ACADEMIC EXCELLENCE AND INSPIRATIONAL TEACHING

Kent is one of the UK’s leading universities, ranked 23rd in The Guardian University Guide 2017. In the Research Excellence Framework (REF) 2014, Kent is ranked 17th* for research intensity, outperforming 11 of 24 Russell Group universities.

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 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.

Inspirational teaching

At Kent, we offer a chance to study the traditional areas of physics, from thermodynamics to quantum mechanics, in a building and lab environment that is either brand new or recently refurbished and well equipped. We 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, physicists in the final year of their BSc work on group projects within industries and the NHS.

Much of our research feeds directly into our teaching, so your studies are at the cutting edge of the subject. For the final year of your undergraduate Master’s degree, you are attached to one of our research teams opening up avenues for deeper exploration. This project may involve designing space probe instrumentation, firing mini meteorites into planetary surfaces; mapping the deeper retinal layers of a patient’s eye using lasers and fibre optics; measuring the properties of a newly developed superconductor at very low temperatures; synthesising and measuring the crystal structure of a new magnetic material; or understanding how stars and galaxies form from molecular clouds.

World-leading research

Research within the School of Physical Sciences is highly rated in the Research Excellence Framework (REF) 2014. Physics at Kent was ranked 7th in the UK for research impact, with all of the research submitted judged to be of international quality. Our world-leading research in the multidisciplinary School of Physical Sciences owes much to the interaction between physicists, chemists and forensic scientists.

*of 122 universities, not including specialist institutions.
Supportive academic community
The School is an encouraging environment where your interests and strengths can flourish. It is an energetic department, in which more than half of the academic staff have been appointed in the last five years and prides itself on its sociable and stimulating atmosphere. There is interaction at multiple levels between our students and staff, and a popular facility is the student room, designed to give you a place to meet and study.

Flexible entry
A foundation year course is available for students who do not have the level of scientific background necessary for direct entry into the standard degree programmes. Providing you pass all modules on the foundation year, you are automatically granted a place on one of our Physics/Astrophysics degree programmes.

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 gain the skills and confidence that are sought after by employers in today’s competitive world, from presentation skills and analytical thinking to writing with cohesion and clarity. Thanks to the School’s multidisciplinary nature, we pride ourselves in producing graduates which have a much broader outlook on the physical sciences – a highly marketable skill.

This makes our research environment unique, broad and exciting because we work at the frontiers between those disciplines.

Our academic staff and postgraduate students are engaged in four research groups:

The Functional Materials Group works in a range of areas including new batteries, superconductors and magnetic materials, nanomaterials and polymers, and all aspects of research in new materials, such as synthesis, measurement of properties, computer modelling and theoretical description.

The Applied Optics Group are world leaders in their field. They work in collaboration with hospitals and technology companies in the UK and abroad to develop novel biomedical imaging technologies based on coherence imaging and microscopy.

The Forensic Imaging Group develops digital imaging for forensic investigation and has a world-class enterprise side.

The Centre for Astrophysics and Planetary Science has a research portfolio that covers a diverse range of topics focused on infrared observations, numerical simulations and laboratory experiments – on themes in which members of the Centre are world leaders, such as the Solar System, space science, the interstellar medium, star formation and planetary nebulae, astrobiology, astrochemistry and astrophysical fluids.

A global outlook
Kent has an international community on campus with 38% of Kent’s academics coming from outside the UK and students representing 148 nationalities. 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 abroad. We have established a strong exchange programme with partner universities, including the Indiana University in Bloomington, several campuses of the University of California, Trent and Calgary Universities in Canada, and the City University Hong Kong. For more details, please see www.kent.ac.uk/goabroad

For more information on the careers help we provide at Kent, please go to p8 or visit www.kent.ac.uk/employability
DID YOU KNOW?

The University has residential accommodation adapted for students with disabilities and wheelchair users. For details see www.kent.ac.uk/accommodation
Throughout your studies, you are based at our Canterbury campus, working with cutting-edge technology. The School of Physical Sciences is located in a newly renovated building, following investment of £10 million.

You have access to first-class research facilities in new laboratories with state-of-the-art equipment, including a full characterisation suite for materials (three powder diffracometers, a single crystal diffracometer, X-ray fluorescence, instruments to measure magnetic and transport properties, a Raman spectrometer, scanning electron microscopes, optical coherence tomography imaging equipment, optical spectrum analysers and a two-stage light gas gun for impact studies).

All students have access to the new Beacon Observatory (tinyurl.com/beaconobs) which is used in both teaching of Stage 2, 3 and 4 modules and research.

There are student-run astronomical observation facilities and academic support enables you to pursue your passion for astronomy as part of the Space Society programme of events. Astronomy, Space Science and Astrophysics students can get involved with real space missions from ESA and NASA, and can work on real telescope data and images from giant telescopes.

The University is a member of the South East Physics Network (SEPnet), which offers a competitive programme of summer internships to Stage 2 and 3 undergraduates. For details see www.sepnet.ac.uk/students-employers/

The newly extended Templeman Library offers light, airy and comfortable study spaces. The library is connected to online resources, such as science journals, and is well stocked with books, periodicals and other resources, as well as specialist collections. A range of study support services are available for students who require help and advice.

A diverse community
Many students comment on the friendly atmosphere at Kent. With an international community representing 148 nationalities, you can 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 campus and has medieval buildings, lively bars, pubs, restaurants and cafés, and a wide range of shops. Canterbury Cathedral is 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.
Tom Dixon is a mature student, in his third year, studying for a Master of Physics degree.

What attracted you to studying at Kent?
I left school at 14 and went to work as a scaffold and painter and decorator before going travelling. Then I had a son and realised that I didn’t want to be doing that for the rest of my life, so I went to college and did an access course in Medicine on the Government’s Access to Higher Education system. I really enjoyed Physics and found out about a foundation course. I’m not as academically gifted as a lot of people in my class, but I work hard and get the marks.

How is your course going?
It’s going well. The first year was a real struggle for me, the other students had just left school, they’re used to studying. I really enjoy it, though, it’s fun. It’s not easy. We need to be challenged and then it really becomes interesting.

Which modules have you enjoyed the most and why?
I’m a maths nerd, so I enjoyed all of the maths modules. We started off doing general calculus, geometry, things like that then you do something very general and it’s quite difficult then you go on to something quite specific but it’s only in second year that you realise that little specific thing comes into a lot of physics and maths and then you really get into it. I enjoyed a lot of the quantum mechanics – that’s heavily maths based, I’m really enjoying it.

How would you describe your lecturers?
We have a range of lecturers and they all have different styles of teaching. I’ve met some real characters. Also, as I am a bit older, I feel that I am getting a lot out of the course because I don’t see them so much as a teacher as someone who is willing to help me to learn something. If you have a genuine question and go looking for help they are willing to help you. Their doors are open and they will help you all they can. All our academic staff are experts in their field.

What do you think about the level of support in your studies?
There is a range of support available. The workload increases as you progress and they push you to do well, but employers are not just looking at the fact that you have a degree but that you can work on your own initiative. We have a School rep and a Student Support Adviser who can help with any personal issues. They can help you to organise the workload so it doesn’t become a major problem. I found some of the maths difficult in my first year and was really struggling, but a PhD student helped me with stats and maths problems. He was fantastic. He gave me lots of hints and tips to help me understand it.

What kind of career do you hope to follow when you leave?
I love teaching and I do maths outreach work. We are also writing a textbook, it’s all paid work, which is really good. The department also does outreach; we take Cool Physics, the big astrodome or liquid nitrogen experiments to local schools. I may look at doing a PhD and then become a lecturer. Or perhaps find work in the energy sector, nuclear energy, something like that. It’s quantum mechanics, atomic level, but with an engineering application so it’s very hands-on. There are a lot of work opportunities all over the world in that field.

Any advice to somebody thinking of studying at Kent?
If you are not sure about coming to Kent I’d suggest you take a walk around the department and talk to someone. If you are not sure what you want to do, I’d say ask lots of questions, that’s the only way you’re going to learn. If you get in, talk, ask questions, don’t be scared to speak up. World-leading research is done at this University, it’s a great place to learn. People from all over the world come and give guest lectures, so you must make the most of it. I feel that I get more than my money’s worth.
A SUCCESSFUL FUTURE

Kent equips you with essential skills to give you a competitive advantage when it comes to getting a job; more than 95% of Kent students who graduated in 2015 were in work or further study within six months.

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, development and technical management in the space, nuclear and defence industries, as well as 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 designed the degree to provide you with a wide array of key skills, including the ability to plan a project and build a theoretical framework, and training in coding and programming, all of which 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 office productivity software.

For final-year MPhys students, we even simulate a scientific conference where you present the results from your own research, to show you what it might be like to participate in the scientific community.

Careers advice
The University of Kent’s award-winning 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

DID YOU KNOW?
The University was awarded an Athena SWAN Bronze Award in 2014. The Athena Swan Charter aims to advance the representation of women in science, technology, engineering, maths and medicine (STEMM).
GRADUATE PROFILE

Kjell Koch-Mehrin graduated from Kent with an MPhys in 2015. He is currently working on a one-year young graduate traineeship at the European Space Agency.

Why did you choose Kent?
After completing my secondary education in Germany, I wanted to continue my studies in the UK because of the campus culture. The University of Kent stood out, in particular because of its location on a hill overlooking the city – and it is not far from London.

How did you find the course?
The course covered all the fundamental subjects in physics. The lecturers introduced us to the theory and how the particular field had developed and in the workshops we could then apply this knowledge to solve problems.

Which part of the course most interested you?
What I enjoyed the most were the lab sessions and research project modules. The labs provided us with hands-on experience using equipment essential for many experiments. We learnt this by reproducing famous defining experiments in physics, such as Robert Millikan’s oil droplet experiment from which the elementary charge was determined and Rutherford’s gold foil experiment to infer the structure of the atom. The research projects were particularly interesting because they gave us the opportunity to invest ourselves in a specific area of physics.

What were the lecturers like?
Many of the lecturers performed small experiments in class to keep us engaged by showing real-world applications of the subject. Some even gave students the chance to help them with their research. During my first year, I joined a lecturer-run project where our task was to detect high proper motion stars from telescope images. Not only was the application of this work exciting but it also introduced me to programmes commonly used in astronomy.

What was the level of support like in your studies?
Lecturers offered support outside of classes through one-on-one sessions during their office hours which was perfect for getting assistance on an assignment or asking questions about the course material. The School also has a peer mentoring programme.

How did Kent help with your career plans?
I found the presentations from external companies very helpful, in particular during Kent Employability Week. These helped to make me aware of what opportunities there were with a degree in Physics, in industry and research as well as fields outside of science. One event, which reinforced my desire to work in the space industry, involved speakers from Airbus Defence and Space, who had studied Physics at Kent, who gave a presentation and explained the cool projects they got to work on.

What are you doing at the moment?
I am undertaking a one-year young graduate traineeship at the European Space Agency (ESA) in Madrid at the European Space Astronomy Centre. This is where the majority of the data from the ESAs telescope fleet and planetary missions is downloaded and analysed. My work is focused on the high-energy astronomy spectrum; I mainly work with data from the XMM-Newton X-ray telescope in orbit around the earth. My primary role is looking at especially bright X-ray sources and investigating how the abundance of incoming photons interact with the instrument CCD-cameras.

How do you see your career progressing?
Having been fortunate to get the opportunity to work at the ESA, working in this industry has become a real possibility. In the future I hope to contribute to mission planning/design, possibly at one of ESA’s industrial partners.

What would you say to someone thinking of studying at Kent?
Kent has a beautiful campus with many things to do, which helped to motivate me to make the most of my time at Kent – and I made many great friendships.
You can take most physics-related subjects as either a three-year BSc or a four-year MPhys degree. You have the flexibility to switch between programmes during your first year of study.

You will, however, need to be firmly committed to the Year Abroad programme at the beginning of Stage 2.

Which degree to choose?

**BSc (Hons) 3 year**

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.

**BSc (Hons) with a Year in Industry 4 year – Physics only**

Our BSc (Hons) in Physics with a Year in Industry programme offers a broad training in physics, and gives you an opportunity to gain valuable experience on an industrial placement between your second and final years of the programme. These programmes are valued by employers because they immerse you in the reality of the workplace for a year and give you more of the ingredients that are considered useful for a successful career after graduation. For more information on this programme, see p15.

**MPhys 4 year**

In our MPhys 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 a major project (worth half the credits of the final year) within the School's research groups.

**Year abroad**

**MPhys with a Year Abroad 4 year**

Our international exchange programme allows you to spend the third year of your degree in the USA, Canada or Hong Kong between Stages 2 and 4, studying equivalent courses to those you would take at Kent. This is a popular programme and a great opportunity to broaden your experience of university. If you take this course, you pay a reduced fee to Kent during your year abroad. You do not pay fees at the host university. For more information, see page 21.

**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 our dynamic 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 obtain and work on actual 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. The mathematics, physics, electronics, computing and laboratory practical work provide an ideal preparation for any of our BSc or MPhys programmes.

**Further information**

For further information on our degree programmes, please contact:
School of Physical Sciences,
Ingram Building, University of Kent,
Canterbury, CT2 7NH
E: spsrecruit@kent.ac.uk
T: +44(0)1227 824392
F: +44(0)1227 827558
www.kent.ac.uk/physical-sciences/prospective
The foundation year is designed for those students who do not have the qualifications for direct entry to our degree programmes. If you successfully complete the foundation year, you can go to the first year (Stage 1) of any of our Physics or Astrophysics programmes.

Possible modules you study during your foundation year are:
• Algebra and Arithmetic
• Calculus
• Electromagnetics for Engineers
• Graphs, Geometry and Trigonometry
• Introductory Physics Laboratory and Communication Skills
• Motion & Mechanics
• Properties of Matter
• Waves and Vibrations.

Please note: that this modules list is not fixed as new modules are always in development and choices are updated yearly. Please see www.kent.ac.uk/ug for the most up-to-date information.

All the teaching is on campus, so you can take part in all student activities. The teaching is conducted by the University’s own academic staff and consists of lectures, example classes and laboratory sessions (in our own physics labs). The knowledge you acquire is, in most cases, equivalent to that of A level standard.

Foundation modules

Algebra and Arithmetic
Algebra and algebraic manipulation provide you with some of the mathematical tools and skills that are fundamental to physics and astrophysics.

Calculus
Differential and integral calculus gives you the tools to understand the mathematical underpinning of many physical phenomena and the ability to apply this knowledge to elementary problem solving.

Electromagnetics for Engineers
This module covers electric and magnetic fields and circuits and it has an important lab component. You will understand basic laws of electrostatics and magnetism and you will be able to perform simple calculations on electromagnetic phenomena.

Graphs, Geometry and Trigonometry
Your problem-solving skills are enhanced by the basic trigonometry, vectors and graphical methods required to progress to Stage 1 physics and astrophysics courses.

Motion & Mechanics
This module focuses on the laws and principles of Newtonian mechanics (laws of motion, momentum, energy, force fields, etc.) and the ability to deploy analytical skills in solving specific problems.

Properties of Matter
This module gives you knowledge of atomic models, interatomic forces, thermal energy and radioactivity. You gain an understanding of how atoms constitute the matter around us in its various states and how we can investigate the properties of solids, liquids and gases.

Waves and Vibrations
This module covers oscillations, simple harmonic motion, properties of waves and various types of waves. You gain an understanding of how different types of waves (from mechanical to electromagnetic) share common elements such as frequency, wavelength, polarisation state, and so on.
STUDYING AT STAGE 1

Stage 1 represents the first year of your degree programme.

Please note: this module list is not fixed as new modules are always in development and choices are updated yearly. Please see www.kent.ac.uk/ug for the most up-to-date information.

- Astrophysics, Space Science and Cosmology
- Computing Skills
- Electricity and Light
- Mathematics
- Mechanics
- Skills for Physicists
- Thermodynamics and Matter

Modules: Stage 1

Astrophysics, Space Science and Cosmology
A background in astrophysics is provided in this module, covering subjects ranging from the Sun and the Solar System, to stars and stellar systems. It introduces you to relativity, cosmology and particle physics, and space missions and the exploration of the Solar System.

Computing Skills
This introduces you to computer programming languages, and to Fortran and Python 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 Python and devise simple computational algorithms.

Electricity and Light
Here, you are introduced to the basics of electrostatics, charge distributions, fields and potentials, the link between voltage and current, DC and AC circuits, and magnetism. You learn about light as an electromagnetic wave, geometrical optics and optical instruments such as microscopes and telescopes.

Mathematics
This provides you with the mathematical tools (differential and integral calculus, vectors, complex numbers, differential equations and vector fields) to enable a deeper understanding of physics and lays a firm foundation for your progression towards more advanced subjects.

Mechanics
In this module, you cover Newtonian mechanics (from measurement and motion to work and energy), rotational motion of rigid bodies and the concept of force fields. It concludes with an introduction to oscillations and waves.

Skills for Physicists
You discover the basic experimental, statistical, data analysis and communication skills required in physics and develop a range of key transferable skills, including information technology and presentation, in addition to experimental laboratory skills in physics. You become familiar with more complex laboratory apparatus and learn the art of data gathering accurately and analysis in context.

Thermodynamics and Matter
This takes you on a journey through the structure of solids, interatomic potentials, fluids, viscosity, and thermodynamics, (ideal gas law, kinetic theory of gases, work and PV diagrams, heat engines, laws of thermodynamics) ending with a look at atomic models.
STUDYING AT STAGE 2

Stage 2 represents the second year of your degree programme.

Please note: this module list is not fixed as new modules are always in development and choices are updated yearly. Please see www.kent.ac.uk/ug for the most up-to-date information.

All 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
- Quantum Physics.

All students on the Physics (including a year in industry or a year abroad) programmes also take one of the following:
- The Multiwavelength Universe and Exoplanets
- Spacecraft Design and Operations.

All 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
- Data Analysis Techniques in Astronomy and Planetary Science
- Electromagnetism and Optics
- Mathematical Techniques for Physical Sciences

- The Multiwavelength Universe Exoplanets
- Physics Laboratory A
- Quantum Physics
- Spacecraft Design and Operations.

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.

Data Analysis Techniques in Astronomy and Planetary Science
A variety of multimedia techniques are applied to astronomical data to process and understand it. In this module, you discover how 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.

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.

CONTINUED OVERLEAF
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.

The Multiwavelength Universe and 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.

Physics Laboratory
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 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.
YEAR IN INDUSTRY

If you choose to follow a programme with a year in industry, this placement year is taken between Stages 2 and 3.

Finding a placement
Work placements are usually advertised nationally and students apply by sending in a CV or application form. We guide you through the process, giving you valuable feedback on the placements that are likely to enhance your career prospects, how to write a winning CV and how to hone your interview skills.

Salary and benefits
You usually work on placement for an entire calendar year. Salary and holiday entitlements vary according to the employer. However, many students find that they earn enough to be able to save some of their income, and this often helps them in their final year at Kent.

Study and career benefits
A work placement provides practical experience that can be put to good use in your final year of study. It gives you a sense of how the theory works in practice and improves your skills in many areas. It also allows you to evaluate a particular career path, and gain knowledge of the working environment.

In general, the year in industry is very popular with employers, because of the skills you gain. If your placement is a success, you may even be offered a job with the same employer after graduation.

Keeping in touch with Kent
To make sure you get the most out of the experience, you are assigned an academic supervisor who approves the company’s programme of work in consultation with your industrial supervisor. At the end, you write a report of the work you did during the placement and, on returning to Kent for your final year of study, present a lecture on your experiences. Your year in industry counts towards your final degree classification.

DID YOU KNOW?
Recent Kent science graduates have gone into research and development, technical management, the City and financial institutions, computing, software design, the media and teaching. Some have also gone on to postgraduate study.
STUDYING AT STAGE 3

Stage 3 represents the third year of the four-year MPhys programme and the final year of the BSc (Hons) programme.

Please note: that this module list is not fixed as new modules are always in development and choices are updated yearly. Please see www.kent.ac.uk/ug for the most up-to-date information.

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.

BSc Astronomy, Space Science and Astrophysics students take the following modules:
• Image Processing
• 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:
• Analytical Mechanics
• Physical Science Research Planning.

Modules: Stage 3

Analytical Mechanics
This module is taken by Physics and Astronomy students intending to continue on the MPhys programme the following year. It offers an opportunity to deepen your knowledge of the conceptual framework used to describe analytical mechanics.

Image Processing
You learn the key principles of imaging and image processing and their real-world applications in this module. 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 image processing techniques.

Numerical and Computational Methods
This 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.
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.

**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.

**Relativity, Optics and Maxwell’s Equations**
Here, you extend your understanding of Maxwell’s equations and their 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.

**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.

**Physical Science Research Planning**
Here, you hone skills related to the preparation of a research proposal after developing a novel idea for which you seek funding. You learn how to search and retrieve information from locations such as books, databases and websites, and compile documents to a professional standard, such as a grant proposal for funding a research activity. You present your grant proposal to members of staff, which gives you the chance to develop your presentation skills.

**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.
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. You also look at physical phenomena, such as superfluidity and Bose-Einstein condensation.

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.
STUDYING AT STAGE 4

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

Please note that this module list is not fixed as new modules are always in development and choices are updated yearly. Please see www.kent.ac.uk/ug for the most up-to-date information.

Physics students take the following:
• Magnetism and Superconductivity
• Particle and Quantum Physics
• Physics Research Project.
And choose two of the following:
• Rocketry and Human Spaceflight
• Space Astronomy and Solar System Science
• Topics in Functional Materials.

Physics with Astrophysics students take the following modules:
• Cosmology and Interstellar Medium
• Physics Research Project.
And choose three of the following:
• 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
• Physics Research Project
• 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 relate directly to the research conducted in the School and you work within the research laboratories. The broad areas you can choose from are astrophysics, planetary science, nanostructured and amorphous materials, quantum materials, theoretical physics, applied optics and imaging. The project carries half of the final year credits. Project students become part of the research group for the duration of their project, during which time they will interact regularly with their academic supervisor and the postgraduates working in the same area.

The projects involve a combination of some, or all, of: literature search and critique, laboratory work, computing and data analysis. Often students’ work leads to publication in scientific journals. Much of our research is highly multidisciplinary – a benefit of a unique departmental structure that houses physicists, chemists and forensic scientists under one roof. As a Master of Physics student at Kent you have unique opportunities offered by such multidisciplinarity, for instance, to engage in research projects involving specialists from across these broad fields of natural sciences.

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.

**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, 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 under the supervision of a specific member of the academic staff on an experimental, computational or theoretical project.

Assessment is by examinations at the end of each year and by continuous assessment of practical classes and other written assignments during the year. 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 (and Stage 4 if on the MPhys) 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 at the end of Stage 2.

**Year abroad**

Our international exchange programme offers you the opportunity to spend the third year of your degree studying abroad at one of our partner universities, which includes Indiana University in Bloomington, several campuses of the University of California and universities in Canada and Hong Kong.

The year abroad programmes are highly competitive. To qualify, you must demonstrate the ability to obtain a first or second class degree both at the end of Stage 1 and at the end of Stage 2.
VISIT THE UNIVERSITY

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

Open Days
Kent runs Open Days during the summer and autumn. These provide an excellent opportunity for you to discover what it is like to live and study at the University. You can meet academic staff and current students, find out about our courses and attend subject displays, workshops and informal lectures. We also offer tours around the campus to view our sports facilities, the library and University accommodation. For more information and details of how to book your place, see www.kent.ac.uk/opendays.

Applicant Days
If you apply to study at Kent and we offer you a place (or invite you to attend an interview). You will usually be sent an invitation to one of our Applicant Days. You can book to attend through your online Kent Applicant Portal. The Applicant Day includes presentations in your subject area, guided tours of the campus, including University accommodation, and the opportunity to speak to both academic staff and current students about your chosen subject. For more information, see www.kent.ac.uk/visit.

Informal visits
You are also welcome to make an informal visit to our campuses at any time. The University runs tours of Canterbury and Medway campuses throughout the year for anyone who is unable to attend an Open Day or Applicant Day. It may also be possible to arrange meetings with academic staff, although we cannot guarantee this. For more details and to book your place, see www.kent.ac.uk/informal.

Alternatively, we can provide you with a self-guided tour leaflet, which includes the main points of interest. For more details and to download a self-guided tour, go to 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, 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 us on:
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 a Year in Industry (F307)
• Physics with Astrophysics (F3F5)
• Astronomy, Space Science and Astrophysics (F590)

MPhys (Hons)
• Physics (F303)
• Physics with a Year Abroad (F304)
• Physics with Astrophysics (F3F5)
• Physics with Astrophysics with a Year Abroad (F3FM)
• Astronomy, Space Science and Astrophysics (F592)
• Astronomy, Space Science and Astrophysics with a Year Abroad (F591)

Required subjects
A level grade B or equivalent in Maths and Physics, with a pass grade in the Physics practicals if taking A levels.

Offer levels
BSc programmes: BBB at A level inc Mathematics (not Use of Mathematics) and Physics at Grade B; IB Diploma 34 points including 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 Physics and Mathematics 5 at HL or 6 at SL Physics and Mathematics (not Mathematics Studies).

MPhys programmes: ABB at A level inc Mathematics (not Use of 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 Physics and Mathematics 5 at HL or 6 at SL Physics and Mathematics (not Mathematics Studies).

F305: Foundation Course.
Individual consideration, evidence of prior scientific study needed.

Year Abroad
The third year of the MPhys programme can be spent studying abroad at one of our partner universities. See p21.

Year in Industry
See p15.

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
Passing all modules in the foundation year programme guarantees you entry on to one of our physics or astrophysics degree programmes. See p11.

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

To find out more about visiting the University, see our website:
www.kent.ac.uk/visit