



School of Engineering and Physical Sciences
Department of Mathematics and Physics

Course Name	Waves and Oscillations
Course Code	PHY 240
Course Credit Hours	3
Prerequisite	PHY 107, MAT 130
Course Objective	This course is designed to introduce the basics of oscillations and its mathematical description from mechanical to electromagnetic vibrations and waves.
Course Description	Students develop an understanding of the mathematical description of vibrations and oscillations. They understand the simple harmonic motion and sinusoidal functions and their application in both the mechanical and electromagnetic cases. Students also learn the different concepts and phenomena associated with the wave properties of electromagnetic waves, e.g. group velocity, phase velocity, interference, diffraction, dispersion, polarization, etc.
Method(s) of Instruction(s)	Interactive lectures, Simulations

COURSE CONTENT BY TOPIC

Module #1	Periodic Motion: Sinusoidal Vibrations, Simple Harmonic Motion, Rotating Vector Representation, Rotating Vectors and Complex Numbers, Complex Exponential, Superposition of Periodic Motion
Module #2	The Free Vibrations of Mechanical Systems: Mass-spring system, Elasticity and Young's Modulus, Floating objects, Pendulums
Module #3	Forced Vibrations and Resonances: Damped Free Oscillators, Driven Oscillators, Transient Phenomena, Resonances
Module #4	Coupled Oscillators and Normal Modes: Coupled Pendulums, Superposition of Normal modes, N - Coupled Oscillators, Normal Modes of N-coupled Oscillators, Longitudinal Oscillations, Normal Modes of Continuous Systems
Module #5	Electromagnetic waves: Maxwell's Equations, Dispersive Medium, Phase Velocity and Group Velocity, Uncertainty Principle, 2D and 3D Waves, Snell's Law
Module #6	Boundary Effects: Polarization, Wave Plates and Radiation, Waves in Medium, Interference, Diffraction, Dispersion
Actual contact hours: Lecture : 3 hours per week, 36 hours per semester	

TEXTBOOK REQUIREMENT

Vibrations and Waves, A. P. French

ASSESSMENT STRATEGY AND GRADING SCHEME

NSU's grading and performance evaluation policies will be followed in assigning your grade. Please note that all final grades are subject to departmental review and approval. A guideline of course assessment is as follows-

Class Attendance	Assignments	Quiz	Midterm	Final
5%	10%	20%	30%	35%

MAPPING OF COURSE OUTCOMES

CLO-#	Outcome Types	Bloom's Taxonomy level (C- Cognitive, A- Affective, P- Psychomotor)	Delivery Method	Assessment Tools	
CLO #1	Understand the basics of simple harmonic motion and sinusoidal motion	C2, P2	Lecture and Discussion	Quiz and Assignment	Midterm Exam
CLO #2	Analyze the periodic motion in spring-mass system and pendulum	C4, P2	Lecture and Discussion	Quiz and Assignment	
CLO #3	Explain damped, undamped oscillations, and resonance	C2	Lecture and Discussion	Quiz and Assignment	
CLO #4	Understand the coupled oscillators and associated modes of oscillations	C2, P3	Lecture and Discussion	Quiz and Assignment	Final Exam
CLO #5	Analyze the electromagnetic waves using Maxwell's equations	C4, P3	Lecture and Discussion	Quiz and Assignment	
CLO #6	Apply different wave properties to explain real world phenomena	C3, P4	Lecture and Discussion	Quiz and Assignment	