The information provided in this brochure is correct at the time of publication (July 2018) but this may be subject to change for example as a result of student feedback, Professional Statutory and Regulatory Bodies’ (PSRB) requirements, staff changes, and new research.

Admissions Team
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You can also follow us on:
- Twitter/LancUniPhysics
- Facebook/LancasterPhysics
- Instagram LancasterUniPhysics
Welcome to Lancaster Physics

By putting aside preconceptions and analysing the world from a scientific viewpoint, physics furthers our understanding and can bring immense intellectual satisfaction. Based on our broad range of world-leading research, we provide flexible and engaging degrees that allow our students to experience the full fascination of the subject. Through project work, extra-curricular activities and an open-door policy, we offer a unique and inclusive study experience. Feedback from our students is excellent, with the latest National Student Survey showing 100% students found the course intellectually stimulating.

At Lancaster, we have built a supportive learning environment where approachable lecturers and dedicated academic advisors will guide you through your studies. Good feedback is essential to the development of your skills, understanding and confidence. As such, all our degree courses include regular coursework assessments that encourage and challenge you to put what you have learned into practice and gain feedback on how to improve. This is supported by an institution that was awarded the highest rating, Gold, in the Teaching Excellence Framework, recognising outstanding teaching and delivery of excellent employment outcomes for its students.

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Whether by contributing to Nobel-prize winning research with colleagues at international facilities such as CERN and the Sudbury Neutrino Observatory, discovering new galaxies, setting low-temperature records, or by providing outreach events for the community, Lancaster University’s Department of Physics strives to play a significant positive role in science and society, and our students have many opportunities to be involved. I hope that this prospectus will be the beginning of your own rewarding journey leading to a deeper understanding of our world.

We have 100% satisfaction for students’ views on the quality of the programmes of study and all our programmes are fully accredited by the Institute of Physics. Lancaster Physics came 1st for satisfied with assessment feedback in the Guardian League Tables 2019. We are also 9th in the UK for Physics in the Complete University Guide 2019 and 3rd in the UK in the NSS 2017 for Physics.

I am proud to be head of one of the top physics departments both for physics education and research in the UK, as recognised in repeated assessments and league tables.

Professor Roger Jones
Head of Department

Dr Andy Marshall
Director of Teaching
An Engaging and Welcoming Atmosphere

Our department is committed to fostering a diverse, supportive community as a source of academic excellence, cultural enrichment, and social strength. Your study spaces and laboratories are alongside our offices and research areas; therefore, you will also have regular informal contact with our staff and researchers.

A friendly department
A remarkable feature of the Department is how everyone is very approachable and happy to help. We operate an open-door policy, meaning you can ask our staff for help when you need it. Our recent investment into the Department was purposefully designed to further encourage the informal interactions of students and lecturers, while our engagement in the JUNO and Athena SWAN programmes constitutes a formal commitment to the principles of diversity, inclusiveness and fairness.

Women in Physics
The Department has developed a Women in Physics group which provides a forum for women to meet, share their experiences and discuss research and career options. Topics such as ‘How I succeeded in science’ create interesting discussions. The group meets regularly and aims to increase the visibility of women in the Department and to facilitate informal mentoring relationships. The group welcomes new members and is supportive to all.

Get involved!
The Department has two associated societies that you can get involved in. The first is the Physics Society (LUPhyS) whose aim is to bring all students and staff together. They organise friendly football matches, BBQs, physics seminars and more. The second society, LUAstro, is aimed at keen astronomers as well as those who have not had the chance to experience astronomy. You will have the chance to use our telescope as well as attend seminars for students given by students. Both societies are run by our enthusiastic students and are welcoming to all.

Staff and ambassadors will welcome you when you visit us.
A Highly Supportive Learning Environment

We have built a supportive learning environment where approachable lecturers and dedicated academic advisors will guide you through your studies.

Comprehensive academic support
You will be able to rely on extensive academic support with multiple possible contacts for any type of question. You will benefit from our open-door policy, small group tutorials, individually supervised projects and dedicated career advice. You will also have the opportunity to apply for summer placements and internships. Your college will also assign you a tutor who is responsible for providing advice and assisting with any other questions you may have.

Continuous feedback
We continually provide academic feedback and keep you informed of your results. A very large part of your lab, project and course work counts towards your final degree mark – this allows us to make the assessment meaningful, in recognition of the fact that proper scientific work is deep and requires time. As a rough guide, 40-50% of your degree marks will be based on this continuous assessment, with the remainder based on exams.

High-quality contact time
In a typical week you will work closely with other students and staff in laboratories, have the opportunity to have solutions explained and receive any support you may need. You will participate in demonstrations of the physical phenomena described in lectures, learn to use scientific equipment and develop skills in taking measurements, drawing conclusions and writing reports. You will also carry out extensive research projects, first in groups and then under individual supervision, where you apply your knowledge and actively contribute to the development of the field.

A TYPICAL WEEK

12-15 HOURS OF LECTURES
3-4 HOURS OF SEMINARS
6 HOURS IN A LAB

Being Mallorcan, Spanish, I thought my adaptation to an English university would be a bit of a struggle, not only for the obvious change in weather. Thankfully, I came across Lancaster. It was not only very highly ranked for Physics in the university league tables but most importantly it had a flexible programme of degree schemes, which enables you to tailor your studies towards the branch of physics you are interested in. The common 1st year allows you to focus and enjoy what you are learning. Once I got to Lancaster, it felt like no adaptation was needed. I found myself in a welcoming department with an ‘open-door policy’, meaning you can find academics outside lectures and office hours, to ask for help. Lecturers are extremely friendly and comprehensive. I am very grateful to be at Lancaster.

Pedro Satorre Mulet
First Year MPhys Physics & Astrophysics and Cosmology

For more information visit www.lancaster.ac.uk/physics
Flexible degrees
Our courses combine fundamental concepts with cutting-edge topics and offer a wide range of degree specialisations. A common first year means you will be able to explore all areas of physics and change your degree specialism up until summer of your first year. Following this, all degrees have a common core, supplemented with degree scheme specific labs and projects. However you will also have a wide range of options that let you explore advanced topics and tailor the degree to your interests.

Getting you involved in world-leading research
The teaching on our courses is directly informed by our world-leading, experimental and theoretical research. Our staff include many leading authorities, and the Department has achieved a number of world firsts in key research areas. Our courses are designed to link strongly to our research - providing up to date physics education that is engaging and inspiring to our students and contributes to excellent student-staff relations. As a Lancaster student you will benefit from this, not only through the wide choice of optional modules and research projects, but also from the enthusiasm and expertise of our staff in these subjects.

Excellent facilities and resources
You will have access to a wide range of learning resources, from our Quantum Technology Centre, IsoLab and Ultra-Low Temperature Lab and our direct involvement in international collaborations such as the Large Hadron Collider at CERN, T2K in Japan, the Hubble Space Telescope, space science experiments inside the Arctic and Antarctic circles, and NASA’s Cassini-Huygens space mission. These provisions significantly enhance your research projects, allowing you to use cutting-edge equipment on-site and providing real research data from international facilities.

An Outstanding Education
All of our degree programmes provide a comprehensive, state-of-the-art physics education at the frontiers of the discipline. We constantly update our syllabus in response to recent scientific developments, skills required by employers, and feedback from our students.

You will benefit from research-led teaching with expert lecturers, engaging projects and access to state-of-the-art facilities.

You will benefit from exploring all areas of physics before making a decision on your specialist subject.

SHAUN DEMPSEY
Fourth year MPhys Physics, Astrophysics & Cosmology

One of the most interesting parts about the physics course at Lancaster is that the teaching is research led. Just by going to lectures, you discover what cutting-edge research is being done in the field. All lecturers are also researchers and bring their research into their teaching so you are learning from an expert. The research is also clear in the Department’s internship scheme where you can get involved in a research group during one of your summers. This is great to experience how research is done and the steps needed to get from a theory to a result. The fourth year MPhys project allows you to develop your own research skills with help from your supervisor to complete your own independent bit of research.

For more information visit www.lancaster.ac.uk/physics
Having invested £14 million in refurbishing our building we officially opened it in March 2018. We gave our students updated labs with new equipment and created welcoming spaces for studying and socialising.

The newly refurbished Physics Department has lots of study spaces including computer rooms. They’re perfect for getting work done between lectures, and the open-door policy means that if you’re stuck on a worksheet you can find your lecturer at any time to get help. It’s also in a central position on campus, meaning you never have to walk too far to get to different lecture theatres throughout the day.

PASCALE DESMET
Second year MPhys Physics, Astrophysics & Cosmology
of transferable skills such as team working, time and project management and communication skills, all of which are highly valued by employers.

Research in the Physics Department is structured into four divisions: Astrophysics, Particle and Accelerator Physics, Experimental Condensed Matter Physics, and Theory. Each division has a team of research-active staff at the forefront of their respective fields. We place great importance on bringing this research into our undergraduate teaching, and into our schools and public engagement programme.

For more information visit www.lancaster.ac.uk/physics

Throughout your course, you will complete a succession of projects, commencing with a computer project in second year and progressing to open-ended research projects of increasing complexity in the following years. This includes a group project on a current research topic in third year, and an extensive, individually supervised research project in the final year of the MPhys/ MSci programmes. The topics are closely connected to our broad portfolio of world-leading research, and provide you with an opportunity to make an active contribution to actual research. You will also develop a range of transferable skills such as team working, time and project management and communication skills, all of which are highly valued by employers.

Research areas:
• Observational Astrophysics
• Theoretical Particle Cosmology
• Space and Planetary Science
• Experimental Particle Physics
• Accelerator Physics
• Low Temperature Physics
• Quantum Nanotechnology
• Nonlinear and Biomedical Physics
• Condensed Matter Theory
• Mathematical Physics

Exciting Research Projects

Throughout your degree you will have the opportunity to undertake exciting research projects, solving a real problem on a topic of your choice whilst being supervised by expert researchers.

For more information visit www.lancaster.ac.uk/physics

DR JONATHAN PRANCE
Physics Lecturer

Working alongside students in the lab is really rewarding. It’s great to see how quickly people can learn new skills and make a contribution to ongoing research. Many students at Lancaster go on to do postgraduate degrees and I think this has a lot to do with the experience that they gain during their final year project.
Examples of Recent Projects

Recent MPhys projects include:

- **Physics for healthcare**
- **Optoelectronics characterisation**
- **Novel nanoscale detectors**
- **Modelling of stellar winds**
- **Studies of the Earth’s aurora**
- **Studies of Saturn’s ring current and aurora**
- **Particle physics with the ATLAS experiment**
- **Neutrino interactions in the T2K near detector**
- **Development of future neutrino experiments**
- **Studies of exotic atoms using quantum Monte Carlo simulations**
- **Galaxies and dark matter**
- **Superfluid wind tunnel**
- **Galaxy formation and evolution across cosmic time**

Recent third year group projects include:

- **Particle physics:** studying of cosmic rays, constructing of low cost radiation detectors and investigating the role of quantum mechanics in nuclear decays
- **Industrial projects:** student teams worked with external organisations to investigate re-condensing gas-based anaesthetics to reduce waste, testing high-tech plastic films to improve the shelf-life of food and characterising technical non-woven fabrics for magnetic shielding
- **Cosmology group project:** using the cosmological constant or dark energy to solve the Age of the Universe problem
- **Theory and theoretical physics with mathematics group project:** modelling the properties of electrons in crystal lattices (e.g. graphene), cold atoms in optical lattices and studies of particles obeying fractional statistics

New third year group project.

**Astrophysics:** working with brand new data taken with the Hubble Space Telescope, the Very Large Telescope in Chile and the Isaac Newton Telescope to discover and study new galaxies, to determine physical properties of stars and star clusters or to unveil the last major transition of the Universe: the epoch of re-ionisation.

My project involved looking into the properties of a new material for use in particle detectors, and before starting, all I knew was that it was able to detect some particles by emitting a pulse of light (scintillating). Now I have measured properties of the material that were unknown, and possibly explained why using different methods seemed to give different results. This meant that I was the first person to see certain properties of the material, which was really exciting!

Not only did the project help me gain skills for research, but it also landed me a PhD offer, as the collaboration I was working with were impressed by my work. They also invited me to talk at a conference in South Korea, and several other students were invited to give talks around the world as well.

For more information visit www.lancaster.ac.uk/physics
Choosing Your Degree

We offer a choice of 4-year MPhys Hons degrees and 3-year BSc Hons degrees. With the exception of our combined course, all our degrees offer a common first year and common core giving you flexibility to tailor your degree to suit you.

Our degrees share a common first year, which makes it easy to settle on your preference. In the subsequent years, the degrees share a common physics core which covers all key areas of the discipline. The degree-scheme specific labs and projects equip you with specialist skills while the wide range of optional modules allows you to explore advanced topics and tailor your degree to suit your interests.

All our degrees provide you with a comprehensive education, and cover all the general and specialist skills valued for further study and employment in the private and public sectors.

The additional year in the MPhys degrees contains an extended research project, which is ideal if you are considering studying for a PhD in the future.

We also offer a BSc/MSci degree in Theoretical Physics with Mathematics, jointly with the Mathematics Department, as well as our Study Abroad exchange programmes, where you can spend your third year studying at a partner institution overseas. We welcome applicants with alternative qualifications and offer a unique Open Plus programme for those not meeting traditional requirements. Further details can be found on our website.

Scholarships

The Physics Department is rewarding excellence by providing an academic scholarship of £1,000 for applicants who choose a Lancaster University Physics course as their firm choice and achieve A** in A level Mathematics and Physics, or equivalent grades for those with alternative qualifications. Lancaster University offers a range of additional scholarships and bursaries, see www.lancaster.ac.uk/ugfinance.

<table>
<thead>
<tr>
<th>UCAS CODE</th>
<th>DEGREE (Hons)</th>
<th>DEGREE TITLE</th>
<th>TYPICAL OFFER A LEVEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>F303/F300</td>
<td>MPhys/BSc</td>
<td>Physics</td>
<td>AAA–AAB</td>
</tr>
<tr>
<td>F305/F30M</td>
<td>MPhys/BSc</td>
<td>Physics, Astrophysics and Cosmology</td>
<td></td>
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<tr>
<td>F331/F372</td>
<td>MPhys/BSc</td>
<td>Physics with Particle Physics and Cosmology</td>
<td></td>
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<tr>
<td>F321/F340</td>
<td>MPhys/BSc</td>
<td>Theoretical Physics</td>
<td></td>
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<tr>
<td>F3G1/F3GC</td>
<td>MSci/BSc</td>
<td>Theoretical Physics with Mathematics</td>
<td></td>
</tr>
<tr>
<td>F305</td>
<td>MPhys</td>
<td>Physics (Study Abroad)</td>
<td>AAA</td>
</tr>
<tr>
<td>F305</td>
<td>MSci</td>
<td>Theoretical Physics with Mathematics (Study Abroad)</td>
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</tbody>
</table>

International Baccalaureate: 35-36 points with 17 from 3 HL subjects including 6 in Physics and Maths. We welcome alternative and international qualifications and consider each case on an individual basis.

In Years 3 & 4, optional modules can be taken from other degree schemes.

Additional advanced topics include:

- Astronomy
- Astrophysics
- Cosmology I & II
- Space Physics
- Groups & Symmetries
- Flavour Physics
- Gauge Theories
- Experimental Particle Physics
- Quantum Information
- Quantum Transport
- Advanced Relativity & Gravitation
- Advanced Electromagnetism
- Advanced Magnetism
- Matter at Low Temperatures
- Fluids
- Lasers
- Semiconductors
- Energy
- Computer Modelling
- Physics of Living Systems

For more information visit www.lancaster.ac.uk/physics

The table below shows the structure of the degree schemes. The first year is common for all degrees, and options are available in Years 2 and 3.

<table>
<thead>
<tr>
<th>DEGREE SCHEME</th>
<th>YEAR 1</th>
<th>YEAR 2</th>
<th>YEAR 3</th>
<th>YEAR 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMMON CORE</td>
<td>Physics Core I</td>
<td>Physics Core II</td>
<td>Physics Core III</td>
<td>Extended Project</td>
</tr>
<tr>
<td></td>
<td>Mechanics</td>
<td>Quantum Mechanics</td>
<td>Atomic/Particle Physics</td>
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<td></td>
<td>Electric &amp; Magnetic Fields</td>
<td>Electromagnetism</td>
<td>Statistical Physics</td>
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<td></td>
<td>Thermodynamics</td>
<td>Waves &amp; Optics</td>
<td>Solid State Physics</td>
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<tr>
<td></td>
<td>Quantum Physics</td>
<td>Properties of Matter</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Laboratory</td>
<td>Special/Relativity</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>Math Core</td>
<td>Particles &amp; Nuclei</td>
<td></td>
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<tr>
<td></td>
<td>Vectors</td>
<td>Computer Programming</td>
<td></td>
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<tr>
<td></td>
<td>Calculus</td>
<td>Further Mathematics</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Series/Methods</td>
<td>Further Linear Algebra</td>
<td></td>
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<tr>
<td></td>
<td>Complex Methods</td>
<td>Partial Differential Equations</td>
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<tr>
<td></td>
<td>Vector Calculus</td>
<td>Fourier Methods</td>
<td></td>
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<thead>
<tr>
<th>PHYSICS</th>
<th>Laboratory Work</th>
<th>Advanced Laboratories</th>
<th>6 Optional Modules</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Group Project (Research or Industry)</td>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>ASTROPHYSICS AND COSMOLOGY</th>
<th>Astronomy</th>
<th>Stellar Astrophysics</th>
<th>Advanced/Relativity Current Cosmology Galaxies</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Introductory Astrophyics</td>
<td>Astrophysics / Cosmology Project</td>
<td>Advanced/Relativity Current Cosmology</td>
</tr>
<tr>
<td></td>
<td>Introductory Cosmology</td>
<td></td>
<td>Further Particle Physics Gauge Theory</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2 Optional Modules</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>PARTICLE PHYSICS AND COSMOLOGY</th>
<th>Astronomy</th>
<th>Flavour Physics</th>
<th>Advanced/Relativity Current Cosmology</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Particle Physics Lab</td>
<td>Big Bang Cosmology</td>
<td>Further Particle Physics Gauge Theory</td>
</tr>
<tr>
<td></td>
<td>Introductory Cosmology</td>
<td>Groups &amp; Particle Cosmology Project</td>
<td>2 Optional Modules</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>THEORETICAL PHYSICS</th>
<th>Analytical Mechanics</th>
<th>Complex Analysis</th>
<th>6 Optional Modules</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Field Theory</td>
<td>Groups &amp; Symmetries</td>
<td>including at least 3 Theory Modules</td>
</tr>
<tr>
<td></td>
<td>Introductory Cosmology</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>THEORETICAL PHYSICS WITH MATHEMATICS</th>
<th>Physics Core I</th>
<th>Physics Core II</th>
<th>Physics Core III</th>
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<tbody>
<tr>
<td>Calculus I (see below)</td>
<td>Real &amp; Complex Analysis</td>
<td>Galaxies</td>
<td>3 Optional Physics Modules</td>
</tr>
<tr>
<td>Calculus II (see below)</td>
<td></td>
<td>Current Cosmology</td>
<td></td>
</tr>
<tr>
<td>Geometry</td>
<td>Group Theory</td>
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<tr>
<td>Matrices</td>
<td>Project</td>
<td></td>
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<tr>
<td>Probability Numbers</td>
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<tr>
<td>Numbers</td>
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<tr>
<td>Differential Equations</td>
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</tbody>
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International Baccalaureate: 35-36 points with 17 from 3 HL subjects including 6 in Physics and Maths. We welcome alternative and international qualifications and consider each case on an individual basis.
Physics
UCAS code: F303 (MPhys), F300 (BSc)

Physics is our broadest degree covering a range of topics from Quantum Physics and Electromagnetism to Particle and Condensed Matter Physics, Quantum Computation and Matter at Low Temperatures. This gives you the most flexibility to tailor your degree to suit your interests.

Our Physics degree equips you with the broad conceptual and practical working knowledge of modern-day physics that underpins present-day research. The specialist teaching is informed by our research activities in areas such as low-temperature physics and quantum technologies. This is combined with key transferable skills enabling you to embark on a wide variety of career paths.

The core curriculum includes subjects such as Quantum Physics and Electromagnetism in your first year, Quantum Mechanics and Relativity in your second year, and Particle Physics, Atomic Physics and Condensed Matter Physics in your third year. This is complemented by laboratories where you will perform state-of-the-art experiments with sophisticated equipment and associated software. In third year, you can choose between a research group project and an extended industrially-oriented group project in collaboration with a company or other external organisation. You also explore advanced topics via a wide range of options, which include subjects such as Quantum Computation, Matter at Low Temperatures, and Physics of Living Systems. In the final year of the MPhys degree you take further advanced options and carry out an extended investigative project. This embeds you into one of our leading research groups and gives you access to world-leading facilities, such as our unique Quantum Technology and Low-Temperature centres. Examples of recent project topics include superconducting qubits, vortices in superfluids, single photon photodiodes, nanoscale probe microscopy of graphene, quantum dots and novel quantum nanostructures.

GEORGIE PLANT
Fourth Year MPhys Physics

Physics allows the study of the big and the small, from galaxies to quarks. At Lancaster, you are given the opportunity to study over this wide range of disciplines. Research-led teaching gives context in addition to lecture material and keeps the content up to date. If you are undecided on which area of physics is your favourite, like me, then this is the best degree scheme to pick because you learn a vast variety of skills and have a choice of many optional modules.

For more information visit www.lancaster.ac.uk/physics

Physics, Astrophysics and Cosmology
UCAS code: F3F5 (MPhys), F3FM (BSc)

Supernovae, black holes, and distant galaxies - there is much to discover, and it holds the key to our existence.

This degree develops your understanding of the relationship between the physical laws of the universe and the astrophysical and cosmological domains. The specialist teaching is informed by our research activities in observational astrophysics, space and planetary science, and particle cosmology. You will obtain a thorough grounding in core physics areas such as Quantum Physics and Electromagnetism in your first year, Quantum Mechanics and Relativity in your second year, and Particle and Atomic Physics in your third year. Furthermore, this scheme also includes lectures on Astronomy, Astrophysics and Cosmology in your second year and Stellar Astrophysics and Big Bang Cosmology in your third year, as well as specialised laboratory work in astrophysics and cosmology.

In your third year, you also carry out an investigative group project where you tackle a problem of current research.

In the final year of the MPhys degree, you will complete an extended research project on topics such as galaxy formation and evolution across cosmic time, dark energy, binary variable stars, cosmic radio noise, gravitational waves and cosmic inflation, and study subjects such as Cosmology, Galaxies and Advanced Relativity and Gravity. For your project work, you can use data from a large range of space and ground based observatories including the Hubble Space Telescope, NASA’s Cassini-Huygens mission, and the ESO Very Large Telescope.

I would recommend the Physics, Astrophysics and Cosmology course to anyone who has an interest in physics at the largest scales. The course is well structured and balances astrophysics and cosmology modules well, and there is a great choice of optional modules available so people can tailor their study to their interests. The lecturers are very friendly and helpful and are experts in their field, which makes me confident that I’ll get a good start to the research career that I’m aiming for.

SOFIA DURWARD
Fourth Year MPhys Physics, Astrophysics & Cosmology

For more information visit www.lancaster.ac.uk/physics
Physics with Particle Physics and Cosmology
UCAS code: F373 (MPhys), F372 (BSc)

The Universe is a mysterious place. How did it form? How does it work? What is the nature of visible and dark matter?

Lancaster’s particle physicists work with state-of-the-art particle accelerators to investigate and identify the nature of space and time. Our resident cosmologists employ all of their creative and mathematical abilities to explain the early history of the Universe in a way that complements and supports observational and experimental data. All this expertise is translated into an exciting, modern physics degree based on the foundation of our core physics programme. Throughout your degree you will take a range of subjects including Quantum Physics and Electromagnetism in the first year, as well as Astronomy, Detection of Particles and Introductory Cosmology in the second year. In your third year, your modules include Big Bang Cosmology, Flavour Physics, a choice of advanced options, and a group project where you research an open question in particle physics or cosmology.

In the final year of the MPhys degree, you will study subjects such as Current Cosmology and Gauge Theory and carry out your individual investigative project, where you can use experimental data from the Large Hadron Collider at CERN or the T2K neutrino experiment in Japan, or develop cosmological models of our Universe. Recent project topics include W bosons, CP violation using B mesons, the Higgs particle, neutrino oscillations and cosmic inflation.

Our renowned theoretical physicists devote themselves to uncovering the most appropriate mathematical laws for deducing the essence of physical phenomena on all scales, from the quantum world of microscopic matter and nanomaterials to the geometry of curved space-time and the large scale structure of the cosmos.

The core curriculum includes subjects such as Quantum Physics and Electromagnetism in your first year, Quantum Mechanics and Relativity in your second year, and Particle Physics, Atomic Physics and Condensed Matter Physics in your third year. In addition, in second and third year you take specialised modules on Quantum Theory, Electromagnetism, Condensed Matter Physics, Gravitation and Cosmology, and Elementary Particle Physics. You also have a choice of options such as Quantum Information and Nanomaterials, Quantum Physics, and Advanced Quantum Theory.

In the final year of the MPhys degree, you take further advanced options, and carry out your individual investigative research project on a topic such as quantum computation, quantum physics of graphene, quantum optics, or axion electrodynamics.

For more information visit www.lancaster.ac.uk/physics

Theoretical Physics
UCAS code: F321 (MPhys), F340 (BSc)

Quite possibly the most astonishing aspect of the world around us is that so much of it can be understood by using a small number of physical laws.

Our renowned theoretical physicists devote themselves to uncovering the most appropriate mathematical laws for deducing the essence of physical phenomena on all scales, from the quantum world of microscopic matter and nanomaterials to the geometry of curved space-time and the large scale structure of the cosmos.

The core curriculum includes subjects such as Quantum Physics and Electromagnetism in your first year, Quantum Mechanics and Relativity in your second year, and Particle Physics, Atomic Physics and Condensed Matter Physics in your third year. In addition, in second and third year you take specialised modules on Quantum Theory, Electromagnetism, Condensed Matter Physics, Gravitation and Cosmology, and Elementary Particle Physics. You also have a choice of options such as Quantum Information and Nanomaterials, Quantum Physics, and Advanced Quantum Theory.

In the final year of the MPhys degree, you take further advanced options, and carry out your individual investigative research project on a topic such as quantum computation, quantum physics of graphene, quantum optics, or axion electrodynamics.

For more information visit www.lancaster.ac.uk/physics
In collaboration with the Mathematics Department, this degree combines specialised theoretical physics with pure mathematics, creating a challenging and rewarding programme.

Taught jointly with Lancaster’s Department of Mathematics and Statistics, this degree combines core physics and specialised theoretical physics subjects with classes in pure mathematics. This equips you with an understanding of the mathematical foundations of physics; for example, you will learn how quantum mechanics is underpinned by the powerful mathematical concept of a Hilbert space.

In your first year you will cover the core of physics in modules such as Quantum Physics and Electromagnetism, and the core of mathematics including geometry and calculus, numbers and relations, and probability.

In second and third year, the core physics modules are complemented by modules from the Theoretical Physics degree and mathematical topics such as group theory and differential equations. In the final year of your course you will take advanced options such as Quantum Information and Advanced Relativity and Gravity, and complete your extended research project on a topic such as quantum computation, or geometry and electrodynamics.

Physics or Theoretical Physics with Mathematics (Study Abroad)
UCAS code: F305 (MPhys), F3G5 (MSci)

A year studying at a university abroad provides a unique opportunity to broaden your educational experience and study of physics within a different academic & cultural context. Positioned in one of our numerous partner universities you will be studying a similar course to that at Lancaster. This means you will fit smoothly back in on your return.

We will support you throughout the process and offer advice on matters concerning your trip. Being able to travel, experience new cultures, make new friends and boost employability means the majority of our students find it a hugely positive experience.

For more information visit www.lancaster.ac.uk/physics
A Shared Love for Physics

Our academic staff engage in a very broad portfolio of internationally leading research. We love our research, and we love to share this with our students.

PROFESSOR JIM WILD

DR SARAH BADMAN

PROFESSOR YURI PASHKIN
Winner of the 2012 Wolfson Award for his work on superconducting qubits.

PROFESSOR DAVID LYTH
Recipient of the 2012 IOP Hoyle medal for his pioneering work on cosmic inflation.

A LONG-STANDING RECORD OF EXCELLENCE

Before being ranked second for world-leading research outputs in the most recent Research Excellence Framework (2014), we were ranked first overall in the previous two Research Assessment Exercises (2001 and 2008).

Our particle physicists played a key role in the discovery of the Higgs boson.

Our low-temperature lab set a new record for cold electrons.

Our quantum metrologists and biomedical physicists developed novel methods of medical diagnosis.

Our astrophysicists and space scientists participated in satellite missions such as Hubble and Cassini, leading to discoveries as highlighted on page 25.

Our condensed matter physicists made groundbreaking discoveries of new materials such as graphene.

SuperDARN

The Space and Planetary Physics group is part of an international consortium called “SuperDARN” (Super Dual Auroral Radar Network) who, in 2017, won the Royal Astronomical Society’s “Group Achievement Award” for Geophysics.

SuperDARN routinely measures the structure and dynamics of the upper atmosphere in the northern and southern polar regions.

SuperDARN routinely measures the structure and dynamics of the upper atmosphere in the northern and southern polar regions that are coupled, via the Earth’s magnetic field, into near-Earth space. Professor Jim Wild and other team members study the data from SuperDARN with the aim of better understanding the effects of the Sun and the aurora on the upper atmosphere, interactions with the lower atmosphere and disturbances that can disrupt radio communications. Our students conduct research projects that use cutting-edge scientific datasets from facilities such as SuperDARN as part of their studies.

Breakthrough Prize

Members of the Lancaster Neutrino group were awarded a share of the 2016 Breakthrough Prize in fundamental physics for their work investigating neutrino oscillations and interactions. Members of the group have leading roles in several current neutrino oscillation experiments and are also actively involved with several future experiments that will search for CP violation using neutrinos.

Research into neutrino oscillations and CP violation will aid our understanding of the Universe, and could help explain why it is dominated by matter. In their final year projects, undergraduate students have the opportunity to work with our group by analysing data from current experiments and simulating future experiments.

Staff and students from the Neutrino group who won a share of the 2016 Breakthrough Prize.
Astronomical Opportunities

Our academics are involved in world-leading research and whenever possible open up opportunities to our students.

I use the largest telescopes in Space and on the ground to time-travel to multiple destinations by billions of years to a much younger Universe and discover some of the first galaxies. They provide us fantastic physical clues of how our own home - the Milky Way - formed and evolved over the last 13.7 billion years.

One of the most exciting aspects of what I do here in Lancaster is being able to teach the state-of-the-art in Astrophysics and share my passion for the subject with our students and giving them opportunities to come and observe at professional telescopes.

There is only so much you can learn in a lecture theatre, and nothing beats the numerous “wow” moments when we discover something unexpected or confirm something that has been predicted. There’s something unique about pointing a large telescope, travelling back in time billions of years and being able to see a galaxy or a supermassive black hole for the very first time.

While leading the new Observational Astrophysics group project module, I’m aiming to provide these exciting opportunities to even more of our Physics students at Lancaster, so they can work with state-of-the-art data from telescopes like Hubble or the Very Large Telescope and make their own discoveries by finding something that no-one has ever seen before.

ANDREW JENKINS
Second year MPhys Physics, Astrophysics & Cosmology

Going to La Palma was the most interesting and beautiful experience of my life. Watching the sun set and rise above the cloud layer each day, on top of a beautiful mountain, with no light pollution, is something I never forget. We had the opportunity to operate the 2.5m telescope directly and select our own targets. We quickly picked up new skills in telescope operations, data taking and false colour image creation. This is why I do physics; experiencing and learning the science I’ve admired since I was a child. My endless thanks to Dr David Sobral for making this possible and giving me a taste of what it’s like to work in physics.

EMMA DODD
Second Year MPhys Physics Astrophysics & Cosmology

La Palma was incredible! By far the highlight of my university experience so far and I am so grateful to my department for it! I never once imagined I’d be lucky enough or even smart enough to be able to go and work with these world-leading telescopes. It makes all the physics worth it and reminds me of why I’m doing this degree and what I’m working towards. The whole experience really helped me become more confident in myself, both with my ability in physics, and also my presenting and communicating skills. I really enjoyed working in a team with my colleagues and making new friends!
A Rewarding Journey Onwards

Preparing you for your next step and helping you achieve good employment prospects is paramount for the Physics Department.

Enhancing your prospects
Our degree schemes will develop your transferable skills such as critical thinking, problem solving, numeracy, computational skills, communication skills, and team working, which are all highly valued by both employers and academia. We ensure we provide as many opportunities as possible to enhance your university experience and your degree. Involving you in real research and working with academics on location allows you to learn from those most experienced in the field and gives you an insight into the area you may later work in.

Industry and placements
You benefit from our direct links with industry and outside agencies, which contribute to the range of our third and fourth year projects and fund departmental research. Taking part in relevant work experience is highly valued when applying for graduate jobs. In addition to the Science and Technology Internship scheme, the Department also provides internship opportunities over the summer months to motivated students who wish to enhance their skills. This is another opportunity to work in a real research environment and solve open-ended problems.

Opportunities and rewards
You will have ample opportunities for extracurricular activities to further enhance your CV, for example, acting as a student ambassador and taking part in outreach activities, or by joining student societies and participating in the University’s Lancaster Award. We also run Physics at Lancaster Annual Conference Exhibition (PLACE) which gives our students the valuable experience of presenting their work to an audience. We reward academic excellence with prizes and certificates for academic achievement in each year of study. We also offer a number of prizes that recognise outstanding physics research, usually undertaken by students during their final year research project. Over the past ten years, physics graduates have been sustained recipients of The Chancellor’s Medal, which is awarded by the University to its six best graduating students.

Exciting careers and excellent employability
We have a dedicated Employability Champion, who offers individual support to our students, organises trips to careers fairs and supports our Science and Technology careers fair. We have also recently added the Physics Internship and Employability Booster programme within the structure of the degree schemes. This is designed to help you achieve the career you want and prepare you for your future.

All these efforts culminate in an excellent range of career options, whether you are considering research or employment. Our graduates find employment in high-technology industries, medical and telecommunication businesses, computer programming, public health and teaching programmes, as well as in consulting, finance and accountancy.

For more information visit www.lancaster.ac.uk/physics
We share your excitement for the subject and are always happy to answer any questions about our courses and the application process. Once you apply we will look at all aspects of your application in a timely manner and keep you well informed. We look forward to welcoming you here to Lancaster, at an Open Day or Interview Day, and eventually as a student in our department.

Find out more
For more details about the Department, our degrees, or research, news and more please visit our website www.lancaster.ac.uk/physics
Or contact us:
Tel: 01524 592261
Email: physics-ugadmissions@lancaster.ac.uk
Follow us
@LancUniPhysics
facebook.com/LancasterPhysics
LancasterUniPhysics
Visit us
We encourage you to visit us to find out what the University and Department has to offer. You can get a feel for the Department, meet staff and students, see the teaching and research facilities, and explore the campus and colleges.
For University Open Days and Campus Tours, where we offer guided tours and talks, see www.lancaster.ac.uk/visitus

How to apply
You can apply through the Universities and Colleges Admissions Service (UCAS). Details are given on their web page www.ucas.com

Interview Days
This is a great opportunity for you to ask us questions about the course and Department and gives us the chance to learn more about you. The day will include a taster lecture, guided tours of the Department and campus, and ample opportunity to talk to staff and students. We look forward to meeting you and invite you to bring a parent/guardian to share in the experience. They can explore the campus and Department with you and have the opportunity to attend a dedicated programme, whilst you are being interviewed.

Offers
We interview between the months of November and March and will determine any offer we may make. We try to ensure we have informed you of our decision within two weeks of interview.

We Are Easy To Find!

By road
From the north or south: leave the M6 motorway at junction 33 and take the A6 north towards Lancaster for about 2 miles. The University is on the right. For Sat Nav use: LA1 4YW.

By rail
There are direct rail links between Lancaster and London (Euston), Birmingham, Leeds, Manchester, Glasgow and Edinburgh. The single journey between London and Lancaster takes between 2.5 and 3 hours. Buses U3R and X3 and taxis are available from just outside the station.

By coach and bus
Lancaster city is on the national coach network; National Express coaches call at the University. Local buses (numbers U2, U3, U3R, U4, X3, 41 & 42) from Lancaster bus station run to the University every 5 minutes on weekdays.
Further details can be found on www.lancaster.ac.uk/travel

Interested? What next?

SHAUN MAY
Fourth Year MPhys Physics, Astrophysics & Cosmology
Lancaster University first caught my attention for being so highly ranked for physics in the university league tables, but it wasn’t until I visited the Department on an Open Day that my decision was made. The staff and students were very welcoming and unmistakably passionate, combine that with how the Department is dedicated to so many projects, and I was sold!

For more information visit www.lancaster.ac.uk/physics