AS2101 - Astronomy and Astrophysics 2 - Compressed

Credits: 15.0  Semester: 2
Number of Lectures: 36  Lecturer: Prof Andrew Cameron with Dr Christiane Helling and Prof Keith Horne
Academic Year: 2016-17

Overview
This module is run in tandem with AS2001 for the benefit of students wishing/needing to take pre-honours Astrophysics 2 in their JH year.
The module comprises three of the four lecture courses of AS2001 which extend knowledge gained in the first level module AS1001, and discuss recent developments in the subject: (i) the structure and evolution of stars - nucleosynthesis, stellar properties as a function of age, a complete understanding of the HR diagram; (ii) the formation, evolution and observational characterisation of exoplanetary systems; (iii) galactic astronomy - the distribution and motion of stars, gas, dust, and dark matter in our Milky Way and other galaxies.
AS2101 students participate in tutorial groups but do not do the practical laboratory work normally associated with the AS2001 module.

Aims & Objectives
To introduce students to a broad range of topics across modern astrophysics. To develop problem solving skills through tutorials.

Learning Outcomes
Familiarity with a broad range of topics in modern astrophysics. Ability to formulate and solve quantitative problems by applying physical concepts and mathematical tools up to the level of differential and integral calculus to astrophysical systems.

Synopsis
Exoplanetary science (12 lectures)
Building on earlier work in the module, this course looks at the formation of planets in circumstellar accretion discs and the implication for internal structures of gas-giant and terrestrial-like planets. Theoretical models and observational techniques are discussed.

Stellar Structure and Evolution (12 lectures)
The determination and distribution of stellar masses, radii and luminosities; the Hertzsprung-Russell diagram, mass-luminosity law and Vogt-Russell theorem. Sources of stellar energy, nucleosynthesis of hydrogen, helium and carbon. Star formation and evolution; the ages of star clusters; supernova events and the synthesis of heavy elements. Final states - white dwarfs, neutron stars (pulsars) and black holes. The evolution of binary stars - Roche lobe overflow, accretion discs and novae.

Galactic Astronomy (12 lectures)
This course will investigate the distribution and motions of stars, gas and dust within our own galaxy in order to determine its dimensions and overall properties. Properties of other galaxies will be discussed. Topics include: galactic coordinate systems; the solar motion and distribution of stellar velocities; differential galactic rotation, the rotation velocity at the Sun and the distance to the Galactic Centre; rotation curves of the Milky Way and other galaxies; galaxy masses and "dark" matter.

Pre-requisites
AS1001 or AS1101, PH2011 and MT1002; alternatively (for the PH and MT modules) passes in Advanced Higher Physics and Mathematics or in A-level Physics and Mathematics, both normally at grade A.

Anti-requisites
AS2001

Assessment
Class Tests = 20%, 2 Hour Examination = 80%

Additional information on continuous assessment etc
Accreditation Matters
This module may not contain material that is part of the IOP “Core of Physics”, but does contribute to the wider and deeper learning expected in an accredited degree programme. The skills developed in this module, and others, contribute towards the requirements of the IOP “Graduate Skill Base”.

Recommended Books
Please view University online record: 
http://resourcelists.st-andrews.ac.uk/modules/as2101.html

General Information
Please also read the additional information in the School’s pre-honours handbook.