AS1001 Astronomy and Astrophysics 1

SCOTCAT Credits:	20	SCQF level 7	**Semester**	1
Academic year:	2020-2021			
Planned timetable:	11am online lectures, one 11am 'in room' workshop a week, one online tutorial a week 2pm, one online lab some weeks 3-5.30pm			
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.				
Pre-requisite(s):	The student must have Higher or A-Level (or equivalent) physics and mathematics at grade B or better			
Anti-requisite(s)	You cannot take this module if you take AS1002 or take AS1101			
Learning and teaching methods of delivery:	**Weekly contact**: 4 x 1 hr online lectures (A) x 10 weeks, 1 hr online tutorial (A) x 10 weeks, 2.5hr online lab (A) x 4 weeks, 1hr in-person workshop (C) x 10 weeks			
	Scheduled learning: 70 hours		**Guided independent study:** 130 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 coordinator:	Dr A Scholz			
Module teaching staff:	Dr Alexander Scholz Scholz; Dr Claudia Cyganowsk;, Prof Moira Jardine; Dr Rita Tojeiro			

AS1101 Astrophysics (Direct Entry)

SCOTCAT Credits:	5	SCQF level 7	**Semester**	1
Academic year:	2020-2021			
Availability restrictions:	Available only to Direct Second level Entry students in Physics or Astrophysics			
Planned timetable:	To be arranged			
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.				
Pre-requisite(s):	Direct entry to level two at the University of St Andrews with a degree intention of astrophysics, physics, theoretical physics or a joint degree with one of these.			
Anti-requisite(s)	You cannot take this module if you take AS1001 or take AS1002 or take PH1501			
Co-requisite(s):	You must also take PH2011			
Learning and teaching methods of delivery:	**Weekly contact**: 3 x 1hr online lectures (A) x 4 weeks, 1hr in-person tutorial (C) x 4 weeks, 1hr online workshop (A) x 4 weeks, 2.5hr online lab (A) x 2 weeks			
	Scheduled learning: 25 hours		**Guided independent study:** 25 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 coordinator:	Dr A Weijmans
Module teaching staff:	Dr Anne-Marie Weijmans; Dr Rita Tojeiro

AS2001 Astronomy and Astrophysics 2

SCOTCAT Credits:	30	SCQF level 8	**Semester**	2
Academic year:	2020-2021			
Planned timetable:	To be arranged			
This module comprises four lecture courses which extend knowledge gained in the first level AS1001 or AS1101 module, and discusses recent developments in the subject: "(i) observational techniques - modern telescopes; instruments and detectors for multiwavelength observations; 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.				
Pre-requisite(s):	Before taking this module you must (pass AS1001 or pass AS1101) and pass PH1011 and pass PH1012 and pass MT1002			
Anti-requisite(s)	You cannot take this module if you take AS2101			
Learning and teaching methods of delivery:	**Weekly contact**: 4 x 1hr online lectures (A) x 11 weeks, 1hr in-person tutorial (C) x 10 weeks, 1hr in-person workshop (C) x 10 weeks, 2.5hr online laboratory (A) x 9 weeks			
	Scheduled learning: 87 hours		**Guided independent study:** 213 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 coordinator:	Professor A C Cameron			
Module teaching staff:	Prof Andrew Cameron; Dr Kenny Wood; Dr Claudia Cyganowski; Dr Anne-Marie Weijmans			

AS2101 Astrophysics 2

SCOTCAT Credits:	15	SCQF level 8	**Semester**	2
Academic year:	2020-2021			
Availability restrictions:	Normally available only to those who took 'direct entry' to second year			
Planned timetable:	To be arranged			
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.				
Pre-requisite(s):	Before taking this module you must (pass AS1001 or pass AS1101) and pass MT1002 and pass PH2011			
Anti-requisite(s)	You cannot take this module if you take AS2001			
Learning and teaching methods of delivery:	**Weekly contact**: 3 x 1hr online lectures (A) x 11 weeks, 1hr in-person tutorial (C) x 10 weeks, 1 hr in-person workshop (C) x 7 weeks			
	Scheduled learning: 50 hours		**Guided independent study:** 100 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 100%, Practical Examinations = 0%, Coursework = 0%			
	As used by St Andrews: 2-hour Written Examination = 80%, 2 x Class Tests = 20%			
Re-assessment pattern:	2-hour Written Examination = 100%			
Module coordinator:	Professor A C Cameron			
Module teaching staff:	Prof Andrew Cameron; Dr Kenny Wood; Dr Anne-Marie Weijmans			

PH1011 Physics 1A

SCOTCAT Credits:	20	SCQF level 7	**Semester**	1
Academic year:	2020-2021			
Planned timetable:	To be arranged			
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.				
Pre-requisite(s):	Students must have Higher or A-Level physics and mathematics (both at grade B or better), or equivalent.			
Anti-requisite(s)	You cannot take this module if you take AS1002			
Learning and teaching methods of delivery:	**Weekly contact**: 4 x 1hr online lectures (A) x 10 weeks, 1hr problem-solving workshop (A) x 10 weeks, 1hr in-person tutorial (C) x 9 weeks, and 2 hr online lab work (A) x 10 weeks			
	Scheduled learning: 79 hours		**Guided independent study:** 121 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 75%, Practical Examinations = 0%, Coursework = 25%			
	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 coordinator:	Dr P Woitke			
Module teaching staff:	Dr Peter Woitke; Dr Janet Lovett; Dr Bruce Sinclair; Dr Cameron Rae			

PH1012 Physics 1B

SCOTCAT Credits:	20	SCQF level 7	**Semester**	2
Academic year:	2020-2021			
Planned timetable:	To be arranged			
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.				
Pre-requisite(s):	Before taking this module you must pass PH1011			
Anti-requisite(s)	You cannot take this module if you take AS1002			
Learning and teaching methods of delivery:	**Weekly contact**: 4 x 1hr online lectures (A) x 8 weeks, 1hr tutorial (C) x 10 weeks, 1hr workshop x 3 weeks, 2.5hr online and in-person laboratory (D, A) x10 weeks, Group Discovery Project 1 x 1hr x 2weeks + 2hr (online, A)			
	Scheduled learning: 74 hours		**Guided independent study:** 126 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 60%, Practical Examinations = 0%, Coursework = 40%			
	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 coordinator:	Dr H M Cammack			
Module teaching staff:	Dr Helen Cammack: Dr Carlos Penedo: Dr Lucy Hadfield: Prof Natalia Korolkova: Dr Sebastian Schulz: Dr Cameron Rae			

PH1501 Mathematics for Physicists 1A

SCOTCAT Credits:	20	SCQF level 7	**Semester**	1
Academic year:	2020-2021			
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.				
Pre-requisite(s):	Students must have gained entry to Physics and Astronomy (Gateway) or International Gateway programmes.			
Anti-requisite(s)	You cannot take this module if you take MT1001			
Co-requisite(s):	You must also take PH1011 and take PH1502			
Learning and teaching methods of delivery:	**Weekly contact**: 4 or 5 x 1hr online lectures x 10 weeks, 1hr tutorial x 10weeks, 4 x 1hr workshops x 11 weeks			
	Scheduled learning: 99 hours		**Guided independent study:** 101 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 70%, Practical Examinations = 0%, Coursework = 30%			
	As used by St Andrews: 2-hour Written Examination = 50%, Coursework (Class Tests, 20%, Other Coursework,30%) = 50%			
Re-assessment pattern:	2-hour Written Examination = 100%			
Module coordinator:	Dr I Leonhardt			
Module teaching staff:	Dr Irina Leonhardt			

PH1502 Physics Skills 1A				
SCOTCAT Credits:	20	SCQF level 7	**Semester**	1
Academic year:	2020-2021			
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).				
Pre-requisite(s):	Students must have gained entry to Physics and Astronomy (Gateway) or International Gateway programmes.			
Anti-requisite(s)	You cannot take this module if you take AS1101			
Co-requisite(s):	You must also take PH1011 and take PH1501			
Learning and teaching methods of delivery:	**Weekly contact**: 7.5hr in-person workshops (C) x 10 weeks , 2.5hr x 4 weeks laboratory sessions (D), 1.5hr online supported study session (A) x 10 weeks			
	Scheduled learning: 100 hours		**Guided independent study:** 100 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 coordinator:	Dr L J Jakeman			
Module teaching staff:	Dr Lucy Hadfield			

PH1503 Physics Skills 1B

SCOTCAT Credits:	20	SCQF level 7	**Semester**	2
Academic year:	2020-2021			
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).				
Pre-requisite(s):	Students must have gained entry to Physics and Astronomy (Gateway) or International Gateway programmes.			
Co-requisite(s):	You must also take PH1012			
Learning and teaching methods of delivery:	**Weekly contact**: Weekly contact: 7.5hr x 11 weeks workshops (C), 3hr laboratory sessions (D) x 10 weeks, 1.5hr online supported study session (A) x 10 weeks			
	Scheduled learning: 127 hours		**Guided independent study:** 72 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 coordinator:	Dr L J Jakeman			
Module teaching staff:	Dr Lucy Hadfield			

PH2011 Physics 2A

SCOTCAT Credits:	30	SCQF level 8	**Semester**	1
Academic year:	2020-2021			
Planned timetable:	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.				
Pre-requisite(s):	Students should have passed PH1011, PH1012 and MT1002 or have passes in Advanced Higher physics and mathematics or A-Level physics and mathematics, both normally at grade A or equivalent.			
Anti-requisite(s)	You cannot take this module if you take AS1002			
Learning and teaching methods of delivery:	**Weekly contact**: 4 or 5 x 1hr online lectures (A) x 10 weeks, 1 hr tutorial (C) x 9 weeks, 2.5-hr laboratory (A,D) x 7 weeks or 2.5-hr laboratory (A) x 9 weeks.			
	Scheduled learning: 76 hours		**Guided independent study:** 223 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 70%, Practical Examinations = 0%, Coursework = 30%			
	As used by St Andrews: 3-hour Written Examination = 60%, Class Test = 10%, Laboratory work = 25%, online quizzes = 5%			
Re-assessment pattern:	3-hour Written Resit Examination = 60%, combined with existing Class Test = 10%, Laboratory Work = 25%, and lecture and pre-online quizzes = 5%			
Module coordinator:	Professor G A Turnbull			
Module teaching staff:	Dr Helen Cammack; Dr Irina Leonhardt; Dr Lucy Hadfield; Dr Graham Smith; Dr Charles Baily; Dr Cameron Rae			

PH2012 Physics 2B

SCOTCAT Credits:	30	SCQF level 8	**Semester**	2
Academic year:	2020-2021			
Planned timetable:	To be arranged			
This module covers the subjects of quantum physics, electricity and magnetism and classical waves. It includes lectures on the origin of Schroedinger'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.				
Pre-requisite(s):	Before taking this module you must pass PH2011			
Learning and teaching methods of delivery:	**Weekly contact**: 4 or 5 x 1hr online lectures (A) x 11 weeks, 1 hr tutorial (C) x 10 weeks, 2.5-hr laboratory (A,D) x 10 weeks.			
	Scheduled learning: 87 hours		**Guided independent study:** 223 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 70%, Practical Examinations = 0%, Coursework = 30%			
	As used by St Andrews: 3-hour Written Examination = 60%, Class Test = 10%, Laboratory work = 25%, online quizzes = 5%			
Re-assessment pattern:	3-hour Written Resit Examination = 60%, combined with existing Class Test = 10%, Laboratory Work = 25%, and online quizzes = 5%			
Module coordinator:	Professor G A Turnbull			
Module teaching staff:	Dr Helen Cammack; Dr Bruce Sinclair; Dr Paul Cruickshank; Dr Charles Baily; Dr Cameron Rae			