

# PHYSICS

UNDERGRADUATE STUDY  
2023/24



WARWICK  
THE UNIVERSITY OF WARWICK

CONSISTENTLY  
RANKED IN THE **TOP**  
**10** FOR THE SUBJECT:

**6<sup>th</sup>**

in *The Times & Sunday Times  
University Guide 2022* (Physics  
and Astronomy subject category)

**8<sup>th</sup>**

in *The Complete University Guide  
2022* (Physics and Astronomy  
subject category)



## PHYSICS at Warwick

Welcome to the Department of  
Physics at the University of Warwick.

Physics is a practical subject full of beautiful ideas. If you study physics as an undergraduate with us, you will be exploring deep questions about the nature of the Universe and developing many useful skills.

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

# IDEAS and SKILLS

Physics is about ideas and skills. An important idea is that systems can be understood by identifying a few fundamental quantities, such as energy and momentum, and the universal principles governing them.

One of the joys of physics is seeing how a simple principle, established after studying one problem, can go on to explain seemingly unrelated phenomena. For example, the laws of thermodynamics were discovered in the 19th century by people trying to design better steam engines. They turned out to apply to everything in the Universe from the Big Bang onwards. Einstein is quoted as saying that thermodynamics “is the only theory of universal content which I am convinced will never be overthrown”.

Physics teaches us ways of thinking about and tackling problems. This is just as true when studying the laws governing interactions between individual particles, as it is when studying the implication of these laws for complicated systems made up of many particles. In all cases, the process involves making measurements, trying to solve models of what might be happening, and, hopefully, celebrating when a coherent picture emerges.

Studying physics gives an excellent preparation for many different careers. Our graduates work in nearly all parts of the public and private sectors including IT, finance, journalism, and management. Some of our graduates also go on to postgraduate study in physics, usually working towards the research degree of PhD.



“One of the things that I was most looking forward to about studying at Warwick was being part of a serious community of physicists - feeling like I was surrounded by people as keen to learn as I was.”

**Alice Stamp**  
MPhys graduate 2018  
Energy Consultant, Arup



# THE PHYSICS COURSES

F303 MPhys  
F300 BSc

Our courses are designed to challenge you and to help you to develop important intellectual and marketable skills. The courses are built around a flexible curriculum, which, after the first year, allows you to choose a sizeable proportion of your modules from lists of options.

You might choose to concentrate on particular areas or try to keep your studies as broad as possible. The need to make choices about which modules to take will encourage you to think about physics in the context of science as a whole, and to develop your own ideas about the relative importance of the various strands within the discipline.

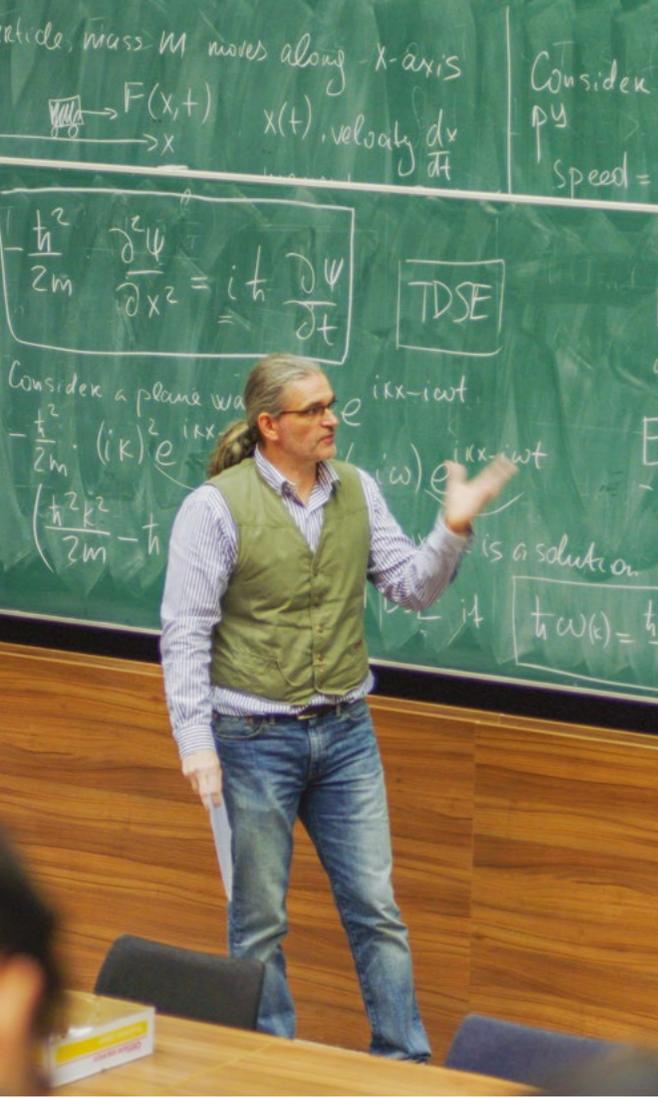
The structure of the course reflects the structure of the subject. You will take core lecture modules (concentrated mainly in the first two years), which introduce and develop the fundamental concepts, such as those of quantum theory and electromagnetism, and cover the mathematics used in physics. The skills training helps you to develop important experimental skills and more general skills training in computing, communication and problem solving.

Modules chosen from lists of options are largely concerned with seeing how the fundamental concepts can explain the phenomena we observe. Examples include the light emitted and absorbed by stellar matter, and the response of

the liquids, solids and gases, which we meet on a daily basis, to the mechanical, electrical and thermal forces acting on them.

We have research strengths in a number of branches of physics and can offer authoritative and coherent accounts of those recent developments likely to be of most interest to you. In the third and fourth years, you will benefit from interacting with our research groups when you undertake research-style projects.

A feature of Warwick is that Departments keep many of their modules open to students from other disciplines. These are available to you 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. You can opt to take modules in related sciences or from outside of science altogether. There are modules in business studies, modern languages, philosophy, and other areas.



# TEACHING

We provide a supportive and friendly environment in which to study. You will learn not just from the lectures and laboratories but also from interacting with others on the course, research students and your friends from outside physics.

## Lectures

Lectures are an effective way of presenting information to a large group of students. The lectures introduce material, which you then study further on your own. The core modules in the first year are supported by weekly classes, at which you and your fellow students meet in small groups with a member of the research staff or a postgraduate student. These classes are there for you to discuss any problems of understanding, which arise from the lectures, and to go through your written work for the module. They also provide an important indirect route back to the lecturer for your comments about the lectures.

## Laboratories

The laboratory modules teach the essential skills of experimental physics. In broad terms every scientist needs to know how to carry out an investigation, assess its significance and report the results clearly and concisely. As well as developing the techniques of experimental physics, time spent in the laboratory helps illustrate the theoretical aspects of the subject presented in the lectures.

## Projects

In your final year, you will work on a research-style project. This is often a very satisfying part of the degree course. It gives you the opportunity to develop your own ideas in a particular field of interest. Usually you will work in a pair, within one of our research groups and alongside postgraduate students and other members of staff. Sometimes the project work can involve interacting with people from other disciplines or from industry.



## Personal Tutor

Your personal tutor will be an important contact with the academic staff in the Department. During the first two years, you will meet your personal tutor at weekly tutorials in the first two terms to discuss coursework and to reflect on your studies and planning for future years. Normally your tutor would also be the first person to see about any problem. In the case of more serious worries, your personal tutor will direct you to the University's Dean of Students, who runs a team of professional counsellors and the student support services.

## Assessment

Your performance is assessed on the basis of written examinations and coursework. In any year about 40% of the overall mark is assigned to coursework. Coursework components of a degree course include problems set in association with lecture modules, laboratory and computational projects, and modules assessed on the basis of one or more reports.

## Feedback

Our staff and student representatives meet regularly on a Staff Student Liaison Committee (SSLC) to discuss any changes and improvements, which can be made to the teaching.



# The **FIRST** Year

## Modules

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

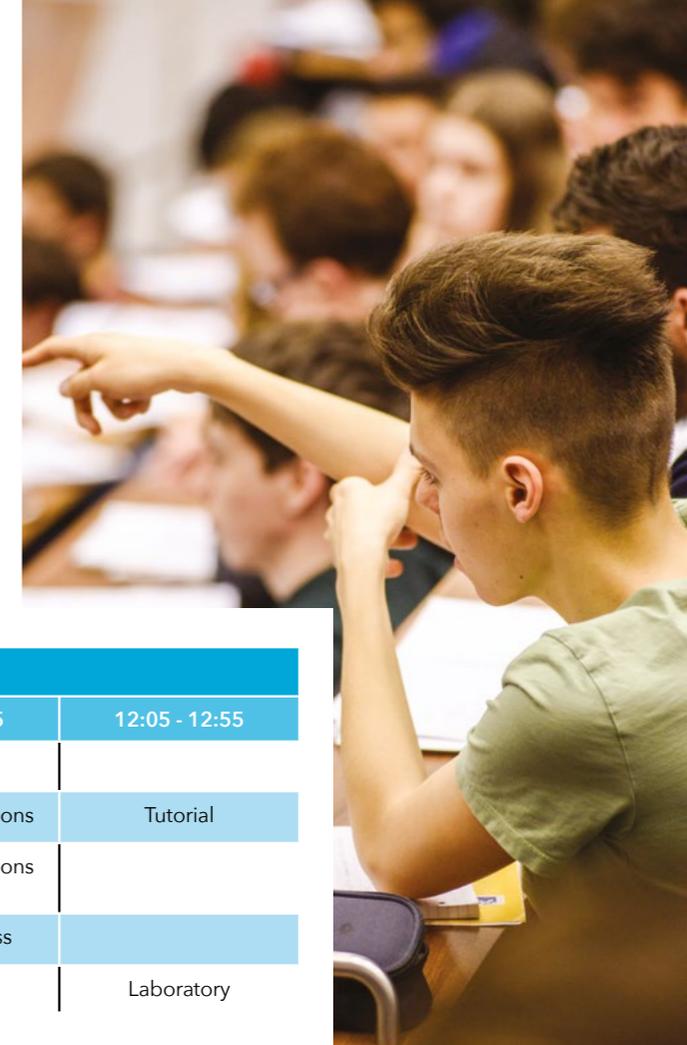
There is a laboratory module which everybody takes. This teaches the skills required for successful laboratory work.

Physics involves observing nature and identifying the universal laws, which govern its behaviour. 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 on relativity and quantum theory deal with the breakdown of Newtonian mechanics at speeds close to the speed of light and at short (atomic) distances. Other first year physics modules treat material, which should in part be familiar from A level (electricity,

magnetism and heat), but are able to illustrate it with more interesting examples and to bring out better the unifying concepts.

To give an impression of the weekly workload of lectures and tutorials, please see overleaf a typical first year timetable. Wednesday afternoons are generally kept free of teaching as this is the main day for university activities such as sport, drama and music.



First Year timetable (weeks 1-5) - mornings

	09:05 - 9:55	10:05 - 10:55	11:05 - 11:55	12:05 - 12:55
Monday	Maths for Physicists			
Tuesday		Maths for Physicists	Physics Foundations	Tutorial
Wednesday	Classical Mechanics and Relativity		Physics Foundations	
Thursday	Maths for Physicists		Examples Class	
Friday		Laboratory	Laboratory	Laboratory

First Year timetable (weeks 1-5) - afternoons

	13:05 - 13:55	14:05 - 14:55	15:05 - 15:55	16:05 - 16:55
Monday	Physics Foundations			Classical Mechanics and Relativity
Tuesday		Classical Mechanics and Relativity		
Wednesday				
Thursday		Maths Supervision		
Friday	Laboratory	Laboratory	Laboratory	



## SECOND Year

In the second and third years there is considerable freedom to choose modules. By now you will have a good idea of your main interests and be well placed to decide which areas to study in greater depth. In effect you design your own degree.

The current second year modules are:

### Core

Mathematical Methods for Physicists, Quantum Mechanics and its Applications, Statistical Mechanics, Electromagnetic Theory and Optics. You continue to work in the laboratory as part of the Physics Skills Programme. You also complete library research, data analysis and writing exercises.

You choose about a further three modules (not all modules are the same length) from lists of options. Currently these are:

### Physics

Computational Physics, Environmental Physics, Hamiltonian and Fluid Mechanics, Stars and the Solar System.

### Outside Options

Modules from Warwick Business School, the Language Centre (Arabic, Chinese, French, German, Italian, Japanese, Portuguese, Russian and Spanish), and the Centre for Education Studies (Introduction to Secondary School Teaching).



"Since childhood I had always maintained an interest in energy and electricity, and this was piqued both by the excellent Second Year module on the Physics of Electrical Power Generation at Warwick and through reading Sustainable Energy without Hot Air.

I now work as a staff scientist at Japan Atomic Energy Agency on various radiation and environmental analyses related to the recovery from the 2011 Fukushima Daiichi meltdowns."

**Alex Malins**  
Staff Scientist,  
Japan Atomic Energy Agency  
BSc Maths and Physics graduate 2007

## THIRD Year BSc

If you are on the three-year BSc course, you will work in a pair on a project chosen from a list of titles and supervised by a member of staff.

The project brings you into contact with a research group where you work alongside research students, technicians and research fellows. The project can give you insights into how research scientists work and think.

You take the modules Quantum Physics of Atoms and Communicating Science. You select further modules from the representative lists below, where we have grouped the physics modules together according to subject matter. Although there is no formal requirement to select a set number of modules from any one list, it is usually better to concentrate on two or three areas.

### Astrophysics

Black Holes White Dwarfs and Neutron Stars, Galaxies and Cosmology.

### Classical Physics

Electrodynamics, Fluid Dynamics, Plasma Physics and Fusion, Statistical Physics.

### Quantum Phenomena

Condensed Matter Physics, The Standard Model.

### Interdisciplinary

The Earth and its Atmosphere, Physics of Life and Medicine, Scientific Computing.

### Outside Options

Modules from Warwick Business School, the Language Centre, the Mathematics, and other departments.

## THIRD Year MPhys

Opting for the MPhys allows you more time to explore the implications of what you have already learnt. This is the idea behind the Group Project and the MPhys laboratory.

The Group Project and the laboratory are designed to give experience of those working methods which cannot easily be taught in lecture halls. For the Group Project, you work in groups of five or six to study an area of physics and write a review of the current status of the area.

In the laboratory, you complete some longer and more involved experiments than are possible in the first and second year teaching laboratories. The rest of the third year consists of a core of compulsory modules covering material which will be assumed by fourth year modules, and modules chosen from lists of options.

### Core

Quantum Physics of Atoms, Electrodynamics, Mathematical Methods for Physicists III.

You take further modules from the options listed for the third year of the BSc.



# FOURTH Year

During the fourth year, you join one of the research groups in the department (experimental or theoretical) and work in pairs on a research project.

The project work gives experience of working more independently. This experience should be valuable in your future career, whether you work as a scientist or not, and can help you make more informed career choices.

You will also take around five of the following modules (not all modules are the same length) with at least eight chosen from the list of physics modules. Current lists are:

## Astrophysics

The Distant Universe, Planets, Exoplanets and Life.

## Classical Physics

General Relativity, Solar and Space Physics.

## Computing

High Performance Computing.

## Condensed Matter

Condensed Matter Physics II, Structure and Dynamics of Solids.

## Quantum Theory

Advanced Quantum Theory, Quantum Computations and Simulation.

## Elementary Particle Physics

Frontiers of Particle Physics, Theoretical Particle Physics.

## Outside Options

There is no formal list of outside options. However, students often follow modules from outside the department provided that their timetable permits this.

# PHYSICS WITH BUSINESS STUDIES FN31 BSc

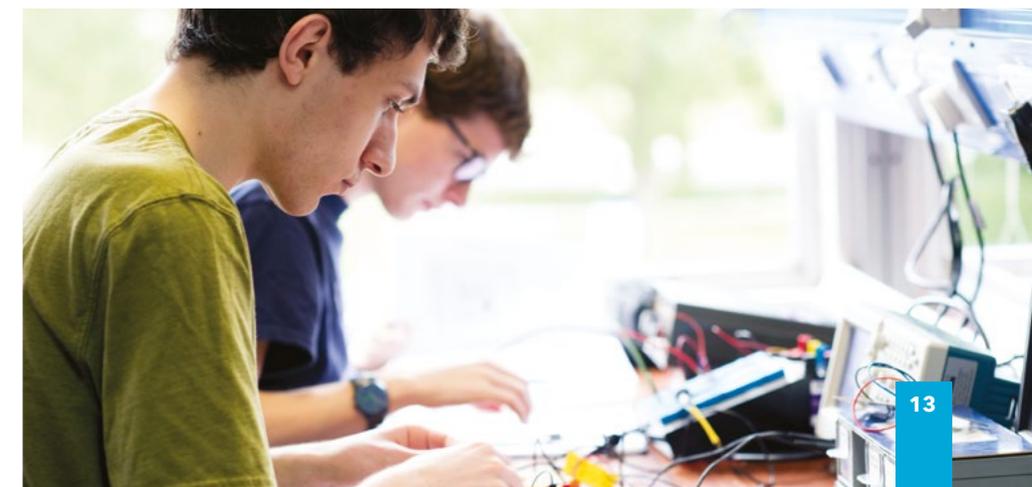
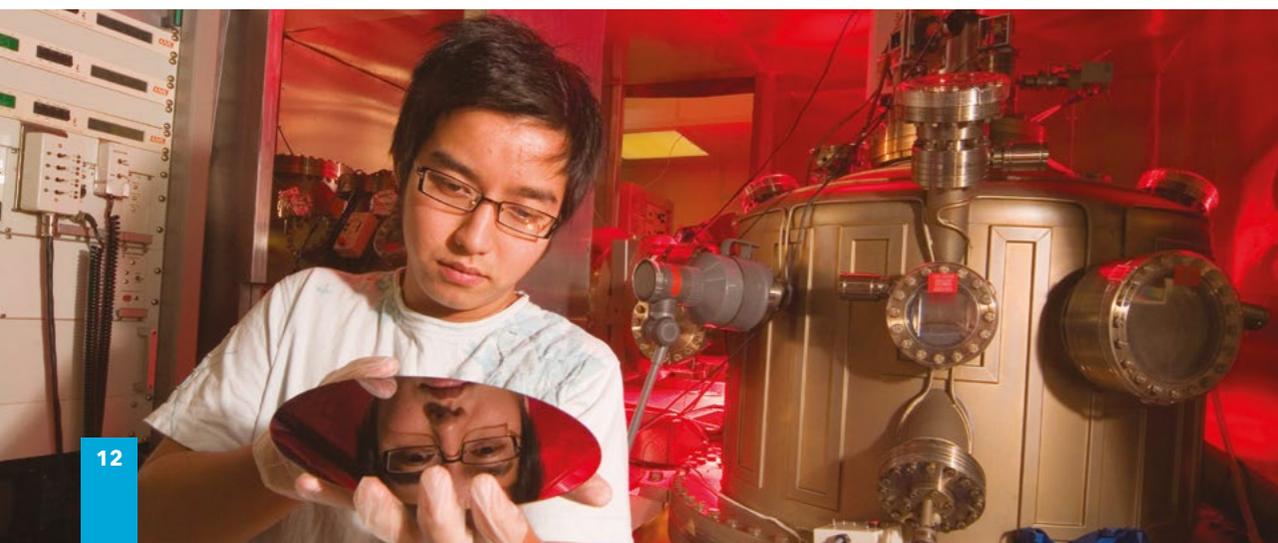
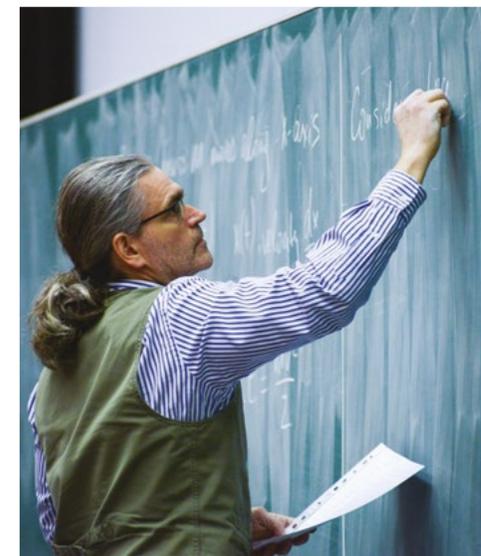
The departments at Warwick have a tradition of offering as many of their modules as possible to students from other disciplines. However, for those with a particular interest in Business Studies there is the Physics with Business Studies degree.

The course is designed for students who enjoy physics but wish also to develop an interest in management and business. The Warwick Business School (WBS), which is a leading Business School in the country, has pioneered the teaching of management science to undergraduates at British universities.

During the first two years of the degree, you are based in the Department of Physics. You take the core physics modules and choose up to three foundational modules on Business Studies.

These modules introduce each the five main areas of the discipline: Accounting, Entrepreneurship, Finance, Management and Marketing.

In the third year, you study predominantly modules taught by WBS. These will develop aspects of the areas you chose to study in years 1 and 2.

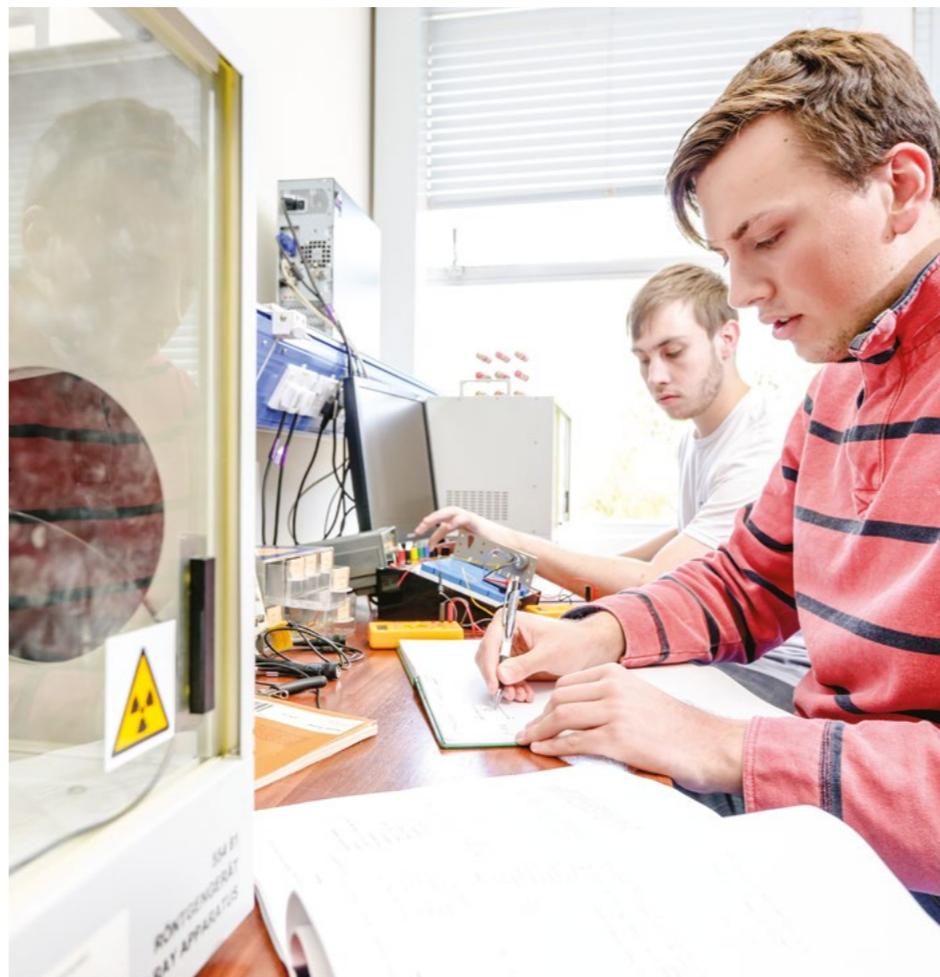




"I studied the MPhys course at Warwick and ended up extending my final year project into a PhD. I'm now a Patent Attorney for Withers & Rogers LLP. Broadly speaking, my role is to help inventors secure effective legal protection for new and innovative technology.

In a typical day, I work on multiple cases across a crazy range of technology - from jet engines to software, satellites to artificial heart valves. My interest in this area came about during my PhD, whilst I worked with Warwick Ventures to patent a novel semiconductor device. It was Warwick that first exposed me to the eclectic mix of science and technology that allows me to work in such a varied and dynamic environment."

Dr James Richardson-Bullock  
Associate Patent Attorney  
Withers & Rogers LLP



## The Physics COMMUNITY

Apart from teaching, the University's main role is to carry out research.

Warwick is consistently ranked one of the best universities for research in the UK and the Department of Physics is itself rated highly in the Research Excellence Framework 2021.

The interaction with the research community within the Department brings you into contact with the latest innovations and ideas and is particularly valuable in your final year when you carry out project work.

The Department of Physics has a number of areas of research excellence including: astrophysics, the physics of condensed matter, elementary particle physics, plasma physics and theoretical physics.



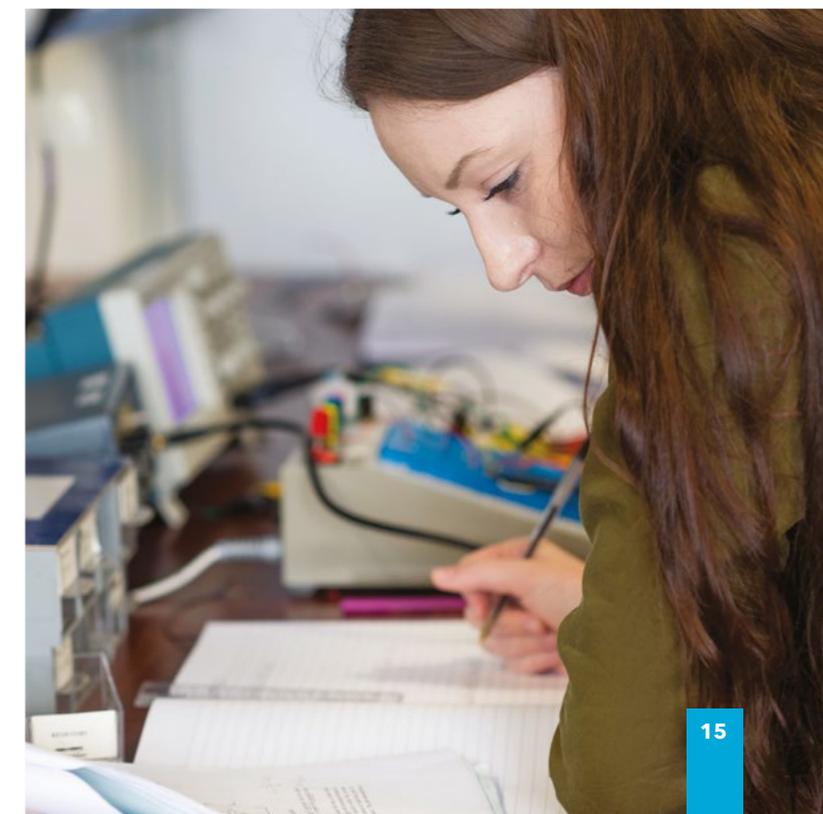
*\*The Times & Sunday Times Good University Guide 2022*

**\*\*Based on 'Main occupation of 18/19 Physics undergraduates', derived from the Graduate Outcomes survey which is carried out approximately 15 months after completion. Contains HESA data: Copyright Higher Education Statistics Agency Limited 2020. HESA cannot accept responsibility for any inferences or conclusions derived by third parties from its data.**

## Looking AHEAD

9th in the Russell Group and 10th in the sector for Graduate Prospects score in Physics & Astronomy\*

Areas of employment Warwick graduates proceed to follow include; computing and consultancy, accounting and financial work, public administration, education and engineering.\*\*



## FIND OUT MORE

### HOW TO APPLY

Applications are made through UCAS  
[ucas.com](https://ucas.com)

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.

For more detailed information about how we process applications please visit:

[warwick.ac.uk/study/undergraduate/apply](https://warwick.ac.uk/study/undergraduate/apply)

### 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.

For more information on applying from your country see:

[warwick.ac.uk/io](https://warwick.ac.uk/io)

### STUDENT 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.

[warwick.ac.uk/studentfunding](https://warwick.ac.uk/studentfunding)

### ACCOMMODATION

Warwick Accommodation manages over 7400 self-catering residences on campus. Living on campus in your first year gives you the opportunity to meet people and form new friendships whilst never being more than a short distance from your lectures or the amazing facilities campus has to offer.

At Warwick, you'll enjoy the freedom of independent living alongside your fellow students but with the security of knowing you're surrounded by people who can support you.

For more information visit:

[warwick.ac.uk/accommodation](https://warwick.ac.uk/accommodation)

### DISCOVER MORE

To find out more about the University, including opportunities to visit and engage with your department of choice, please visit:  
[warwick.ac.uk/undergraduate/visits](https://warwick.ac.uk/undergraduate/visits)

This course information was accurate at the time of publication (June, 2022). While the University tries to ensure that the information is accurate, it does not warrant that this is the case. The University may need to make changes including to the course content, syllabus, delivery, methods of assessment, or to comply with external accrediting or reviewing bodies. It is therefore important that you revisit the relevant course website before you apply and when you accept an offer to ensure you are viewing the most up to date information. This information should not be construed as an offer and nor does it create a contract or other legally binding relationship between the University and you or a third party. For full terms and conditions, please visit [warwick.ac.uk/ugtermsandconditions](https://warwick.ac.uk/ugtermsandconditions)

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