1. **Title of the module**

PH321 Mechanics

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

School of Physical Sciences

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

4

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

15 (7.5 ECTS)

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

Term 1

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

Pre-requisites:

UK Advanced Level Physics Examinations with a normal minimum attainment of a

Grade C on the main Physics A - Level. Any generally accepted equivalent of this

content and attainment is regarded as an acceptable prerequisite.

Co-requisite PH300 Mathematics, PH304 Astrophysics, Space Science and Cosmology, PH322 Electricity and Light, PH323 Thermodynamics and Matter, PS370 Skills for Physicists

1. **The programmes of study to which the module contributes**

Physics (BSc, BSc with Foundation Year, BSc with Year in Industry, MPhys, MPhys with Year Abroad)

Physics with Astrophysics (BSc, MPhys, MPhys with Year Abroad)

Astronomy, Space Science and Astrophysics (BSc, MPhys, MPhys with Year Abroad)

This is not available as a wild module.

1. **The intended subject specific learning outcomes.  
   On successfully completing the module students will be able to:**
   1. Knowledge and understanding of physical laws and principles of mechanics, and their application to diverse areas of physics. (A1)
   2. An ability to identify relevant principles and laws when dealing with problems, and to make approximations necessary to obtain solutions. (B1)
   3. An ability to solve problems involving mechanics using appropriate mathematical tools. (B2)
   4. An ability to use mathematical techniques and analysis to model physical behaviour involving mechanics. (B4)
   5. An ability to present and interpret information relating to mechanics graphically. (C2)
   6. An ability to make use of appropriate texts, research-based materials or other learning resources about mechanics as part of managing their own learning. (C6)
2. **The intended generic learning outcomes.  
   On successfully completing the module students will be able to:**
   1. Problem-solving skills, in the context of both problems with well-defined solutions and open-ended problems; 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. (D1)
   2. 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. (D4)
3. **A synopsis of the curriculum**

Measurement and motion; Dimensional analysis, Motion in one dimension: velocity, acceleration, motion with constant acceleration, Motion in a plane with constant acceleration, projectile motion, uniform circular motion, and Newton’s laws of motion

Work, Energy and Momentum; Work, kinetic energy, power, potential energy, relation between force and potential energy, conservation of energy, application to gravitation and simple pendulum, momentum, conservation of linear momentum, elastic and inelastic collisions

Rotational Motion; Rotational motion: angular velocity, angular acceleration, rotation with constant angular acceleration, rotational kinetic energy, moment of inertia, calculation of moment of inertia of a rod, disc or plate, torque, angular momentum, relation between torque and angular momentum, conservation of angular momentum

Concept of field; 1/r2 fields; Gravitational Field; Kepler’s Laws, Newton’s law of gravitation, Gravitational potential, the gravitational field of a spherical shell by integration

Oscillations and Mechanical Waves; Vibrations of an elastic spring, simple harmonic motion, energy in SHM, simple pendulum, physical pendulum, damped and driven oscillations, resonance, mechanical waves, periodic waves, their mathematical representation using wave vectors and wave functions, derivation of a wave equation, transverse and longitudinal waves, elastic waves on a string, principle of superposition, interference and formation of standing waves, normal modes and harmonics, sound waves with examples of interference to form beats, and the Doppler Effect. Phase velocity and group velocity.

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

CORE:

*Physics for Scientists and Engineers* (6th Ed.); Tipler, P.A. & Mosca, G. (2008)

BACKGROUND:

*Dimensional Analysis*; Gibbings JC London, Springer London (2011)

1. **Learning and Teaching methods**

* Contact hours: Lectures (24 hours); workshop sessions (8 hours)
* The number of independent learning hours, including assignments 118 hrs
* Total number of study hours 150 hrs

Achievement of module learning outcomes:

* Lectures (8.1-8.5)
* Workshop sessions (8.1-8.6, 9.1, 9.2)
* Assignments (8.1-8.6, 9.1, 9.2)
* Self-study (8.1-8.6, 9.1, 9.2)

1. **Assessment methods.**

• Coursework 20%; comprising at least one ICT (in-course test) and at least one piece of independent work involving problem solving.

• Final (written, unseen, length 2 hours) exam 80%.

The above assessments test students’ knowledge and understanding of laws and principles (8.1, 8.2, 9.2) and application of techniques to model behaviour and solve problems (8.3, 8.4, 8.5, 9.1, 9.2). In preparing for the assessments, students will need to manage their own revision using reference materials. (8.6, 9.2).

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* |
| **Learning/ teaching method** | **Hours allocated** |  |  |  |  |  |  |  |  |
| *Lectures* | *24* | **x** | **x** | **x** | **x** | **x** |  |  |  |
| *Workshops* | *8* | **x** | **x** | **x** | **x** | **x** | **x** | **x** | **x** |
| *Assignments* | *36* | **x** | **x** | **x** | **x** | **x** | **x** | **x** | **x** |
| *Self-studies* | *82* | **x** | **x** | **x** | **x** | **x** | **x** | **x** | **x** |
| **Assessment method** |  |  |  |  |  |  |  |  |  |
| *Coursework* |  | **x** | **x** | **x** | **x** | **x** | **x** | **x** | **x** |
| *Final Exam* |  | **x** | **x** | **x** | **x** | **x** | **x** | **x** | **x** |

1. **The School recognises and has embedded the expectations of current disability equality legislation, and supports students with a declared disability or special educational need in its teaching. Within this module we will make reasonable adjustments wherever necessary, including additional or substitute materials, teaching modes or assessment methods for students who have declared and discussed their learning support needs. Arrangements for students with declared disabilities will be made on an individual basis, in consultation with the University’s disability/dyslexia student support service, and specialist support will be provided where needed.**
2. **Campus(es) or Centre(s) where module will be delivered:**

Canterbury

**FACULTIES SUPPORT OFFICE USE ONLY**

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

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Date approved | Major/minor revision | Start date of the delivery of revised version | Section revised | Impacts PLOs( Q6&7 cover sheet) |
| 26/05/16 | Major | September 2016 | 6, 10, 13 | No |
|  |  |  |  |  |