Confirmation that this version of the module specification has been approved by the School Learning and Teaching Committee:

…………11th March 2015……………………………………….

**MODULE SPECIFICATION**

1. Title of the module

*PH507 The Multiwavelength Universe and Exoplanets*

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

*School of Physical Sciences*

1. Start date of the module

*Existing module, next running from 2015-16*

1. The number of students expected to take the module

*70*

1. Modules to be withdrawn on the introduction of this proposed module and consultation with other relevant Schools and Faculties regarding the withdrawal

*None.*

1. The level of the module (e.g. Certificate [C], Intermediate [I], Honours [H] or Postgraduate [M])

*I*

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 2.*

1. Prerequisite and co-requisite modules

*None*

1. The programmes of study to which the module contributes

*Physics (BSc, BSc with Foundation Year, MPhys, MPhys with Year Abroad) (OPTIONAL)*

*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
   1. *Knowledge and understanding of physical laws and principles of astronomy, astrophysics and space science, and their application to diverse areas of physics. (A1)*
   2. *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. (A2)*
   3. *An ability to identify relevant principles and laws when dealing with problems in astronomy, astrophysics and space science, and to make approximations necessary to obtain solutions. (B1)*
   4. *An ability to solve problems in astronomy, astrophysics and space science using appropriate mathematical tools. (B2)*
   5. *An ability to use mathematical techniques and analysis to model physical behaviour within astronomy, astrophysics and space 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 astronomical, astrophysical 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)*
2. The intended generic learning outcomes
   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

*Aims: To provide a basic but rigorous grounding in observational, computational and theoretical aspects of astrophysics to build on the descriptive course in Part I, and to consider evidence for the existence of exoplanets in other Solar Systems.  
  
SYLLABUS:  
  
Observing the Universe   
Telescopes and detectors, and their use to make observations across the electromagnetic spectrum. Basic Definitions: Magnitudes, solid angle, intensity, flux density, absolute magnitude, parsec, distance modulus, bolometric magnitude, spectroscopic parallax, Hertzsprung-Russel diagram, Stellar Photometry: Factors affecting signal from a star. Detectors: Examples, Responsive Quantum Efficiency, CCD cameras. Filters, UBV system, Colour Index as temperature diagnostic.  
  
Extra Solar Planets   
The evidence for extrasolar planets will be presented and reviewed. The implications for the development and evolution of Solar Systems will be discussed.  
  
Astrophysics   
Basic stellar properties, stellar spectra. Formation and Evolution of stars. Stellar structure: description of stellar structure and evolution models, including star and planet formation. Stellar motions: Space velocity, proper motion, radial velocity, Local Standard of Rest, parallax. Degenerate matter: concept of degenerate pressure, properties of white dwarfs, Chandrasekhar limit, neutron stars, pulsars, Synchrotron radiation, Schwarzschild radius, black holes, stellar remnants in binary systems.*

1. Indicative Reading List

*An introduction to Modern Astrophysics; Carroll, B.W. & Ostlie, D.A. (2013)*

1. Learning and Teaching Methods, including the nature and number of contact hours and the total study hours which will be expected of students, and how these relate to achievement of the intended module learning outcomes

*Contact hours: 33 lectures (33 hours);*

*Total number of study hours 150 hrs (including private study time)*

*Achievement of module learning outcomes:*

* *Lectures (11.1-11.3, 11.6, 2.1,2.2)*
* *Self-study (11.1-11.8, 12.1, 12.2)*

1. Assessment methods and how these relate to testing achievement of the intended module learning outcomes

*Coursework (class tests) 30%*

*Final (written, unseen, length 2 hours) exam 70%*

*The above assessments test students’ knowledge and understanding of the laws and principles of astronomy, astrophysics and space science (11.1, 11.2, 11.6, 12.2) and application of techniques to model behaviour and solve problems (11.3, 11.4, 11.5, 11.7, 2.1). In preparing for the assessments, students will need to manage their own revision using reference materials (11.8, 12.2).*

1. Implications for learning resources, including staff, library, IT and space

*None.*

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 support service, and specialist support will be provided where needed.
2. Campus where module will be delivered:

*Canterbury*