Warwick's La Palma Observatory, with Gravitational wave Optical Transient Observer (GOTO) in the foreground.
If you like thinking about the universe, where it came from and where it is going, then Physics with Astrophysics is a great course to study.

At Warwick, you will join our diverse astrophysics community. The staff there will advise you and support your studies during your time with us.

Studying physics will help you to develop the analytical, practical and computing skills that will be valuable to you professionally. At a personal level, there is also the pleasure that will come from being able to understand the developments and opportunities, particularly in astrophysics, that are likely to occur during your lifetime.

There are two variants of the degree course: the three-year BSc and the four-year MPhys. BSc courses should be seen as part of a general rounded education, which should leave you numerate, articulate and employable. The four-year course should appeal most to you if you intend to make direct use of your knowledge of physics after you graduate.

Neil Wilson
Head of Undergraduate Admissions
THE PHYSICS WITH ASTROPHYSICS DEGREE
F3FA MPhys
F3F5 BSc

In astrophysics, we use ideas from the various parts of physics - electromagnetism, gravitation, theory of matter, mechanics, quantum theory - to explain what we can see. It’s like being a detective. There is what we observe (the evidence) and there is piecing it together (the thinking).

The first year, and a major part of the second year, cover skills and the fundamental principles. The principles of physics are fundamental in the sense that they apply to everything and will always do so - your counterparts in the next millennium will still be studying Newton’s laws and the laws of thermodynamics. They govern the way we move as much as they do the motion of galaxies and black holes.

One skill you will learn is how to analyse and interpret data, essentially how to separate a signal from its background. This is central to all quantitative investigations both within and outside physics.

In the second and later years, attention in the lecture modules moves away from principles and more towards how they explain the phenomena we observe. The laboratories include night-time (optical astronomy) and daytime (studying the sun) observation, the handling and processing of data, and spectroscopy. There are optional modules encouraging you to explore other areas of physics and modules from outside of physics.

If you stay for a fourth year, perhaps with a view to working as an astrophysicist, the astrophysics modules encourage you study up to the limits of our understanding within different sub-areas of astrophysics including exoplanets, galaxies, general relativity, and solar physics.

In your final year you will be completing research-style projects under the supervision of staff members working in the area of astrophysics. We are one of the two leading UK departments in exoplanets research and a leading department for solar plasma astrophysics. We also have an operational observatory on La Palma (a major astronomical site).

We are involved in collaborations studying compact objects - black holes, white dwarfs and neutron stars - as well as the large-scale properties of the Universe. Gravitational waves (GW) emitted by collisions between such compact objects have opened a new window in astronomy. GWs interact so weakly with matter that they were undetectable for over a century after Einstein predicted their existence as a consequence of his theory of General Relativity. Combining information from GWs with that from electromagnetic emission (light) and particle astrophysics will allow us to explore events not accessible before.
The first year is currently:
Mathematics for Physicists (60 Lectures), Classical Mechanics and Relativity (30L), Electricity and Magnetism (30L), Introduction to Astronomy (15L), Physics Foundations (30L), Quantum Phenomena (15L).

The skills modules include:
Astrophysics Laboratory I, Physics Skills and Programming Workshop.

Physics involves observing systems and identifying the principles which determine their behaviour. The module on classical mechanics illustrates this well. The laws of mechanics were deduced by Newton after studying observations of planetary motion. They apply to nearly all systems familiar from everyday life as well as many of the phenomena observed in stars and the other planets, some of which are also discussed in the module on astronomy.

The modules Classical Mechanics and Relativity, and Quantum Phenomena, deal with the breakdown of Newtonian mechanics at speeds close to the speed of light and at short (atomic) distances. Other modules treat material, which should in part be familiar from A-level (electricity and heat), but are able to illustrate it with more interesting examples and to bring out better the unifying concepts. The module on Astronomy introduces what we study in astrophysics (planets, stars and galaxies), how we classify them and how we observe them.

Measurement is central to physics and nearly all discoveries involve experiment. Time spent in the teaching laboratory helps you to develop the skills needed for measurement and the reliable interpretation of data.

You may also take other modules taught within the University under our ‘unusual option’ scheme. We encourage you to explore outside the field of physics. As well as exposing you to alternative ways of thinking, outside modules can help set physics into the context of science as a whole.
TIMETABLE

To give an impression of the weekly workload of lectures and tutorials, please see a typical timetable for the first five weeks of the second term.

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<th>First Year timetable (Term 2, weeks 1 to 5) - mornings</th>
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SECOND Year

Core

The modules on the Solar System and Stars introduce questions that have intrigued people throughout time. What are stars, how do they move and form, and where do our Sun and the planets fit into the story? The solar system is where we start. There is a lot of data to work with, as the Sun and planets are close, and we can even send observers (spacecraft) to observe them. Studying other stars in the Milky Way (our galaxy) and stars in other galaxies is harder work. Analysing the radiation (principally electromagnetic waves) that reaches us has allowed us to develop our understanding of the evolutionary history of stars and galaxies, and of the Universe as a whole.

In the astrophysics laboratory you will make measurements with both optical and radio telescopes, study spectroscopy and develop skill in data analysis. You will also work in a team on generic skills including website development, a poster presentation and writing.

You choose about four further modules (not all modules are the same length and those on offer may change over time) from:

Physics
Computational Physics, Geophysics, Hamiltonian Mechanics, Physics of Electrical Power Generation, Physics of Fluids.

Outside Options
Interdisciplinary modules like The Challenges of Climate Change, and modules from WBS (Warwick Business School), the Language Centre (Arabic, Chinese, French, German, Italian, Japanese, Portuguese, Russian and Spanish), and the Centre for Education (Introduction to Secondary School Teaching).
THIRD Year
BSc

You will work with a partner on a project chosen from a list of titles proposed by members of one of our astrophysics groups.

The project asks you to use many of the skills developed in years 1 and 2. You will be working on an unsolved question - one where it is not possible simply to look up the answer somewhere. You will need to plan how to find (or measure) relevant data, how to analyse the data and how to present the results. You will be working as members of a research group and interact with research students and research fellows as well as with your supervisor.

You take modules on the Quantum Physics of Atoms, Black Holes White Dwarfs and Neutron stars, Cosmology, and Communicating Science. Cosmology deals with questions about the origin of the Universe, where it is going and how it may get there. One of the questions addressed in the module is whether the Universe will continue to expand or ultimately contract. Relevant experimental data include those on the Cosmic Microwave Background radiation, the distribution of galaxies and the distribution of mass in the Universe.

You take about 4 further modules from (not all modules are the same length):

**Physics**

**Outside Options**
Modules from WBS, the Language Centre, the Mathematics, and other, departments.
Third Year MPhys

Opting for the MPhys allows you more time to study how what you have learnt can be applied to unsolved problems of physics.

This is particularly the motivation of the Astrophysics Group Project and Astrophysics Laboratory III. In the Group Project you work in groups of five or six to study an active area of research in astrophysics. You write a report and give a presentation on the current status of the field. In the laboratory, you complete longer observations, and need to perform more involved data analysis, than are possible in the 1st or 2nd year laboratories.

There is a core of compulsory lecture modules, which cover material that will be assumed in the fourth year, and you choose further modules from the list of options.

Core
Black Holes White Dwarfs and Neutron Stars, Cosmology, Electrodynamics, Plasma Electrodynamics, Quantum Physics of Atoms.

Options

“I studied Physics as an undergraduate at Warwick University, initially to focus on particle physics, but I was drawn in by the astrophysics lecture courses. The Astrophysics community is both world-leading in multiple areas of astrophysics, and a great, friendly place to learn and work. After a summer research project and my MPhys final year project within one of the astrophysics groups, I didn’t want to leave and started a PhD. I am now a Postdoctoral Research Fellow in the department, studying the remnants of planetary systems around dead stars known as white dwarfs, and I still don’t want to leave!”

Chris Manser
Warwick Graduate, now Postdoctoral Researcher in the Astronomy and Astrophysics Group
FOURTH Year

In the fourth year you will join one of the research groups and work as a member of a pair on a research-style project.

You will be working on a topic, which relates to questions of current interest, and will be supported by a member of staff active in that area of astrophysics. Your project will also give you experience of independent working - taking responsibility for the time spent on different aspects of the project, informing yourself of the background to the work, and writing a report. The report has to explain not just what your results are but also why they are interesting and what they imply. These are all skills that will be valuable to you, whether you choose to work as a scientist or not.

You will take between five and ten further modules (not all modules are the same length). At least four should be from List A.

List A

List B
Condensed Matter Physics II, Neutrino Physics, Relativistic Quantum Mechanics.

Outside Options
There is no formal list of outside options. However, you can follow modules from outside the department provided that the timetable permits this.

The List A options are those that are directly relevant to astrophysics. Solar MHD looks at current models of the Sun’s behaviour. The basic operation of the Sun is simple: Heat moves outwards from its source at the centre (nuclear fusion). However, on its way out, this energy drives many processes on many different length scales, many of which are not yet well understood. Exoplanets are now being discovered in large numbers and these discoveries are challenging existing theories of planet formation and evolution. The module looks at this rapidly developing field and addresses questions relating to habitability on these planets.
FIND OUT MORE

HOW TO APPLY
Applications are made through UCAS ucas.com

If you are made and accept an offer, and obtain the required grades in your exams we will confirm your place. We will look forward to welcoming you at the start of your life here at Warwick.

warwick.ac.uk/study/undergraduate/apply

OVERSEAS APPLICANTS
We welcome applications from international students. Local advice about the application procedure is available from all British Council offices and Warwick representatives.

warwick.ac.uk/study/international

STUDENT FEES AND FUNDING
We want to ensure that, wherever possible, financial circumstances do not become a barrier to studying at Warwick and therefore we provide extra financial support for qualifying students from lower income families. For more information about fees and funding for both home/EU and Overseas students see warwick.ac.uk/study/undergraduate/studentfunding

ACCOMMODATION
Warwick Accommodation has over 6000 rooms across a range of well-managed, self-catering residences. We also have an excellent network of support staff in the Residential Life Team.

warwick.ac.uk/accommodation

VISIT US
The university organise four open days in early summer and in autumn for students wishing to visit the university, including opportunities to visit the academic departments of your choice warwick.ac.uk/opendays

If you receive an offer from us, you will also be invited to one of our Offer Holder Days giving you a chance to learn more about the course and student life in the Department of Physics.

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This course information was accurate at the time of printing. Our course and module content and schedule is continually reviewed and updated to reflect the latest research expertise at Warwick, so it is therefore very important that you check the website for the latest information before you apply and when you accept an offer.