



TEACHING INSTRUCTIONAL DESIGN (BRP)

**COURSE
VIBRATION AND WAVES**

by

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

TEACHING INSTRUCTIONAL DESIGN

Course Name	Vibration and Waves	Credit(s)	Prerequisite course(s)	Requisite for course(s)	Integration Between Other Courses
Course Code	SCPH602235	2	Basic Physics 1, Basic Physics 2, Basic Mathematics 1, Basic Mathematics 2, Mathematical Physics 1	-	-
Relation to Curriculum	-				
Semester	3				
Lecturer(s)	Dr. Djonaedi Saleh				
Course Description	<i>Provides an overview of the events of vibration or oscillation and wave motion, both mechanical and electrical, one dimension or more than one dimension. Here students are expected to be able to analyze and explain properly and correctly about events that occur in the natural environment around them related to vibrations and waves.</i>				
Graduate Learning Outcome (GLO)					
GLO-1	Formulating problems and solving physics of mechanics, electricity and magnetism, thermodynamics, and modern physics.				

GLO-2	Formulate general physics problems and solutions
GLO-3	Measure physical quantities
GLO-4	Processing data and interpreting data
GLO-5	Studying the latest instruments that support his work
GLO-6	Apply knowledge of physics in society and practical life.
GLO-7	Able to work in teams.
GLO-8	Have attitudes and skills that support success at work and in participating in community activities.
Course Learning Outcome (CLO)	
CLO	After completing this course of learning, when faced with problems related to vibrations and waves in the field of science and technology, 5th semester Physics students are able to apply their knowledge to explain surrounding events related to vibrations and waves.
Sub-CLO(s)	

Sub-CLO 1	Mastering the basic principles of Simple and Muted Harmonious Motion
Sub-CLO 2	Mastering the principle of force on the oscillator
Sub-CLO 3	Mastering the combined principles of Oscillatory Motion
Sub-CLO 4	Mastering theoretical concepts and formulating solutions to the problem of Transverse Wave motion
Sub-CLO 5	Mastering theoretical concepts and formulating the solution to the Longitudinal Wave problem
Sub-CLO 6	Mastering the theoretical concepts of linear wave transmission
Sub-CLO 7	Mastering theoretical concepts and formulating solutions to the Electromagnetic Waves problem
Sub-CLO 8	Mastering the theoretical concepts and applications of more than one dimensional Wave
Sub-CLO 9	Mastering the theoretical concepts of the Fourier method in waves.
Sub-CLO 10	Mastering theoretical concepts and wave applications in optical systems
Sub-CLO 11	Mastering theoretical concepts and applications of non-linear oscillation motion
Sub-CLO 12	Mastering the basic theoretical concepts of wave mechanics

Study Materials	<ul style="list-style-type: none"> • Simple Harmonic Motion and Damped Harmonic Motion • Oscillator • Combination of various oscillators • Transverse Waves • Longitudinal Waves • Waves on the transmission line • Electromagnetic Waves • Many dimension waves • Fourier Method • Waves on an optical system • Non linear oscillation • Wave mechanics
Reading List	<ul style="list-style-type: none"> • H.J. Pain, The Physics of Vibrations and waves, 3rd edition • Bekefi and Barrett. Electromagnetic Vibrations, Waves and Radiation. Cambridge, MA: The MIT Press, ISBN: 9780262520478 • French, A. P. Vibrations and Waves. New York, N.Y.: W.W. Norton & Company, . ISBN: 9780393099362 • Iain G, Main, Vibrations and Waves in Physics, Cambridge Univesity Press, isbn: 9780521447010

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	1	<ul style="list-style-type: none"> Simple Harmonic Motion and Damped Harmonic Motion <p>[Reference] H.J. Pain, The Physics of Vibrations and waves, 3rd edition</p>	Offline Lecture [Estimated time] 100 minutes	70% O, 30% F	Students are able to understand the concept of Simple Harmonic Motion and Damped Harmonic Motion		6
2	2	<ul style="list-style-type: none"> Oscillator <p>[Reference] H.J. Pain, The Physics of Vibrations and waves, 3rd edition</p>	Offline Lecture [Estimated time] 100 minutes	70% O, 30% F	Students are able to understand the concept of an oscillator		6
3	3	<ul style="list-style-type: none"> Combination of various oscillators <p>[Reference] H.J. Pain, The Physics of Vibrations and waves, 3rd edition</p>	Offline Lecture [Estimated time] 100 minutes	70% O, 30% F	Students are able to understand the combination of various oscillators		6
4	4	<ul style="list-style-type: none"> Transverse Waves <p>[Reference] H.J. Pain, The Physics of Vibrations and waves, 3rd edition</p>	Offline Lecture [Estimated time] 100 minutes	70% O, 30% F	Students are able to understand the concept of transverse waves		6

5	5	<ul style="list-style-type: none"> Longitudinal Waves <p>[Reference] H.J. Pain, The Physics of Vibrations and waves, 3rd</p>	<p>Offline Lecture</p> <p>[Estimated time] 100 minutes</p>	70% O, 30% F	Students are able to understand longitudinal waves		6
6	6	<ul style="list-style-type: none"> Waves on the transmission line <p>[Reference] H.J. Pain, The Physics of Vibrations and waves, 3rd</p>	<p>Offline Lecture</p> <p>[Estimated time] 100 minutes</p>	70% O, 30% F	Students are able to understand the concept of waves on the transmission line		10
7	7	<ul style="list-style-type: none"> Electromagnetic Waves <p>[Reference] H.J. Pain, The Physics of Vibrations and waves, 3rd</p>	<p>Offline Lecture</p> <p>[Estimated time] 100 minutes</p>	70% O, 30% F	Students are able to understand the concept of electromagnetic waves		10
8	Mid Term Exam						
9	8	<ul style="list-style-type: none"> Many dimension waves <p>[Reference] H.J. Pain, The Physics of Vibrations and waves, 3rd</p>	<p>Offline Lecture</p> <p>[Estimated time] 100 minutes</p>	70% O, 30% F	Students are able to understand multi-dimensional waves		10
10	9	<ul style="list-style-type: none"> Fourier Method <p>[Reference] H.J. Pain, The Physics of Vibrations and waves, 3rd</p>	<p>Offline Lecture</p> <p>[Estimated time] 100 minutes</p>	70% O, 30% F	Students are able to apply the Fourier method		10

11	10	<ul style="list-style-type: none"> Waves on an optical system <p>[Reference] H.J. Pain, The Physics of Vibrations and waves, 3rd</p>	Offline Lecture [Estimated time] 100 minutes	70% O, 30% F	Students are able to understand the application of waves in optical systems		10
12	10	<ul style="list-style-type: none"> Waves on an optical system <p>[Reference] H.J. Pain, The Physics of Vibrations and waves, 3rd</p>	Offline Lecture [Estimated time] 100 minutes	30% O, 40% E, 30% F	Students are able to understand the application of waves in optical systems		10
13	11	<ul style="list-style-type: none"> Non linear oscillation <p>[Reference] H.J. Pain, The Physics of Vibrations and waves, 3rd</p>	Offline Lecture [Estimated time] 100 minutes	30% O, 40% E, 30% F	Students are able to understand non-linear oscillations		4
14	11	<ul style="list-style-type: none"> Non linear oscillation <p>[Reference] H.J. Pain, The Physics of Vibrations and waves, 3rd</p>	Offline Lecture [Estimated time] 100 minutes	30% O, 40% E, 30% F	Students are able to understand non-linear oscillations		6
15	12	<ul style="list-style-type: none"> Wave mechanics <p>[Reference] H.J. Pain, The Physics of Vibrations and waves, 3rd</p>	Offline Lecture [Estimated time] 100 minutes	30% O, 40% E, 30% F	Students are able to apply and formulate wave mechanics		4
16	Final Exam						

- *) O: Orientation
- E: Exercise
- F: Feedback

II. Assignment Design

Week	Assignment Name	Sub-CLOs	Assignment	Scope	Working Procedure	Deadline	Outcome
3	Individual Assignment 1	1	Problems	Simple Harmonic Motion and Damped Harmonic Motion	Homework	1 week	Homework answer sheet
5	Individual Assignment 2	2	Problems	Oscillator	Homework	1 week	Homework answer sheet
7	Individual Assignment 3	3	Problems	Combination of various oscillators	Homework	1 week	Homework answer sheet

11	Individual Assignment 4	4	Problems	Transverse Waves	Homework	1 week	Homework answer sheet
12	Group Assignment 1	5	Reading material according to reference	Longitudinal Waves	Group assignment of 3-4 people	2 week	The results of the presentation are in the form of power points
13	Individual Assignment 5	6	Problems	Waves on the transmission line	Homework	1 week	Homework answer sheet

13	Group Assignment 2		Reading material according to reference	Electromagnetic Waves	Group assignment of 3-4 people	2 week	The results of the presentation are in the form of power points
15	Individual Assignment 6		Problems	Fourier Method	Homework	1 week	Homework answer sheet

III. Assessment Criteria (Learning Outcome Evaluation)

Evaluation Type	Sub-CLO	Assessment Type	Frequency	Evaluation Weight (%)
Individual Assignment	1-4	Answer sheet	6	20
Group Assignment	5-6	Grading sheet	2	20
Mid Term Exam	1-3	Answer sheet	1	30
Final Exam	4-6	Answer sheet	1	30
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—<55	D	1,00
<40	E	0,00

B. Assessment rubric

Presentation Grade Criteria

Score	Answers Quality
85-90	Groups are able to convey explanations logically, fluently, and on time and are able to answer questions from fellow students and teachers
75-84	The group is able to convey explanations logically and smoothly and can answer questions from fellow students and teachers, but cannot manage time well

65-74	The group is able to convey explanations smoothly but is unable to convey the logic of their reasoning
55-64	The group is less able to convey explanations smoothly and on time and is less able to convey the logic of their reasoning
<55	

Essay Grade Criteria

Score	Answers Quality
100	The answer is very precise, all the definitions and main components are complete
76-99	The answer is quite precise, the meaning and the main components are almost complete
51-75	Inaccurate answers, incomplete understanding and main components
26-50	The answer is very inaccurate, the meaning and main components are very incomplete
<25	Wrong answer