Imperial College London

Module Specification (Curriculum Review)

Basic details

			Earliest cohort	Latest cohort
UID		Cohorts covered	2024-25	

Long title: Oscillations and Waves

New code	PHYS40003	New short title	

Brief description of module *(approx. 600 chars.)*:

This module provides an in-depth knowledge of oscillation and waves, demonstrating their importance in multiple areas of basic physics including mechanics, optics and electronics, whilst also introducing some of the basic tenets of quantum mechanics. As with other modules within the core physics programme the module is taught in a holistic style i.e. the necessary mathematical skills are provided alongside the physics thereby reinforcing and aiding understanding of all parts.

480 characters

Available as a standalone module/ short course? N

Statutory details

	ECTS	CATS	Non-credit		
Credit value	15	30	N	HECOS codes	
FHEQ level	4				

Allocation of study hours

	Hours	
Lectures	64	
Group teaching	24	*Incl. seminars, tutorials, problem classes.*
Lab/ practical	0	
Other scheduled	24	*Incl. project supervision, fieldwork, external visits.*
Independent study	263	*Incl. wider reading/ practice, follow-up work, completion of assessments, revisions.*
Placement	0	*Incl. work-based learning and study that occurs overseas.*
Total hours	375	
ECTS ratio	25.00	

Project/placement activity

Is placement activity allowed? No

Module delivery

Delivery mode	Taught/ Campus	Other	
Delivery term	Year-long	Other	

Ownership

Primary department: Physics

Additional teaching departments	None
Delivery campus	South Kensington

Collaborative delivery

Collaborative delivery?	N

External institution	N/A
External department	N/A
External campus	N/A

Associated staff

Role	CID	Given name	Surname
Module Leader		Mike	Tarbutt
		Roland	Smith
		Isabel	Rabey
		Mike	Damzen
		Alan	Heavens
		Carl	Paterson

Learning and teaching

Module description

Learning outcomes	On completion of this module you will be able to: • describe the physical principles and be able to apply the theories of oscillations and waves to a broad range of phenomena including mechanical and electrical systems, light, and matter at both macroscopic and quantum mechanical scales; • select and utilise appropriate mathematical tools for solving problems involving vibrations and waves in range of situations including those specific to optics and electronics; • select and utilise appropriate numerical and computational techniques for developing insight into certain problems in vibrations, waves, optics and electronics; • demonstrate an awareness of the successes and limitations of current physical theories in vibrations and waves;

Module content	The overarching outcome will be for students to understand and apply the physics theory of oscillations and waves to a broad range of phenomena including mechanical systems, electronics and light. The detailed outcomes include: • Using complex notation to represent waves and oscillations, simplifying the mathematics required for their study. • Using these techniques to analyse wave behaviour in mechanics, drawing parallels to the mechanics module. • Understand damped and forced oscillations. • Developing a basic knowledge of electronics circuit theory and apply wave analysis to oscillating LCR circuits. • Learning mathematical series and Fourier transforms and seeing how they can affect electronics and optics. • Exploring both the classical ray and the modern wave-like interpretation of light – from ray diagrams and lenses through to diffraction and interference. • Introducing key concepts in quantum mechanics, from the wave-particle duality to the simple particle in a well.
Learning and Teaching Approach	Students will be taught over two terms using a combination of lectures, small-group teaching, office hours, study groups and directed exercises on theoretical, and computational work.
Assessment Strategy	The major component of summative assessment is an exam in term 3. In-course assessment such as in-class and end-of-module tests and written problems account for the remainder of the summative assessment.
Feedback	Formative feedback will be provided throughout the module following formative assessment in the form of in-class quizzes, online tests, marking of handwritten problems sheets and verbal feedback for any practical or computational exercises. Feedback for any continuous assessment will be provided within two weeks of the submission date. General feedback on written examinations for each module is provided in the form of written reports from the examiners for the students.
Reading list	The module is self-contained and no additional books are required to be purchased by the students. Further discussion of material covered by the module, along with relevant problems can be found in: • Sears and Zemansky's University Physics by Young and Freedman • Principles of Electronic Instrumentation by Diefenderfer and Holton • Mathematical Methods in the Physical Sciences, by Mary L. Boas

Quality assurance

Date of first approval	
Date of last revision	
Date of this approval	
Module leader	Mike Tarbutt

Office use only

QA Lead	
Department staff	
Date of collection	
Date exported	
Date imported	

Notes/ comments	

Template version 16/06/2017

Programme structure

Associated modules

UID	Legacy code	Module title	Requisite type

Assessment details

		Pass mark
Grading method	Numeric	40%

Assessments

Assessment type	Assessment description	Weighting	Pass mark	Must pass?
Examination	2.5-hour exam	70%		N
Coursework	Other in-course assessment	30%		N
		100%		