WARWICK
THE UNIVERSITY OF WARWICK

PHYSICS WITH ASTROPHYSICS

UNDERGRADUATE STUDY
2025/26

Warwick's La Palma Observatory, with Gravitational wave Optical Transient Observer (GOTO) in the foreground

PHYSICS WITH ASTROPHYSICS
Courses

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.

James Lloyd-Hughes
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 this means learning how to separate a signal from its background. This is central to all quantitative investigations.

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 to study up to the limits of current understanding. There are modules on the main 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 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.

FIRST Year

The first year is currently:

Mathematics for Physicists (60 Lectures), Classical Mechanics and Relativity (30L), Electricity and Magnetism (30L), Astronomy (30L), Physics Foundations (30L), Quantum Phenomena (30L).

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

Physics involves observing systems and identifying the principles that 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.

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, here is a typical timetable for the first five weeks of the second term.

The tutorials, examples classes and supervisions involve smaller groups and a lecturer or postgraduate student, working through examples sheets handed out in the lectures and discussing any problems with the material.

First Year timetable (Term 2, weeks 1 to 5) - mornings			
	10:05 - 10:55	11:05 - 11:55	12:05 - 12:55
Monday		Astronomy	Electricity and Magnetism
Tuesday	Astronomy		Mathematics for Physicists
Wednesday	Electricity and Magnetism	Mathematics for Physicists	Astronomy
Thursday	Astrophysics Laboratory I	Astrophysics Laboratory I	Astrophysics Laboratory I
Friday	Maths Tutorial	Programming Workshop	

First Year timetable (Term 2, weeks 1 to 5) - afternoons				
	13:05 - 13:55	14:05 - 14:55	15:05 - 15:55	16:05 - 16:55
Monday		Mathematics for Physicists		
Tuesday		Electricity and Magnetism		Tutorial
Wednesday				
Thursday	Astrophysics Laboratory I	Astrophysics Laboratory I	Astrophysics Laboratory I	
Friday		Physics Examples Class		

SECOND Year

Core

Astrophysics Laboratory II and Skills, Mathematical Methods for Physicists, Quantum Mechanics and its Applications, Stars and the Solar System, Statistical Mechanics, Electromagnetic Theory and Optics.

The module on Stars and the Solar System introduces questions that have always intrigued people. 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 skills in data analysis. You will also work in a team on generic skills including website development, a poster presentation and writing.

You choose at least two further modules from:

Physics Options

Computational Physics, Environmental Physics, Hamiltonian and Fluid Mechanics.

Outside Options

Interdisciplinary 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 one and two. You will be working on an unsolved question – one where it is not possible to simply 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, Galaxies and 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 includes those on the Cosmic Microwave Background radiation, the distribution of galaxies and the distribution of mass in the Universe.

You will take at least four further modules from:

Physics Options

Condensed Matter Physics, The Earth and its Atmosphere, Plasma Physics and Fusion, Physics of Life and Medicine, Scientific Computing.

Outside Options

Modules from WBS, the Language Centre, the Mathematics Institute, 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 perform more involved data analysis than in years one and two. You will also spend time in the Warwick observatory making night-time observations.

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

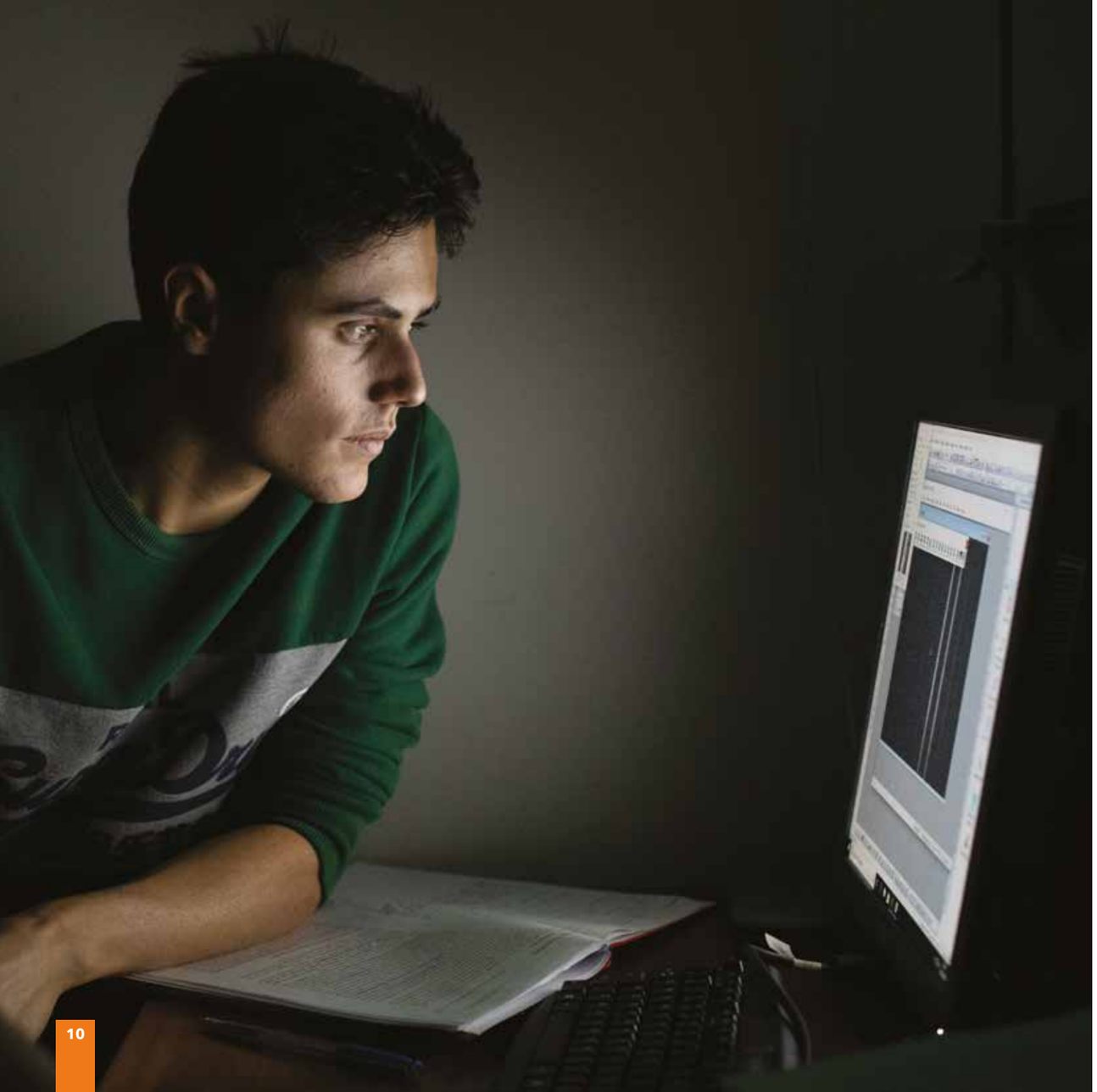
Black Holes, White Dwarfs and Neutron Stars, Electrodynamics, Galaxies and Cosmology, Mathematical Methods III, Quantum Physics of Atoms.

Options

Condensed Matter Physics, Fluid Dynamics, The Earth and its Atmosphere, Plasma Physics and Fusion, Scientific Computing, The Standard Model.

"I studied Physics as an undergraduate at Warwick, 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 became a Postdoctoral Research Fellow in the department, studying the remnants of planetary systems around dead stars known as white dwarfs, and am now a research fellow at Imperial College London."

Chris Manser
Warwick Graduate, now Research Fellow at Imperial College London



FOURTH Year MPhys

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 at least five further modules including at least four from List A.

List A

The Distant Universe; General Relativity; High Performance Computing in Physics; Planets, Exoplanets and Life; Solar and Space Physics.

List B

Advanced Quantum Theory; Condensed Matter Physics II; Quantum Computation and Simulation.

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. For example, Solar and Space Physics 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 processes of 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.

HOW TO APPLY

Everything you need to know about applying to Warwick is on our web pages. There is up-to-date information about:

- How to apply
- Writing your personal statement
- Key dates and deadlines
- How we process your application
- After you've applied

If you are made and accept an offer, and meet any outstanding conditions, we will confirm your place and look forward to warmly welcoming you at the start of your life here at Warwick.

OVERSEAS APPLICANTS

At Warwick, we welcome applications from across the globe, and have dedicated teams available to advise and support, as well as a global network of Agents and Representatives.

CONTEXTUAL OFFERS

We're committed to supporting students from diverse and under-represented backgrounds. We do this in a variety of ways, including through our contextual admissions policy which is designed to ensure fairness in our admissions processes.

FEES AND FUNDING

We want to ensure that, wherever possible, financial circumstances do not become a barrier to studying at Warwick. We provide extra financial support for qualifying students from lower income families.

ACCOMMODATION

We manage approximately 7,500 self-catered rooms on campus for different budgets and requirements. Living on campus in your first year gives you the opportunity to meet people and form friendships whilst never being more than a short distance from your lectures or our amazing campus facilities. At Warwick, you'll enjoy the freedom of independent living with the security of knowing you're surrounded by people who can support you.

CHAT TO OUR STUDENTS ON UNIBUDDY

If you have questions about living and studying at Warwick, speak to our current students to get answers on:

- Campus life
- Accommodation
- Study support, wellbeing and more

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