Centre for High Energy Physics
Faculty of Science
University of the Punjab, Lahore
Course Outline

Program	BSCP	**Course Code**	CPHY 112	**Credit Hours**	3
Course Title	**Waves and Oscillations**				

Course Introduction

This course encloses the basic understanding of wave mechanics from classical point of views with different physical aspects of mechanical and light waves.

Learning Outcomes

1. Understand basic principles of mechanics related to its applications on oscillating systems.
2. Understand the basic equation of wave in elastic medium and its properties.
3. Be able to solve relevant numerical problems.

Course Content

Week 1	Simple Harmonic Motion, Energy considerations in SHM
	Spring system and coupled pendulums
Week 2	Damped Vibrations, forced vibrations, Resonance, Phase of Resonance,
	Quality Factor. Mechanical waves
Week 3	Traveling waves, Phase velocity, Group velocity and dispersion
	Wave speed, Principle of superposition,
Week 4	Interference of wave, Standing wave
	Resonance. Sound Waves: Beats,
Week 5	The Doppler effect. Light Waves: Nature of light
	Speed of light in matter, Doppler effect for light
Week 6	Mirror and Lenses: Image formation by mirrors and Lenses,
	Plane mirror, spherical mirrors, spherical refracting surface
Week 7	Thin Lenses, Optical instrument.
	Interference: Coherence, double slit interference (analytical treatment)
Week 8	Interference from thin films, Newton's ring (analytical treatment),
	Michelson's interferometer.
Week 9	Fresnel's Biprism
	Single slit diffraction
Week 10	Intensity in single slit diffraction (analytical treatment)
	Double slit diffraction & interference combined
Week 11	Diffraction at circular aperture

	Diffraction from multiple slits
Week 12	Diffraction grating
	Dispersion and resolution power
Week 13	Definition of Polarization; polarizing sheet with mathematical discerption
	Polarization by reflection with some examples
Week 14	Polarization by double refraction
	Electromagnetic polarization
Week 15	Single slit polarization and double slits polarization
	Double scattering
Week 16	Polarization states
	Mechanical wave polarizations

Textbooks and Reading Material

Recommended Books:

1. Physics Vol.1 (4^{th}edition), Halliday and Resnic, *John Wiley and Sons* (1992).
2. Physics Vol.1 (5^{th}edition), Halliday and Resnic, *John Wiley and Sons* (2002).
3. Fundamentals of Physics (5^{th}edition), Halliday&Resnic, *John Wiley and Sons* (1999).
4. Physics for Scientists and Engineers (extended version), P. M. Fishbane, *Prentice-Hall International Editions* (2016).
5. Classical Mechanics Simulations, Bruce Hawkins and Randall Jones, *John Wiley & Sons* (1995).

Teaching Learning Strategies

The instructor is required to make use of Mathematica/Maple/Python to teach the concepts through visualization/antimutation and symbolic/numerical calculations. The students are required to solve a large portion of related exercises/questions/problems of the main textbooks.

Assignments: Types and Number with Calendar

At least two assignments and two quizzes. A course project may also be assigned.

Assessment

Sr. No.	Elements	Weightage	Details
1.	Midterm Assessment	35%	Written Assessment at the mid-point of the semester.
2.	Formative Assessment	25%	Continuous assessment includes: Classroom participation, assignments, presentations, viva voce, attitude and behavior, hands-on-activities, short tests, projects, practical, reflections, readings, quizzes etc.

3.	Final Assessment	40%	Written Examination at the end of the semester. It is mostly in the form of a test, but owing to the nature of the course the teacher may assess their students based on term paper, research proposal development, field work and report writing etc.