Discover your world

Physics

lancaster.ac.uk/physics
Welcome

Professor Roger Jones
Head of Department

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

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 with degree programmes that are constantly evolving along with the frontiers of the discipline.

Our Department strives to play a significant positive role in science and society 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, and our students have many opportunities to be involved.

I hope that this subject brochure will be the beginning of your own rewarding journey leading to a deeper understanding of our world.

Image by Andy Reilly
What can you expect?

**Flexible degrees** – all our single honours subjects have a common first year, meaning you will benefit from exploring all areas of physics and can change your degree specialism up until the end of your first year.

**Research-led teaching** – teaching is directly informed by our world-leading, experimental and theoretical research. You will benefit from expert lecturers, engaging projects and access to state-of-the-art facilities.

**Supportive department** – we build a diverse and supportive community, with dedicated academic advisors, disabilities officer and an open-door policy. It means there is always someone to support you through your studies.

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### #2

Our research is ranked second in the UK for world-leading publications in the REF 2014

### #2

2nd in the UK for Physics in the UK Guardian League Table 2020

### #4

4th for Graduate Prospects Complete University Guide 2020

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A supportive environment

We have built a supportive learning environment where approachable lecturers and dedicated academic advisors will guide you through your studies. By building study spaces into our Department, you can work together and remain close to the support you need.

We also know that 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. Our teaching is underpinned by world-leading research, spanning a wide range of physics disciplines. We are particularly proud to be able to say that the academics driving this research contribute to undergraduate teaching, so you can be confident that the lecturers supporting you through your studies are experts at the forefront of their field.

Dr Andy Marshall
Director of Teaching

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**Open-door policy**

We operate an open-door policy, meaning help is never far away as you can ask our staff for help when you need it.

**Continuous feedback**

We continually provide academic feedback and keep you informed of your results. A very large part of your lab, project and coursework counts towards your final degree mark – this allows us to make the assessment meaningful, in recognition of the fact that in-depth scientific research 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 in your first year, you will have 12-15 hours of lectures, 3-4 hours of seminars and 6 hours in a lab. In later years, the balance between lectures, seminars and lab work will change depending on your chosen degree specialism. 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.
The Physics Department has two societies that you can get involved in.

**The Physics Society (LUPhyS)** You'll be part of a society that brings students and staff together and supports you in your studies. It's a great chance to get involved in organising physics seminars, friendly sport activities, BBQs and more.

**The Astrophysics Society (LUAstro)** is for keen astronomers as well as those who have not had the chance to use our telescope. You can also attend seminars given by students, for students!

**Student Ambassadors**

Our Ambassadors support recruitment events and school visits. Every year we recruit Student Ambassadors to provide support to the Department and work with outreach and engagement to encourage others to learn about physics. This is a great way of developing your skills and experience whilst earning money.

**Inclusivity**

We proudly promote inclusivity within the Physics Department and have both the Athena SWAN Silver Award and the IoP Juno Champion status. We also have an Inclusion in Physics group which meets regularly and arranges seminars and provides forums for members to share their experiences and discuss career and research options.
When did you know Physics at Lancaster University was the place for you?
When I visited, I felt so at home, it was so welcoming and everyone was so enthusiastic and friendly, plus the facilities were great, I could see myself living and studying here.

What made the facilities so great?
The newly refurbished Physics Department has lots of study spaces including computer rooms and laboratories. 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 lecturers outside of teaching hours to get help. It's also in a central position on campus, meaning you never have to walk too far to get to a different lecture theatre throughout the day.

What is your favourite aspect of your course?
I've most enjoyed the astrophysics modules, as well as the coding which is something I've found out that I'm quite good at that I wouldn't have done otherwise. I really like all the study space in the Department, in makes it much easier to sit with your friends and work through coursework.

What are you going to do after your degree?
I want to stay in academia and do research. Lancaster is helping me by letting me know about all the internships I can apply for as well as hosting some within the Department and supporting all my applications.
You will benefit from our unique and world-leading research facilities. This includes specialised equipment and materials in our Quantum Technology Centre, IsoLab and Ultra-Low Temperature Lab. You will also have access to a wide range of learning resources, from our own computer suites and new teaching laboratories to the 365mm Schmidt-Cassegrain reflecting telescope.

We also have direct involvement in international collaborations such as the Large Hadron Collider at CERN, T2K in Japan, 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 research data from international facilities.
Opportunities for you

Dr David Sobral

Reader in Observational Astrophysics who discovered the CR7 galaxy, which was listed among ESO’s all time top 10 astronomical discoveries. In recent years David has provided opportunities for our students to go with him to La Palma to study real data using state-of-the-art telescopes.

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 with 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.

The new Observational Astrophysics group project module provides students with the unique opportunity to make exciting discoveries with state-of-the-art data from telescopes like Hubble. In the first edition our students discovered some of the most metal poor stars in our Galaxy, investigated open and globular clusters, studied local galaxies and unveiled the nature of thousands of incredibly distant galaxies and super-massive black holes. I am looking forward to the new discoveries in the years to come!

Meet Emma

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 get 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!

I created the image shown here on this trip by taking images of the pillars of creation in different colours and then putting them all together in our Astrolab computers back in Lancaster.

Emma Dodd
Third Year MPhys Physics Astrophysics & Cosmology
What attracted you to study Physics at Lancaster University?

The low temperature labs and the wonderful new Physics Building. It was lovely to look at them on the Interview and Open Days and I couldn’t get enough of all the experimental work that was going on.

When did you know it was right for you?

When I walked around campus and up to Physics for the first time and I saw how lovely the building and people are. Staff and students were working in labs and I knew that I wanted to do the same.

Did you attend an Open Day/Interview Day, what were your thoughts?

I really enjoyed the Interview Day. The tours of the building made me feel more at home and it was great to see the observatory and the low temperature fridges as I’m interested in that area of science. Talking to the academics at lunch also made the interviews easier as we knew who they were. Overall, it was a great day.

What has been your favourite aspect of your course so far?

I’ve loved the lectures along with the labs that have been set because they were ground breaking science that have shaped physics we know today. It’s fun to be able to get to grips with the lab books on such exciting topics.

What do you do in your spare time?

Normally I attend the University concert band and brass band in the evenings but I also like to explore campus and the surrounding area of Lancaster or I like to go skateboarding around campus – sometimes to lectures. I can’t recommend getting out and enjoying campus enough on a nice day.

Scott Henderson
First Year MPhys Physics Hons
We use space- and ground-based observations and experiments, as well as theory and modelling, to tackle important open questions in Astrophysics, Cosmology, Space Physics and Planetary Physics. Our research spans topics from space weather in the solar system through to galaxy formation and the evolution of the Universe from the earliest times to the present day.

**Astrophysics**
We study the forces and interactions that shape our Universe, conduct searches for new particles, and build the technologies and mathematical models that will be needed for future generations of particle accelerators. We are striving to answer fundamental questions such as why particles have different masses and why the Universe is made of matter and not anti-matter?

**Particle and Accelerator Physics**
We perform experiments at temperatures close to absolute zero, build and operate nanometer-scale electronic, optical and mechanical devices, study new materials, and seek to understand the dynamic behaviour of biological systems. By working with industrial partners and startup companies, we are developing new technologies for imaging, sensing and information security.

**Experimental Condensed Matter**
Our research concerns the theoretical properties of condensed matter systems and molecular-scale devices, and the development of new mathematical techniques to predict the classical and quantum behaviour of light and matter. By studying systems ranging from artificial materials to ultra-intense plasmas, we seek to advance the mathematical descriptions that underpin our understanding of the physical world.

**Theory**
We are active in a wide range of research areas, and teaching on our degrees is directly informed by our world-leading, experimental and theoretical research. Our staff include many leading authorities, and work with world-leading facilities.

Research in our Department is structured into four major research areas:

- **Astrophysics**
- **Particle and Accelerator Physics**
- **Experimental Condensed Matter Physics**
- **Theory**

The place for the Researcher

We are active in a wide range of research areas, and teaching on our degrees is directly informed by our world-leading, experimental and theoretical research. Our staff include many leading authorities, and work with world-leading facilities.
Our courses are designed to link strongly to our research - providing an 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.

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.

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.

**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  
Theory of Molecular-Scale Transport

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
- **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

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
Hello Future

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

Transferable skills
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.

Employability Champion
Our dedicated Employability Champion provides individual support, organises trips to careers fairs and runs the Employability Booster programme. This is designed to help you achieve the career you want and prepare you for your future.

Internships
Each year we offer a number of internships for our students, which will give you a relevant work experience and the opportunity to apply your academic knowledge in real-world situations.

Industry and placements
You will 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.

What else?
You will have ample opportunities to further enhance your CV, for example, acting as a student ambassador, taking part in outreach activities, or by joining student societies and participating in the University's Lancaster Award. You will also take part in our Physics at Lancaster Annual Conference and Exhibition (PLACE) which gives our students the valuable experience of presenting their work to an audience.

What are you doing after your degree?
I’m going to do an internship at UBS in equity sales and trading based in London. This will involve buying and selling companies’ stocks and their derivatives on the stock market for clients including asset managers and hedge funds. A lot of the work involves modelling, and many of these models originate in physics which is something I find fascinating.

How has Lancaster helped with that?
Lancaster’s careers service has helped me write CV/cover letters, find employers and helped in applications. In first/second year I was able to attend lots of events that helped me identify which industry I wanted to join, how to get there and helped me gain commercial awareness. I also got great support from the Department in the form of the Department’s Employability Champion.

How has your studies helped develop your skills?
A large part of the course involves weekly worksheets, so this has really helped me develop and put into practice my problem solving, mathematical and analytical skills. Other aspects such as modules on presentation skills have helped my interpersonal skills as well as report writing and presentation skills. Lab work has massively helped my data skills.

What advice do you have for students worried about their skills and about becoming more employable?
I would say that physics teaches you an extraordinary number of transferable skills, and when you realise the range of places you can apply these skills, you’ll discover that a physics degree opens a lot of doors. Just by studying physics you are at an advantage, and then finding something you enjoy is important, as this passion will definitely come across in job applications.

A career for Matt
Matt Watson
Third Year BSc Physics Hons

Preparing you for your next step and helping you achieve good employment prospects is paramount for the Physics Department. 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 and further research.
The right degree for you?

Accredited by the Institute of Physics (IoP), all of 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.

3 or 4 years?
We offer a choice of 4 year MPhys Hons degrees and 3 year BSc Hons degrees. Providing you are meeting academic requirements you can easily transfer from 3 to 4 years up until term 2 of your third year. 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 or aiming at a research-based career outside academia.

Combined?
We also offer a BSc/MSc degree in Theoretical Physics with Mathematics, taught jointly with the Department of Mathematics and Statistics. This means that there is extra maths content, and you will also receive extra support from the Department of Mathematics and Statistics.

Study Abroad?
If travel is appealing to you we also offer a Study Abroad option with all of our degrees where you can spend your third year studying at a partner institution overseas.

Scholarships
The Physics Department reward excellence by providing an academic scholarship of £1,000 for applicants who choose one of our Physics degrees as their firm choice and achieve A*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

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

### Degree Scheme

<table>
<thead>
<tr>
<th>COMMON CORE</th>
<th>YEAR 1</th>
<th>YEAR 2</th>
<th>YEAR 3</th>
<th>YEAR 4</th>
</tr>
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<tbody>
<tr>
<td>Physics Core I (see above)</td>
<td>Mechanics</td>
<td>Electromagnetic Fields</td>
<td>Thermodynamics</td>
<td>Quantum/Physics Laboratory</td>
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<td>Math/Calculus</td>
<td>Series Methods</td>
<td>Complex Methods</td>
<td>Vectors Calculus</td>
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<th>PHYSICS</th>
<th>YEAR 1</th>
<th>YEAR 2</th>
<th>YEAR 3</th>
<th>YEAR 4</th>
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<tbody>
<tr>
<td>Laboratory Work</td>
<td>Advanced Laboratories</td>
<td>Group Project</td>
<td>Research or Industry</td>
<td>2 Optional Modules</td>
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<table>
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<tr>
<th>ASTROPHYSICS AND COSMOLOGY</th>
<th>YEAR 1</th>
<th>YEAR 2</th>
<th>YEAR 3</th>
<th>YEAR 4</th>
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<tbody>
<tr>
<td>Astronomy</td>
<td>Introduction to Astropysics</td>
<td>Introduction to Cosmology</td>
<td>Stellar Astrophysics</td>
<td>Big Bang Cosmology</td>
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<tr>
<td>Astrophysics</td>
<td>Groups &amp; Statistics</td>
<td>Project</td>
<td>1 Optional Module</td>
<td>Advanced Relativity</td>
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<tr>
<td>Cosmology</td>
<td>Groups &amp; Statistics</td>
<td>Project</td>
<td>1 Optional Module</td>
<td>Advanced Relativity</td>
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<th>PARTICLE PHYSICS AND COSMOLOGY</th>
<th>YEAR 1</th>
<th>YEAR 2</th>
<th>YEAR 3</th>
<th>YEAR 4</th>
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<tbody>
<tr>
<td>Astronomy</td>
<td>Particle Physics Lab</td>
<td>Introduction to Cosmology</td>
<td>Flavor Physics</td>
<td>Big Bang Cosmology</td>
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<tr>
<td>Cosmology</td>
<td>Groups &amp; Statistics</td>
<td>Project</td>
<td>1 Optional Module</td>
<td>Advanced Relativity</td>
</tr>
<tr>
<td>Cosmology</td>
<td>Groups &amp; Statistics</td>
<td>Project</td>
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<th>YEAR 3</th>
<th>YEAR 4</th>
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<td>Analytical Mechanics</td>
<td>Field Theory</td>
<td>Introduction to Cosmology</td>
<td>Complex Analysis</td>
<td>Field Theory</td>
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<td>Cosmology</td>
<td>Groups &amp; Symmetries</td>
<td>Advanced Quantum Methods</td>
<td>Theory Project</td>
<td>1 Optional Module</td>
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<td>Physics Core II (see above)</td>
<td>Mathematics II</td>
<td>Real &amp; Complex Analysis</td>
<td>Linear Algebra</td>
<td>Group Theory</td>
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<th>THEORETICAL PHYSICS WITH MATHEMATICS</th>
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<th>YEAR 3</th>
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<td>Mathematics I</td>
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<td>Differential Equations</td>
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<td>Physics Core II (see above)</td>
<td>Mathematics II</td>
<td>Real &amp; Complex Analysis</td>
<td>Linear Algebra</td>
<td>Group Theory</td>
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<tr>
<td>Physics Core III (see above)</td>
<td>Theory Project</td>
<td>2 Optional Maths Modules</td>
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</tbody>
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| Extended Project | YEAR 4 | |
|------------------|--------| |

- Advanced Electromagnetism
- Advanced Magnetism
- Matter at Low Temperatures
- Fluids
- Lasers
- Semiconductors
- Energy
- Computer Modelling
- Physics of Living Systems
Physics

MPhys (F303)
BSc (F300)

Physics is our broadest degree covering a range of topics. 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 investigative group project where you tackle a problem of current research. In the final year of the MPhys degree you will study subjects such as cosmology, galaxies and advanced relativity and gravity. 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.

Physical, Astrophysics and Cosmology

MPhys (F355)
BSc (F3FM)

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 study subjects such as cosmology, galaxies and advanced relativity and gravity. 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.
Physics with Particle Physics and Cosmology

*MPhys (F373)*
*BSc (F372)*

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:
- CP violation using B mesons
- The Higgs particle
- W bosons
- Neutrino oscillations
- Cosmic inflation

**Entry requirements:**

**A levels:** AAA/AAB inc A in Physics & A in Maths

**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.

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Theoretical Physics

*MPhys (F321)*
*BSc (F340)*

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 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 Matter at Low Temperatures and carry out a group project on a topic of current research.

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.

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5th for student satisfaction for Physics
Complete University Guide 2020

98% intellectually stimulating courses
National Student Survey 2018

I’ve found it fascinating being able to learn about the mathematical models that underpin our current understanding of the Universe, and I’ve loved learning how to create accurate computational models of physical phenomena.

Alice Lake
*MPhys Theoretical Physics*
Theoretical Physics with Mathematics
MSci (F3G1)
BSc (F3GC)

Taught jointly with the Department of Mathematics and Statistics, this degree combines specialised theoretical physics with pure mathematics, creating a challenging and rewarding programme.

You will be equipped 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.

Entry requirements:
A levels: AAA/AAB inc A in Physics & A in Maths
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.

91% satisfied with the quality of the course National Student Survey 2018

Whilst physics is an inherently mathematical subject, I wanted a deeper understanding of the mathematical foundations behind it. That is exactly what the Theoretical Physics with Mathematics course provides.

Luke Knight
BSc Theoretical Physics with Mathematics

Global experiences

You have the option to study abroad with any of our programmes during your time here at Lancaster.

A year studying at a university abroad provides a unique opportunity to broaden your educational experience and study of physics within a different academic and cultural context. We have opportunities in the USA, Canada, Australia, New Zealand or Europe.

If you wish to study MSci Theoretical Physics with Mathematics Abroad, you should select Theoretical Physics with Mathematics (Study Abroad) (F3G5). If you wish to take any of our other courses, you should select the MPhys Physics (Study Abroad) (F305) degree scheme and let us know in your personal statement which course you prefer. For both degree schemes, you will spend your third year studying at one of our partner universities, taking modules equivalent to those that you would have taken at Lancaster. In addition, you may also have the option of choosing topics not delivered at Lancaster.

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.
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 and keep you well informed. We look forward to welcoming you here at Lancaster, at an Open Day or Interview Day, and eventually as a student in our department.

You can apply through the Universities and Colleges Admissions Service (UCAS), find out more at www.ucas.com

Interview Days
We interview our applicants as this gives us a chance to get to know you better and also gives you a great opportunity to ask us questions about the course and Department. The day will include a taster lecture, guided tours of the Department and campus, and many opportunities 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.

Of course if you don’t want to wait you are very welcome to visit one of the University Open Days or Campus Tours, where we offer guided tours and talks, for more information see www.lancaster.ac.uk/visitus

Still have questions?

For more details about the Department, our degrees, or research, news and more please visit our website www.lancaster.ac.uk/physicis

Or contact us:
Tel: 01524 592261
Email: physics-ugadmissions@lancaster.ac.uk

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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. Turn right at the third set of traffic lights on the A6 into the University main entrance – Bigforth Drive.

By coach and bus
Lancaster city is on the national coach network; National Express coaches call at the University.

Local buses run from the railway station and Lancaster bus station to the University every 5 minutes on weekdays.

Further details can be found on www.lancaster.ac.uk/travel

By Rail
There are direct rail links between Lancaster and many of the UK’s major cities and airports.