and final project paper **Exercise (30 %):** Presentation and demonstration Final Project **Feedback (20%)** Laboratory Asisstant Coment			
14	Sub CPMK 1 – 4	Final Project [Reference] S. K. Wijaya, D. W. Hastuti, A. Hifzhi, R. Arif, Buku Penuntun Praktikum Elektronika 2, 2018	Creating a State Machine as a daily life application using Vivado [Est. Time] 200 minutes	**Orientation(40%) :** 1. Study the material needed for a series of related projects. 2. Create a series of projects and simulate them in EasyEDA. 3. Make a proposal and final project paper **Exercise (30 %):** Presentation and demonstration Final Project **Feedback (20%)**	Able to report the process of making final project in form of proposals and papers in accordance with existing rules	Able to use VHDL programming language as an application in everyday life.	6,25 %

				Laboratory Asisstant Coment			
15	**Final Exam**						

II. Assignment Design

Week	Assignment Name	Sub-CLOs	Assignment	Scope	Working Procedure	Deadline	Outcome
2 -12	Practicum Report	1 – 4	Make a practicum report	• Digital AND, OR, NOT, NOR, and NAND gates • Binary adder digital circuit • Full Adder digital circuit • Digital decoder and encoder circuit • Flip-Flops . digital circuits • Counter digital circuit • IC Digital 555 Timer • Half Adder and Full Adder using VHDL • Decoder using VHDL • Seven Segment BCD uses VHDL • Sequential BCD Counter using VHDL • State Machine using VHDL	Individual Assigment at Home	1 week	Practical report uploaded on EMAS
2 -12	Practicum Simulation	1 – 4	Simulate circuit in practicum module	• Digital AND, OR, NOT, NOR, and NAND gates • Binary adder digital circuit	Individual Assigment at Home	1 week	Simulation data uploaded on EMAS

				• Full Adder digital circuit • Digital decoder and encoder circuit • Flip-Flops . digital circuits • Counter digital circuit • IC Digital 555 Timer • Half Adder and Full Adder using VHDL • Decoder using VHDL • Seven Segment BCD uses VHDL • Sequential BCD Counter using VHDL • State Machine using VHDL			
2 -10	Pre – test and Post – test	1 – 4	Work problems	• Digital AND, OR, NOT, NOR, and NAND gates • Binary adder digital circuit • Full Adder digital circuit • Digital decoder and encoder circuit • Flip-Flops . digital circuits • Counter digital circuit • IC Digital 555 Timer • Half Adder and Full Adder using VHDL • Decoder using VHDL	Doing problem set on EMAS	40 minutes	Answer sheet uploaded on EMAS

				• Seven Segment BCD uses VHDL • Sequential BCD Counter using VHDL • State Machine using VHDL			
2 -10	Discussion	1 – 2	Discuss practicum modules which are done in groups	• Digital AND, OR, NOT, NOR, and NAND gates • Binary adder digital circuit • Full Adder digital circuit • Digital decoder and encoder circuit • Flip-Flops . digital circuits • Counter digital circuit • IC Digital 555 Timer • Half Adder and Full Adder using VHDL • Decoder using VHDL • Seven Segment BCD uses VHDL • Sequential BCD Counter using VHDL State Machine using VHDL	Asynchronous discussion on EMAS	1 week	Discussion report on EMAS forum
13 – 14	Final Project	1 – 4	Making a series of electronic concept applications 1 that	• Digital AND, OR, NOT, NOR, and NAND gates • Binary adder digital circuit • Full Adder digital circuit	1. Designing final project in group 2. Write proposal and paper in group	1 semester	1. Final project uploaded on EMAS 2. Proposal final project

			are useful in everyday life	• Digital decoder and encoder circuit • Flip-Flops . digital circuits • Counter digital circuit • IC Digital 555 Timer • Half Adder and Full Adder using VHDL • Decoder using VHDL • Seven Segment BCD uses VHDL • Sequential BCD Counter using VHDL State Machine using VHDL			uploaded on EMAS 3. Paper final project uploaded on EMAS
15	Final Exam	1, 2, 4	Work problems	All material Electronics Laboratory Work 2	100 minutes		Answer sheet uploaded on EMAS

III. Assessment Criteria (Learning Outcome Evaluation)

Evaluation Type	Sub-CLO	Assessment Type	Frequency	Evaluation Weight (%)
Practicum	1 – 4	1. Practicum Report 2. Pre – test and Post – test Problem Set 3. Modul Simulation in EasyEDA and Vivado 4. Discussion 5. Practicum	1 week	50
Final Project	1 – 4	1. Proposal 2. Paper 3. Presentation 4. Demonstration	1 semester	25
Final Exam	1, 2, 4	Problem Set in EMAS UI	1	25
Total				100

IV. Rubric(s)

This rubric is used as a guideline for assessing or giving levels of student performance results. a rubric usually consists of assessment criteria that include the dimensions / aspects that are assessed based on indicators of learning achievement. This assessment rubric is useful for clarifying the basics and aspects of the assessment so that students and lecturers can be guided by the same thing regarding the expected performance demands. Lecturers can choose the type of rubric according to the assessment given.

A. Conversion of the student's 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 - < 50	D	1.00
< 40	E	0.00

B. Assessment rubric

- **Practicum Report Value Criteria**

Score	Answers Quality
>90	If students can fulfill more than 90% of the rules of the practicum report correctly
70-89	If students can meet between 70% s.d. 89% of practicum report rules correctly
60-69	If students can meet between 60% s.d. 69% correct practicum report rules
55-59	If students can meet between 55% s.d. 59% correct practicum report rules
50-54	If students can meet between 50% s.d. 54% correct practicum report rules

- **Proposal and Paper Value Criteria**

Criteria	A (90)	B (75)	C (60)	D (50)
Organization (Overall sequences, flows, and transitions)	Information is presented in an effective order. The excellent structure of paragraphs and transitions improves readability and comprehension. The executive summary or abstract is presented first, allowing the reader to easily follow the rest of the report.	Information is logically ordered with paragraphs and transitions. Within a section, the order in which ideas are presented may be confusing at times	Information is scattered and requires further development.	There is no clear sequence of paragraphs, so there is no progressive flow of ideas. Details and examples are not organized, difficult to follow and understand.
Information Quality	Supporting details are topic specific and provide the necessary information.	Some details don't support the topic of the report.	Details are a bit sketchy.	Could not find certain details.
Introduction	Introductory paragraph is clearly stated, has a sharp focus, is different and increases the impact of the report	Introductory paragraph is clearly stated with focus.	Introductory paragraph is unclear.	Introductory paragraph is unclear.
Summary	Concluding paragraphs summarize and draw clear, effective conclusions and increase the impact of the report.	Summarize the following paragraphs and summarize the discussion report and draw conclusions.	Closing paragraphs are only remotely related to the topic of the report.	The closing paragraph is not clear.

Use of language: choice words, grammar, and sentence structure	Sentences are complete and grammatical, and they flow together easily. The word is chosen for its proper meaning.	For the most part, sentences are complete and grammatical, and they flow together easily. Every mistake is minor and doesn't distract the reader. Avoid repetition of the same words and phrases	Minor errors in sentence structure and grammar are frequent enough that they detract from the reader and interfere with meaning. There are unnecessary repetitions of the same words and phrases	Major mistakes in sentence structure and grammar are frequent enough that they distract the reader and interfere with meaning. There are unnecessary repetitions of the same words and phrases
Use of pictures: numbers, graphs & pictures	All figures, graphics, and images used are accurate, consistent with the text, and of good quality. Labeling is precise and consistent.	For the most part, the numbers, graphics, and images used are accurate, consistent with the text, and of good quality. Some labels are imprecise and consistent.	Few of the numbers, graphics, and images used are accurate, consistent with the text, and of good quality. They aren't properly labeled.	Angka, grafik, dan gambar berkualitas buruk, memiliki banyak ketidakakuratan & salah pelabelan atau tidak ada sama sekali.

- **Pre – test, Post – test, and Final Exam**
  1) Able to express ideas in problem solving (25 %)
  2) Able to determine the right basic concepts in problem solving (35 %)
  3) Able to formulate a final solution to correct language errors (30 %)
  4) Able to use the appropriate important units and figures (10%)

- **Criteria for Peer Review Practicum Form**

Criteria	5	4	3	2	1
Communication	Practical pairs provide specific and easy to understand explanations and use various tools / methods to facilitate understanding.	Practicum partner provide specific explanations and some are easy to understand and use various tools/methods to facilitate understanding.	Practicum partner gave an explanation that was less specific and partly difficult to understand and didn't use various tools / methods to facilitate understanding.	Practicum partner gave an explanation that was not specific and difficult to understand and didn't use various tools / methods to facilitate understanding.	Practicum partners provide non-specific and incomprehensible explanations and do not use various tools/methods to facilitate understanding.
Work Atmosfer	Practicum partner use polite language in interacting, contribute actively, and do not dominate the discussion.	Practicum partner use polite language in their interactions, contribute partially, and do not dominate the discussion.	Practicum partner used disrespectful language in their interactions, contributed in part, and dominated the discussion a lot.	Practicum partners use language that is not polite in their interactions, doesn't contribute, and really dominates the discussion.	Practicum partner uses inappropriate language in interacting, doesn't contribute, and dominates the discussion.
Openness	Practical Practicum partners provide feedback and respect the opinions of others.	Practical Practicum partners provide partial feedback and respect the opinions of others	Practicum partners don't provide feedback and do not respect the opinions of others	Practicum partner gives little feedback and doesn't respect the opinions of others	Practicum partner doesn't give feedback and doesn't respect the opinions of others.
Behavior	Practicum partner together to carry out experiments and are willing to accept special roles and responsibilities.	Practicum partner together to experiment and are willing to accept a special role but are less responsible.	Practicum partner don't cooperate in conducting experiments even though they are still willing to accept a	Practicum partners are less cooperative in conducting experiments and are not willing to accept special roles	Practicum partner didn't cooperate in conducting the experiment and refused to accept the special apparatus.

			special role with irresponsibility.		

- Criteria for Psychomotor Values for Practical Work

Criteria	**5**	**4**	**3**	**2**	**1**
Work	Practice following all procedures properly and in order	Practitioners follows some procedures well and sequentially	Practitionersfollows some procedures well but not sequentially	Practitioners following some procedures poorly and out of order	Practitioner doesn't follow the practical procedure properly
Safety	Practice being careful in experimenting and being aware of your surroundings	Practitioners are careful in conducting experiments and are less aware of their surroundings	Practitioners are less careful in conducting experiments and are less aware of their surroundings.	Practitioners is a little careful in conducting the experiment and is not aware of the surroundings.	Practitioner carelessness and harm the surroundings.
Report	Practice writes the experimental results in a complete and easy to understand manner	Practictioners writing the results of the experiment incomplete and easy to understand	Practitioners writing the results of experiment incomplete and difficult to understand	Practitioner writes some of the experimental results that are incomplete and not easy to understand	Practitioner doesn't write the results of experiment
Activity	Practitioners actively work and show interest in experiments and are diligent in discussing / asking questions	Practitioners are actively working but show less interest in the experiment even though they are diligent in discussing / asking questions	Practitioners are less active in work and show less interest in experiments even though they are diligent in discussing / asking questions	Practitioners is less active in working and shows no interest in the experiment and is less diligent in discussing / asking questions	Practitioner isn't actively working and shows no interest in experiment and doesn't discuss/ask questions