School of Physics & Astronomy
Astronomy (AS) Modules

AS1001 Astronomy and Astrophysics 1

SCOTCAT Credits:	20	SCQF Level 7	**Semester:**	1
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 simple but powerful geometric methods 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:	Compulsory for Astrophysics			
Pre-requisite(s):	SQA Higher or A-Level Physics and Mathematics, at grade B or better			
Anti-requisite(s):	AS1002		**Required for:**	AS2001, AS2101
Learning and teaching methods and delivery:	**Weekly contact**: 4 or 5 lectures, 1 tutorial and 1 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: Laboratory work = 25%, Class Tests = 15%, 2-hour Written Examination = 60% Re-Assessment: Laboratory work = 25%, 2-hour Written Examination = 75%			
Module Co-ordinator:	Prof M M Jardine			
Lecturer(s)/Tutor(s):	Prof M M Jardine, Dr J Greaves, Prof I A Bonnell, Dr K Wood			

AS1002 The Physical Universe

SCOTCAT Credits:	20	SCQF Level 7	**Semester:**	2
Planned timetable:	11.00 am			
This module presents a descriptive, 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, PH1011, PH1012			
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: Coursework (2 Class Tests) = 50%, 2-hour Written Examination = 50% Re-Assessment: 2-hour Written Examination = 100%			
Module Co-ordinator:	Dr P A S Cruickshank			
Lecturer(s)/Tutor(s):	Dr P A S Cruickshank, Dr H Zhao, Dr J Greaves			

AS2001 Astronomy and Astrophysics 2

SCOTCAT Credits:	30	SCQF Level 8	**Semester:**	1
Planned timetable:	11.00 am lectures, Tue or Thu 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) the chemical evolution of the Universe - abundances from the Big Bang to the present; (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, PH1011, PH1012 and MT1002.		**Anti-requisite(s):**	AS2101
Required for:	AS3013, AS4010, AS4011, AS4021, AS4022, AS4023, AS4025. Either AS2001 or AS2101 is required for AS5003.			
Learning and teaching methods and delivery:	**Weekly contact**: 4 lectures, 1 tutorial and 1 laboratory.			
	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: Laboratory work = 25%, 2 Class Tests = 15%, 3-hour Written Examination = 60% Re-Assessment: Laboratory work = 25%, 3-hour Written Examination = 75%			
Module Co-ordinator:	Dr H Zhao			
Lecturer(s)/Tutor(s):	Dr H Zhao, Dr J Greaves, Dr V Wild, Dr K Wood			

AS2101 Astrophysics 2

SCOTCAT Credits:	15	SCQF Level 8	**Semester:**	1
Availability restrictions:	Normally available only to those who took “direct entry” to second year and who are currently in a Junior Honours programme in the School			
Planned timetable:	11.00 am lectures, plus Tue or Thu 2.00 pm -3.00 pm tutorial.			
This module is designed to extend the knowledge gained in the first level AS1001 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 the chemical evolution of the Universe including the synthesis of the elements. The module is based on the physical principles and mathematical techniques acquired earlier, and applied to the astrophysical concepts covered in AS1001.				
Programme module type:	Compulsory for Astrophysics (Direct Second Year Entry)			
Pre-requisite(s):	AS1001		**Anti-requisite(s):**	AS2001
Required for:	AS3013, AS4010, AS4011, AS4021, AS4022, AS4023, AS4025. AS2001 or AS2101 is also required for 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 Class Tests = 20%, 2-hour Written Examination = 80% Re-Assessment: 2-hour Written Examination = 100%			
Module Co-ordinator:	Dr H Zhao			
Lecturer(s)/Tutor(s):	Dr H Zhao, Dr V Wild, Dr K Wood.			

Physics (PH) Modules

PH1011 Physics 1A

SCOTCAT Credits:	20	SCQF Level 7	**Semester:**	1
Planned timetable:	12.00 noon lectures, one afternoon from five 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, Materials Chemistry, 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, at grade B or better.			
Anti-requisite(s):	AS1002			
Learning and teaching methods and delivery:	**Weekly contact**: 4 lectures, 1 workshop, 1 tutorial and 1 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: Laboratory Work = 25%, Class Test = 15%, 2-hour Written Examination = 60% Re-Assessment:2-hour Written Resit Examination = 60%, combined with existing Laboratory Work = 25%, Class Test = 15%			
Module Co-ordinator:	Dr C A T Brown			
Lecturer(s)/Tutor(s):	Dr C A T Brown, Dr L J Hadfield, Dr B D Sinclair			

PH1012 Physics 1B

SCOTCAT Credits:	20	SCQF Level 7	**Semester:**	2
Planned timetable:	12.00 noon lectures; One afternoon 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, Materials Chemistry, 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**: 4 lectures, 1 workshop, 1 tutorial and 1 laboratory.			
	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%, Laboratory work = 25%, and Group Discover Project = 15%, Class Test = 10% Re-Assessment: 2-hour Written Resit Examination = 50%, combined with existing Laboratory work = 25%, and Group Discover Project = 15%, Class Test = 10%			
Module Co-ordinator:	Dr C A T Brown			
Lecturer(s)/Tutor(s):	Dr C A T Brown, Dr L J Hadfield, Dr D Cassettari			

PH2011 Physics 2A

SCOTCAT Credits:	30	SCQF Level 8	**Semester:**	1
Academic year:	2012/3			
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, Materials Chemistry (or MT2001), 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.	
Required for:	PH3073, PH4038	
Learning and teaching methods and delivery:	**Weekly contact**: 4 or 5 lectures, 1 workshop, 1 tutorial and 1 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: Coursework (Laboratory work and workshops) = 30%, Class Test = 10%, 3-hour Written Examination = 60% Re-Assessment:3-hour Written Resit Examination = 60%, combined with existing Laboratory Work and Workshops = 30%, Class Test = 10%	
Module Co-ordinator:	Dr A S Kohnle	
Lecturer(s)/Tutor(s):	Dr A S Kohnle, Dr Frank Kruger, Dr G M Smith, Prof S L Lee	

PH2012 Physics 2B

SCOTCAT Credits:	30	SCQF Level 8	**Semester:**	2
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):	PH1011, PH1012 and MT1002; alternatively passes in Advanced Higher Physics and Mathematics or A-Level Physics and Mathematics, both normally at grade A. Normally PH2011 is taken before this module.	
Required for:	AS4010, AS4011, PH3007, PH3081, PH3082, PH4022. PH2012 or MT3601 is also required for AS5002.	
Learning and teaching methods and delivery:	**Weekly contact**: 4 or 5 lectures, 1 workshop, 1 tutorial and 1 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: Coursework (Laboratory work and workshops) = 30%, Class Test = 10%, 3-hour Written Examination = 60% Re-Assessment: 3-hour Written Resit Examination = 60%, combined with existing Laboratory Work and Workshops = 30%, Class Test = 10%	
Module Co-ordinator:	Dr A S Kohnle	
Lecturer(s)/Tutor(s):	Dr A S Kohnle, Dr C Hooley, Dr B D Sinclair	

Gateway to Physics and Engineering (PH) Modules

PH1501 Mathematics for Physicists 1A

SCOTCAT Credits:	20	SCQF Level 7	**Semester:**	1
Availability restrictions:	Available only to those on the Gateway to Physics and Engineering 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 engineering 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 syllabi.				
Programme module type:	Gateway to Physics and Engineering Programme			
Pre-requisite(s):	Entry to Gateway to Physics and Engineering Programme		**Anti-requisite(s):**	MT1001
Co-requisite(s):	PH1011, PH1502			
Learning and teaching methods and delivery:	**Weekly contact**: 5 lectures and 3 tutorials.			
	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: Coursework = 50%, 2-hour Written Examination = 50% Re-Assessment:2-hour Written Examination = 100%			
Module Co-ordinator:	Dr L J Hadfield			
Lecturer(s)/Tutor(s):	Dr L J Hadfield			

PH1502 Physics Skills 1A

SCOTCAT Credits:	20	SCQF Level 7	**Semester:**	1
Availability restrictions:	Available only to those on the Gateway to Physics and Engineering 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 "Gateway to Physics and Engineering".				
Programme module type:	Gateway to Physics and Engineering Programme			
Pre-requisite(s):	Entry to Gateway to Physics and Engineering Programme			
Co-requisite(s):	PH1011, PH1501			
Learning and teaching methods and delivery:	**Weekly contact**: 1 lecture and 5 tutorials.			
	Scheduled learning: 110 hours		**Guided independent study:** 90 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 0%, Practical Examinations = 0%, Coursework = 100%			
	As used by St Andrews: Coursework = 100%			
Module Co-ordinator:	Dr L J Hadfield			
Lecturer(s)/Tutor(s):	Dr L J Hadfield			

PH1503 Physics Skills 1B

SCOTCAT Credits:	20	SCQF Level 7	**Semester:**	2
Academic year:	2012/3			
Availability restrictions:	Available only to those on the Gateway to Physics and Engineering 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 "Gateway to Physics and Engineering".				
Programme module type:	Gateway to Physics and Engineering Programme			
Pre-requisite(s):	Entry to Gateway to Physics and Engineering Programme			
Co-requisite(s):	PH1012		**Anti-requisite(s):**	MT1001
Learning and teaching methods and delivery:	**Weekly contact**: 1 lecture and 5 tutorials.			
	Scheduled learning: 120 hours		**Guided independent study:** 80 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 0%, Practical Examinations = 0%, Coursework = 100%			
	As used by St Andrews: Coursework = 100%			
Module Co-ordinator:	Dr L J Hadfield			
Lecturer(s)/Tutor(s):	Dr L J Hadfield			