1. **Title of the module**

PHYS5080 (PH508) - Spacecraft Design and Operations

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 5

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)**

Spring

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

None

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

BSc/BSc with Foundation Year/MPhys/MPhys with Year Abroad Physics (Optional)

BSc/MPhys/MPhys with Year Abroad Astronomy, Space Science and Astrophysics

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:**

8.1 Demonstrate knowledge and understanding of physical laws and principles, and their application to diverse areas of physics focussed on spacecraft design and operations.

8.2 Demonstrate knowledge and understanding of aspects of the theory and practice of astronomy, astrophysics and space science, and of those aspects upon which astronomy, astrophysics and space science depends.

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

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

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

8.6 Demonstrate an ability to comment critically on how spacecraft are designed, their principles of operation, and their use to access and explore space. Also, on how they are used in astronomy and astrophysics research.

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

8.8 Demonstrate an ability to make use of appropriate texts, research-based materials 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 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.

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.

1. **A synopsis of the curriculum**

This module aims to provide a basic understanding of the major subsystems of a spacecraft system and the frameworks for understanding spacecraft trajectory and orbits, including interplanetary orbits, launch phase and altitude control. Students will also gain an awareness of ideas on how space is a business/commercial opportunity and some of the management tools required in business.

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

Recommended texts:

* Fortescue, Stark and Swinerd, Spacecraft Systems Engineering, Wiley (2003). [TL875, 6 copies]
* Roy, Orbital Motion, Adam Hilger, [QB355] (6 copies, 3rd edition)

Other useful texts:

* Griffin and French, Space Vehicle Design, AIAA [TL875]
* Wertz and Larson, Space Mission Analysis and Design, 2nd ed. Kluwer [TL790]
* Chetty, Satellite Technology and its Applications, TAB Books, Inc. [TL796]
* Wertz, Spacecraft Attitude Determination and Control, Reidel Publishing Co. [TL3260]
* Turner, Rocket and Spacecraft Propulsion, pub. Praxis [TL782]

1. **Learning and teaching methods**

Total contact hours: 32

Private study hours: 118

Total study hours: 150

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

Test 1 (10hours, 15%)

Test 2 (10hours, 15%)

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** |  |  |  |  |  |  |  |  |  |  |
| Private Study |  |  |  |  |  |  |  | **X** |  | **X** |
| Lecture | **X** | **X** | **X** | **X** | **X** | **X** | **X** |  | **X** | **X** |
| Workshop |  |  | **X** | **X** | **X** | **X** | **X** |  | **X** | **X** |
| **Assessment method** |  |  |  |  |  |  |  |  |  |  |
| Coursework | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** |
| Exam | **X** | **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**

Physics is an international subject with laws of physical sciences discovered and techniques developed and refined by physical scientists across the globe. Mastery of the subject-specific learning outcomes in this module will equip students to apply the learned theories and techniques in a wide range of international contexts. In compiling the reading list, consideration has been given to the range of texts that are available internationally. The support SPS provides to its students is also attuned to 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.**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Date approved | Major/minor revision | Start date of delivery of revised version | Section revised | Impacts PLOs (Q6&7 cover sheet) |
| 01/05/2020 | Minor | January 2021 | 10, 12 |  |
|  |  |  |  |  |