1. **Title of the module**

PHYS6080 (PH608) - The Sun, The Earth and Mars

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

Physical Sciences

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

Level 6

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**

Prerequisites:

PHYS5080 Spacecraft Design and Operations

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

BSc/MPhys Astronomy Space Science and Astrophysics

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

Have:

1. Knowledge and understanding of physical laws and principles in Solar System Science, and their application to diverse areas of physics. (A1)
2. Aspects of the theory and practice of astronomy, astrophysics and space science, and of those aspects upon which astronomy, astrophysics and space science depends. (A2)
3. An ability to identify relevant principles and laws when dealing with problems in Solar System Science, and to make approximations necessary to obtain solutions. (B1)
4. An ability to solve problems in Solar System Science using appropriate mathematical tools. (B2)
5. An ability to use mathematical techniques and analysis to model physical behaviour in Solar System Science. (B4)
6. An ability to comment critically on how spacecraft are designed, their principles of operation, and their use to access and explore space, and on how telescopes (operating at various wavelengths) are designed, their principles of operation, and their use in astronomy and astrophysics research. (B5)
7. An ability to present and interpret astronomy, astrophysics and space science information graphically. (C2)
8. An ability to make use of appropriate texts, research-based materials or other learning resources as part of managing their own learning. (C6)
9. **The intended generic learning outcomes.  
   On successfully completing the module students will be able to:**

Have a knowledge and understanding of:

1. Problem-solving skills, in the context of both problems with well-defined solutions and open-ended 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**

Aims:

* To understand the nature of the solar activities, emissions and its properties, and its effects on the Earth’s atmosphere and the near-Earth space within which spacecraft operate.
* To have a familiarity with the modes of operation of remote sensing and communications satellites, understanding their function and how their instruments work.
* To be familiar with the current space missions to Mars and their impact on our understanding of that planet.

Solar Terrestrial physics

The sun: Overall structure, magnetic field and solar activities.

Interactions with Earth: plasma physics, solar wind, Earth’s magnetic field.

Ionospheric physics. Terrestrial physics: Earth’s energy balance, Atmosphere. Environmental effects.

Remote Sensing

Modes of operation of remote sensing satellite instruments: radio, microwave, visual and infrared instruments. Basic uses of the instruments. Digital image processing, structure of digital images, image-processing overview, information extraction, environmental applications: UV radiation and Ozone concentration, climate and weather.

Martian Science

An overview of recent and future Mars space missions and their scientific aims. Discussions of the new data concerning Mars and the changing picture of Mars that is currently emerging.

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

Core:

* Physical Principles of Remote Sensing; Rees, Gareth 2001
* Terrestrial Physics; 2013
* The Scientific Exploration of Mars; Taylor, F. W. 2010

Recommended:

* Physics of the Sun: A First Course; Mullan, Dermott J. 2010
* Mars: A Warmer, Wetter Planet; Kargel, J. S. 2004
* Introduction to the physics and techniques of remote sensing, Elachi, 2nd Edition, 2006

1. **Learning and teaching methods**

Total contact hours: 30

Private study hours: 120

Total study hours: 150

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

Assessment 1 - 15% (10 hours)

Assessment 2 - 15% (10 hours)

Examination - 70% (2 hours)

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* | *8.7* | *8.8* | *9.1* | *9.2* |  |  |
| **Learning/ teaching method** |  |  |  |  |  |  |  |  |  |  |  |  |
| **Lectures** | **x** | **x** | **x** |  |  | **x** |  |  |  | **x** |  |  |
| ***Workshops/Revision sessions*** |  |  | **x** | **x** | **x** |  | **x** |  | **x** |  |  |  |
| **Private Study** |  |  |  |  |  |  |  | **x** |  | **x** |  |  |
| **Assessment method** |  |  |  |  |  |  |  |  |  |  |  |  |
| *Assignments* | **x** | **x** | **x** | **x** | **x** | **x** | **x** | **x** | **x** | **x** |  |  |
| *Examination* | **x** | **x** | **x** | **x** | **x** | **x** | **x** |  | **x** | **x** |  |  |

1. **Inclusive module design**

The School 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**

This is an international subject with underlying physics and discoveries 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 School of Physical 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 SPS provides to its students is also internationally attuned given our international student body.

**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.**

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| --- | --- | --- | --- | --- |
| Date approved | Major/minor revision | Start date of the delivery of revised version | Section revised | Impacts PLOs (Q6&7 cover sheet) |
| 10/07/2019 | Minor | September 2019 | 6, 12, 13, 14 |  |
|  |  |  |  |  |