"The interaction between staff and students in the School is informal yet respectful, and the modules are well thought through. One of my best experiences so far has been the opportunity last summer to work within a Condensed Matter research group; this has made me more enthusiastic than ever for my chosen degree path of Experimental Physics."

Alisa (Rickmansworth, Hertfordshire, England)
Why study Physics or Astronomy here?

- The nature of the School allows significant interaction amongst staff and students.
- Physics at St Andrews was rated top in the UK in the 2017 Guardian University Guide.
- The UK Research Excellence Framework 2014 has rated the quality of the School’s research (joint with Edinburgh) as 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.
- 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. Our degrees have been accredited by the UK Institute of Physics.

The University Observatory houses the largest operational 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 first and second year 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 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.

Our astronomy team played a major role in the collaboration that discovered the most Earth-like planet yet found outside our solar system. This artist’s impression is courtesy of the European Southern Observatory.
Physics & Astronomy (continued)

What will I study?

Physics / Astronomy element of your Honours degree
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, 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, 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.

Typical class sizes and teaching information
First and second year: lectures 20 - 150, 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, most modules are assessed by a mix of 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

Investigating the physics of a broadly tunable laser in the third-year photonics teaching laboratory.

The 16 inch Meade telescope at the University Observatory is used in teaching, and by the student Astronomical Society. The Observatory also houses the largest optical research telescope in the UK.

A student is setting up a sample on a scanning tunnelling microscope to explore the arrangement of atoms on the surface.
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.

Study abroad
You may apply to the University’s St Andrews Abroad programme. See page 22.

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.

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.

See also page 46 for details of the University’s Careers Centre.