



Jordan University of Science and Technology
Faculty of Science & Arts
Physics Department

PHY281 Vibrations And Waves

Summer Semester 2023-2024

Course Catalog

3 Credit Hours. 1- Simple harmonic motion with applications to include additions, subtractions and modulations. 2- Damped harmonic motion to include the variables of this motion and energy dissipation. The quality factor. 3- Forced oscillations to include : the concept of impedance, resonance and the resonance power curve. 4- Coupled oscillations to include mechanical and electrical systems. The coupling strength. To introduce the concept of degrees of freedom. Coupling in extended systems as a prerequisite to wave motion. 5- Transverse waves: wave variables, wave equation, impedance, group and phase velocities. Wave propagation in periodic structures. Reflection and transmission of waves .

Teaching Method: Blended

Text Book

Title	The Physics of vibrations and Waves Author(s)
Author(s)	H. J. Pain
Edition	6th Edition
Short Name	1
Other Information	

Course References

Short name	Book name	Author(s)	Edition	Other Information
2	Vibrations and Waves	A. P. French	6th Edition	

Instructor

Name	Dr. Mahmoud AbuKharna
Office Location	-
Office Hours	Sun : 11:15 - 13:15 Mon : 11:15 - 13:15 Tue : 11:15 - 12:15 Wed : 11:15 - 12:15

Email	mhabukharma@just.edu.jo
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Class Schedule & Room

Section 2:
 Lecture Time: Sun, Mon, Tue, Wed : 10:00 - 11:00
 Room: NF40

Prerequisites

Line Number	Course Name	Prerequisite Type
922010	PHY201 Mathematical Physics(1)	Prerequisite / Pass
821024	HSS102PHY General Physics (2)	Prerequisite / Pass
921020	PHY102 General Physics (2)	Prerequisite / Pass

Tentative List of Topics Covered

Weeks	Topic	References
Weeks 1, 2, 3	Simple Harmonic Motion of mechanical and electrical systems. The equation of motion, variables of the motion, solution of the equation of motion using the force method, the energy method. Phasors. Addition of more than one harmonic motions .	From 1, From 2
Weeks 4, 5, 6	Damped Harmonic Motion, amplitude decay, logarithmic decrement, relaxation time , the Q-Value.	From 1, From 2
Weeks 6, 7, 8	Forced Harmonic Motion: The mechanical forced oscillator, it?s equation of motion, the solution of the equation of motion. The vector operator(l). The electrical oscillator, equation of motion, concept of impedance, the mechanical impedance, variables of, motion (displacement, velocity and acceleration).Power absorption, the amplification factor	From 1, From 2
Weeks 9, 10, 11	Coupled oscillators: The equation of motion. The normal coordinates and the normal modes of vibrations. Electrically coupled oscillators. Coupling of many oscillators. Wave motion.	From 1, From 2
Weeks 12, 13, 14	Transverse Wave motion: Mathematical approach to the wave equation . particle phase velocity. The wave equation in a string. The string as a forced oscillator. The characteristic impedance of a string. Reflection and transmission of transverse waves at a boundary .Standing waves on a string of fixed length. Normal modes, energy in a normal mode of oscillation. Wave groups and dispersion. Transverse waves in a periodic structure.	From 1, From 2

Mapping of Course Outcomes to Program Outcomes	Course Outcome Weight (Out of 100%)	Assessment method
Understand principles of simple harmonic motion and damped motion. [3SLO1(K1S1)]	33%	First Exam, Final Exam
Solve second-order differential equations for forced oscillations, and obtain the natural modes of coupled oscillations. [3SLO1(K1S1)]	33%	Second Exam, Final Exam

Understand the Physical Characteristics of different types of Waves, To solve problems on the applications of the different waves. [3SLO1(K1S1)]	34%	Final Exam
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Relationship to Program Student Outcomes (Out of 100%)					
SLO1(K1S1)	SLO2(S23C1)	SLO3(C24)	SLO4(C3)	SLO5(C4)	SLO6(S2C3)
100					

Evaluation	
Assessment Tool	Weight
First Exam	30%
Second Exam	30%
Final Exam	40%

Policy	
Lectures attendance and grading	<p>Students are required to come to the class on time. None will be allowed to enter the class later than 5 minutes from the start of the class. Students are requested to follow the attendance policy strictly which has been set by the university.</p> <p>Grading will be based on the following weighting:</p> <p>Midterm Exam 1: 50%</p> <p>Final Exam :50%</p>

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