1. **Title of the module**

PHYS0025 (PH025) - Waves and Vibrations

1. **Division or partner institution which will be responsible for management of the module**

Division of Natural Sciences

1. **The level of the module (Level 4, Level 5, Level 6 or Level 7)**

Level 3

1. **The number of credits and the ECTS value which the module represents**

15 Credits (7.5 ECTS)

1. **Which term(s) the module is to be taught in (or other teaching pattern)**

Autumn

1. **Prerequisite and co-requisite modules**

None

1. **The course(s) of study to which the module contributes**

Physics Foundation Year.

This is not available as an elective module choice.

1. **The intended subject specific learning outcomes.  
   On successfully completing the module students will be able to:**

8.1 Demonstrate knowledge and understanding of physical laws and principles, and their application to diverse areas of physics (this will include laws of motion, electromagnetism, wave phenomena and the properties of matter), with modules covering the necessary mathematics.

8.2 Demonstrate an ability to identify relevant principles and laws when dealing with problems, and to make approximations necessary to obtain solutions.

8.3 Demonstrate an ability to solve problems in physics using appropriate mathematical tools.

8.4 Demonstrate an ability to use mathematical techniques and analysis to model physical behaviour.

8.5 Demonstrate an ability to present and interpret information graphically.

8.6 Demonstrate an ability to make use of appropriate texts, or other learning resources as part of managing their own learning.

1. **The intended generic learning outcomes.  
   On successfully completing the module students will be able to:**

9.1 Demonstrate an ability to formulate problems in precise terms and to identify key issues, and the confidence to try different approaches in order to make progress on challenging problems. Numeracy is subsumed within this area.

9.2 Demonstrate analytical skills, associated with the need to pay attention to detail and to develop an ability to manipulate precise and intricate ideas, to construct logical arguments and to use technical language correctly.

9.3 Demonstrate the ability to work independently, to use initiative, to organise oneself to meet deadlines and to interact constructively with other people.

1. **A synopsis of the curriculum**

The module will cover the following:

Types of waves. Characteristics of a wave:- frequency, period, amplitude, wavelength and velocity. Introduction to transverse and longitudinal waves and polarisation. c = f?

Properties of Waves. Qualitative description of the properties of waves; motion, reflection, refraction (Snell's law), dispersion, diffraction, interference, standing waves.

Sound Waves. Description of sound - loudness, noise, note, pitch, intensity, intensity level. Properties of sound - reflection, refraction, interference (interference pattern produced by two speakers), beats, and resonance in a vibrating wire, including overtones/harmonics. Qualitative treatment of Doppler Effect.

Electromagnetic (em) Waves. Electromagnetic spectrum. Qualitative treatment of em waves from different parts of the spectrum. Refraction of light - critical angle and optical fibres. Polarisation of light, microwaves and radio waves. Interference. Young's double slit experiment. The Michelson interferometer. Transmission diffraction grating - orders of diffraction, application in spectroscopy.

Simple Harmonic Motion (SHM). Displacement, velocity and acceleration of a body undergoing SHM Link between SHM and circular motion. Force acting on a body undergoing SHM. Qualitative description of systems displaying SHM. Detailed description of pendulum and mass on a spring. Energy in SHM. General expression for SHM.

Damping and Forced Oscillations. Qualitative treatment of light, heavy and critical damping. Qualitative discussion of the concepts of natural frequency, resonance and the behaviour of vibratory systems driven by a periodic force.

1. **Reading list (Indicative list, current at time of publication. Reading lists will be published annually)**

Breithaupt*,* J. (1999). *New Understanding Physics for Advanced Level,* Fourth Edition. Oxford: Oxford University Press.

Breithaupt*,* J. (2010). *Physics,* Third Edition. London: Palgrave Macmillan.

1. **Learning and teaching methods**

Total Contact Hours: 24

Total Private Study Hours: 126

Total Study Hours: 150

1. **Assessment methods**
   1. Main assessment methods

* Assignment (1 hour) – 15%
* Moodle Quiz (1 hour) – 15%
* Examination (2 hours) – 70%

13.2 Reassessment methods

* Like-for-like

1. ***Map of module learning outcomes (sections 8 & 9) to learning and teaching methods (section12) and methods of assessment (section 13)***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Module learning outcome** | *8.1* | *8.2* | *8.3* | *8.4* | *8.5* | *8.6* | *9.1* | *9.2* | *9.3* |
| **Learning/ teaching method** |  |  |  |  |  |  |  |  |  |
| Private Study | **x** | **x** | **x** | **x** | **x** | **x** | **x** | **x** | **x** |
| Lecture | **x** | **x** | **x** | **x** | **x** |  | **x** | **x** |  |
| **Assessment method** |  |  |  |  |  |  |  |  |  |
| Assignment | **x** | **x** | **x** | **x** | **x** | **x** | **x** | **x** | **x** |
| ICT | **x** | **x** | **x** | **x** | **x** | **x** | **x** | **x** | **x** |
| Examination | **x** | **x** | **x** | **x** | **x** | **x** | **x** | **x** | **x** |

1. **Inclusive module design**

The Division recognises and has embedded the expectations of current equality legislation, by ensuring that the module is as accessible as possible by design. Additional alternative arrangements for students with Inclusive Learning Plans (ILPs)/declared disabilities will be made on an individual basis, in consultation with the relevant policies and support services.

The inclusive practices in the guidance (see Annex B Appendix A) have been considered in order to support all students in the following areas:

a) Accessible resources and curriculum

b) Learning, teaching and assessment methods

1. **Campus(es) or centre(s) where module will be delivered**

Canterbury

1. **Internationalisation**

Physics is an international subject with physical laws discovered and techniques developed and refined by scientists across the globe. Mastery of the subject-specific learning outcomes will equip students to apply the theories and techniques of this module in a wide range of international contexts. The module team is drawn from the Division of Natural Sciences, which includes many members of staff with international experience of teaching and research collaboration. In compiling the reading list, consideration has been given to the range of texts that are available internationally and a selection of texts has been identified to complement the delivery of the material. The support the Division provides to its students is also internationally attuned given our international student body.

**DIVISION USE ONLY**

**Revision record – all revisions must be recorded in the grid and full details of the change retained in the appropriate committee records.**

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| Date approved | Major/minor revision | Start date of delivery of revised version | Section revised | Impacts PLOs (Q6&7 cover sheet) |
| 10/07/2019 | Minor | September 2019 | 13-14 |  |
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