1. **Title of the module**

PHYS5120 (PH512) - Data Analysis Techniques in Astronomy and Planetary Science

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/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:**

Have:

1. Knowledge and understanding of aspects of the theory and practice of astronomy, and of those aspects upon which astronomy depends. (A2)
2. Competent use of appropriate C&IT packages/systems for the analysis of data and the retrieval of appropriate information. (C1)
3. An ability to present and interpret astronomical information graphically. (C2)
4. An ability to communicate scientific information, in particular to produce clear and accurate scientific reports. (C3)
5. An ability to make use of appropriate texts, research-based materials or other learning resources as part of managing their own learning. (C6)

Other more specific learning outcomes:

1. Students will become able to: use the web to access and process astronomical data available on the internet, enhance digital and astronomical images, learn how to use astronomical image processing packages, carry out searches of astronomical databases on the web, and develop familiarity with the topics covered in the course by use of computer exercises to illustrate them.
2. Develop key skills for employment, learning to access data, the internet and data libraries, and development of practical skills in data collection and processing. The course is also aimed in part at promoting independent thinking when handling practical problems with astronomy data.
3. **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; 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. Investigative skills in the context of independent investigation including the use of textbooks and other available literature, databases, and the interaction with colleagues to extract important information. (D2)
3. Communication skills in the area of dealing with surprising ideas and difficult concepts, including listening carefully, reading demanding texts and presenting complex information in a clear and concise manner. C&IT skills are an important element to this. (D3)
4. 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)
5. Personal skills – the ability to work independently, to use initiative, to organise oneself to meet deadlines. (D5)
6. **A synopsis of the curriculum**

This module focuses on the use of data processing and analysis techniques as applied to astronomical data from telescopes. Students will learn how telescopes and CCD cameras work, to process astronomical images and spectra and apply a range of data analysis techniques using multiple software packages. Students will also engage in the scientific interpretation of images and spectra of astronomical objects.

* Use of Virtual Observatories for accessing astronomical databases and applying analysis tools to the data files retrieved (with particular emphasis on the Aladdin system); astronomical image formats.
* Astrometry: Measuring coordinates of celestial objects from images.
* Photometry: Determining magnitudes of variable stars and/or solar system bodies.
* Spectroscopy: Determining spectral properties of variable stars and/or solar system bodies.
* Image Analysis and Enhancement with AIP: Quantifying digital imagery in more detail than Aladdin, and applying a range of techniques (primarily through the use of image operators and convolution kernels).

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

* The Handbook of Astronomical Image Processing [with cd-rom] (2nd Edition); Berry, R. & Burnell, J. (2005)

1. **Learning and teaching methods**

Total contact hours (Presentation and workshop-style tutoring during scheduled sessions: not including office contact hours): 33

Private study hours: 117

Total study hours: 150

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

Assignment 1 (1,400-1,600 words) – 25%

Assignment 2 (1,400-1,600 words) – 25%

Assignment 3 (1,400-1,600 words) – 25%

Assignment 4 (1,400-1,600 words) – 25%

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* | *9.1* | *9.2* | *9.3* | *9.4* | *9.5* |
| **Learning/ teaching method** |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
| Presentation and workshop-style tutoring during class, including guidance on report preparation | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** |
| Private Study | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** |
| **Assessment method** |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
| Assignments | **X** | **X** | **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**

Astronomy is an international subject with physical laws discovered and techniques developed and refined by scientists across the globe (the associated text was drawn from this international expertise and knowledge base). Mastery of the subject-specific learning outcomes will equip students to apply the theories and techniques of this module to astronomy-based problems. The module team is drawn from the School of Physical Sciences, which includes members of staff with experience of international collaborations in this area. 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.**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Date approved | Major/minor revision | Start date of the delivery of revised version | Section revised | Impacts PLOs (Q6&7 cover sheet) |
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Revised FSO Jan 2018