PRIFYSGOL ABERYSTWYTH UNIVERSITY

Department of Physics

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Important information
The programme information published in this brochure was correct at time of going to print (October 2019) and may be subject to change. Prospective students are advised to check the definitive programme information, including entry requirements, that is available on our website before making an application, to ensure that the programme meets their needs.

Welcome

Welcome to the Department of Physics. My name is Professor Andrew Evans and I am Head of Department.

Physics and Astronomy have been taught at Aberystwyth since the University was established in the Old College on the sea front in 1872.

The Department is now housed in one of the most distinctive and architecturally renowned buildings on the Penglais campus, where lecture theatres, laboratories, study areas and the Physical Sciences Library are located together. Recent refurbishment ensures that we continue to provide a stimulating learning environment for a growing body of students from all over the world. The department is now home to over 300 undergraduate and postgraduate students.

A degree in Physics is an excellent preparation for careers in areas such as teaching, engineering and finance as well as providing the first step in becoming a professional scientist. The majority of our Physics courses are accredited by the Institute of Physics (IOP) and the curriculum enables students to take joint courses with other departments in the university and to specialise in areas such as mathematical physics and astrophysics. Working closely with Coleg Cymraeg Cenedlaethol, the department has a leading role in the provision of physics in higher education through the medium of Welsh.

Our aim is to provide the highest quality education in a friendly and supportive environment and to undertake internationally competitive, collaborative research in Space Physics, Materials Physics and Quantum Physics.

We look forward to welcoming you to the Department.

Professor Andrew Evans
Head of Department

IOP | Institute of Physics
Juno Practitioner

Our Degree Schemes

> Astrophysics
> Engineering Physics
> Mathematical and Theoretical Physics
> Physics
> Physics with integrated foundation year
> Physics with Planetary and Space Physics
> Space Science and Robotics

Astrophysics

BSc (Hons) / MPhys (Hons)

The Astrophysics degree at Aberystwyth incorporates current topics in astronomy alongside a core of fundamental physics to explore the interaction of energy and matter in the near and far universe. The degree studies areas which include the formation and evolution of the solar system, gas giant and terrestrial worlds, planetary interiors and surfaces, planetary atmospheres, the solar wind, the Sun as a star, comets, red giants, white dwarfs, neutron stars, black holes, galaxies, quasars and cosmology.

Specialist opportunities at Aberystwyth for Astrophysics include:

- your final year project may link to current research in space physics and astronomy;
- accreditation by the Institute of Physics;
- access to specialist astronomical equipment;
- being taught by researchers that are involved in current space missions such as the European Space Agency ExoMars 2020 Project.

Employability

A degree in Astrophysics will prepare you for career destinations such as space scientist, physicist, scientific laboratory technician, radiation protection practitioner, and research scientist. Other career paths may include systems developer, product development scientist, technical author, or meteorologist.

Degree type: BSc/MPhys.

UCAS Code: F510/F511./ F512

Duration: 3 years/4 years.

Core modules and teaching structure on this course includes:

Year 1

> Algebra and Differential Equations*;
> Astronomy;
> Calculus*;
> Classical Dynamics*;
> Classical Physics*;
> Laboratory Techniques for Experimental Physics*;
> Forces and Energy*;
> Further Algebra and Calculus;
> Modern Physics;
> Physics Career Planning and Skills Development*.

Year 2

> Mathematical Physics*;
> Numerical Techniques for Physicists;
> Planets;
> Stars;
> Electricity and Magnetism;
> Experimental Physics*;
> Optics;
> Principles of Quantum Mechanics.

Year 3

> Concepts in Condensed Matter Physics*;
> Galaxies;
> Interior of the Sun;
> Numerical Methods;
> Project*;
> Space Plasmas;
> General Relativity and Cosmology;
> Probing Atoms and Molecules*;
> The Solar Atmosphere and Heliosphere.

* also available partially or entirely through the medium of Welsh.

Engineering Physics

BEng (Hons) / MEng (Hons)

Engineering Physics focusses on the application of physical principles and techniques to engineering and technology, two demanding industries. At Aberystwyth, we prepare you with the knowledge and skills of physics training that are required for producing engineering solutions in real-world situations.

This course has a strong practical IT element and an opportunity to gain expertise in specialist topics such as micro- and nano- electronics, applied photonics, materials design and production, quantum technology, robotics, solar energy and space instrumentation. With the opportunity to study a year in industry we are confident that our innovative teaching and opportunities can equip you for the future.

Specialist opportunities for Engineering Physics students at Aberystwyth include:

- studying a degree accreditided by the Institute of Physics;
- a year in industry to develop practical experience of applying the skills acquired in the first two years of study;
- specialist facilities include mechanical, electronics and robotics workshops, materials fabrication and characterisation, optical and space instrumentation and analogue planetary terrains;
- being taught by researchers that are involved in current space missions such as the European Space Agency ExoMars 2020 Project and engineering low dimensional materials (e.g. graphene).

Employability

A degree in Engineering Physics will prepare you for a career as an engineer or scientist in areas such as industrial R&D, product development and national research laboratories. Employment sectors include energy, photonics, space, IT, health and education.

Degree type: BEng/MEng.

UCAS Code: 179H (179G with integrated year in industry)/168F (with integrated year in industry).

Duration: 3 years (179G is 4 years)/5 years.

Core modules and teaching structure on this course includes:

Year 1

> Algebra and Differential Equations*;
> Calculus*;
> Classical Dynamics*;
> Classical Physics*;
> Communication and Technology;
> Laboratory Techniques for Experimental Physics*;
> Forces and Energy*;
> Further Algebra and Calculus;
> Modern Physics;
> Physics Career Planning and Skills Development*.

Year 2

> Electricity and Magnetism ;
> Experimental Physics*;
> Numerical Techniques for Physicists;
> Optics;
> Principles of Quantum Mechanics;
> Sensors, Electronics and Instrumentation;
> Thermodynamics*.

Year 3

> Concepts in Condensed Matter Physics*;
> Engineering Control Theory;
> Numerical Methods;
> Probing Atoms and Molecules*;
> Professional Issues in the Computing Industry;
> Semiconductor Technology;
> Systems Engineering Concepts.

* also available partially or entirely through the medium of Welsh.

Mathematical and Theoretical Physics

BSc (Hons) / MPhys (Hons)

Mathematical and Theoretical Physics studies the more theoretical parts of physics and provides a solid grounding in mathematics. At Aberystwyth, you will study a wide range of themes including abstract and linear algebra, calculus, differential equations, quantum mechanics, dynamics and thermal physics.

This combination of mathematics and physics links to many spheres of interest and reflects research expertise in applied mathematics, quantum control, solar physics and condensed matter physics.

Specialist opportunities at Aberystwyth for Mathematical and Theoretical Physics include:

- mathematics and physics have been taught at Aberystwyth since the foundation of the university in 1872, making the university the first in Wales to teach these subjects;
- your final year project can link to research groups in mathematics and physics;
- studying a degree recognised by the Institute of Physics.

Degree type: BSc/MMath

UCAS Code: F340/F341.

Duration: 3 years/4 years.

Core modules and teaching structure on this course includes:

Year 1

> Algebra*;
> Calculus*;
> Classical Dynamics*;
> Classical Physics*;
> Coordinate and Vector Geometry*;
> Probability*;
> Different Equations*;
> Further Algebra and Calculus;
> Mathematical Analysis*;
> Modern Physics;
> Statistics*.

Year 2

> Distributions and Estimation;
> Introduction to Abstract Algebra;
> Mathematical Physics*;
> Real Analysis*;
> Complex Analysis;
> Electricity and Magnetism;
> Linear Algebra*;
> Principles of Quantum Mechanics.

Year 3

> Group Theory;
> Norms and Differential Equations;
> Probability and Stochastic Processes;
> Probing Atoms and Molecules*.

* also available partially or entirely through the medium of Welsh.

Physics

BSc (Hons) / MPhys (Hons)

Understanding the laws of physics underpins the whole of modern science and technology. It involves the application of abstract concepts expressed through mathematics to model and predict the behaviour of systems ranging in scale from the sub-atomic to the galactic. Physics at Aberystwyth explores areas as diverse as quantum technology, the theory of relativity, and solid-state physics.

Our research-led teaching staff will provide you with specialist knowledge and practical skills, covering exciting topics such as quantum technology, relativity, computational physics, advanced materials, nanoscience, optics, lasers and instrumentation. Specialist opportunities at Aberystwyth for Physics include:

- Physics has been taught at Aberystwyth since the university was founded in 1872.
- studying a degree accredited by the Institute of Physics;
- the option to link your final year projects to research specialisms in materials, quantum and space physics;
- being taught by researchers that are involved in current space missions such as the European Space Agency ExoMars 2020 Project and engineering low dimensional materials (i.e. graphene).

Employability

Physics graduates are well-equipped for a wide range of career options. Some of our graduates are now pursuing careers as diverse as meteorology, accountancy, computing, geophysics, medical physics, teaching in schools and universities, and research in materials physics and in the astronomical, space and planetary sciences.

Degree type: BSc/MPhys.

UCAS Code: F300 (F304 with year in industry)/F303 (F305 with year in industry).

Duration: 3 or 4 years/4 or 5 years.

This degree is also available as a four year course with a foundation year (F301). The first year of this course will bring you up to university entry level, preparing you for the final three years.

Core modules and teaching structure on this course includes:

Year 1

> Algebra;
> Calculus*;
> Classical Dynamics*;
> Classical Physics*;
> Laboratory Techniques for Experimental Physics*;
> Forces and Energy*;
> Further Algebra and Calculus;
> Modern Physics;
> Physics Career Planning and Skills Development*.

Year 2

> Mathematical Physics*;
> Numerical Techniques for Physicists;
> Sensors, Electronics and Instrumentation;
> Electricity and Magnetism;
> Experimental Physics*;
> Optics;
> Principles of Quantum Mechanics.

Year 3

> Concepts in Condensed Matter Physics*;
> Modern Optics and Photonics;
> Numerical Methods;
> Project*;
> Structure and Determination of Condensed Matter;
> Materials Physics;
> Probing Atoms and Molecules*;
> Semiconductor Technology.

* also available partially or entirely through the medium of Welsh.

Physics with Planetary and Space Physics

BSc (Hons) / MPhys (Hons)

The Physics with Planetary and Space Physics degree at Aberystwyth provides you with a core of physics alongside a detailed exploration of the physics of the solar system. You'll be taught by experts in this field and you'll have access to specialist astronomical equipment.

You will study the evolution of the solar system, planetary interiors and surfaces, the sun as a star, comets, and red giants. You will also cover quantum mechanics, thermal physics, and atmospheric physics. Specialist opportunities at Aberystwyth for Physics with Planetary and Space Physics include:

- your final year project may link to current solar system physics research;
- studying a degree accredited by the Institute of Physics;
- physics with Planetary and Space Physics is one of the most established space physics courses in the UK;
- being taught by researchers that are involved in current space missions such as the European Space Agency ExoMars 2020 Project;
- the possibility of spending a semester studying in the Arctic Circle on the island of Svalbard.

Employability

A degree in Physics with Planetary and Space Physics at Aberystwyth will prepare you for such career destinations as space scientist, physicist, scientific laboratory technician, radiation protection practitioner, and research scientist. Other career paths may include systems developer, product development scientist, technical author, or meteorologist.

Degree type: BSc/MPhys.

UCAS Code: F364/F366.

Duration: 3 years/4 years.

Core modules and teaching structure on this course includes:

Year 1

> Algebra and Differential Equations*;
> Calculus*;
> Classical Dynamics*;
> Classical Physics*;
> Laboratory Techniques for Experimental Physics;
> Forces and Energy*;
> Further Algebra and Calculus;
> Modern Physics;
> Physics Career Planning and Skills Development.

Year 2

> Mathematical Physics*;
> Numerical Techniques for Physicists;
> Planets;
> Stars;
> Electricity and Magnetism;
> Experimental Physics*;
> Optics;
> Principles of Quantum Mechanics.

Year 3

> Concepts in Condensed Matter Physics*;
> Interior of the Sun;
> Numerical Methods;
> Planetary Neutral Atmospheres;
> Project*;
> Space Plasmas;
> Ionospheres and Magnetospheres;
> Probing Atoms and Molecules*;
> The Solar Atmosphere and Heliosphere.

* also available partially or entirely through the medium of Welsh.

Space Science and Robotics

BSc (Hons) / MPhys (Hons)

This degree scheme will expose you to the foundations of space exploration and will equip you with the skills that meet the requirements and challenges of the space industry. This course combines expertise in solar system and space physics with the space robotics and artificial intelligence and expertise of the Department of Computer Science to consider the challenges to be met in robotic exploration of the solar system and their solutions.

As you'll be taught by experts in their field, you will be exposed to the foundations of space exploration and equipped with the skills that meet the requirements and challenges of the space industry, as well as the planning and development of future Space Physics and Astrophysics missions. You will also be immersed in both the fundamentals of Computer Science and the very latest technological innovations.

Specialist opportunities at Aberystwyth for Space Science and Robotics include:

- studying the only degree of its kind in the UK;
- studying a degree recognised by the Institute of Physics;
- you will have the opportunity to undertake a project linked to current research in space physics or robotics;
- being taught by researchers that are involved in the current European Space Agency ExoMars 2020 Project.

Employability

This degree scheme perfectly equips graduates with the necessary skills for careers in the space industry. Several of our graduates have gone on to specialise in space robotics or a related field of astrophysics or robotics. Other potential careers that graduates of this degree scheme could enter include software and systems development, computer programming, engineering or teaching.

Degree type: BSc/MPhys.

UCAS Code: FH56/FH5P.

Duration: 3 years/4 years.

Core modules and teaching structure on this course includes:

Year 1

> Astronomy;
> Classical Dynamics*;
> Forces and Energy*;
> Introduction to Computer Infrastructure;
> Introduction to Programming*
> Laboratory Techniques for Experimental Physics*;
> Modern Physics;
> Programming Using an Object-Oriented Language*;

Year 2

> C and C++;
> Planets ;
> Scientific Python*;
> Sensors, Electronics and Instrumentation;
> Experimental Physics*;
> Optics;
> Robotics and Embedded Systems.

Year 3

> Concepts in Condensed Matter Physics*;
> Ionospheres and Magnetospheres;
> Major Project*;
> Numerical Methods;
> Planetary Neutral Atmospheres;
> Semiconductor Technology;
> Space Robotics;
> Ubiquitous Computing.

* also available partially or entirely through the medium of Welsh.

Physics with integrated foundation year

Available as a 4 year BSc in Physics (F301) or Astrophysics (F512)

In the Department of Physics we have over 25 years of experience delivering foundation year teaching in Physics, teaching students from a wide range of backgrounds and experiences with an emphasis on widening participation and access to Physics for all.

These 4-year BSc degree schemes are available to candidates without formal qualifications who have suitable background education, experience and motivation.

These programmes are suitable for students:

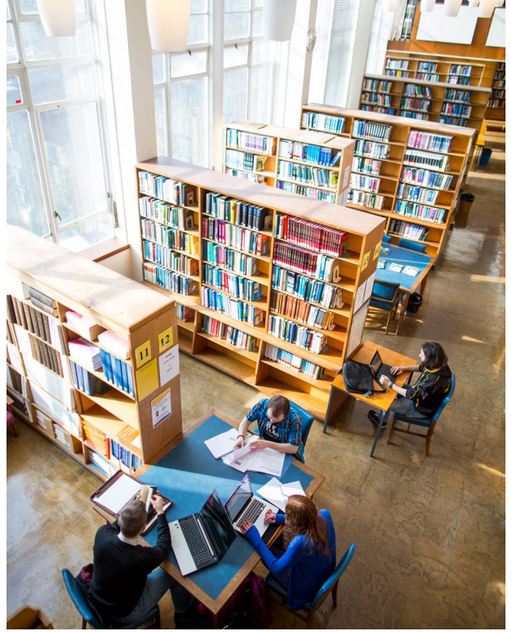
- Whose academic qualifications are not appropriate for direct entry into our 3-year BSs programmes.
- Those who are returning to study following a break, where they may have gained relevant experience but do not have traditional academic qualifications.
- Mature students returning to education
- Care leavers
- Students who have not met their expected entrance requirements due to adverse situations
- Those looking for a more supported transition to university life and to gain confidence in the subject.

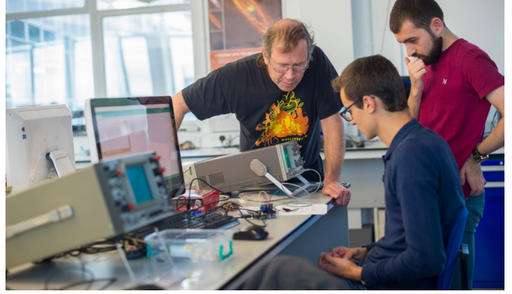
The integrated foundation year allows you to cover a broad area of learning and then specialise later in your career. You will receive foundations in the key areas of Physics and Astronomy, taught in a supportive environment, developing the transferable skills required by employers, for education, business and industry with the benefit of small group practical sessions in the laboratory and enhanced tutorial support.
All foundation year modules are taught on campus with the same facilities as the undergraduate courses.

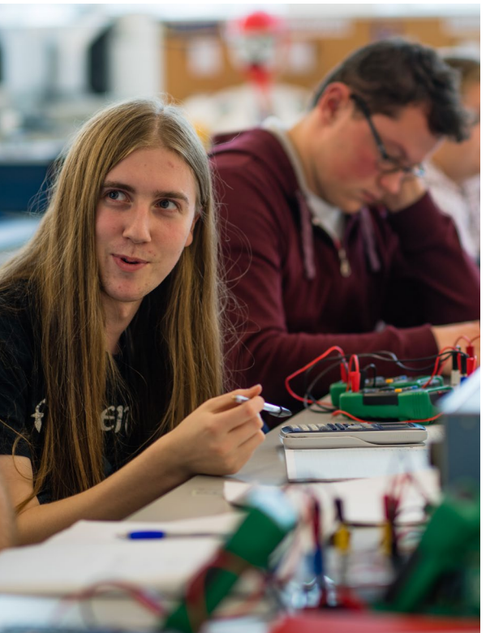
Progression routes

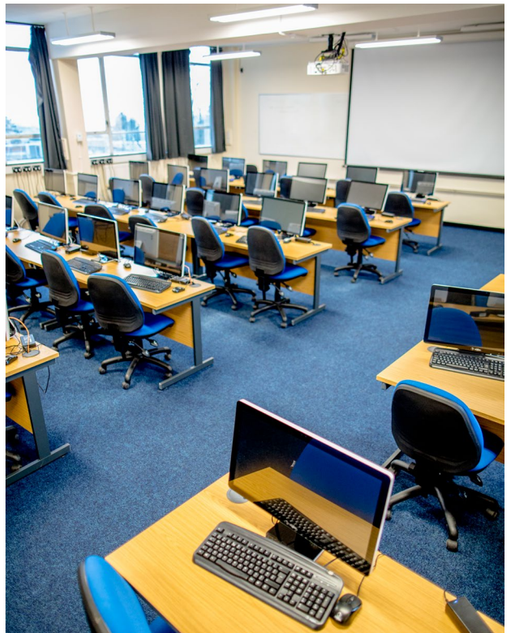
Successful completion of the foundation year covers the necessary pre-requisite material for higher study, with students continuing on their BSc Physics or Astrophysics degree scheme.

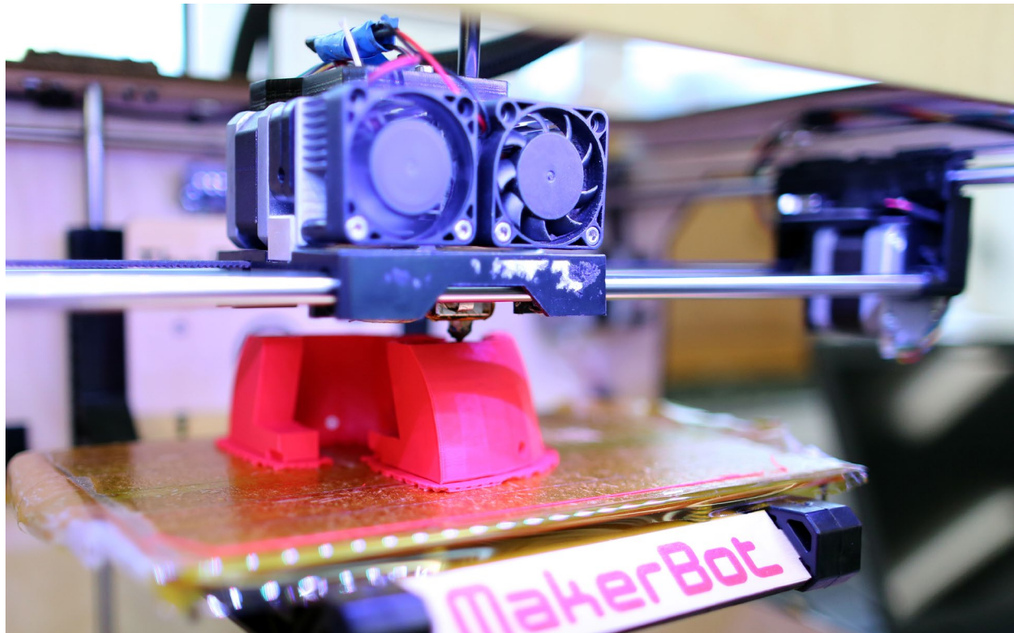
The Department











Studying Abroad Opportunities

At Aberystwyth, students have two pathways for studying abroad. The Erasmus + route involves studying in one of our partnered European Universities and comes with financial incentives in the form of an Erasmus+ grant. If you wish to study further afield, you can participate in the University's International Exchange Programme.

Erasmus+

Czech Republic
> Charles University, Prague

France
> Paris-Sorbonne University
> University of La Rochelle

Germany
> University of Goettingen

Ireland
> National University of Ireland, Galway
> Mary Immaculate College, Limerick
> Maynooth University
> University College Dublin

Netherlands
> University of Utrecht

Norway
> University of Tromso

Poland
> University of Wroclaw

Portugal
> University of Coimbra

International Exchange Programme

Australia
> Griffith University
> Murdoch University, Perth
> University of New South Wales, Sydney
> University of Newcastle

Canada:
> Dalhousie University, Halifax, Nova Scotia
> McGill University, Montreal
> Thompson Rivers University, British Columbia
> University of Guelph, Ontario
> University of Ottawa
> University of Victoria, British Columbia

USA:
> American University, Washington DC
> Boise State University, Idaho
> Bowling Green State University, Ohio
> Carroll University, Wisconsin
> Purdue University, Indiana
> Queen's University of Charlotte, North Carolina
> University of Alabama
> University of Georgia
> University of Louisville, Kentucky
> University of Montana
> Utica College, New York
> Washington State University
> Westminster College, Missouri
> Willamette University, Oregon

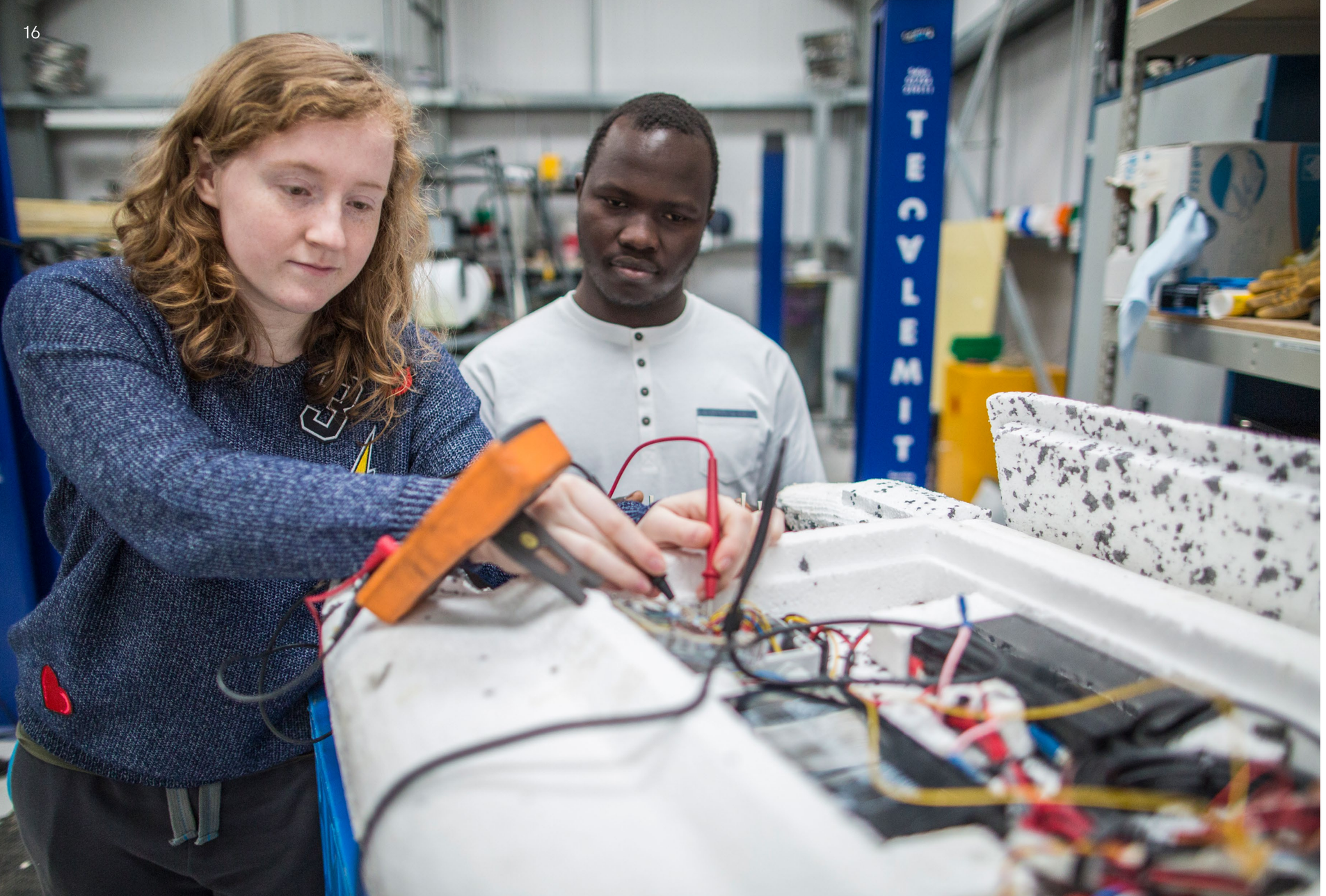
Azerbaijan
> ADA University, Baku

China
> University of Nottingham, Ningbo

Japan
> Rikkyo University, Tokyo

Hong Kong
> Hong Kong Baptist University

Thailand
> Thammasat University



Employability

A degree in Physics will prepare you for such career destinations as medical physicist, scientific laboratory technician, radiation protection practitioner, research scientist and more.

Other career paths may include systems developer, product development scientist, technical author or meteorologist. Further study at postgraduate level will open doors into research, lecturing and teaching. In a recent survey, 93% of UK/EU undergraduates who graduated from the Department of Physics in 2018 were in employment or further education six months after graduating (HESA 2018).

Transferable skills

Studying for a degree in Physics will equip you with a range of transferable skills which are highly valued by employers.
These include:

- Research and data analysis skills
- Enhanced mathematical and computational skills
- Effective problem-solving and creative thinking skills
- Facility to deal with abstract concepts
- Thorough grounding in information technology skills
- Ability to work independently
- Time-management and organisational skills, including the ability to meet deadlines
- Ability to express ideas and communicate information in a clear and structured manner, in both written and oral form
- Self-motivation and self-reliance
- Team-working, with the ability to discuss concepts in groups, accommodating different ideas and reaching agreement

Studying through the medium of Welsh

The Department of Physics provides all students the opportunity to study a part of the course through the medium of Welsh.

Aberystwyth University offers a high level of provision for students to be able to study through the medium of Welsh - one of the highest in Wales.

We offer opportunities for students who are fluent in Welsh, in addition to those who are less confident or learners. There are variations in undergraduate course modules and the amount that can be studied through the medium of Welsh. Some offer a few modules in Welsh, while others the entire course. You can also study modules in Welsh even if you are studying mainly in English.

'Addewidion Aber' is Aberystwyth University's commitment to develop Welsh medium provisions following the University's Welsh Medium Academic Strategy.

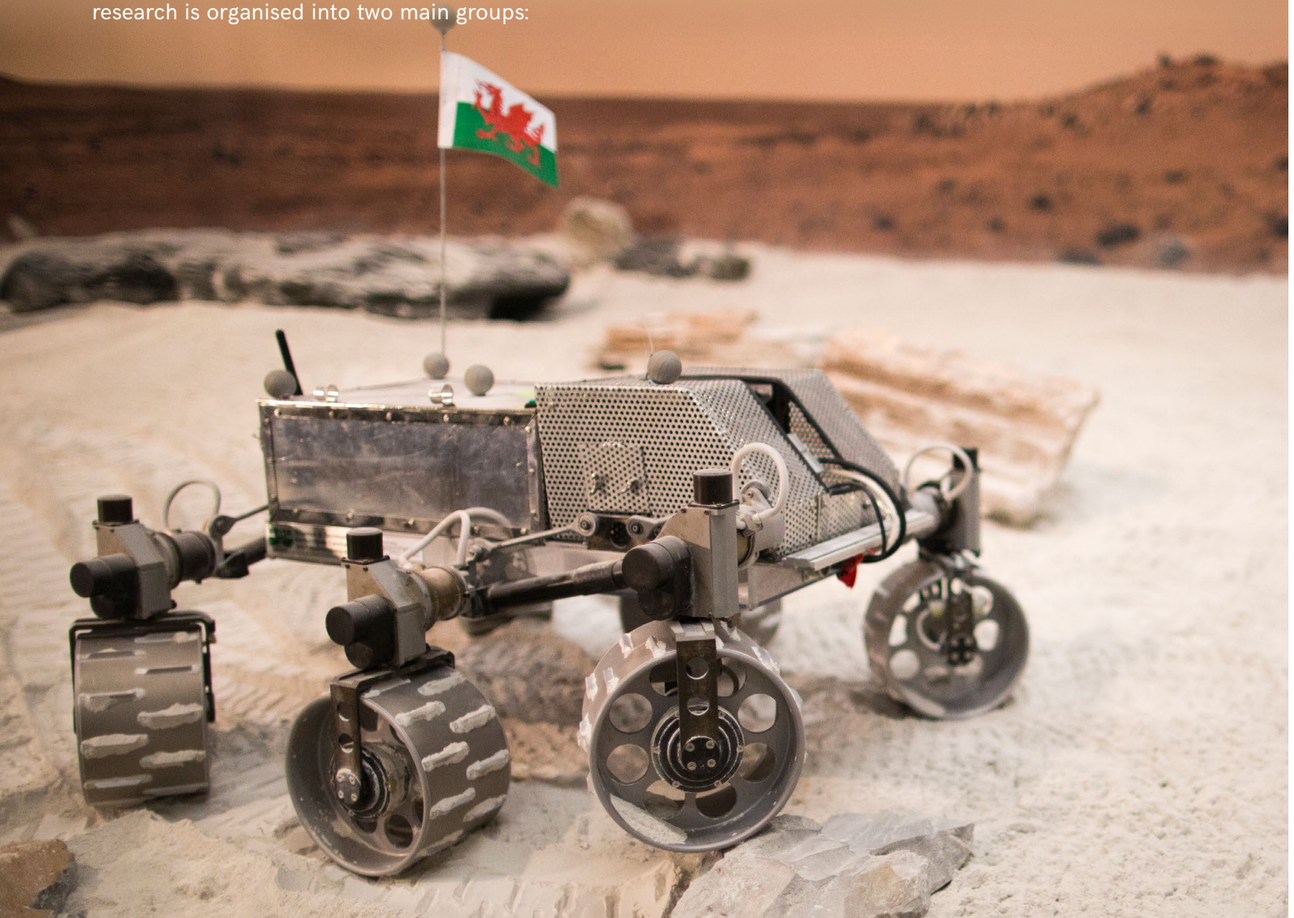
These pledges highlight what's special about Aberystwyth and how the University offers a complete Welsh experience, including:

- Flexible opportunities to study through the medium of Welsh in all departments;
- Guaranteed Welsh-speaking Personal Tutor;
- Bilingual work experience;
- Guaranteed Welsh medium accommodation;
- Lessons to learn and improve Welsh;
- Free membership to the Welsh Students' Union (Undeb Myfyrwyr Cymraeg Aberystwyth).

Departmental Research

Our mission is to provide the best learning environment for our students, informed by world leading research in space, quantum, materials and engineering physics.

Our lecturers are research-active in their fields, involved in projects ranging from engineering new materials and novel instruments to planetary missions and ground breaking studies of the Sun's activity. Our staff actively encourage undergraduate students to become involved in their work throughout their studies. Our research is organised into two main groups:



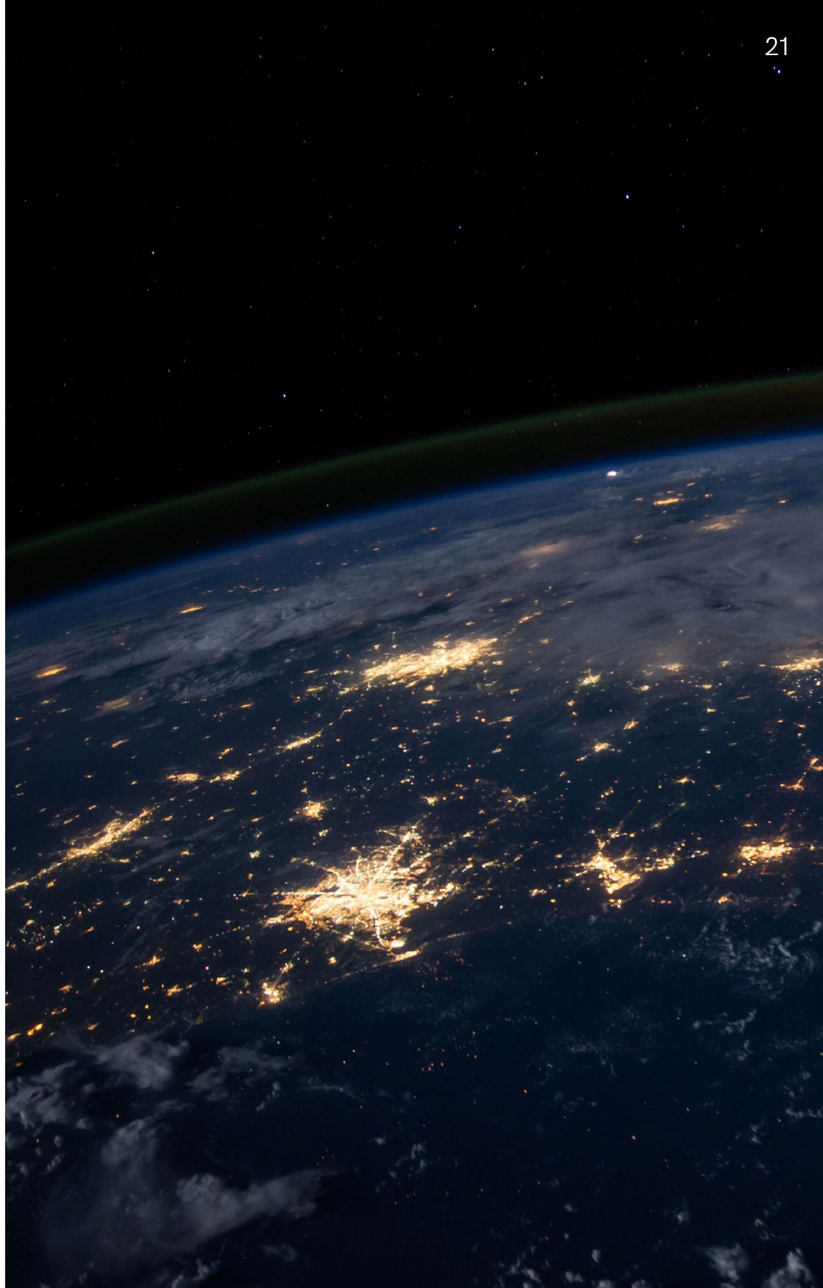
Materials Physics Group

Researchers in the Materials Physics Research Group use a variety of experimental measurement and modelling techniques in order to learn more about industrially relevant materials. Materials research at Aberystwyth is centred around several key areas: glasses, zeolites and ceramics, foams and complex fluids, spin physics and control, and semiconductor thin films and surfaces. In each of these areas advanced techniques are applied, measuring aspects of the materials as they are formed or processed. Our work is often interdisciplinary, for example we work closely with our colleagues in; Mathematics on Quantum Structures, Information and Control Theory, Biology on Bio-pigments and novel characterisation of protein interactions, and Earth Sciences on novel luminescence instrumentation.

Solar System Physics Group

The Solar System Physics Group at Aberystwyth studies this single system from the development of eruptive features on the Sun, through the evolution and structure of material in the solar wind, and the impact of this flow on the environments of the inner planets. The group is involved in several current or planned missions and has a programme of developing novel optical systems and robotic components for space exploration.

The group carries out research in four main themes: The Sun, Solar Wind and Heliosphere, Planetary Magnetospheres and Ionospheres, Astrochemistry, and Planetary Surfaces.



Study in the High Arctic

Svalbard: Land of Polar Bears and Aurorae.

Svalbard is one of the most exotic locations on Earth. It is an archipelago of islands spanning latitudes from about 74N to 81N, far inside the arctic circle. It is one of the few unspoilt wilderness areas left - much of the islands are covered in glaciers and are home to wildlife including polar bears, reindeer, walruses, seals and arctic foxes.

Svalbard is the ideal place to study atmospheric, ionospheric and space physics because at high latitudes dramatic phenomena occur which are inaccessible elsewhere, such as the stratospheric polar-night vortex, ozone depletion, and the connection of the planet's magnetic field to interplanetary space via the open field lines found at polar latitudes.

Students taking MPhys Physics with Planetary and Space Physics have the unparalleled opportunity of spending the second semester of their final year (January-May) studying at UNIS (University Centre on Svalbard) an international university in the town of Longyearbyen on Svalbard. Students from across Europe meet to study advanced courses in polar science (all teaching is in the common language of English and there are no additional tuition fees). Longyearbyen is a lively town with restaurants, an art gallery and museum, a sports hall and swimming pool, pubs and a cinema.

Students live in purpose-built modern accommodation and are taught by University staff from Norway of international standing.

How to apply

Once you have decided what course you want to study and where, you'll be able to start the university application process. Here's a brief overview of the process and our procedures here at Aberystwyth.

1 Apply through UCAS.com

Deadline 15 January. Aberystwyth University institution code: A40.

TOP TIP: You'll be given a 10 digit UCAS ID number. Keep this to hand as you'll be asked for it many times.

2 The university will consider your offer

TOP TIP: Use UCAS Track to keep an eye on your application. At Aberystwyth we aim to make a decision within 4 weeks.

3 The offer will show on UCAS track

4 Decide where to go

Once you've received all your offers, you'll need to decide which university you want to go to, within a set time. This is when you'll need to note which universities will be your firm and insurance choices.

5 Accommodation

Once you've chosen your firm/insurance choice you'll be able to apply for your accommodation (April 1st onwards).

6 Results day

UCAS Track will confirm your offer of a place. If you're not clear what the offer is, contact the university directly. Make sure you're not on holiday on results day. If you don't get the grades you've hoped for, you may want to consider entering Clearing.

7 Start packing!

1872 PRIFYSGOL ABERYSTWYTH UNIVERSITY