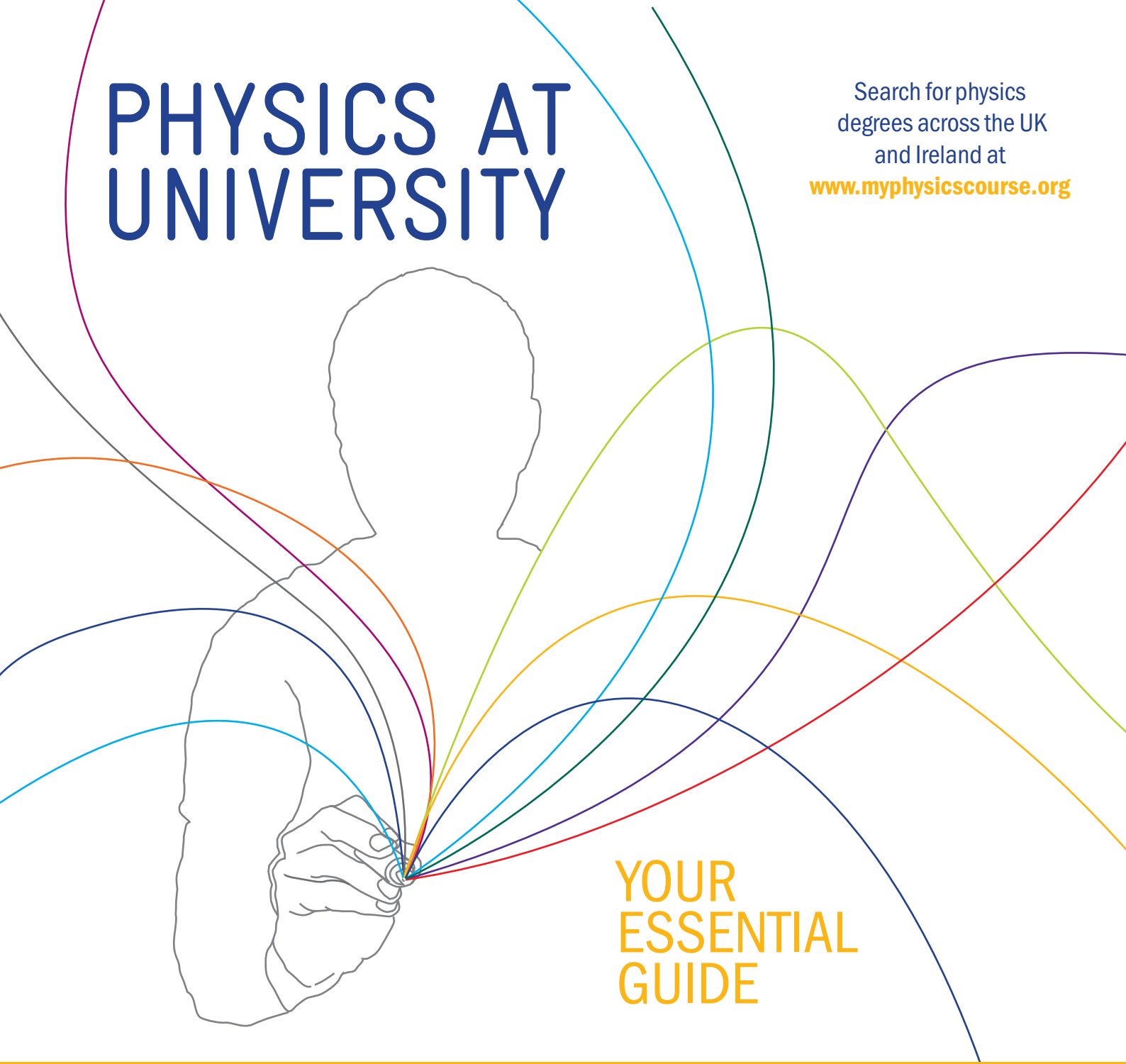
PHYSICS AT UNIVERSITY

Search for physics degrees across the UK and Ireland at **www.myphysicscourse.org**



YOUR ESSENTIAL GUIDE

IOP Institute of Physics

The Institute of Physics is a leading scientific society promoting physics and bringing physicists together for the benefit of all.

It is a charitable organisation, with a worldwide membership of around 45 000 comprising physicists from all sectors, as well as those with an interest in physics. It works to advance physics research, application and education; and engages with policy makers and the public to develop awareness and understanding of physics. Its publishing company, IOP Publishing, is a world leader in professional scientific communications.

Aged between 16 and 19 and studying physics?
Join the Institute of Physics for free at www.iop.org/16-19

WHY STUDY PHYSICS?

A physics degree develops highly regarded transferable skills.

Physics is unique. No other subject allows you to gain such a deep understanding of the way the world works.

You will learn how both the ordinary and extraordinary can be explained with ideas that are profound, imaginative and beautifully simple.

Physics will give you the ability to communicate complex ideas, a hunger to make sense of patterns, the capacity to look past the superficial and a fluency with mathematics that will allow you to make predictions and solve problems.

Physics graduates are not confined by their degree. Physics is universal - it provides the tools for understanding the unknown and addressing any problem in any sphere. That is why a degree in physics is so respected; the skills it develops will allow you to excel in just about any area you choose to work in.

PHYSICS PROVIDES THE TOOLS FOR UNDERSTANDING THE UNKNOWN

WHAT CAN I DO WITH A PHYSICS DEGREE?

Physics can take you anywhere. Find out more at **www.physics.org/careers**

FINANCE

Use your mathematical modelling skills to predict the behaviour of the stock market in **banking**.

LAW

Combine your understanding of technology with a law qualification to protect new inventions in **patent law**.

HI-TECH INDUSTRIES

Design space probes and satellites or plan manned missions to Mars and commercial space flights in the fast growing **space** industry.

Design structures at the atomic scale to improve medicines, communications and manufacturing in the **nanotechnology** industry.

Improve renewable energy sources and develop other alternatives to fossil fuels in the **energy** industry.

Develop technologies such as optical fibre broadband and Blu-ray Discs, in the **optoelectronics** industry.

ENVIRONMENT

Help to predict earthquakes and volcanic eruptions with **geophysics**.

Investigate the long-term effects of climate change or produce the daily weather forecast with **meteorology**.

ENTERTAINMENT

Build virtual worlds for **computer games** or **films**.

EDUCATION

Combine your understanding of physics with your ability to communicate and inspire the next generation in **teaching**.

HEALTHCARE

Transform the diagnosis and treatment of illness with new techniques, such as MRI and radiotherapy, with **medical physics**.

CURIOSITY-DRIVEN RESEARCH

Reveal the wonders of the universe at the large scale and study stars, black holes, galaxies and planets in **astrophysics** research.

Discover the mysteries of universe at the smallest scale and study the interactions of fundamental particles in **particle physics** research.

MEDIA

Use your technical knowhow and communication skills to report on the latest scientific discoveries as a **science journalist**.

COMPARED TO SOMEONE WITH JUST A-LEVELS

On average going to university increases your earnings by..... **23%**

Physics graduates are amongst the best earners at **30%**

which is double the advantage gained by studying subjects such as psychology, biological sciences, linguistics and history at university

[THE ECONOMIC BENEFITS OF HIGHER EDUCATION QUALIFICATIONS, PRICEWATERHOUSECOOPERS LLP (2005)]

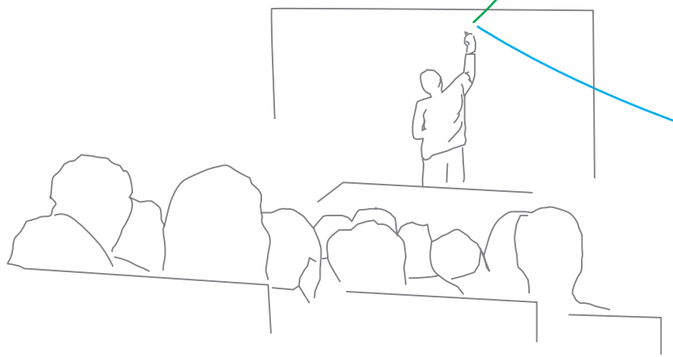
WHICH QUALIFICATIONS DO I NEED TO GET ON A COURSE?

Detailed information about entry requirements and foundation courses are available at **www.myphysicscourse.org**

UK and Irish universities usually require A-level/Advanced-Higher physics and mathematics or Leaving Certificate honours mathematics.

Although further mathematics A-level is not a requirement, it is looked on favourably by admission tutors at the more competitive universities. Scottish universities require AS or Higher physics for entry and A-levels or Advanced Highers may allow direct entry on to the second year of a degree programme.

Most universities will also accept equivalent qualifications, such as an appropriate baccalaureate.



HAVEN'T GOT THE RIGHT QUALIFICATIONS?

If you haven't studied the right subjects or got the grades needed, some universities also offer foundation courses, which usually last one year full-time. After successfully completing the foundation year you can usually progress directly onto a standard physics degree.

Students constructing a detector for low-temperature physics experiments as part of their degree.

WHAT WILL I STUDY?

Studying for a degree in physics usually involves a combination of lectures, practical sessions and tutorials.

Lectures can be for anything between 50 to 300 students in large lecture theatres. Tutorials are classes with smaller numbers and practical sessions are taught in specialist laboratories. The amount of practical work is different depending on the course and university, but you should expect to spend about 15% of your time on practical work.

MATHS IN PHYSICS

You will cover mathematics as part of your degree. Many of the mathematical concepts will be familiar to you; integration, differentiation, vectors, matrices and statistics, however you will use them in new ways in your physics degree to build a proper understanding of the laws of nature. You will also learn new areas of maths required for topics such as quantum mechanics.

If the mathematical side of physics appeals to you, then you may want to consider a degree in theoretical physics.

CORE TOPICS IN PHYSICS

In a typical physics degree you will spend about half of your time studying the core topics of physics:

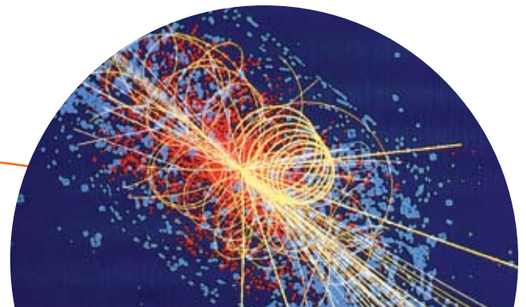
- Particle physics
- Relativity
- Lasers
- Solid-state physics
- Waves and optics
- Statistical physics
- Mechanics
- Quantum physics
- Nuclear and atomic physics
- Electromagnetism
- Oscillations
- Thermodynamics

What you spend the remainder of the time on depends on the course.

TYPICAL ADDITIONAL TOPICS

- Astrophysics
- Cosmology
- Biophysics
- Applied physics
- Atmospheric physics
- Environmental physics

Many universities also offer courses that allow you to combine studying physics with a completely different subject such as music or a modern language.



Computer simulated particle tracks for the Higgs Boson (courtesy of GridPP, CERN).

CHOOSING A COURSE

There are a variety of physics degrees to choose from. Most universities offer both Bachelor of Science (BSc) and Master of Physics/Science (MPhys/MSci) degrees and some offer courses with either a year abroad or a year in industry.

If you are considering becoming a professional physicist, then it may also be important to think about whether your degree is accredited by the Institute of Physics (IOP).

BSc

- Usually involve studying for three years (four years in Scotland)
- Provide a solid training in physics and open the door to a wide range of careers
- May involve a year abroad or in industry

MPhys/MSci degrees*

- Usually involve studying for four years (five in Scotland)
- Provide a more in-depth study of physics than BSc degrees and usually involve a significant research project
- Offer more opportunities to develop skills such as problem solving, presentation and communication skills
- May involve a year abroad or in industry
- Provide a good basis for a PhD or a career in physics-based research

* MPhys/MSci degrees have exactly the same status as each other; these courses simply have different names at different universities

PHYSICS WITH INDUSTRIAL EXPERIENCE

Some universities offer degree courses that involve a period of work in industry.

The experience you gain is valuable if you are considering a career in industry (it may even lead to a job directly after you finish your degree). If you are undecided about what you want to do after university it may help make up your mind about whether this type of career is for you. Students are usually paid by companies during their placement.

PHYSICS WITH A YEAR ABROAD

There are lots of degrees in physics that involve a year abroad. You could spend a year in Europe, the US, Australia or even Asia.

The first two years of these courses are normally spent following a standard physics degree in a UK university and learning a language if you need to for your time abroad. The third year is spent studying abroad. During this year you will follow the syllabus of the host university and will be assessed before returning to the UK for your final year.

PHYSICS WITH COURSES

These courses generally involve spending about **70%** of your time studying physics and the remainder studying another subject.

- CHEMISTRY
- ASTROPHYSICS
- MEDICAL APPLICATIONS
- GEOPHYSICS
- GERMAN

Search for subject combinations at **www.myphysicscourse.org**

PHYSICS AND COURSES

These courses generally involve spending about **50%** of your time studying physics and **50%** studying another subject.

- MATHEMATICS
- BUSINESS
- ENVIRONMENTAL SCIENCE
- PHILOSOPHY
- EDUCATION

ACCREDITED COURSES

FIND OUT MORE AT www.iop.org/accreditation

Accredited IOP degrees give a solid grounding in all of the core areas of physics. If you complete such a degree you will eligible for professional awards such as chartered physicist.

RECOGNISED COURSES

IOP recognised degrees do not cover all the core areas of physics, but do contain enough physics for membership of IOP. These degrees tend to be more interdisciplinary with some of the core physics topics replaced with additional material from other science or non-science subjects.

STARTING SALARIES

+18% Mphys Physics £23,300

+14% BSc Physics £22,500

Average Graduate £19,700

Immediately after graduation, students that studied physics, on average start on between **14%** and **18%** more than the average graduate.

[THE CAREER PATHS OF PHYSICS GRADUATES, A LONGITUDINAL STUDY 2006-2010, INSTITUTE OF PHYSICS (2012)]

CHOOSING A UNIVERSITY

Attending open days is a good way to help you choose where to study. They give you the opportunity to meet lecturers and students and ask questions face to face and develop an idea of whether you like the campus, location, and general feel of the university.

SOME QUESTIONS YOU MAY WANT TO CONSIDER ARE LISTED BELOW. THERE IS NO RIGHT OR WRONG ANSWER TO THESE QUESTIONS

IT'S JUST A CASE OF WHAT IS BEST FOR YOU

UNIVERSITY LIFE

- Do you want to live at home?
- Would you like to study at a small university or one where there are lots of other students?
- Do you want to be at a university in the centre of a town or on a university campus out of town?
- What type of student accommodation will be available and what will it include?
- What is the university, city or campus, social life like?

COSTS

- How much does accommodation cost?
- How much are the tuition fees?
- Are there any grants or bursaries available that you can apply for to help fund living at university?
- What additional expenses are there (e.g. books?)

UNIVERSITY COURSES

- Do you want to study for 3 or 4 years?
- What areas of physics interest you the most and will the course include these?
- Can you switch to another course and how do you do this?
- How flexible is the course?
- How easy is it to transfer between a BSc and MPhys/ MSci, can you choose different modules?
- How much time is spent doing practical work?
- How will you be assessed?
- Outside lectures and lab work, how many hours of work are you expected to do each week?
- What other services can the university offer (such as extra tutoring and careers advice)?

WHICH UNIVERSITY IS BEST FOR PHYSICS?

There is no simple answer to this question. Different universities have different strengths and you should choose a university that suits you in terms of the courses they offer and location.

With regards to career prospects, if you choose to study physics the university you attend is generally less important than the class of degree (i.e. the "grade" you get).

If you do decide that after you complete your degree you want to go on to further study, you can always change to a university that specialises in the areas you want to become expert in.
Most importantly, people often look back at university as the best time of their lives, so above all else choose a course and university that you think you will enjoy.

Search for physics degrees across the UK and Ireland at **www.myphysicscourse.org**

It is always a good idea to do what interests you the most and get the highest level qualification you can. **In the long term you'll be bored if you settle for less.**

JUNO RATING

You may also want to look at the department's Juno rating. A Juno award is given to departments that are taking steps to ensure that everyone – staff and students, men and women – can reach their full potential.

Women have been underrepresented in physics in the past, but the picture is now changing, with more women than ever-before becoming top scientists. A Juno award is a sign that a department is committed to developing an inclusive atmosphere where everyone can succeed in their studies and career.

FIND OUT MORE ABOUT PROJECT JUNO www.iop.org/juno

To order more copies email
education@iop.org

Stock code: EDU008

Institute of Physics
76 Portland Place
London W1B 1NT
Tel: +44 (0) 20 7470 4842
www.iop.org/education

Registered charity: 293851
Scottish charity register number: SC040092