Imperial College London

Module Specification (Curriculum Review)

Basic details

UID	
Cohorts covered	Earliest cohort: / Latest cohort:
Long title	Oscillations and Waves
New code	
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	2	
Other scheduled	24	*Incl. project supervision, fieldwork, external visits.*
Independent study	261	*Incl. wider reading/ practice, follow-up work, completion of assessments, revisions.*
Placement		*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		Martin	McCall
		Michael	Coppins
		Chris	Carr
		Mike	Damzen
		Carlo	Contaldi
		Simon	Bland

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;
• apply appropriate techniques for effective team work and have an understanding of team dynamics.

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 – including Kirchhoff's laws for superposition, and then 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, practical and computational work. For the basic electronics component all students get a 2 hour introduction to circuit simulation software in the computer suite, sometime between their second and third electronics lecture. This is supported by demonstrators. Following each subsequent lecture, students are given a short circuit-simulation exercise to do in their own time, to illustrate the material from that lecture.
Assessment Strategy	The major component of summative assessment is an exam in term 3. There is a group project in term 1 and other 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

Quality assurance

Date of first approval	
Date of last revision	
Date of this approval	
Module leader	Martin McCall
Notes/ comments	

Office use only

QA Lead	
Department staff	
Date of collection	
Date exported	
Date imported	

Programme structure

Associated modules

UID	Legacy code	Module title	Requisite type

Programme structure

Associated programmes

UID	Legacy code	Programme title	Core?

Assessment details

Grading method	Numeric	Pass mark	40%

Assessments

Assessment type	Assessment description	Weighting	Pass mark	Must pass?
Examination	2.5-hour exam	70%		N
Coursework	Other in-course assessment	23%		N
Coursework	Group project	7%		N

Err:522