INSTRUCTIONAL TEACHING DESIGN (BRP)

BASIC PHYSICS 1

by

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Undergraduate Program in Physics
Faculty of Mathematics and Natural Sciences
University of Indonesia
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UNIVERSITY OF INDONESIA
FACULTY OF MATHEMATICS AND NATURAL SCIENCES
UNDERGRADUATE PHYSICS

INSTRUCTIONAL TEACHING DESIGN

Course Name	Basic Physics 1	**Credit(s)**	**Prerequisite Course(s)**	**Requisite Course(s)**	**Integration Between Other Courses**
Course Code	SCPH601101	4	None	Laboratory Works of Basic Physics 1 & 2, Modern Physics, Thermodynamics, Electronics, Mechanics, EM Field, Vibrations and Waves, and Physics of Energy	Laboratory Works of Basic Physics 1
Course Branch	-				
Semester	1				
Lecturer(s)	Dr. sc. hum. Deni Hardiansyah				
Course Description	*After completing this course, when faced with basic physics problems in the field of motion mechanics, work and energy, momentum, equilibrium, gravity, fluid mechanics, vibrations and waves, and heat physics, 1st semester physics students will be able to apply the concepts of motion mechanics, work and energy, momentum, equilibrium, gravity, fluid mechanics, vibrations and waves, and heat physics in everyday life correctly to formulate a solution in accordance with the laws of physics. This course will be taught in Indonesian.*				

Program Learning Outcome (PLO)	
PLO 1	Able to apply classical and modern physics concepts in solving general physics problems.

PLO 2	Able to apply mathematics methods to solve physics problem analytically or numerically.
PLO 3	Able to apply physics knowledge in real life as well as identify and adapt to new things.
Course Learning Outcomes (CLO)	
CLO 1	Students are able to apply basic physics concepts to formulate a solution as well as its application in physics phenomenon in every day life.
Sub-CLO	
Sub-CLO 1	Able to apply motion mechanics concepts to physics phenomenon in every day life.
Sub-CLO 2	Able to apply fluid mechanics concepts to physics phenomenon in every day life.
Sub-CLO 3	Able to apply vibrations and waves concepts to physics phenomenon in every day life.
Sub-CLO 4	Able to apply heat physics concepts to physics phenomenon in every day life.
Study Materials	• Units, Dimension, and Measurements. • Motion Kinematics • Motion Dynamics • Work and Energy • Momentum and Impulse • Rotating Motion • Equilibrium • Gravity • Vibrations • Waves • Fluid Mechanics • Calor and Kinetic Theory of Gas

	• 1st and 2nd Law of Termodynamics
References	1. Halliday, Resnick, dan Walker, Principles of Physics 10th Edition, Wiley, 2014. 2. Serway Jewett, Physics for Scientists and Engineers 9th Edition, Thomson Brooks/Cole, 2014. 3. Giancoli, Physics for Scientists and Engineers 7th Edition, Pearson, 2014

TEACHING PLAN

Week	Sub-CLOs	Study Materials [References]	Teaching Method [Time Required]	Teaching Modality	Learning Experiences		Sub-CLO Achievement Indicator	Sub-CLOs Weight on Course (%)
					Orientation; Exercise; Feedback		General Indicator; Specific Indicator	
					Online	Offline		
1	**Introduction to course**							
1	Sub-CLO 1	• Units, Dimension, and Measurements **[References]** [1]	Interactive learning, question-based learning, self-directed study **[Time Required]** 200 minutes	**Syncronous** msTeams, Gmeet, Zoom (150 minutes) **Asyncronous** EMAS and Youtube (50 minutes)	**Orientation:** Introduction to learning method and topics (30%) **Exercise:** Discussion through EMAS/msTeams/Gmeet/Zoom with lecturer and others student (40%) **Feedback:** Lecturer gives feedback as well as question and answer (30%)		**General Indicator:** Able to apply and explain units, dimension, and measurements concepts in everyday life. **Specific Indicator:** Able to explain units, dimension, scalar, and vector as well as apply measurement and uncertainties concepts	7.22%
2	Sub-CLO 1	• 1D Motion **[References]** [1]	Interactive learning, question-based learning, self-directed study **[Time Required]** 200 minutes	**Syncronous** msTeams, Gmeet, Zoom (150 minutes) **Asyncronous** EMAS and Youtube (50 minutes)	**Orientation:** Watching lecture videos through Youtube asyncronously (30%) **Exercise:** Discussion with lecturer and others student asyncronously (40%) **Feedback:**		**General Indicator:** Able to apply and explain 1D motion concepts in everyday life. **Specific Indicator:** Able to explain position, displacement, velocity, speed, and	7.22%

					Lecturer gives feedback as well as question and answer syncronously (30%)		acceleration in 1 dimension	
3	Sub-CLO 1	• 2D Motion **[References]** [1]	Interactive learning, question-based learning, self-directed study **[Time Required]** 200 minutes	**Syncronous** msTeams, Gmeet, Zoom (150 minutes) **Asyncronous** EMAS and Youtube (50 minutes)	**Orientation:** Watching lecture videos through Youtube asyncronously (30%) **Exercise:** Discussion with lecturer and others student asyncronously (40%) **Feedback:** Lecturer gives feedback as well as question and answer syncronously (30%)		**General Indicator:** Able to apply and explain 2D motion concepts in everyday life. **Specific Indicator:** Able to explain position, displacement, velocity, speed, and acceleration in 2 dimensions	7.22%
4	Sub-CLO 1	• Motion Dynamics **[References]** [1]	Interactive learning, question-based learning, self-directed study **[Time Required]** 200 minutes	**Syncronous** msTeams, Gmeet, Zoom (150 minutes) **Asyncronous** EMAS and Youtube (50 minutes)	**Orientation:** Watching lecture videos through Youtube asyncronously (30%) **Exercise:** Discussion with lecturer and others student asyncronously (40%) **Feedback:** Lecturer gives feedback as well as question and answer syncronously (30%)		**General Indicator:** Able to apply and explain motion dynamics concepts in everyday life. **Specific Indicator:** Able to apply and explain motion dynamics concepts in everyday life.	7.22%

5	Sub-CLO 1	• Momentum and Impulse **[References]** [1]	Interactive learning, question-based learning, self-directed study **[Time Required]** 200 minutes	**Syncronous** msTeams, Gmeet, Zoom (150 minutes) **Asyncronous** EMAS and Youtube (50 minutes)	**Orientation:** Watching lecture videos through Youtube asyncronously (30%) **Exercise:** Discussion with lecturer and others student asyncronously (40%) **Feedback:** Lecturer gives feedback as well as question and answer syncronously (30%)		**General Indicator:** Able to apply and explain momentum and impulse concepts in everyday life. **Specific Indicator:** Able to apply and explain momentum and impulse concepts in everyday life.	7.22%
6	Sub-CLO 1	• Work and Energy **[References]** • [1]	Interactive learning, question-based learning, self-directed study **[Time Required]** 200 minutes	**Syncronous** msTeams, Gmeet, Zoom (150 minutes) **Asyncronous** EMAS and Youtube (50 minutes)	**Orientation:** Watching lecture videos through Youtube asyncronously (30%) **Exercise:** Discussion with lecturer and others student asyncronously (40%) **Feedback:** Lecturer gives feedback as well as question and answer syncronously (30%)		**General Indicator:** Able to apply and explain work and energy concepts in everyday life. **Specific Indicator:** Able to explain work, kinetic energy, and potential energy concepts in everyday life.	7.22%
7	Sub-CLO 1	• Rotating Motion **[References]** • [1]	Interactive learning, question-based learning, self-directed study **[Time Required]** 200 minutes	**Syncronous** msTeams, Gmeet, Zoom (150 minutes) **Asyncronous**	**Orientation:** Watching lecture videos through Youtube asyncronously (30%) **Exercise:**		**General Indicator:** Able to apply and explain rotation motion concepts in everyday life. **Specific Indicator:**	7.22%

				EMAS and Youtube (50 minutes)	Discussion with lecturer and others student asyncronously (40%) **Feedback:** Lecturer gives feedback as well as question and answer syncronously (30%)		Able to explain the dynamics and kinematics of rotation in everyday life.	
Mid-Term Exam								
9	Sub-CLO 1	• Equilibrium **[References]** [1]	Interactive learning, question-based learning, self-directed study **[Time Required]** 200 minutes	**Syncronous** msTeams, Gmeet, Zoom (150 minutes) **Asyncronous** EMAS and Youtube (50 minutes)	**Orientation:** Watching lecture videos through Youtube asyncronously (30%) **Exercise:** Discussion with lecturer and others student asyncronously (40%) **Feedback:** Lecturer gives feedback as well as question and answer syncronously (30%)		**General Indicator:** Able to apply and explain equilibrium concepts in everyday life. **Specific Indicator:** Able to apply and explain equilibrium concepts in everyday life.	7.22%
10	Sub-CLO 1	• Gravity **[References]** [1]	Interactive learning, question-based learning, self-directed study **[Time Required]** 200 minutes	**Syncronous** msTeams, Gmeet, Zoom (150 minutes) **Asyncronous** EMAS and Youtube (50 minutes)	**Orientation:** Watching lecture videos through Youtube asyncronously (30%) **Exercise:** Discussion with lecturer and others student asyncronously (40%) **Feedback:**		**General Indicator:** Able to apply and explain gravity concepts in everyday life. **Specific Indicator:** Able to apply and explain gravity concepts in everyday life.	7.22%

					Lecturer gives feedback as well as question and answer syncronously (30%)			
11	Sub-CLO 2	• Fluid Mechanics **[References]** [1]	Interactive learning, question-based learning, self-directed study **[Time Required]** 200 minutes	**Syncronous** msTeams, Gmeet, Zoom (150 minutes) **Asyncronous** EMAS and Youtube (50 minutes)	**Orientation:** Watching lecture videos through Youtube asyncronously (30%) **Exercise:** Discussion with lecturer and others student asyncronously (40%) **Feedback:** Lecturer gives feedback as well as question and answer syncronously (30%)		**General Indicator:** Able to apply and explain fluid mechanics concepts in everyday life. **Specific Indicator:** Able to apply and explain fluid mechanics concepts in everyday life.	7%
12	Sub-CLO 3	• Vibrations and Waves **[References]** [1]	Interactive learning, question-based learning, self-directed study **[Time Required]** 200 minutes	**Syncronous** msTeams, Gmeet, Zoom (150 minutes) **Asyncronous** EMAS and Youtube (50 minutes)	**Orientation:** Watching lecture videos through Youtube asyncronously (30%) **Exercise:** Discussion with lecturer and others student asyncronously (40%) **Feedback:** Lecturer gives feedback as well as question and answer syncronously (30%)		**General Indicator:** Able to apply and explain vibrations and waves concepts in everyday life. **Specific Indicator:** Able to apply and explain vibrations and waves concepts in everyday life.	7%

13	Sub-CLO 3	• Sound Waves **[References]** • [1]	Interactive learning, question-based learning, self-directed study **[Time Required]** 200 minutes	**Syncronous** msTeams, Gmeet, Zoom (150 minutes) **Asyncronous** EMAS and Youtube (50 minutes)	**Orientation:** Watching lecture videos through Youtube asyncronously (30%) **Exercise:** Discussion with lecturer and others student asyncronously (40%) **Feedback:** Lecturer gives feedback as well as question and answer syncronously (30%)		**General Indicator:** Able to apply and explain sound waves concepts in everyday life. **Specific Indicator:** Able to apply and explain sound waves concepts in everyday life.	7%
14	Sub-CLO 4	• Heat, Expansion, and Conduction **[References]** • [1]	Interactive learning, question-based learning, self-directed study **[Time Required]** 200 minutes	**Syncronous** msTeams, Gmeet, Zoom (150 minutes) **Asyncronous** EMAS and Youtube (50 minutes)	**Orientation:** Watching lecture videos through Youtube asyncronously (30%) **Exercise:** Discussion with lecturer and others student asyncronously (40%) **Feedback:** Lecturer gives feedback as well as question and answer syncronously (30%)		**General Indicator:** Able to apply and explain heat concepts in everyday life. **Specific Indicator:** Able to apply and explain heat concepts in everyday life.	7%
15	Sub-CLO 4	• Kinetic Theory of Gas, Thermodynamics, and Heat Engine **[References]** • [1]	Interactive learning, question-based learning, self-directed study **[Time Required]** 200 minutes	**Syncronous** msTeams, Gmeet, Zoom (150 minutes) **Asyncronous**	**Orientation:** Watching lecture videos through Youtube asyncronously (30%) **Exercise:**		**General Indicator:** Able to apply and explain thermodynamics concepts in everyday life.	7%

				EMAS and Youtube (50 minutes)	Discussion with lecturer and others student asyncronously (40%) **Feedback:** Lecturer gives feedback as well as question and answer syncronously (30%)		**Specific Indicator:** Able to apply and explain thermodynamics concepts in everyday life.	
Final Exam								

*) Syncronous: Teaching is done through real-time interaction between lecturer and student either through video conference or messaging. Asyncronous: Teaching is done through a forum or e-Learning system that don't need real time interaction and can be done in a span of days or weeks.

ASSIGNMENT DESIGN

Week	Assignment Name	Sub-CLO	Assignment	Scope	Working Procedure	Deadline	Outcome
3	Individual Assignment 1	SUB-CLO 1	Problem sets	• Units, Dimension, and Measurements • 1D and 2D Motion	Homework	1 week	Answer sheet
5	Individual Assignment 2	SUB-CLO 1	Problem sets	• Motion Dynamics • Work and Energy	Homework	1 week	Answer sheet
7	Individual Assignment 3	SUB-CLO 1	Problem sets	• Momentum and Impulse • Rotating Motion	Homework	1 week	Answer sheet
7	Quiz 1	SUB-CLO 1	Problem sets	• Units, Dimension, and Measurements • 1D and 2D Motion • Motion Dynamics • Work and Energy • Momentum and Impulse	Quiz through EMAS	100 minutes	Answer sheet

				• Rotating Motion			
7	Mid-Term Exam	SUB-CLO 1	Problem sets	• Units, Dimension, and Measurements • 1D and 2D Motion • Motion Dynamics • Work and Energy • Momentum and Impulse • Rotating Motion	Exam through EMAS	100 minues	Answer sheet
10	Individual Assignment 4	SUB-CLO 1	Problem sets	• Equilibrium • Gravity	Homework	1 week	Answer sheet
11	Individual Assignment 5	SUB-CLO 2	Problem sets	• Fluid Mechanics • Vibrations	Homework	1 week	Answer sheet
14	Individual Assignment 6	SUB-CLO 1	Problem sets	• Waves and Sound • Heat Mechanics	Homework	1 week	Answer sheet
14	Quiz 2	SUB-CLO 1-4	Problem sets	• Equilibrium • Gravity • Fluid Mechanics • Vibrations • Waves and Sound • Heat Mechanics	Quiz through EMAS	100 minutes	Answer sheet
14	Paper	SUB-CLO 1-4	Scientific papers	• All study materials	Group Assignment	1 semester	Submitted papers
14	Final Exam	SUB-CPMK 1-4	Problem sets	• Equilibrium • Gravity • Fluid Mechanics • Vibrations • Waves and Sound • Heat Mechanics	Exam through EMAS	100 minutes	Answer sheet

ASSESMENT CRITERIA (LEARNING OUTCOME EVALUATION)

Evaluation Type	**Sub-CLOs**	**Assessment Type**	**Frequency**	**Evaluation Weight (%)**
Individual Assignment	1-4	Submitted file and discussion in EMAS	6	15
Group Assignment	1-4	Papers grading and peer review assessment	1	15

Quiz 1	1	Answer sheet	1	10
Quiz 2	1-4	Answer sheet	1	10
Mid-Term Exam	1	Answer sheet	1	25
Final Exam	1-4	Answer sheet	1	25
Group Assignment				1-16

Grading Criteria

Grading is based on University of Indonesia guideline.

Score Point	Grade	Weight
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

Assessment Rubric:

A. Criteria of Individual Assignment

Score	Answer Quality
>90	Student able to answer 90% of the problem sets correctly
70-89	Student able to answer 70-89% of the problem sets correctly
60-69	Student able to answer 60-69% of the problem sets correctly
55-59	Student able to answer 55-59% of the problem sets correctly
50-54	Student able to answer 50-54% of the problem sets correctly

<50	Students able to answer <50% of the problem sets correctly

B. Criteria of Group Assignment

Criteria	A (90)	B (75)	C (60)	D (50)
Organization (Order, flow, and transition)	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 by paragraphs and transitions. Within sections, the order in which ideas are presented may be confusing at times.	Information is scattered and needs further development.	There is no clear sequence of paragraphs, so there is no progressive flow of ideas. The details and examples are disorganized, difficult to follow or understand.
Information Quality	Supporting details are specific to the topic and provide the necessary information.	Some details do not support the topic of the report.	Details are a bit vague.	No details on the information given.
Introduction	Paragraph is clearly stated, has a sharp focus, and increases the impact of the report.	Paragraph is clearly stated.	Paragraph is not structured correctly.	Paragraph is unclear and vague.
Conclusion	Paragraphs summarize concisely and draw a clear and effective conclusion that increase the impact of the report.	Paragraphs summarize the entire topic concisely.	Paragraphs does not draw the correct conclusion.	Paragraph is unclear and vague
Use of language: words choice, grammar, and sentence structure	Sentences are complete, grammatical, and flow together easily. The word is chosen for its proper meaning.	Most sentences are complete, grammatical, and flow together. Mistakes are minor and does not distract reader.	Minor mistakes in sentence structure and grammar are frequent. Unnecessary repetition of words and phrases.	Major mistakes in sentence structure and grammar. Frequent repetition of words and phrases.
Use of pictures: numbers, graphs & images	All numbers, graphics and images used are accurate, consistent with text, and of good quality. Appropriate and consistent labeling.	Most numbers, graphics, and images used are accurate. A few inconsistencies in labeling.	Some inaccurate graphics and images are used. Labeling is not consistent.	Numbers, graphs, and images used are not accurate, bad quality, and not properly labeled.

C. Criteria of Quiz, Mid-Term Examx, and Final Exam

1) Able to write down their ideas and use it to solve a problem (25%);
2) Able to use the correct concept in solving the problem (35%);
3) Able to formulate the final result correctly (30%);
4) Able to use the appropriate dimension, units, and significant figures (10%);