Physics & Astronomy

Degree options in the Faculty of Science

BSc (Single Honours Degrees)
Astrophysics
Physics

MPhys (Integrated Masters Degrees)
Astrophysics
Physics
Theoretical Physics

BSc (Joint Honours Degrees)
Physics and one of:
Computer Science
Mathematics
Philosophy

MPhys (Joint Integrated Masters Degree)
Theoretical Physics and Mathematics

MSci (Joint Integrated Masters Degree)
Physics and Chemistry

Entrance Requirements

Obtaining the following grades will not guarantee you a place as we consider all aspects of every application, including the Personal Statement.

First Year Entry
SQA Highers and GCE A-Levels should include Physics and Mathematics
SQA Highers: AAAA
GCE A-Levels: AAA
International Baccalaureate Points: 38 including HL6 in Physics AND HL6 in Mathematics
For full Faculty Entrance Requirements, see page 53.
For further country-specific qualifications and pre-degree foundation programmes see: www.st-andrews.ac.uk/study/international

Second Year Entry
SQA Highers/Advanced Highers and GCE A-Levels should include Physics and Mathematics
SQA Highers: AAAA at Highers, and AA at Advanced Highers
GCE A-Levels: AAA
International Baccalaureate Points: 38 including HL6 in Physics AND HL6 in Mathematics
For full Faculty Entrance Requirements, see page 53.
For degrees combining more than one subject, the subject with the higher Entrance Requirements determines the grades you need. You will also need to meet any further subject-specific Entrance Requirements as outlined on their pages.

Physics and Astronomy (Gateway) and (International Gateway) Entry
For UK students with high academic potential but having experienced disadvantage, at least BBBB or ABBC at Highers, B88 at A-Level, in all cases to include Physics and Mathematics. Also for international students with high academic potential but with less access to advanced level qualifications.
Preference may be given to candidates offering strong science qualifications.

Do I need previous knowledge of this subject?
Yes, see above.

Subject enquiries

Dr Kenny Wood
E: physics@st-andrews.ac.uk

“I have loved my time here, both academically and socially. My courses are all really interesting and the lecturers are enthusiastic about their subjects. The highlight for me, so far, was the opportunity to work with researchers in Astrophysics during the summer months where I carried out research on galaxy models. This opportunity opened my eyes to the possibility of postgraduate study and developed my research and coding skills which have proved useful in many of my modules.”

Amy (Leven, Fife, Scotland)
“Studying Physics at St Andrews has been an incredibly rewarding experience. The lecturers are passionate and enthusiastic about the subject and their work. This creates an ideal learning environment alongside plenty of opportunities to be part of the ongoing research in the school. St Andrews has allowed me to experience many different areas of physics and meet like-minded people in an inspirational environment.”

Kimberley (Kinross, Scotland)

Features

* The nature of the School allows significant interaction amongst staff and students.
* The UK Research Excellence Framework 2014 has rated the quality of the School’s research (joint with Edinburgh) at third in the UK.
* Our programmes are particularly flexible offering a choice of entry and exit points.
* Entrants with good Advanced Highers /A-Levels may attain an Honours BSc in three years, or an MPhys in four.
* Our degrees have been accredited by the Institute of Physics.
* National and international recognition of the research work of some final year students.

Facilities and resources

Physics is thriving at St Andrews, with major research groups working in astronomy and astrophysics, laser physics and optoelectronics, biophotonics, quantum optics, magnetism and superconductivity, millimetre-wave techniques, semiconductor physics, and theoretical physics. Healthy numbers of well-qualified students join our BSc and MPhys programmes each year.

The strong research base in the School provides exciting opportunities to use high specification experimental apparatus. Almost all our teaching is done in the same building as our research labs and offices, which helps build the student and staff community in the School.

The University Observatory houses the largest optical research telescope in the UK, and is an active part of the exoplanet research programme.

You become part of a stimulating academic community, and can progress from the core modules of years one and two through to modules at the end of your studies that are at the frontiers of current knowledge. The final year project, which is usually undertaken within one of the research groups, is often a highlight of the degree programme. Recent projects have involved using data on terahertz radiation obtained from a world-class telescope to map out the surface of Pluto, optimising magnetic resonance imaging for diagnosis of cardiac disease, developing tools for probing atomic-scale properties of materials in our ultra-low vibration research laboratories, and modelling the interaction of photons with qubits.

In recent years there have been particularly striking developments in astronomy. Searches for planetary systems around stars other than the Sun are being successfully pursued. The theory and observation of star and planet formation is developing rapidly, as is our understanding of the galaxy population. In cosmology ‘dark matter’, ‘dark energy’ and alternative theories of gravity are key areas which are advancing rapidly.

Entry and exit points

A five-level structure is used in order to provide suitable entry points tailored to students with different backgrounds.

The final choice between BSc and the more advanced MPhys can usually be postponed until mid-way through third year.

First year entry has been designed for those entering straight from Scottish Highers, those wishing to experience the traditional broad-based first year at a Scottish university, and those on some Joint Honours degree programmes. If you have good Advanced Highers or A-Levels, and you are sure that you wish to study for a degree in physics, astrophysics, or the joint degrees with Mathematics, you are invited to enter directly into second year, from which point an Honours BSc degree lasts three years and an MPhys degree four years. Currently between a quarter and a half of our entrant students take this accelerated route. Further information is overleaf.

We have alternative entry routes entitled Physics and Astronomy (Gateway) and Physics and Astronomy (International Gateway). These give a specially tailored first year with about half of the modules taken from existing physics and maths modules, and half on new modules aimed specifically at students who have high academic potential but who have for various reasons not been able to demonstrate that fully in school-level examinations. The modules provide many contact hours of learning a week to develop maths and physics knowledge and associated academic skills. Success in first year opens up progression to the second year of the degree programmes in physics, astrophysics, maths/physics and others.
What will I study?

Indicative programme information

First Year
All students take the modules Physics 1A and Physics 1B. In addition, students aiming for the Astrophysics degree take Astronomy and Astrophysics 1 which presents a broad outline of the astronomical universe. You also take at least one module in Mathematics, as well as other modules of interest to give a total of 120 credits.

Second Year (second year for some, year of entry for others)
The main branches of physics are discussed in Physics 2A and Physics 2B. The module Astronomy and Astrophysics 2 is required for astronomers and is optional for others. It is intended to introduce you to advanced astrophysics material. Students take at least two 2000-level Mathematics modules and other modules to give usually a 120 credit total.

Honours (Third, Fourth and optionally Fifth Years)
In the two (BSc) or three (MPhys) Honours years the main branches of the degree subject are covered in considerable depth. You take some or all of the mainstream modules in quantum mechanics, physics of atoms, nuclear and particle physics, thermal and statistical physics, electromagnetism and solid state physics, and take additional modules in the appropriate specialist areas. Depending on the degree programme, these might include Extragalactic Astronomy, Computational Astrophysics, Physics of Electronic Devices, Signals and Information, Laser Physics, Special Relativity and Fields, and Fluids. In your final year, you carry out a research project which usually involves working with one of the research groups in the School.

The optional MPhys additional year contains a number of advanced modules chosen from topics that may include Biophotonics, Quantum Optics, Group Theory, Contemporary Astrophysics, Magnetofluids and Space Plasmas, as well as a major research project.

Study abroad
You may apply to study abroad under the University’s St Andrews Abroad programme. See page 46.

In addition, the Robert T Jones Trust currently funds one year of postgraduate Masters study at the prestigious Georgia Institute of Technology (Atlanta) for a selected person graduating from our School.

Typical class sizes and teaching information
First and Second Year: lectures 20 - 120, tutorials 4 - 8
Honours: lectures 5 - 80, third year tutorials 5 - 9

Laboratory work is usually undertaken in pairs in first year, individually in second year, and as a mixture of individual and pair/team work in the Honours labs.

In first year you will typically have Physics 1A or 1B as one third of your workload in a semester. In these modules you typically have four lectures a week, one problem-solving workshop, one small group (~7 students) tutorial, and 2.5 hours in the teaching laboratory. In second year you typically have Physics 2A or 2B as one half of your workload. In these modules you typically have five lectures a week, one problem-solving workshop, one small group (~5 students) tutorial, and 2.5 hours in the teaching laboratory. In the Honours years you typically have three lectures a week for each 15-credit lecture-based module. Laboratory modules take two afternoons a week for students on Physics and Astrophysics programmes. The final year projects last for a semester, full time for most MPhys students and 20 hours a week for most BSc students.
Typical methods of assessment
At 1000 and 2000 level, modules are assessed by at least 50% written examinations and a mixture of coursework (including laboratory work). At Honours level the assessment depends on the nature of the specific module.

Scholarships
There are several scholarships for students taking part in the Gateway and International Gateway programmes. There are also various scholarships available from the University that all students may apply for, see: www.st-andrews.ac.uk/physics/pandaweb/admiss/bursaries

Programme-specific fees
There are no additional fees for labs and the like in the School. Most students in the Transferable Skills for Physicists module are expected to attend the Burn Conference, and are asked to make a contribution (currently £30) towards the costs of the weekend away. In line with University policy, the School expects its students to purchase a number of textbooks as part of their study.

Careers
Graduates in any of these disciplines enjoy a wide range of career options, including research and development in industry and in Government agencies. Many find employment in fields not directly related to their degree subject, e.g. computing, software development, meteorology, biophysics, geophysics, banking and commerce, where their problem-solving skills and numeracy are in demand. Our School webpages include a number of ‘graduate profiles’ showing our graduates working as an investment manager in Brisbane, a photonics researcher in Japan, an “engineer in charge” on the fusion project JET, a physics teacher in Mallaig, a patent lawyer in London, and an accountant in Edinburgh. Other graduates are working in high-tech companies in the USA and UK, some have started up their own businesses in science and technology, and some are in the university sector doing research and teaching. Others carry out postgraduate research here, especially as the University offers a Recent Graduate Discount. For more information: http://bit.ly/sta-physicsgrads and http://bit.ly/sta-physics-careers

See also page 36 for details of the University’s Careers Centre.