



Course Specification

(Bachelor)

Course Title: **Waves and vibrations**

Course Code: **PHYS 0231**

Program: **BSc in Physics and BSc in Physics of Renewable Energy and Environment**

Department: **Physics**

College: **Science**

Institution: **Majmaah University**

Version: **2**

Last Revision Date: **26/12/2024**



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A. General information about the course:

1. Course Identification

1. Credit hours: (.....)

3 (3, 0, 0)

2. Course type

A. University College Department Track Others

B. Required Elective

3. Level/year at which this course is offered: (Level 3/ Second year)

4. Course General Description:

This course provides students with foundations of Vibrations and Waves in mechanical, electromagnetic, and quantum contexts. The course addresses free vibrations, simple harmonic motion, superposition, forced vibrations, and resonance, leading into normal modes of discrete and continuous systems. Wave propagation is covered for several different types of waves, including electromagnetic waves based on the wave equation (alone—without need for Maxwell's equations) and sound. Similarly, the course deals with wave aspects of matter without requiring quantum mechanics as a prerequisite.

5. Pre-requirements for this course (if any):

PHYS 0111 Classical Mechanics 1

6. Co-requisites for this course (if any):

None

7. Course Main Objective(s):

Main objective of this course is summarized below:

- The aim of the course is to give students an understanding of oscillations and waves and an appreciation of their importance in the study of physics; to introduce the mathematical tools used in their analysis.
- Understanding Simple harmonic oscillation, damped oscillation, forced oscillation, resonance, applications
- Superposition of simple harmonic oscillation, traveling waves, standing, beats
- Transverse waves in wire, Longitudinal waves in rod
- Application of longitudinal wave in open and closed air columns
- Fourier analysis
- Doppler effect and its applications



2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	45 hours	100%
2	E-learning	0 hours	0%
3	Hybrid <ul style="list-style-type: none"> Traditional classroom E-learning 		
4	Distance learning	0	0

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	Lectures	45 hours
2.	Laboratory/Studio	
3.	Field	
4.	Tutorial	
5.	Others (specify)	
Total		45 hours

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	Knowledge and understanding			
1.1	List various systems of oscillation.	K(1): Recognize the knowledge of fundamental concepts in classical physics (mechanics, electrodynamics, thermodynamics, vibrations, waves and optics) and modern physics (quantum, atomic and molecular, nuclear, elementary particle and solid-state physics)	Lecture Exercises Quizzes Problem solving	Exams Quizzes Homework Assignments





Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
1.2	Identify the behaviour of various types of waves.	K(2): K(1) : Recognize the knowledge of fundamental concepts in classical physics (mechanics, electrodynamics, thermodynamics, vibrations, waves and optics) and modern physics (quantum, atomic and molecular, nuclear, elementary particle and solid-state physics)		
1.3	Have basic knowledge about meteorology, hydrology and geophysics			
2.0	Skills			
2.1	List various systems of oscillation.	S(2): Develop the skill for analyzing/solving the physics-based problems in the fields of mechanics, electromagnetism, solid state and nuclear physics	Oral quizzes Class discussion Class Activity	Exams Homework Assignments Presentations
2.2	Identify the behaviour of various types of waves.			
2.3	Define the role of driving and damping forces in oscillating systems.			
2.4	List various systems of oscillation.			
3.0	Values, autonomy, and responsibility			
3.1	Learn how to search for information through library and internet.	V(1): Work effectively in groups as well as individually, Learn how to collect and classify the required topics using internet communication tools. V(2): Learn how to collect and classify the required topics using internet communication tools.	Give time bound task. Group Presentation Group assignments	Observation Group discussion Group Report
3.2	Present a short report in a written form and orally using appropriate scientific language			
3.3	Operate questions and communicate with teacher through solve problems and work in groups			

C. Course Content

No	List of Topics	Contact Hours
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1.	Basic introduction to wave (Amplitude, Wavelength, frequency, time period, wave speed)	6 hours
2.	Periodic motion; simple harmonic oscillation	6 hours
3.	Damped oscillation and Forced oscillation	9 hours
4.	Application of damped and forced oscillations	6 hours
5.	Principle of Superposition of waves	6 hours
6.	Superposition of simple harmonic oscillation – traveling waves, standing waves, beats	6 hours
7.	Transverse waves in wire, Longitudinal waves in rod	6 hours
8.	Application of longitudinal wave in open and closed air columns	6 hours
9.	Fourier analysis	3 hours
10.	Doppler effect	6 hours
Total		45 hours

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	First Mid-Term exam	Week #6	15%
2.	Second Mid-Term exam	Week #11	15%
3.	E-learning quizzes	Once/ semester	10%
4.	Presentation	Once/ semester	20%
5.	Discussions	Every week	
6.	Home Work	Every week	
7.	Final exam	End of the semester	40%

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.).

E. Learning Resources and Facilities

1. References and Learning Resources

Essential References

- Raymond A. Serway and Chris Vuille , Cengage Learning , 9th Edition , (2011)





	<ul style="list-style-type: none"> • Almost all about waves; John R, Pierce, Dover Publications (October 6, 2006)
Supportive References	<ul style="list-style-type: none"> • Vibrations and Waves, George C. King @ 2009 John Wiley & Sons, Ltd • The physics of vibrations and waves , H. J. Pain @ 2008, 6th Edition , John Wiley & Sons, Ltd
Electronic Materials	<ul style="list-style-type: none"> • Saudi Digital Library (SDL) • https://www.wikipedia.org/ • Web of Knowledge • Physics Today (web version) • MIT Courseware • www.eagle.co.uk/news/ppnews.html • http://faculty.mu.edu.sa/ • http://vlib.org/physics.html • http://dir.yahoo.com/science/physics • http://demonstrations.wolfram.com • http://askthephysicist.com • http:// cyberphysics.co.uk
Other Learning Materials	<ul style="list-style-type: none"> • GIS Software • Excel software for drawing graphs. • MS Office for writing reports and presentations.

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Classrooms, Physics Laboratory and computer with internet lab.
Technology equipment (projector, smart board, software)	Computer Lab. and internet lab , data show, Smart Board.
Other equipment (depending on the nature of the specialty)	Library with text book for search and revision, Wi-Fi internet connections

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Internal Reviewer committee	Direct
Effectiveness of Students assessment	Student Self-Assessment and Peer Assessment.	Indirect
Quality of learning resources	Peer Reviewer	Direct
The extent to which CLOs have been achieved	Internal Reviewer committee	Direct





Assessment Areas/Issues	Assessor	Assessment Methods
Other	Internal Reviewer committee	Direct

Assessors (Students, Faculty, Program Leaders, Peer Reviewers, Others (specify))

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	DEPARTMENT COUNCIL
REFERENCE NO.	16
DATE	30/12/2024

