PHYSICS/ASTRONOMY, SPACE SCIENCE AND ASTROPHYSICS

Canterbury
Kent is one of the UK’s leading universities. All of our academic schools produce world-class research, and Kent is rated as internationally excellent, leading the way in many fields of study.

Studying physics or astronomy at Kent’s School of Physical Sciences can lead to either a Bachelor’s degree or an undergraduate Master’s degree in perhaps the two most beguiling and fascinating of scientific disciplines.

Physics ranges from subatomic particles to the largest of galaxies, encompassing the length, mass and timescales within these two extremes. It is no surprise, then, that at the heart of a professional physicist is a fascination with, and a desire to understand, the ‘how and why’ of the world around us.

A more specialised area of study is astrophysics, which emphasises the physical concepts of the stars and galaxies that make up the universe. Astronomy is one of the oldest sciences, practised by most of the world’s ancient civilisations, and one of the most modern, turning to high technology and the space programme for many of its recent discoveries. Studying any, or all, of these areas can quickly take you to the frontiers of scientific knowledge.

World-leading research
Research at the School of Physical Sciences is very strong, with a large number of staff and postgraduate students engaged in four different research groups. These are: the Functional Materials Group, who work in a range of areas including bioactive materials, fuel-cell technology and superatoms; the Applied Optics Group, who are world leaders in their field and work in collaboration with a number of hospitals in the UK and abroad to develop novel diagnostic technologies; the Forensic Imaging Group, who develop digital imaging for forensic investigation; and the Centre for Astrophysics and Planetary Science, where staff conduct research for NASA and the European Space Agency, and are leaders in astrobiology.

Inspirational teaching
At Kent, we offer you the chance to study all of the traditional areas of physics – from thermodynamics to quantum mechanics. And we also give you the chance to branch out into more unusual subjects, such as space studies and the structure of the universe – a fascinating area thanks to its constant stream of new discoveries. We bring innovative features into our teaching. In our projects, for example, physics is often applied to a range of situations taken from films, such as the threat from incoming meteorites.

A lot of our research feeds directly into our teaching, so that your studies are at the cutting edge of the subject. For your final year of our undergraduate Master’s degree, you may be attached to one of our research teams that opens up avenues for deeper exploration. For example, you might find yourself involved in designing space probe instrumentation, firing mini
meteorites into planetary surfaces; mapping the retina of a patient’s eye using fibre optics; modelling the atomic-scale structure of a new engineering material or how stars and galaxies form from molecular clouds; or taking the Channel Tunnel to Paris for neutron-scattering work.

**Supportive academic community**

The School of Physical Sciences is an encouraging environment where your interests and strengths can flourish. Our School prides itself on its sociable and stimulating atmosphere. There is a lot of interaction between our students and staff, and one very popular facility is the Student Room, designed to give you a place to meet and to study.

There are also Open Lectures that you are welcome to attend. In recent years, these have included Nobel Laureate, Sir Anthony Leggett and Professor John Zarnecki, Principal Investigator on the Surface Science Package of the Huygens Mission to Titan.

**A global outlook**

Kent has a reputation as the UK’s European university and has developed international partnerships with a number of prestigious institutions.

At the School of Physical Sciences, you have the opportunity to expand your horizons through an exchange programme, which enables you to spend the third year of your degree studying in the USA/Canada. This gives you an excellent chance to witness an international approach to physics. Over the years, we have established a strong exchange programme with our partner universities, which include the Pennsylvania State University on the east coast, the University of California in Santa Barbara and the University of Indiana, Bloomington, among others in the USA. Plus the University of Calgary and Trent University, Canada.

For more details of our overseas opportunities, please see [www.kent.ac.uk/goabroad](http://www.kent.ac.uk/goabroad)

**Flexible entry**

If you do not have the formal entry requirements for our degree programme, we have devised a Foundation Year that prepares you for entry on to any of our BSc or MPhys programmes. This is ideal for mature students returning to full-time education and also suitable for those who may not have the grades required for direct entry on to the degree programme. For more information on the programmes you can take, please see p10.

**A successful future**

As well as providing a first-rate academic experience, we want you to be in a good position to face the demands of a tough economic environment. During your studies, you develop key transferable skills considered essential for a successful career in any discipline. You gain the skills and confidence that are sought after by employers in today’s competitive world, from presentation skills, analytical thinking to writing with cohesion and clarity.

For more information on the careers help we provide at Kent, please go to p8 or visit [www.kent.ac.uk/employability](http://www.kent.ac.uk/employability)
SUPERB STUDENT EXPERIENCE

Throughout your studies, you will be based at our scenic Canterbury campus, working with cutting-edge technology in the laboratory. The School of Physical Sciences offers access to first-class research facilities, with our recently refurbished £2.5 million teaching wing with state-of-the-art equipment.

All our students have access to student-run astronomical observation facilities and there are opportunities to investigate the possibilities of life elsewhere in the universe. Astronomy, Space Science and Astrophysics students can get involved with real space missions from ESA and NASA, and can work on Hubble Telescope data and images from giant telescopes. Good academic facilities are available on campus, such as the Templeman Library, which is well stocked with books, periodicals and other essential resources as well as specialist collections in a number of areas. Kent has more than 1,000 computers on campus, all with high-speed web access, and there is a range of study support services for students who require help and advice.

Sociable campus
The campus is set in 300 acres of parkland, overlooking Canterbury. Modern buildings are surrounded by open, green spaces, courtyards, gardens and woodland. It is self-contained with all the main facilities within walking distance. These include a sports centre, cinema, nightclub, restaurants, bars, shops, bank, medical centre and pharmacy.

A diverse community
Many students comment on the international and friendly atmosphere at Kent. We have an international community on campus with 149 nationalities represented, allowing you to make friends from all over the world.

Historic city
Canterbury city centre is just a 25-minute walk or a short bus-ride from the University campus. It’s a small but beautiful city with stunning medieval buildings, lively bars, pubs, restaurants and cafés, and a wide range of shops, from small independent outlets to high-street chains. At the heart of the city, Canterbury Cathedral is also the venue for the University’s degree ceremonies.

Excellent location
Canterbury is an ideal base from which to explore further afield. The coastal town of Whitstable is close by and there are sandy beaches further down the coast. London is less than an hour away by high-speed train. We have strong links with universities in Europe, and Kent is only around two hours by train from Paris and Brussels.

DID YOU KNOW?
Canterbury is consistently rated as one of the safest university cities in England and Wales in The Complete University Guide.
What do you get up to in your spare time?
I’m a member of the Space Society, which is for anyone interested in astronomy or space. There are a lot of sci-fi movie nights, socials, telescope sessions, rocket building and trips. You don’t have to be studying physics or astronomy to be a member, it’s really for anyone who is interested. I also started the Aikido Club, which is a self-defence focused martial art. The Student Union has hundreds of societies you can choose from, but if they don’t have the one you want you can start your own with like-minded people.

What kind of career do you hope to follow when you leave?
I really want to do something research-based, and I’m thinking seriously of going on to study for a PhD. I’ve already been talking to some of the lecturers to see what kind of opportunities may be available. I’ve found that the Careers and Employability Service is really good for helping you to figure out what sort of options you will have after you graduate.

Any advice to other students?
Make sure that you take advantage of all the help and advice that is on offer, because it can make such a huge difference. Kent really is a great place to study astrophysics, and the School of Physical Sciences offers a lot of support to help you to succeed.

Sally Makin is in her fourth year of study on the MPhys (Hons) in Astronomy, Space Science and Astrophysics.

What attracted you to studying at Kent?
I was always interested in astronomy, but never thought of pursuing it as a career. The Open Day was excellent: I got to look around the campus and chat to people who were already studying here. There was a really friendly atmosphere.

How is your course going?
It’s hard work but definitely worth the effort. The topics are really varied. In the first two years, you share a lot of modules with the Physics students, so you gain a good, broad understanding of the whole subject. In the third year, everything is more specialised.

Which module have you enjoyed the most?
I really enjoyed the maths module because of the teaching. Everyone loved the lecturer, who was funny and had a great way of explaining things. The content was pitched really well – it didn’t matter how much maths we knew from A level, and we were taught everything we needed to know for our degree.

How do you find the lecturers?
The lecturers are really good. Most are doing research in astronomy and astrophysics or have come from the space industry, so they really are experts in the field. If you want to get some help, they are always happy to answer questions, and you know you are getting the most up-to-date knowledge available.

How are you supported in your studies?
I took advantage of the peer-mentoring scheme, where students who have already been through the process volunteer to help tutor small groups of first years. It was brilliant and really helped me get to grips with academic study.

How do you get along with your fellow students?
The students on my course are some of the most sociable people I’ve ever met. There are always ‘physics’ socials going on, usually with a sci-fi theme where everyone gets dressed up. We’ve formed a great support network where we all help each other out if anyone gets stuck.

How do you find the campus?
I love the campus. It’s so refreshing to be away from an urban environment. You barely need to leave campus in your first year, as there are all the facilities you need here such as the library, shops, the medical centre and the sports centre.
Kent equips you with essential skills to give you a competitive advantage when it comes to getting a job. We are consistently in the top 20 of graduate starting salaries and, six months after graduation in 2012, less than 6% of Kent graduates were without a job or a further study opportunity.

**Good career prospects**

Physics provides an excellent basis for many jobs and our graduates’ careers bear this out. Recent graduates have gone on to work in a wide range of areas including research and development, technical management, the City and financial institutions, computing, software design, the media and teaching.

**Key employment skills**

We want our graduates to be well-equipped for the challenges of the working world. As well as giving you a solid grounding in your subject, we also aim to provide you with the key skills that can be vital to a successful career.

As a scientist, it is important that you are able to communicate effectively, so we teach students how to give presentations, write technical information in an accessible way and work effectively within a group. You also become proficient in Word, Excel and PowerPoint.

For final-year MPhys (Hons) students, we even simulate a scientific conference, to show you what it might be like to participate in the scientific community.

**Careers advice**

The University of Kent’s Careers and Employability Service can give you advice on how to choose your future career, how to apply for jobs, how to write a good CV and how to perform well in interviews and aptitude tests. It also provides up-to-date information on graduate opportunities before and after you graduate.

For more details, see www.kent.ac.uk/employability

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**DID YOU KNOW?**

100% of Kent Physics students found employment or went on to further study within six months of graduating in 2012, according to the Destination of Leavers from Higher Education survey.
Izabela Zajac and Emily Tipper graduated from Kent in 2012. They work as graduate Spacecraft Thermal engineers at Astrium, a global leader in the Space industry.

**Izabela:** I am on a graduate development programme as a Spacecraft Thermal Engineer.

**Emily:** I am also on the graduate scheme at Astrium, which design and manufacture spacecraft for telecommunication services and science missions and are Europe’s leading space company, second to Boeing worldwide. As a thermal engineer, I am responsible for the design and analysis of the thermal control subsystem of spacecraft. So far, I have worked on some very interesting projects such as the LISA Pathfinder spacecraft, which will demonstrate, in orbit, the technologies for LISA, the ESA-NASA Laser Interferometer Space Antenna gravity wave observatory. I feel very lucky to have joined the company as thousands of physics and engineering graduates apply to the scheme each year and I have Kent to thank for my success.

**Any advice for someone thinking of studying at Kent?**

**Izabela:** It’s an excellent choice, I would not do anything different if I had to choose again.

**Emily:** If you’re looking for a university that provides interesting courses, supportive staff and an excellent student community then you definitely should not think twice about choosing Kent. It’s helped me in both my professional and personal development, and I can’t think of anything I would change about my university career.

**Did the course live up to your expectations?**

**Izabela:** Yes! It was very well structured and the teachers were helpful and inspiring.

**Emily:** Absolutely. The course structure was well programmed and as interesting as I had hoped. I left Kent with the appropriate level of knowledge to pursue a career in my chosen field.

**What were the lecturers like?**

**Izabela:** The lecturers were very supportive and obviously dedicated towards teaching their subject.

**Emily:** The lecturers were great teachers and my course tutor was very helpful. Other staff within the School were very supportive and the peer mentoring group was really useful.

**Which part of the course most interested you?**

**Izabela:** I found the Space Science courses most interesting, with topics like rocketry and the history of human spaceflight. I also really enjoyed the final-year research project – it was very exciting to contribute to new research.

**Emily:** I found the Quantum Physics modules most interesting, which was a surprise to me as it was not a subject I’d learnt outside of University. We had an excellent lecturer who made it interesting with lots of great anecdotes!
CHOOSING YOUR PROGRAMME

You can take most physics-related subjects as either a three-year BSc or four-year MPhys degree. You also have some flexibility to switch between programmes during your first year of study.

Which degree to choose?

BSc (Hons)
Our BSc (Hons) programmes offer a broad training in physics, and provide an ideal preparation for a wide range of careers in the manufacturing and service industries, as well as education, the media and the financial sector.

MPhys (Hons)
In our MPhys (Hons) programmes, core knowledge and skills are enhanced by an additional fourth year to concentrate on the in-depth training required for a science-based career, including the practical aspects of the research processes and major projects within the School’s research groups.

A range of subjects

Physics
The BSc or MPhys in Physics offers you the broadest training in physics and allows you the maximum choice of options.

Physics with Astrophysics
In this BSc or MPhys programme, core physics modules are supplemented by modules in astrophysics, complemented by the areas of expertise of our staff, ranging from solar system exploration through stellar formation and collapse to the structure and evolution of the universe. You could choose this subject if you find excitement in exploring the universe, but also appreciate the need for down-to-earth training in physics.

Astronomy, Space Science and Astrophysics
This is a fantastic BSc or MPhys programme for those who are inspired by the wonders and vastness of the universe. In this degree programme, there are opportunities to investigate the possibilities of life elsewhere in the universe. You get involved with real space missions from ESA and NASA and can work on actual Hubble Telescope data.

Physics with a Foundation Year
This four-year BSc programme is designed for students who do not possess the formal entry requirements for a physics degree, or overseas students who require additional preparation in science, mathematics or English language. The mathematics, physics, electronics, computing and laboratory practical work provide an ideal preparation for any of our BSc or MPhys programmes.

Year in the USA/Canada
Those on a four-year MPhys programme can opt to spend their third year in the USA/Canada.
STUDYING AT STAGE 1

Stage 1 represents the first year of your degree programme.

The following modules are compulsory in your first-year:
• Astrophysics, Space Sciences and Cosmology
• Computing Skills
• Introduction to Ballistics
• Mathematics
• Physics
• Skills for Physicists.

Modules: Stage 1

Astrophysics, Space Sciences and Cosmology
A basic background in astrophysics is provided in this module, covering subjects ranging from the sun and the solar system, to stars and stellar systems. It also introduces you to particle physics and cosmology. The space sciences aspect concentrates on space missions and the exploration of the solar system.

Computing Skills
This module introduces you to computer programming languages, and to Fortran in particular. You learn how to use the UNIX operating system, including the text editor, the directory system, basic utilities, and the edit-compile-run cycle. By the end of the module, you will be able to program in Fortran 90 and devise simple computational algorithms.

Introduction to Ballistics
This is an introduction to the study of ballistics. The module explores types and uses of weaponry looking at construction, weaponry mechanisms and scientific ballistic applications. Your study focuses on the uses of mathematical concepts for impact studies, Newton's laws of motion, vectors, impacts and momentum studies, and looks at energy considerations in practical applications.

Mathematics
This module provides you with the necessary mathematical tools to enable a deeper understanding of physics and to lay a firm foundation for your progression towards the more advanced mathematical subjects.

Physics
You are introduced to the foundations of physics. The module forms a firm basis upon which you can build in later years of your degree programme. You gain an understanding of the laws and concepts of mechanics, waves, electromagnetism and thermodynamics, and their application to the study of properties of solids and gases, electrical circuits and optics.

Skills for Physicists
This module provides you with the basic experimental, statistical, data analysis and communication skills required in physics. You develop a range of subject-specific and key transferable skills, including information technology and presentation skills, in addition to experimental laboratory skills in physics. Through a series of experiments, this module also enables you to become familiar with more complex apparatus and gives you the opportunity to learn the art of accurate recording and analysis of data. Such data also has to be put in the context of the theoretical background and an estimate of accuracy made.
STUDYING AT STAGE 2

Stage 2 represents the second year of your degree programme.

Physics and Physics with Astrophysics students take the following modules:
- Atomic and Nuclear Physics
- Electromagnetism and Optics
- Mathematical Techniques for Physical Sciences
- Medical Physics
- Physics Laboratory A
- Quantum Physics.

Students on the Physics or Physics with a Year in the USA/Canada programmes also take one of the following:
- Spacecraft Design and Operations
- The Multiwavelength Universe Exoplanets.

Students taking Physics with Astrophysics also take:
- The Multiwavelength Universe Exoplanets.

Astronomy, Space Science and Astrophysics students take the following modules:
- Atomic and Nuclear Physics
- Electromagnetism and Optics
- Mathematical Techniques for Physical Sciences
- Multimedia for Astronomy, Astrophysics and Planetary Science
- Physics Laboratory A
- Quantum Physics
- Spacecraft Design and Operations
- The Multiwavelength Universe Exoplanets.

Modules: Stage 2

Atomic and Nuclear Physics
Atomic and nuclear processes are fundamental to understanding the universe around us. This module gives you an understanding of the way in which quantum numbers cover the properties of atoms and nuclei, and an appreciation of how the theory is related to experimental observation.

Electromagnetism and Optics
This module provides a conceptual framework of electromagnetism at the level needed for understanding the propagation of electromagnetic waves in free space. The module relates optics to electromagnetism and provides an excellent grounding for understanding lasers and modern optics.

Mathematical Techniques for Physical Sciences
You build on the mathematics studied in your first year and concentrate on the techniques that physicists need for problem solving in a whole range of physical applications. This module treats mathematics as a tool to solve advanced physical problems, such as those found in quantum mechanics or optics.

Medical Physics
Here, you gain a broad overview of the role of physics and the physicist in modern medicine. This module sets out the physical and mathematical essentials of major diagnostic and therapeutic techniques such as radiology, MRI and ultrasound. The module involves several contributors from the Department of Medical Physics at the Kent and Canterbury Hospital.

Multimedia for Astronomy, Astrophysics and Planetary Science
A variety of multimedia techniques are applied to astronomical data to process and understand it. On this module, you discover how to use the internet to access astronomical databases and go on to cover a range of topics including: deconvolution, as used by the Hubble Space Telescope for image enhancement; astrometry, the measuring of the co-ordinates of celestial objects from images; photometry, determining magnitudes of variable stars; and image analysis, which covers the quantifying of digital imagery.

Physics Laboratory A

Here, you have the opportunity to practise the necessary observational, recording, analytical and presentation skills required by modern physicists. You carry out a series of extended experiments (each over a two-week period) and two communication exercises. Those on the Physics or Physics

DID YOU KNOW?
Kent was ranked 4th in the UK for overall course satisfaction for Physics in The Guardian University Guide 2014.
with Astrophysics programmes take this as a double module; Astronomy, Space Science and Astrophysics students as a single module.

Quantum Physics
Quantum physics is arguably the most fundamental discovery of 20th-century physics. This module provides an introduction to quantum theories, developing the concept of the wave function and the methods of solving simple physics problems using a quantum formulation. It provides a conceptual background to the ideas of wave particle duality leading to the formulation of the Schrödinger equation. You learn how to solve simple problems and to understand the origins of quantum numbers in one- and three-dimensional systems.

Spacecraft Design and Operations
In this module, you gain a basic understanding of the major subsystems of a spacecraft system and spacecraft trajectory and orbits, including the launch phase, altitude control and interplanetary orbits. You also look at space as a business/commercial opportunity and become familiar with basic management tools for planning work. You develop an understanding of the way in which space missions are configured from constituent subsystems to the mission profile.

The Multiwavelength Universe
Exoplanets
Building on work you have done in Stage 1, this module provides a basic but rigorous grounding in observational, computational and theoretical aspects of astrophysics. You develop a clear understanding of the fundamentals of making astronomical observations across the whole electromagnetic spectrum.

You look at observational characteristics of stars and how their physical structures are derived from observation and using simple models. You also study the origin and evolution of solar systems and evaluate claims for evidence of solar systems other than our own.
Stage 3 represents the third year of the four-year MPhys (Hons) programme and the final year of the BSc (Hons) programme.

BSc students in Physics, and Physics with Astrophysics take the following modules:
- Image Processing
- Physics Group Project
- Physics Problem Solving
- Physics Project Laboratory
- Relativity, Optics and Maxwell’s Equations
- Solid State Physics
- Thermal and Statistical Physics.

Physics students also take:
- Numerical and Computational Methods.

Physics with Astrophysics students also take:
- Stars, Galaxies and the Universe.

Astronomy, Space Science and Astrophysics students take the following modules:
- Image Processing
- Numerical and Computational Methods
- Physics Group Project
- Physics Project Laboratory
- Relativity, Optics and Maxwell’s Equations
- Stars, Galaxies and the Universe
- The Sun, The Earth and Mars
- Thermal and Statistical Physics.

Those on MPhys courses take the same compulsory modules in their third year as BSc students but replace the Physics Project Laboratory and the Physics Group Project with:
- Physical Science Research Planning
- Physics Project.

**Modules: Stage 3**

**Image Processing**
In this module, you learn about the key principles of imaging and image processing, and their real-world applications. You go on to test some of these principles and discover how they can be used in a practical way. You are introduced to the MATLAB programming language, which allows you to implement many of the image processing techniques discussed.

**Numerical and Computational Methods**
This module introduces you to some of the more advanced numerical techniques useful to mathematical physics and illustrates these techniques with appropriate examples classes and computing console sessions.

**Physical Science Research Planning**
Here, you develop skills related to the preparation of a research proposal. You learn how to search and retrieve information from...
Physics Problem Solving
Teaching you the art of problem solving, this module consists of classes where you work in small groups on set problem sheets that contain either exam-style questions or general physics problems. Through working in small groups, you are able to talk to your colleagues as you learn the techniques necessary to solve general problems. A member of staff and an assistant attend each class and offer advice as needed.

Physics Project Laboratory
This module gives you invaluable experience in laboratory-based experiments. The module is divided into two parts. In the first part, you work in the laboratory on a series of two-week experiments; in the second part, you work on longer, more open-ended, mini-projects, where you are given only a brief introduction to the topic to be investigated. You also learn to present your research in a written report.

Physics Project
This module is aimed at students intending to take the MPhys. It offers an opportunity to deepen your knowledge of a specialised field. A choice of projects is available, and may include topics such as experimental measurement and observation, the design and construction of electronic devices and the development and evaluation of new teaching aids.

Relativity, Optics and Maxwell's Equation
Here, you extend your understanding of Maxwell's equation and its relationship to the other laws of electromagnetism. The module also includes such topics as dielectric media, polarisation, electromagnetic waves at a vacuum-dielectric interface, failure of attempts to detect ether and the representation of polarisation in optics. Special relativity is also discussed in depth.

Physics Group Project
The project gives you the opportunity to work with other students to plan, research and conduct a short programme of work. You can choose from a wide range of topics and produce your final report in written, oral, computer or video form, depending on the nature of the project.
STUDYING AT STAGE 3 (CONT)

Solid State Physics
In this module, you gain an increased understanding of the nature and structure of different types of solid materials, including magnetic materials and of the band structure of conducting materials. You learn how to explain the operation of simple semiconductor devices in terms of band structure concepts. Topics include crystal structure, band theory of solids, semiconductor materials and magnetic properties of materials.

Stars, Galaxies and the Universe
What is the internal structure of a star? How are stars formed, and what are the processes by which energy is produced and transferred within a star? And what are the possible end states of stars? An understanding of the fundamentals of general relativity and its use in understanding the properties and evolution of the universe is developed in this module. You also gain an understanding of the structure of the universe, from fundamental particles to individual stars, from galaxies to the entire universe.

The Sun, The Earth and Mars
What are the physical properties and processes of the Sun, and how does it interact with the Earth’s environment? In this module, you study how spacecraft are used with the Earth’s environment for specific purposes and what instruments they can carry. You take a critical look at a current field of planetary exploration, focusing on Mars, and develop an understanding of impact hazards to spacecraft.

Thermal and Statistical Physics
This module covers thermodynamics, basic statistical concepts, semi-classical perfect gases, quantum statistics of perfect gases and transport properties of gases and solids. We also look at physical phenomena, such as superfluidity and Bose-Einstein condensation.
STUDYING AT STAGE 4

Stage 4 represents the final year for those on the MPhys programme.

In your final year, all MPhys students take the following module:
- Physics Research Project.

Physics students also take the following:
- Magnetism and Superconductivity
- Particle and Quantum Physics
- Space Astronomy and Solar System Science
- Topics in Functional Materials.

Physics with Astrophysics students take the following modules:
- Cosmology and Interstellar Medium
- Magnetism and Superconductivity
- Particle and Quantum Physics
- Rocketry and Human Spaceflight
- Space Astronomy and Solar System Science.

Astronomy, Space Science and Astrophysics students take the following modules:
- Cosmology and Interstellar Medium
- Particle and Quantum Physics
- Rocketry and Human Spaceflight
- Space Astronomy and Solar System Science.

Modules: Stage 4

Cosmology and Interstellar Medium

In this module, you look at current knowledge in the fields of extragalactic astrophysics and the interstellar medium. The module provides in-depth study of selected astrophysics material and gives you the knowledge you need for entry to a research degree in the field of astronomy and astrophysics.

Magnetism and Superconductivity

Magnetism and superconductivity are the two prime examples of quantum-mechanical symmetry-breaking. This module provides a good introduction to the world of condensed-matter physics research. A range of topics are covered, including: Type I and Type II superconductors; microscopic superconductivity; isotopic effect; superfluids; magnetism and paramagnetism; neutron and x-ray scattering; spin waves; magnons; and magnetic phase transitions.
Particle and Quantum Physics
You gain a background in quantum mechanics in this module, sufficient for continuing into a research career, and an appreciation of some of the applications and philosophical questions it raises. Starting out from Schrödinger’s equation and probability interpretation of wave functions, you encounter Dirac notation, the uncertainty principle and the conservation laws. You also look at angular momentum, orbital states, spin states and approximation methods.

Physics Research Project
All MPhys students carry out a laboratory-based project related to their degree specialism. The projects involve a combination of some or all of literature search and critique, laboratory work, computing and data analysis. The majority of the projects relate directly to the research conducted in the School and you work within the research laboratories. Often students’ work leads to publication in scientific journals.

Rocketry and Human Spaceflight
This module introduces the concept of the human occupation of space, via discussion of space medicine and the International Space Station. You study aspects of the design and operations of spacecraft and are provided with sufficient knowledge of spacecraft systems to enable you to move on to specialist employment or research in the field.

Space Astronomy and Solar System Science
How can astronomy be carried out in space itself? How can the solar system be explored by spacecraft? How has our solar system evolved and what is its composition? This module looks at space astronomy, the exploration of the solar system, solar system evolution, extra-solar planets and special topics, including the Kuiper Belt, Titan, cosmic dust, terrestrial impacts and a current solar system exploration mission.

DID YOU KNOW?
Kent was ranked 3rd in London and the South-East for overall student satisfaction in the National Student Survey 2013.
Topics in Functional Materials
This provides you with a general appreciation of materials, and an understanding of current topics of interest in materials research. You develop an awareness of the applications of materials in industry, an ability to apply knowledge to solve problems, and an appreciation of the key driving forces in nanotechnology and knowledge of nanostructured materials and phenomena.

Teaching and assessment
Teaching is via lectures, practical classes and workshops. You attend an average of eight one-hour lectures, one to two days of practical or project work and a number of workshops each week.

The practical units include specific study skills in physics and general communication skills. Laboratory classes emphasise different aspects of the subject, but normally you work individually or in pairs and are assessed on your results and written reports.

Workshops are integrated with the lecture programmes and discussion focuses on difficulties you may encounter with written work or physics problems you have undertaken.

In your final year, you work with a specific member of the academic staff on an experimental, computing or theoretical project. Most MPhys projects involve work at the forefront of research conducted in one of our research groups.

Assessment is by examinations at the end of each year and by continuous assessment of practical classes and other written assignments. Stage 1 (and the Foundation Year) are qualifying years and are not included in the final degree classification, which is made up of a combined mark from Stages 2 and 3 with maximum weight applied to the final year. To guarantee progression on the MPhys programmes, you need to demonstrate the ability to obtain a first or second class degree.

“...Early modules covered core physics, mathematics and lab work, and later we specialised in space-related modules such as stars, galaxies and the universe, and spacecraft systems engineering. This gave me a good understanding of key concepts within physics, as well as an in-depth knowledge of my chosen area of space and astrophysics.”

Emily Tipper
Physics/Astronomy, Space Science and Astrophysics graduate
Our research covers a wide range of areas. We often work in partnership with other institutions and with industry, developing innovative solutions to 21st-century challenges.

Research in our School is carried out within four principal groups: the Applied Optics Group, the Forensic Imaging Group, the Functional Materials Group and the Centre for Astrophysics and Planetary Science.

**Applied Optics Group**
The Applied Optics Group is pioneering instruments and patenting new technologies for non-contact imaging of biomedical structures, such as eye retina, skin, or teeth, at extremely high resolution. In collaboration with leading art galleries, its researchers also investigate the structure of paintings for art conservation using the coherence properties of light. The Group’s research in fibre optic sensors stretches to a multitude of environments, from aircraft instrumentation to earthquake monitoring.

**Forensic Imaging Group**
The forensic imaging activity in our School is concerned with the application of image processing and analysis techniques for a variety of forensic applications. Current projects involve the development of the EigenFit facial composite system, evolutionary facial synthesis, the automatic age progression of faces to assist in the location of missing persons and forensic document examination. We have strong links with the UK police and a number of commercial organisations.

**Functional Materials Group**
The Functional Materials Group is focused on the synthesis and characterisation of functional materials: those materials with novel optical, electronic and magnetic properties. What drives the Group’s researchers is the need to understand, at the level of atomic-scale structure, why a new material or system behaves the way it does. This involves the use of advanced physical probes including diffraction, spectroscopy and microscopy, and of extensive computer modelling. Their current research on new solids with enhanced magnetic and electronic properties seeks to relate the fundamental structure of the materials to their applications in battery and data storage technologies.

**Centre for Astrophysics and Planetary Science**
The Centre for Astrophysics and Planetary Science concentrates on the science of the solar system, from large-scale phenomena, such as star/galaxy formation and molecular clouds, to small bodies such as asteroids, comets or even cosmic dust. The Centre has recently begun a very successful new programme in astrobiology, studying whether bacteria can survive in space. Astronomical research involves observations and modelling of star forming regions and observations of distant galaxies. Use is made of ground-based telescopes around the world and space observatories, such as the Hubble Space Telescope.
VISIT THE UNIVERSITY

Come along for an Open Day or a UCAS Visit Day and see for yourself what it is like to be a student at Kent.

Open Days
Open Days are held in the summer and autumn for potential students, as well as their families and friends, to have a look round the campus. The day includes a wide range of subject displays, demonstrations and informal lectures and seminars, and the chance to tour the campus with current students to view student accommodation and facilities.

You can also meet staff to discuss course options, admissions, disability and dyslexia support as well as study skills. For more information, please see www.kent.ac.uk/opendays

UCAS Visit Days
Our UCAS Visit Days are held between December and April each year. Visit Days include a tour of the School and the campus, a talk on the programmes and the admissions process. During the day you have the chance to talk to current students and academic staff in your chosen subject, and discuss any queries you may have about the course. For more information, please see www.kent.ac.uk/visitdays

Informal visits
You are welcome to visit the campus at any time. We produce a leaflet that can take you on a self-guided tour and you may be able to meet up with an academic member of staff, although we cannot always guarantee this. For more details, and to download a tour leaflet, please see www.kent.ac.uk/informal

Scholarships and bursaries
For details of scholarships and bursaries at Kent, please see www.kent.ac.uk/ugfunding

On the web
For the latest information on studying Physics, Astronomy, Space Science and Astrophysics at Kent, please see www.kent.ac.uk/physical-sciences/prospective/undergraduate/physics
More information

If you would like more information on Kent’s courses, facilities or services, or would like to order another subject leaflet, please contact our Information and Guidance Unit:

Information and Guidance Unit,
The Registry,
University of Kent,
Canterbury, Kent CT2 7NZ

Tel: +44 (0)1227 827272
Freephone (UK only): 0800 975 3777
www.kent.ac.uk/ug

Location
Canterbury.

Award
BSc (Hons), MPhys (Hons).

Degree programme
BSc (Hons)
• Physics (F300)
• Physics with a Foundation Year (F305)
• Physics with Astrophysics (F3F5)
• Astronomy, Space Science and Astrophysics (F590)

MPhys (Hons)
• Physics (F303)
• Physics with Astrophysics (F3FN)
• Physics with Astrophysics with a Year in the USA/Canada (F3FM)
• Physics with a Year in the USA/Canada (F304)
• Astronomy, Space Science and Astrophysics (F592)
• Astronomy, Space Science and Astrophysics with a Year in the USA/Canada (F591)

Offer levels
F300, F3F5, F303, F3FN, F3FM, F304, F590, F591, F592:
ABB at A level inc Mathematics and Physics at Grade B; IB Diploma 34 points inc Physics and Mathematics 5 at HL or 6 at SL Physics and Mathematics (not Mathematics Studies) or IB Diploma with 16 points at Higher inc HL Physics and 5 in Mathematics or SL Physics and 6 in Mathematics (not Mathematics Studies).

F305:
On an individual basis.

Year in the USA/Canada
The third year of the MPhys programme can be spent studying in the USA/Canada.

Professional recognition
Our Physics degrees are accredited by the Institute of Physics; our Astronomy, Space Science and Astrophysics degrees are recognised by the Institute of Physics.

Foundation programme
See page 10 for details.

Offer levels and entry requirements are subject to change. For the latest information see www.kent.ac.uk/ug

Terms and conditions: the University reserves the right to make variations to the content and delivery of courses and other services, or to discontinue courses and other services, if such action is reasonably considered to be necessary. If the University discontinues any course it will endeavour to provide a suitable alternative. To register for a programme of study, all students must agree to abide by the University Regulations (available online at: www.kent.ac.uk/regulations).

Data protection: for administrative, academic and health and safety reasons, the University needs to process information about its students. Full registration as a student of the University is subject to your consent to process such information.
COME AND VISIT US

We hold Open Days at our Canterbury and Medway campuses.
For more information, see:
www.kent.ac.uk/opendays