School of Physics & Astronomy

Astronomy (AS) Modules

AS1001 Astronomy and Astrophysics 1

SCOTCAT Credits:	20	SCQF Level 7	**Semester:**	1
Academic year:	2016/7 & 2017/8			
Planned timetable:	11.00 am lectures, one afternoon chosen from Mon, Wed and Fri with tutorial 2.00 pm - 3.00 and lab 3.00 pm - 5.30 pm			
This module surveys our present state of knowledge of the orbits, surfaces and atmospheres of the planets in our solar system; the structure and evolution of the Sun and other stars, including extra-solar planetary systems; the bizarre menagerie of star-forming regions, violent stellar objects and supermassive black holes found within our own Milky Way Galaxy and in other galaxies; and the large-scale structure and ultimate fate of the expanding Universe. Throughout the module, fundamental observations are interpreted using mathematical models to show how distances and other properties of astronomical objects throughout the Universe have been measured, from the time of Copernicus to the era of the Hubble Telescope and beyond.				
Programme module type:	AS1001 or AS1101 is compulsory for Astrophysics			
Pre-requisite(s):	SQA Higher or A-Level Physics and Mathematics, at grade B or better		**Anti-requisite(s):**	AS1002, AS1101
Required for:	AS2001, AS2101			
Learning and teaching methods and delivery:	**Weekly contact**: 4 or 5 lectures, 1 tutorial and 1 x 2.5-hour laboratory.			
	Scheduled learning: 90 hours		**Guided independent study:** 110 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 60%, Practical Examinations = 0%, Coursework = 40%			
	As used by St Andrews: 2-hour Written Examination = 60%, Class Tests = 15%, Laboratory work = 25%			
Re-Assessment pattern:	2-hour Written Examination = 75%, Existing Laboratory work = 25%			
Module Co-ordinator:	Dr A Scholz			
Lecturer(s)/Tutor(s):	Dr A Scholz, Prof M Jardine, Dr C Cyganowski, Dr R Tojeiro			

AS1002 The Physical Universe

SCOTCAT Credits:	20	SCQF Level 7	**Semester:**	2
Academic year:	2016/7 & 2017/8			
Planned timetable:	11.00 am			
This module presents a descriptive, largely non-mathematical account of the physical universe. It is aimed at students from across the University. It is divided into two components: concepts in astronomy, dealing with our understandings of the properties and ages of planets, stars, galaxies, and their distributions in space, cosmology and the origin of the Universe; and concepts in physics, dealing with our understandings of the nature of light and matter, the structure of atoms, fundamental particles and their links to cosmology.				
Programme module type:	Available to any degree programme.			
Anti-requisite(s):	AS1001, AS1101, AS2001, AS2012, PH1011, PH1012, PH2011, PH2012			
Learning and teaching methods and delivery:	**Weekly contact**: 4 lectures, 1 tutorial/seminar.			
	Scheduled learning: 43 hours		**Guided independent study:** 157 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 50%, Practical Examinations = 0%, Coursework = 50%			
	As used by St Andrews: 2-hour Written Examination = 50%, Coursework (2 x Class Tests) = 50%			
Re-Assessment pattern:	2-hour Written Examination = 100%			
Module Co-ordinator:	**Dr M Dominik**			
Lecturer(s)/Tutor(s):	**Dr M Dominik, Dr H Zhao**			

AS1101 Astrophysics (Direct Entry)

SCOTCAT Credits:	5	SCQF Level 7	**Semester:**	1
Academic year:	2016/7 & 2017/8			
Availability restrictions:	Available only to Direct Second level Entry students in Physics or Astrophysics			
Planned timetable:	11.00 am (4 hours of lectures/tutorials every 2 weeks (weeks 1 - 8)			
This module provides a streamlined introduction to the science of astrophysics for students who have taken direct entry to Second level and who are planning to take level two astrophysics later in the same academic session. It covers the essential items of observational astrophysics and how the radiation that is detected on Earth can be used to develop a physical model of the Sun, stars, planets, our Galaxy and external galaxies as well as the Universe as a whole. Topics will include stellar evolution, the rotation curves of galaxies and the need for Dark Matter as well as the expanding Universe, Dark Energy and cosmology.				
Programme module type:	Compulsory for Direct Entry to Second Year students in Astrophysics BSc and MPhys			
Pre-requisite(s):	Direct entry to level two at the University of St Andrews with a degree intention of Astrophysics, Physics, Theoretical Phyiscs or a joint degree with one of these.			
Co-requisite(s):	PH2011		**Anti-requisite(s):**	AS1001, AS1002
Learning and teaching methods and delivery:	**Weekly contact**: 1.5-hour lecture (x 8 weeks), 3-hour practical work (x 2 weeks) 1-hour tutorial (x 4 weeks)			
	Scheduled learning: 22 hours		**Guided independent study:** 28 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 75%, Practical Examinations = 0%, Coursework = 25%			
	As used by St Andrews: Coursework (Class test = 50%, laboratory work=25%, take-home exam = 15%, online quizzes = 10%) = 100%			
Re-Assessment pattern:	1-hour Written Examination = 75%, Existing Laboratory work = 25%			
Module Co-ordinator:	Dr A-M Weijmans			
Lecturer(s)/Tutor(s):	Dr A-M Weijmans			

AS2001 Astronomy and Astrophysics 2

SCOTCAT Credits:	30	SCQF Level 8	**Semester:**	2
Academic year:	2016/7 & 2017/8			
Planned timetable:	11.00 am lectures, Tue or Fri afternoons 2.00 pm - 3.00 pm tutorial and 3.00 pm - 5.30 pm lab			
This module comprises four lecture courses which extend knowledge gained in the first level module AS1001, and discuss recent developments in the subject: (i) observational techniques - modern telescopes; instruments and detectors for gamma-, X-, uv, optical, IR and radio radiation; spherical astronomy and essential coordinate systems; (ii) the structure and evolution of stars - nucleosynthesis, stellar properties as a function of age, a complete understanding of the HR diagram; (iii) exoplanetary science - theoretical and observational studies of planetary systems beyond our own; (iv) galactic astronomy - the distribution and motion of stars, gas, dust, and dark matter in our Milky Way and other galaxies.				
Programme module type:	Compulsory for Astrophysics (First Year Entry)			
Pre-requisite(s):	AS1001 or AS1101, PH1011, PH1012 and MT1002.		**Anti-requisite(s):**	AS2101
Required for:	Either AS2001 or AS2101 is required for AS3013, AS4010, AS4011, AS4021, AS4022, AS4023, AS4025,AS5003.			
Learning and teaching methods and delivery:	**Weekly contact**: 4 lectures, 1 tutorial and 1 x 2.5-hour laboratory session.			
	Scheduled learning: 78 hours		**Guided independent study:** 222 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 60%, Practical Examinations = 0%, Coursework = 40%			
	As used by St Andrews: 3-hour Written Examination = 60%, 2 x Class Tests = 15%, Laboratory work = 25%			
Re-Assessment pattern:	3-hour Written Examination = 75%, Existing Laboratory work = 25%			
Module Co-ordinator:	Prof A Cameron			
Lecturer(s)/Tutor(s):	Prof A Cameron, Prof K Horne, Dr C Helling, Dr Cyganowski			

AS2101 Astrophysics 2

SCOTCAT Credits:	15	SCQF Level 8	**Semester:**	2
Academic year:	2016/7 & 2017/8			
Availability restrictions:	Normally available only to those who took “direct entry” to second year			
Planned timetable:	11.00 am lectures, plus Tue or Fri 2.00 pm - 3.00 pm tutorial			
This module is designed to extend the knowledge gained in the first level AS1001 or AS1101 module and to prepare the way for more advanced material appearing in the honours astrophysics modules. The module has three basic components dealing with the physics of stellar structure and evolution, the components and dynamics of galaxies, and exoplanetary science - theoretical and observational studies of planetary systems beyond our own . The module is based on the physical principles and mathematical techniques acquired earlier, and applied to the astrophysical concepts covered in AS1001 or AS1101.				
Programme module type:	Compulsory for Astrophysics (Direct Second Year Entry)			
Pre-requisite(s):	AS1001 or AS1101, MT1002, PH2011		**Anti-requisite(s):**	AS2001
Required for:	Either AS2001 or AS2101 is required for AS3013, AS4010, AS4011, AS4021, AS4022, AS4023, AS4025,AS5003.			
Learning and teaching methods and delivery:	**Weekly contact**: 3/4 lectures and 1 tutorial.			
	Scheduled learning: 45 hours		**Guided independent study:** 105 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 80%, Practical Examinations = 0%, Coursework = 20%			
	As used by St Andrews: 2-hour Written Examination = 80%, 2 x Class Tests = 20%			
Re-Assessment pattern:	2-hour Written Examination = 100%			
Module Co-ordinator:	Prof A Cameron			
Lecturer(s)/Tutor(s):	Prof A Cameron, Dr C Helling, Prof K Horne			

Physics (PH) Modules

PH1011 Physics 1A

SCOTCAT Credits:	20	SCQF Level 7	**Semester:**	1
Academic year:	2016/7 & 2017/8			
Planned timetable:	12.00 noon lectures, one afternoon from five each week, 2.00 pm - 3.00 pm tutorial and 3.00 pm -5.30 pm lab			
This module covers the core subjects of mechanics, waves and optics, and also provides an overview of the physical properties of matter. It is suitable for those who have studied physics to the level of Higher Physics or equivalent. It includes lectures on Newton's laws, work and energy, simple harmonic motion, the different types of wave motion, geometrical and wave optics, and the nature and composition of nuclei, atoms, molecules and solids, and their interactions. Relevant laboratory work is an important part of the module.				
Programme module type:	Compulsory for Astrophysics, Single and Joint Honours Physics, Single and Joint Honours Theoretical Physics (First Year Entry)			
Pre-requisite(s):	SQA Higher or A-Level Physics and Mathematics, both at grade B or better, or equivalent.		**Anti-requisite(s):**	AS1002
Learning and teaching methods and delivery:	**Weekly contact**: Typically 4 lectures, 1 problem-solving workshop, 1 tutorial and 1 x 2.5-hour laboratory.			
	Scheduled learning: 88 hours		**Guided independent study:** 112 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 60%, Practical Examinations = 0%, Coursework = 40%			
	As used by St Andrews: 2-hour Written Examination = 60%, Class Test = 15%, Laboratory Work = 25%			
Re-Assessment pattern:	2-hour Written Resit Examination = 60%, combined with existing Laboratory Work = 25%, existing Class Test = 15%			
Module Co-ordinator:	**Dr P Woitke**			
Lecturer(s)/Tutor(s):	**Dr P Woitke,** Dr B D Sinclair, Prof M Gather , **Dr C Rae**			

PH1012 Physics 1B

SCOTCAT Credits:	20	SCQF Level 7	**Semester:**	2
Academic year:	2016/7 & 2017/8			
Planned timetable:	12.00 noon lectures; One afternoon from up to five per week, 2.00 pm - 3.00 pm tutorial, 3.00 pm - 5.30 pm lab			
This module covers an introduction to quantum mechanics, the mechanics of rotation and gravity and an introduction to lasers. The module is suitable for those who have studied physics to the level of Higher Physics or equivalent. It includes lectures on the origins of quantum theory, its application to atoms and other small-scale systems; the principles of lasers, and some aspects of optical communication. The module also includes a set of group-based activities associated with the use of physics ideas to solve an interesting problem. Relevant laboratory work is an important part of the module.				
Programme module type:	Compulsory for Astrophysics, Single and Joint Honours Physics, Single and Joint Honours Theoretical Physics (First Year Entry)			
Pre-requisite(s):	PH1011		**Anti-requisite(s):**	AS1002
Learning and teaching methods and delivery:	**Weekly contact**: Typically 4 lectures, 1 workshop, 1 tutorial and 1 x 2.5 hr laboratory. Group Discovery Project replaces some lectures for part of the semester.			
	Scheduled learning: 78 hours		**Guided independent study:** 122 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 50%, Practical Examinations = 0%, Coursework = 50%			
	As used by St Andrews: 2-hour Written Examination = 50%, Class Test = 10%, Laboratory work = 25%, Group Discovery Project = 15%			
Re-Assessment pattern:	2-hour Written Resit Examination = 50%, combined with existing Laboratory work = 25%, and existing Group Discovery Project = 15%, existing class test 10%			
Module Co-ordinator:	Dr G P Wahl			
Lecturer(s)/Tutor(s):	**Dr G P Wahl,** Dr L J Hadfield, Dr T Brown, Dr D Cassettari, **Dr C Rae**			

PH1501 Mathematics for Physicists 1A

SCOTCAT Credits:	20	SCQF Level 7	**Semester:**	1
Academic year:	2016/7 & 2017/8			
Availability restrictions:	Available only to those on the Physics and Astronomy (Gateway) Programme and the Physics and Astronomy International Gateway Programme.			
Planned timetable:	To be arranged.			
This module is designed to give physics students a secure base in elementary calculus and other mathematical tools to enable them to access the mathematics modules needed for progression into physics and astronomy degrees. Participants will learn to use this mathematics effectively and efficiently in the context of work in physics. Some of the work is a revision and practice of material that will normally have been seen in the Scottish Higher and some A-Level maths syllabuses. The content is similar to that in MT1001 and will allow students to progress to MT1002 in semester 2.				
Programme module type:	Physics and Astronomy (Gateway) Programme Physics and Astronomy International Gatway Programme			
Pre-requisite(s):	Entry to Physics and Astronomy (Gateway) or International Gateway Programmes.		**Anti-requisite(s):**	MT1001
Co-requisite(s):	PH1011, PH1502			
Learning and teaching methods and delivery:	**Weekly contact**: 5 lectures, 1 tutorial and 1 workshop.			
	Scheduled learning: 77 hours		**Guided independent study:** 123 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 50%, Practical Examinations = 0%, Coursework = 50%			
	As used by St Andrews: 2-hour Written Examination = 50%, Coursework = 50%			
Re-Assessment pattern:	2-hour Written Examination = 100%			
Module Co-ordinator:	Dr L Hadfield			
Lecturer(s)/Tutor(s):	Dr L Hadfield, **Dr G Smith**			

PH1502 Physics Skills 1A

SCOTCAT Credits:	20	SCQF Level 7	**Semester:**	1
Academic year:	2016/7 & 2017/8			
Availability restrictions:	Available only to those on the Physics and Astronomy (Gateway) Programme and the Physics and Astronomy International Gateway Programme			
Planned timetable:	To be arranged.			
This module develops academic and transferable skills in problem-solving, team-working, information retrieval and analysis, and study skills. It is a core module of the level one programme "Physics and Astronomy (Gateway)".				
Programme module type:	Physics and Astronomy (Gateway) Programme Physics and Astronomy International Gateway Programme			
Pre-requisite(s):	Entry to Physics and Astronomy (Gateway) or International Gateway Programme			
Co-requisite(s):	PH1011			
Learning and teaching methods and delivery:	**Weekly contact**: 2 lectures, 3 x 1.25-hour workshops, 1 x 3-hour lab, 1 x 2-hour supported study session.			
	Scheduled learning: 118 hours		**Guided independent study:** 82 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 0%, Practical Examinations = 0%, Coursework = 100%			
	As used by St Andrews: Coursework = 100%			
Re-Assessment pattern:	60% new assignments, 40% marks for the assignments that make up the first assessment specification of the module.			
Module Co-ordinator:	Dr L Hadfield			
Lecturer(s)/Tutor(s):	Dr L Hadfield, Dr G Smith, **Dr J Lovett, Dr Weijmans**			

PH1503 Physics Skills 1B

SCOTCAT Credits:	20	SCQF Level 7	**Semester:**	2
Academic year:	2016/7 & 2017/8			
Availability restrictions:	Available only to those on the Physics and Astronomy (Gateway) Programme and the Physics and Astronomy International Gateway Programme			
Planned timetable:	To be arranged.			
This module develops academic and transferable skills in problem solving in physics, in mathematical modelling of physical systems, in numerical/computational work applied to physics, and in study skills. It is a core module for the level one programme "Physics and Astronomy (Gateway)".				
Programme module type:	Physics and Astronomy (Gateway) Programme Physics and Astronomy International Gateway Programme			
Pre-requisite(s):	Entry to Physics and Astronomy (Gateway) or International Gateway Programme			
Co-requisite(s):	PH1012			
Learning and teaching methods and delivery:	**Weekly contact**: 2 lectures, 3 x 1.25-hour workshops, 1 x 3-hour lab, 1 x 2-hour supported study session			
	Scheduled learning: 118 hours		**Guided independent study:** 82 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 0%, Practical Examinations = 0%, Coursework = 100%			
	As used by St Andrews: Coursework = 100%			
Re-Assessment pattern:	60% new assignments, 40% marks for the assignments that make up the first assessment specification of the module.			
Module Co-ordinator:	Dr L Hadfield			
Lecturer(s)/Tutor(s):	Dr L Hadfield, Dr G Smith, **Dr J Lovett**			

PH2011 Physics 2A

SCOTCAT Credits:	30	SCQF Level 8	**Semester:**	1
Academic year:	2016/7 & 2017/8			
Planned timetable:	10.00 am lectures; one problem solving workshop and lab chosen from Tue, Thu or Fri (2.00 pm - 5.30 pm); one tutorial to be arranged.			
This module covers the subjects of mechanics, special relativity, oscillations, and thermal physics. It is suitable for those who have taken the specified first year modules in physics and mathematics, or have good Advanced Higher or A-level passes or equivalent in physics and mathematics. It includes lectures on the dynamics of particles and rigid bodies, Einstein's special theory of relativity, free, forced and damped harmonic motion, and lectures on thermal physics including elementary thermodynamics and the notion of entropy.				
Programme module type:	Compulsory for Astrophysics, Single and Joint Honours Physics, Single and Joint Honours Theoretical Physics			
Pre-requisite(s):	PH1011, PH1012 and MT1002; alternatively passes in Advanced Higher Physics and Mathematics or A-Level Physics and Mathematics, both normally at grade A or equivalent.			
Anti-requisite(s):	AS1002	**Required for:**	PH3073, PH4038 and all other honours modules in physics and astronomy	
Learning and teaching methods and delivery:	**Weekly contact**: 4 or 5 lectures, 1 workshop, 1 tutorial and 1 x 2.5-hour laboratory.			
	Scheduled learning: 99 hours		**Guided independent study:** 201 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 60%, Practical Examinations = 0%, Coursework = 40%			
	As used by St Andrews: 3-hour Written Examination = 60%, Class Test = 10%, Laboratory work = 25%, lectures and pre-lecture questions = 5%			
Re-Assessment pattern:	3-hour Written Resit Examination = 60%, combined with existing Class Test = 10%, Laboratory Work = 25%, and lecture and pre-lecture questions = 5%.			
Module Co-ordinator:	Dr P Cruickshank			
Lecturer(s)/Tutor(s):	Dr P Cruickshank, Dr G Smith, Prof S Lee, Dr C Baily, Dr I Leonhardt, **Dr C Rae**			

PH2012 Physics 2B

SCOTCAT Credits:	30	SCQF Level 8	**Semester:**	2
Academic year:	2016/7 & 2017/8			
Planned timetable:	10.00 am lectures; one problem solving workshop and lab chosen from Tue, Thu or Fri (2.00 pm - 5.30 pm); one tutorial to be arranged.			

This module covers the subjects of quantum physics, electricity and magnetism and classical waves. It is suitable for those who have taken the specified first year modules in physics and mathematics, or have good Advanced Higher or A-Level passes or equivalent in physics and mathematics. It includes lectures on the origin of Schrödinger's equation in quantum mechanics and its solution for simple one-dimensional potentials; an elementary introduction to the electromagnetic field comprising electrostatics, magnetostatics, electromagnetic induction and circuit theory; and lectures on waves, acoustics, polarisation of light, and interference.

Programme module type:	Compulsory for Astrophysics, Single and Joint Honours Physics, Single and Joint Honours Theoretical Physics	
Pre-requisite(s):	PH2011*. Also PH1011, PH1012 and MT1002; alternatively passes in Advanced Higher Physics and Mathematics or A-Level Physics and Mathematics, both normally at grade A. *the School may be willing to waive in special cases.	
Required for:	AS4010, AS4011, PH3007, PH3081, PH3082, PH4022, and all other AS and PH modules at levels 3, 4, and 5.	
Learning and teaching methods and delivery:	**Weekly contact**: 4 or 5 lectures, 1 workshop, 1 tutorial and 1 x 2.5-hour laboratory.	
	Scheduled learning: 98 hours	**Guided independent study:** 202 hours
Assessment pattern:	**As defined by QAA:** Written Examinations = 60%, Practical Examinations = 0%, Coursework = 40%	
	As used by St Andrews: 3-hour Written Examination = 60%, Class Test = 10%, Laboratory work = 25% , lecture and pre-lecture questions = 5%	
Re-Assessment pattern:	3-hour Written Resit Examination = 60%, combined with existing Class Test = 10%, Laboratory Work = 25% and lecture and pre-lecture questions = 5%.	
Module Co-ordinator:	Dr P Cruickshank	
Lecturer(s)/Tutor(s):	Dr P Cruickshank, Dr C Baily, Dr B Sinclair, **Dr C Rae**	