Graduate careers in Microelectronics

Join STFC Technology and engineer the future
The Science and Technology Facilities Council (STFC) is one of Europe’s largest multidisciplinary research organisations, and is at the forefront of science and engineering projects worldwide. STFC employs more than 2,000 staff, most of whom are professionally qualified scientists and engineers.

The Technology Department represents a major component of STFC. It focuses on providing advanced engineering capabilities, including electronics and microelectronics engineering, to the whole organisation and external customers. By joining as a graduate you will receive excellent training and support, and have the chance to work on exciting frontier science and technology projects.
Exciting career opportunities for graduate microelectronics engineers

The outstanding quality of our staff is the foundation of our success. Through the vast experience of our engineers, the use of leading-edge design tools and the application of modern technologies, we meet the most formidable of design challenges to deliver innovative solutions for our customers.

Our microelectronics systems range from single system-on-chip solutions to large systems that use tens of thousands of custom ASICs and hundreds of multi-million gate FPGAs. You will not find our products on the high street, but our systems can be found throughout the world and even in space.

Explore our organisation and the exciting, challenging careers that we offer in electronics and microelectronics engineering.

Our graduate microelectronics engineers are offered permanent contracts and will work on real projects for real customers from day one. They are given a wide variety of training in professional and personal skills, and encouraged to develop and achieve their full potential. They are also supported in attaining a Chartered Engineer qualification from the Institution of Engineering and Technology (IET).

This brochure offers a taste of opportunities for graduate microelectronics engineers at STFC. Why not apply and see for yourself?
JOIN THE ASIC DESIGN GROUP

ASICs

…chips for everything

Application Specific Integrated Circuits (ASICs), designed by us, are enabling research in a diverse range of areas – from biomedical projects, such as developing artificial eyes, to helping to reveal the secrets of the Universe through high-energy physics experiments and space missions.

The STFC ASIC Design Group specialises in designing analogue and mixed-signal integrated circuits for challenging science applications. The group’s highly skilled microelectronics engineers work in close partnership with other specialists in STFC, including detector scientists, system engineers, real-time software developers and design tool specialists, to deliver advanced solutions for state-of-the-art instruments.

Supporting advanced science and international research projects means designing to very demanding specifications, and the diversity of science applications ensures that our work is never routine. We pride ourselves on our specialist ability to deliver high performance chips able to operate in extreme environments.

Our use of the latest industry-standard design tools and ISO 9001 quality management practices helps to deliver our designs on time and to budget.

The diverse application areas for our designs make good customer interaction vital to understanding the requirements and optimising the performance of our designs. Our designers are involved at all levels of the project – from concept, through design and verification, to implementation, testing and integration. Some examples of our recent chips include:

- **LPD** – a low-noise full-custom multi-channel amplifier chip with analogue memory and analogue-to-digital (A-to-D) conversion, which is capable of processing thousands of high-luminosity X-ray frames per second, enabling detailed real-time observation of biological samples.

- **3DIC** – actually two integrated circuits (ICs) – one providing pixelated low-noise analogue readout, and the other providing highly parallel A-to-D conversion. These are designed to be stacked, using through-silicon-via (TSV) technology that allows connectivity between the chips at the pixel level. This provides a complete integrated readout solution, with a compact footprint easily tiled side-by-side for large detector arrays.

...a great opportunity to get involved in new cutting-edge technology and science
Devising new electronics for fundamental science

Davide joined the ASIC Design Group as an analogue design engineer shortly after graduating in electronic engineering at the University of Padua in Italy.

“My first project was the design of an ASIC for nuclear spectroscopy under the supervision and guidance of expert colleagues. Thanks to their assistance and support, I could explore new ideas and architectures, and at the same time learn about design tools and fabrication technologies. Even now that the ASIC is manufactured and the scientific experiment of which the ASIC is part is coming to fruition, I am involved in commissioning the electronics. It’s very educating and quite unique for an electronics engineer to experience all the aspects of IC design from the initial feasibility study to circuit layout and system-level design.

“Since then, I have worked on a variety of full-custom chips for applications from space instruments to X-ray imaging and particle physics. I find it very rewarding to be able to design microelectronics for ground-breaking experiments, and the involvement often results in publications and presentations at conferences. I have already presented my work at two major international conferences in Florida and Belgium.

“At present, I am working on a new ASIC for the planned upgrade of the CMS detector at CERN. This upgrade will push the performance of this already extreme machine to new limits. However, for it to be able to deliver new physics, we need to devise new electronics.

I consider myself very lucky to be able to work on such exciting projects.”

• APV – a highly-sensitive analogue chip capable of sensing the charge of single particles. Thousands of these chips are now installed and operational at the centre of the ground-breaking experiments at Europe’s largest particle-physics laboratory, CERN.

• CDS ADC – a video-processing chip with both analogue and digital circuits. It is already installed on the STFC-supported NASA STEREO spacecraft which are returning impressive images of the Sun in 3D.

• SIXS – a multi-channel amplifier and A-to-D chip for an instrument to measure solar intensity. SIXS is destined for orbit around Mercury as part of the European Space Agency’s BepiColombo mission to be launched in 2014 to investigate the origin and evolution of the nearest planet to the Sun.
Digital image sensors are everywhere – in mobile phones, compact cameras and laptops. STFC engineers are world-leaders in this technology – pushing its performance beyond consumer applications and combining it with image-processing circuitry to create ‘intelligent cameras’ in a single semiconductor chip for scientific applications.

The number of applications for these devices is vast, ranging from space applications and Earth observation to systems that are unlocking the secrets of biological processes and aiding medical diagnosis.

To meet the demands of these applications, we merge basic CMOS technology with our own patented techniques. Using this approach, we have designed sophisticated megapixel sensors that can be configured for sensitivity to a wide range of wavelengths. Infrared, visible and ultraviolet light, and X-rays, can all be detected with our devices. Using wafer-scale integration techniques, our current devices can fill a full 200 mm diameter wafer to create very large sensors with hundreds of millions of pixels.

Sensors for instruments that journey into space also bring additional challenges for our designers. They must be light, ultra reliable (because they travel beyond the reach of any service technician), use little power and be robust enough to survive both the launch and the harsh environment of space with its extremes of temperature and constant stream of radiation.

In the medical sphere, we have developed sensors that can take precise digital X-ray...
images at extremely rapid frame rates. The sensitivity of our devices is higher than a standard radiographic plate, meaning that fewer X-rays are required to capture the same amount of detail. As the images produced are digital, they can be further processed to reveal minute details that would be missed by conventional radiography techniques. In another challenging field, we have designed sensors that can react to a tiny stimulus in only a few nanoseconds. The sensor then independently decides if this stimulus is significant or can be ignored. These types of sensor can be used in mass spectrometers (powerful instruments that analyse the composition of materials), which have numerous applications from the development of new drugs to improved security.

A new generation of image sensors

Rebecca began working as an integrated circuit design engineer in the CMOS Sensor Design Group at Rutherford Appleton Laboratory after graduating from the University of Southampton with an MEng in electronic engineering.

“My first project involved designing a small test CMOS based sensor containing variants of a new pixel architecture which hadn’t been investigated before. It was challenging at first, but I was given a lot of help from my fellow team members and I made use of their design experience. I’m currently testing my chip for features such as low-noise and radiation tolerance. I am finding some interesting results that I hope to present at a conference in the near future.

“I’ve also been part of the STFC Graduate Scheme since I started here, which has been fantastic, and have undertaken a wide variety of courses, including a voyage on a tall ship – which my fellow graduate friends and I deemed unforgettable. It was a great way to get to know everyone and I took a lot of personal learning experiences away with me from the trip. The Graduate Scheme courses have run alongside technical training within my group, which included courses in basic image-sensor knowledge, as well as more advanced courses in IC design. Many of these technical courses are in Europe or the US, so together with conference appearances, I’ve jetted off to many exciting places. When I started, I never expected to travel as much as I have done over the past year.

“I’ve really enjoyed my time here at STFC. I’m very happy in my group, have made some great friends, learnt a lot of new skills and am looking forward to designing and testing my next chip.”
Advances in Field Programmable Gate Array (FPGA) technology have seen these devices evolve into very capable components. Typical FPGAs now contain multiple microprocessors, high-speed interfaces and many millions of configurable logic gates, enabling programmable system-on-chip solutions, which are ideal for many of our systems.

We make extensive use of high end FPGA devices and their rich library of complex intellectual property (IP) blocks. Our latest single chip FPGA based data acquisition card contains a complete system that, only a few years ago, would have required a number of large boards to implement.

...the LHC CMS processing system is massive with 75,000 ASICs and 15,000 FPGAs all working to process the data in real-time.
Getting to grips with complexity

Edward joined as a digital systems designer after graduating in electronic engineering at the University of Bradford.

“I work for the Electronic Systems Design Group, which is responsible for designing data acquisition (DAQ) systems for scientific applications of all sizes.

“This has provided many opportunities for design work on a diverse range of scales, from a small two-channel readout and data logging system for a quantum electronics research project to one with tens of thousands of channels for the CMS tracker experiment at CERN.

“Most of the DAQ systems that we produce utilise FPGA technology to provide the performance, flexibility and processing density requirements. FPGAs are incredible, allowing millions of gates and embedded microprocessors to be configured within a single device – ideal for the complex digital systems I help to design.

“When I first arrived, I was placed in a friendly team working on a project that was a part of the tracker readout chain for the CMS experiment. It was a multi-disciplinary team drawn from several design groups, and was an excellent project to start on, providing me with a wealth of learning opportunities, design challenges and, because of the international collaborative nature of the project, opportunities for some travel!”

As semiconductor technology has advanced, customer expectations have also increased. We still build systems that span multiple large format boards, but each board now contains many of these high end FPGA devices – not only incorporating dedicated digital logic but also large amounts of software running on embedded microprocessors.

One of the many applications of our FPGA based digital systems is as scientific instrumentation for particle physics experiments. Often installed in underground caverns, where they are closely coupled to massive detectors and networked to PC processing farms, these systems are amongst the most challenging being designed anywhere today.

One of our biggest projects was the design of much of the sophisticated data acquisition and analysis electronics at the heart of the CMS Tracker on the Large Hadron Collider (LHC) at CERN. The LHC is the world’s most powerful particle accelerator aiming to unlock some of the fundamental secrets of the Universe. Millions of detector channels produce more instantaneous data than the entire world’s telephone system – much more than can be practically stored. However, only a small fraction of the particle interactions produce events that are of interest to the physicists. Sophisticated real-time electronic systems select the interesting events, and then trigger the processing and the storage of the useful data.

We designed and produced one of the major electronic systems at CERN using state-of-the-art analogue ASICs and FPGA based digital processing. Following particle collisions, the system searches for patterns in the energy deposited in the detector. Seventy five thousand of our full custom analogue ASICs, each with 128 channels, detect and amplify this energy, and forward it via thousands of optical fibre links to the digital part of the system. The digital processing system uses some 15,000 FPGAs spread across 500 large PCBs, to analyse more than 40 million events per second, and select around one event in 1,000 for storage and further analysis.

STFC’s contribution to the LHC at CERN does not stop at electronics. Our mechanical engineering and physicist colleagues have helped to design and build other key parts, from immense 130-tonne superconducting magnets, to cryogenic cooling systems and ultra-stable composite mechanical structures at the heart of the particle collision chambers.

www.stfc.ac.uk/technology
How do you design a working integrated circuit with millions of transistors, each of which are thousands of times smaller than a human hair? Rigorous design methodology and advanced design tools are essential parts of successful microelectronics design.

The relentless demand for higher performance has driven semiconductor technology to smaller processes and faster transistors. Exploiting this new technology is key to survival in this competitive industry. However, while each generation of technology presents opportunities, it often comes with more extreme design challenges. Using the correct design methodology and tools is critical. Design teams need both designers and design tool specialists to succeed.

Our design tool specialists are microelectronics engineers who have chosen to focus in a particular area of the design process. The potential specialisms are numerous and wide ranging – from analogue design to hardware description languages, and from design verification to novel transistor design. This high level of expertise enables them to offer in depth technical support which is critical for design projects, whilst also providing the breadth of knowledge required for the higher level advice that is essential for longer term strategic planning.

Design tool specialists ensure that we have the necessary design tools and expertise to meet the complex technical needs of our projects, whilst also driving the enhancement and expansion of our capabilities in mission-critical areas. Evaluating new design methodologies and piloting the deployment of new design tools is just one of their key roles.

Managing design complexity, accurately modelling the physical circuits and designing for low-power consumption are some of the most challenging aspects of modern integrated circuit design. This is where effective use of design tools is essential and it is what makes design tools one of the most important aspects of the design process. Design tool choices can make the difference between the success and failure of a project.

We invest significant time and money in order to ensure that we maintain and extend our design expertise in a number of key areas including:

- system-on-chip, embedded processors and hardware-software co-design methodologies
- system-level modelling and hardware description languages
- analogue, digital, mixed-signal and RF integrated circuit design and implementation tools
- deep sub-micron ASIC technologies
- FPGAs and programmable logic
- micro-electro-mechanical systems (MEMS)
- semiconductor and transistor analysis (Technology CAD)
- PCB and system-in-package technology
- test and advanced verification methodologies.

To use these technologies effectively, and compete internationally, it is important to develop and extend the engineering expertise continually within the organisation. That is the role of a design tool specialist and is what makes it a varied and interesting career.
Russ graduated with an MEng from the University of Southampton in electronic engineering and now works as a design tool specialist at the Microelectronics Centre at Rutherford Appleton Laboratory.

“I’m a member of the Design Tool Group. As a group, we supply and provide technical expertise in the use of advanced design tool software for all aspects of the microelectronic design process, from the design of PCBs down to the modelling of semiconductor device physics. The diverse range of projects, coupled with access to first-class computing equipment and a plethora of leading-edge design tools, makes this a unique environment in which to exercise a flair for microelectronics.

“Day-to-day work involves: responding to design enquiries from internal design colleagues, as well as designers from our broad customer base of universities and research institutions; producing and presenting bespoke training courses addressing design tool usage and best-practice design techniques; administering to the technical aspects of the design tool provision scheme; and keeping abreast of the latest technical developments impacting upon my area of expertise.

“With a commitment to maintaining excellence through a focus on training and professional development, the opportunity to travel, and to work with a diverse range of individuals, the Microelectronics Centre is a fantastic group to be a part of.”
GRADUATE PROFILES

A fantastic place

ASICs – designing chips for the future

Matt joined the ASIC Design Group after graduating from the University of Leeds.

“My first project as a graduate ASIC designer was a retinal implant chip designed to aid research towards the ultimate goal of a functional retinal prosthesis. This was a collaborative project between the ASIC Design Group and researchers at the University of Glasgow.

“Following this, I became part of the team working on the XFEL project where we are developing a large detector system for the European Free Electron Laser at the DESY Laboratory in Hamburg. This detector system has to operate at almost 5 million frames a second to keep pace with the pulse frequency of the XFEL machine. The combination of high frame-rate with low noise and high dynamic-range requirements makes this a really challenging project. I’ve had the chance to be involved with many aspects of the design, including the sensors, the ASIC, and the interconnect and testing as the system is brought together. My involvement in this design has given me a breadth of experience, not just in the different technical areas but also in meeting and dealing with engineers and scientists from other countries, all of which I’ve found both exciting and rewarding.

“More recently I’ve been working on our first 3D chip, which brings together two layers of silicon vertically integrated to increase the amount of analogue and digital processing that we can achieve in a small area. This has been a great opportunity to get involved in new cutting-edge technology.”

Sensors – for medical applications

Iain has been working as an IC design engineer in the CMOS Sensor Design Group after graduating in engineering science from the University of Oxford.

“My first project involved the design of a very large sensor for detecting X-rays in medical applications. This has been a very unusual and interesting project that has allowed me to develop a great deal of insight into the way integrated circuits are manufactured. I had no previous experience of this sort of work, but my colleagues have been extremely helpful and I have received a lot of support.

“I have also completed many courses as part of the Graduate Scheme. These include training in presentation skills, dealing with different personality types and time management. Undertaking technical training on external courses is also encouraged, and I have taken advantage of this as well. Many of these courses take place abroad, so there is some scope to travel as part of the job. Joining professional engineering bodies is also encouraged – currently I am working towards achieving Chartered Engineer status with the IET.

“I have really enjoyed my time at the STFC so far. The work is interesting and very varied, and the opportunities to undertake further training are extensive. I have made a lot of friends during my time here, and am looking forward to whatever challenges the next few years are going to bring!”
FPGAs – improving design for FPGAs

Manuel joined after graduating from the University of Porto, Portugal, with an integrated masters degree in electrical and computer engineering.

“I work with new design tools and emerging high-level design languages for the efficient development of large FPGA-based digital systems, which may include embedded software.

“The nature of my job and the rapidly evolving field of microelectronics make it very important that I stay up to date with current technologies and design tools. I have been given the opportunity to learn and work with the latest design languages and design tools, and I have attended a number of advanced technical training courses. Part of my work also involves helping other designers to apply these techniques, and this provides real opportunities to put my skills and knowledge into practice to solve problems on real projects.

Design tools – supporting cutting-edge design

Emily works as a design tool specialist following graduation with an MEng in electrical and electronic engineering from the University of Bristol.

“I’d done summer placements at several engineering companies, and knew what kind of role and what kind of place I wanted to work, so I was thrilled to be offered a job here. The group that I work with provides support for cutting-edge microelectronics design tools to universities and research institutes throughout Europe. This makes my job both varied and challenging.

“To be able to provide support to designers, I have received a lot of training. I’ve used the skills learnt to help develop design examples for the training courses that we run ourselves to teach people how best to use the design tools for their designs. This means that in little more than a year after graduation, I was presenting material to lecturers who – not so long before – had been teaching me. It was a bit daunting! However, this is also the best part of my job. The designers and researchers in universities that we support make chips that push the available technology to its limits, and they need design tools that can cope with such complexities. The enquiries we receive from them are not run of the mill, they require me to investigate how to make the software work at the edge of its capabilities, identify the best tools available in the industry and develop robust design methodologies.

“The great advantage of being at STFC is having technically demanding work to do in an intellectually stimulating environment, but in a relaxed and supportive setting. It’s a fantastic place to work.”
The Microelectronics Centre is a group of microelectronics design specialists who work closely with engineers to provide technical expertise, assistance and advanced training in microelectronics design and verification techniques. Originating as a team to support internal designers, the group has grown into an internationally recognised centre of excellence that has for more than 20 years been helping designers from the academic sector across Europe with their microelectronics design issues.

The Centre offers a range of services, from technical support and technical training to the high-profile Europractice project – a scheme that allows universities affordable access to fully featured commercial design tools for their research and teaching. If you have graduated in electronic engineering from a UK or European university, you will almost certainly have used design tools that have been made available through this project and, via local lecturers, received technical support from the Microelectronics Centre’s experts.

For a microelectronics designer to be efficient, knowing what design methodology to use and which design tools best suit the project is critical. To do this, designers need training in the use of the design tools, and also the security of knowing that there is an expert on hand to help if problems arise. However, the complexity of the design tools for microelectronic design is only marginally surpassed by the complexity of the circuit, and it is impossible for most engineers to be both an expert designer and expert design tool specialist. This is where the Microelectronics Centre fits in, providing the specialist design tool and methodology advice to help designers focus on the detail of their design problem.

A key aspect of this work is not only focusing on technical expertise, but also going out to help designers. The Microelectronics Centre works with more than 600 universities and research laboratories across Europe – 80 of which are in the UK.

In addition to reactive problem solving, the Centre runs a number of seminars, workshops and training courses each year to increase awareness of new design tools and emerging design techniques. These provide a great opportunity to show designers what is possible and to get feedback from the users of our services.
Nick graduated from the University of Wales, Bangor with an MEng in electronic engineering. Subsequently he completed a DPhil in materials science at the University of Oxford.

"Following the completion of my doctoral research into increasing the data density in magnetic thin-film recording media, I was keen to get back into mainstream electronic engineering and, in particular, to the design and modelling of cutting-edge, industrially relevant microelectronic circuits and devices.

"Following an initial period working in semi-custom digital design, I have chosen to specialise in an area of design automation called technology computer aided design (TCAD). TCAD has two main themes: process simulation concerned with modelling the fabrication of semiconductor structures and determining the resultant doping profiles; and device simulation in which the electrical behaviour of semiconductor structures is calculated. I have found my educational background, the combination of electronic engineering, solid state physics, and materials science, to be particularly well suited to the issues being confronted in the TCAD field. Two examples illustrating this point are the increasing necessity of taking into account the effect of crystallographic defects in process modelling, and the requirement that contemporary device simulators be capable of solving the Schrödinger equation to determine accurately the carrier density in the inversion layer of deep-submicron MOSFETs.

"Recently, in a departure from purely technical activities, I have taken a role in helping coordinate STFC Technology’s part in a pan-European project to promote micro-electro-mechanical systems (MEMS) design activities across Europe. My role has been to ensure that researchers have access to finite-element modelling, layout entry, and systems-level simulation tools that are compatible with design kits distributed by the foundry partners.

"The broad variety of work that I have been exposed to is one of the high points of working in the Microelectronics Centre."

Coordinating design across Europe
Leading-edge knowledge is fundamental to the success of our organisation. Life as a professional engineer requires the use of this knowledge to demonstrate its value, provide high-quality services and deliver innovative solutions to customers.

On joining as a graduate microelectronics engineer, you will be working on real projects for real customers from day one. You will also be part of our professional development scheme, which is accredited by the IET, and will take part in more general events such as personal development courses and social gatherings with graduates from other parts of STFC. The specific technical training is tailored to your individual requirements and builds on your existing knowledge and experiences gained during your degree. The scheme also includes training in broader business skills such as teamwork, understanding personality types, project management and communication skills.

Completion of your initial graduate microelectronics engineer training leads to a process of continued professional development that lasts throughout your career with us. We are committed to continued professional development and will encourage and support our engineers in achieving Chartered status.

... continued professional development are key features of a career with STFC
Mark joined STFC after graduating with an MEng in electronics from UMIST (now the University of Manchester) and is now a group leader within the Microelectronics Centre.

"While it is possible for a semiconductor foundry to fabricate a chip with billions of transistors, this does not mean that designing microelectronics is a solved problem. Being able to design a circuit, in a reasonable time, which will actually work when it is manufactured remains an extreme challenge. Designers still have all of the issues of managing the complexity of a design, as well as dealing with all of the effects that using ultra-small transistors bring. An example of this is the problem of managing power and thermal issues, so that the chip will not destroy itself when turned on. Microelectronics design is, in fact, getting more difficult and remains as challenging as ever.

"I started as a graduate microelectronics engineer and now – around 10 years and several promotions later – I lead a team of microelectronics engineers that specialises in advanced IC design, verification and implementation techniques. My team uses its expert knowledge to provide advice to designers, who may be down the corridor – or equally in a university on the other side of Europe. Whilst managing a team brings extra responsibilities, I still retain a significant technical role and spend most of my time solving the more involved design questions. I am able to keep my technical knowledge up to date with the latest semiconductor technology and design techniques.

"Would I recommend STFC as a great place to be a microelectronics engineer? Definitely yes! I enjoy the variety, the challenge of working with leading-edge technology, and for me, gain tremendous satisfaction from finding solutions to problems and knowing that I have helped a project to succeed."

We expect our graduate microelectronics engineers to progress to key positions within the organisation. This may be to specialist technical roles with little or no management responsibility, or to roles that require significant people or project management skills. Whichever route you take, you will receive support to develop an individual learning and development plan which identifies the key technical and personal skills you need. You will be supported in your development by your manager and also by a mentor, and you will be provided with opportunities to learn from a combination of on-the-job experience and formal training events.

If you are interested in promoting science and engineering, then STFC is an active member of the national Science, Technology, Engineering, and Maths Ambassadors scheme. This, and other initiatives, offer opportunities to work with the general public and especially schools to inspire the next generation of engineers.
Life outside work

...the sports and social scene

...the organisation has a friendly atmosphere and supportive culture. We are located in a pleasant rural setting with a strong sports and social scene.
STFC’s microelectronics engineering programmes are based at Rutherford Appleton Laboratory (RAL) which is situated in a semi-rural location about 15 miles south of Oxford. The campus style site offers a unique ‘informal but professional’ atmosphere, with an on-site restaurant, coffee lounges, nursery and recreational facilities.

RAL is home to a bustling Recreational Society with all the major (and minor!) sports represented. In particular, there are active teams for football, rugby, cricket and rounders, organised in weekend, evening and lunchtime leagues. In addition to all of these, there are organised sports days each year, where our staff compete with teams drawn from public sector and Civil Service organisations throughout the UK. The Recreational Society facilities include a multi-gym and weights room, a snooker room and a multi-purpose indoor sports hall for aerobics, fencing, yoga, and so on. There is also a lounge and bar where less energetic pursuits take place! In addition to sporting endeavours, there are activities ranging from dancing and various crafts through to photography and model railways.

South Oxfordshire is well served with most amenities, and London is less than one hour away by train. Oxford is within easy reach, and is a vibrant city with a thriving cultural scene, theatres, cinemas and pubs. Alternatively, a quieter life may be found in smaller towns such as Abingdon (located on the River Thames), Didcot (with excellent rail links) or the historic market town of Wantage. The site is also surrounded by several idyllic villages, most with a selection of country pubs serving good quality food. Whatever your outlook, the area includes a location that will suit your taste and provide an ideal environment for both work and leisure.

Designing circuits and playing rounders

Kwan joined STFC after a MSci in physics from University College London followed by an MSc in microelectronics at University of Southampton, and now works as a design-verification specialist.

“How do you know that your circuit design will work under all possible inputs? That is a difficult question and what makes verification of designs a challenging topic. As designs get larger, verification is more difficult and planning for verification is something that must be incorporated as part of the design process, and not left until the end.

“Every design is different, meaning that every verification plan needs to be developed for the design. I work with the best design tools and assist designers in applying these so that their chips will work first time when manufactured. Design verification is rewarding, your hard work really pays off.

“I am based at the Rutherford Appleton Laboratory, which is located in the beautiful Oxfordshire countryside. I chose to live closer to site and, in the summer, it is a very enjoyable 30-minute cycle ride to work. Another reason to get away from the desk in the summer is, believe it or not, rounders! I am part of a team that competes in the local lunch-time league. The matches are sure a great way to meet new people from the whole campus and run around in the sun! However it is not just rounders, colleagues compete in a wide range of activities from fencing to sailing in the Civil Service regattas.

STFC is certainly an employer that encourages you to have a life outside work!”
STFC is one of the UK’s Research Councils reporting to Government via the Department for Business Innovation and Skills. STFC owns and operates the Rutherford Appleton Laboratory in South Oxfordshire, the Daresbury Laboratory in Cheshire, the Chilbolton Observatory in Hampshire, the UK Astronomy Technology Centre in Edinburgh, the Isaac Newton Group of Telescopes on La Palma in the Canary Islands and the Joint Astronomy Centre in Hawaii.

STFC’s work aids advances in science and technology by providing industry and the international research community with access to advanced facilities and the extensive expertise of its staff. STFC’s laboratories and associated campuses host some of the UK’s major research facilities. A brief selection of the facilities and expertise are:

- **ISIS** – a powerful neutron and muon source for research into the molecular structure of materials, physical and life sciences
- the Central Laser Facility for research into fundamental science, medicine and security
- advanced microelectronic engineering capabilities for the design of devices, systems and leading-edge integrated circuits
- RAL Space, which plays an integral part in hundreds of international missions and projects, supporting ground and space based research
- high performance computing facilities
- advanced detector and instrumentation design capabilities
- world-leading technology to design and build advanced systems for astronomy
- research into alternative energy, radio communications and materials.
Electronic engineering and advanced microelectronics technology are crucial to the success of many of our programmes. They include the design of advanced electronic systems and the creation of bespoke microelectronic solutions for a wide variety of projects including scientific instruments, space satellites and medical systems.

The wide variety of projects and the close links with both the academic community and industry mean that STFC provides excellent opportunities for a professional career in microelectronics engineering. STFC offers:

- leading-edge facilities and resources
- a diversity of projects
- real opportunities to use your engineering skills
- an IET-accredited professional development scheme
- a lively sports and social scene
- the possibility of overseas travel.
A CAREER WITHIN STFC TECHNOLOGY

**Q Are the opportunities relevant to industry?**
Most definitely yes! As a graduate looking for employment after completing your degree, it is important to choose the correct employer. Through our IET-accredited professional development scheme and wide-ranging projects, we provide an environment that will challenge and stretch your abilities, and a support structure that will enable you to develop. Many of our graduate engineers go on to have long and successful careers with us, but those who stay only for a few years find that their time with STFC builds an impressive skill-set that is highly marketable and valued by other employers.

**Q What are the prospects for promotion and career progression?**
When you successfully complete the initial phase of the accredited training scheme for graduate engineers, you will be promoted and receive a significant pay rise. Typically, this is within two years, but exceptional graduates can achieve this promotion earlier. After that, all staff have an Annual Performance Review at which their progress and readiness for further promotion are discussed.

**Q How is the work organised?**
The work is project-based, with projects varying in time from a few weeks to several years, and in team size from a couple of engineers to a large team. At any one time, there may be around 100 projects underway and obviously these need careful management. This is achieved through our project-management system and the organisation’s full certification under the ISO9001 Quality Assurance scheme.

**Q Are there opportunities for international travel?**
We collaborate with many prestigious research institutions throughout the world and you may well have the opportunity to travel to, or work at, a world-leading establishment overseas.

**Q What are the holiday entitlements?**
When you start with us, you will get 25 days holiday a year. This is in addition to bank holidays and a further couple of organisation holidays – another 10.5 days in total. So you will actually have a total of seven weeks’ holiday!

Before applying, you will undoubtedly have a few questions. To help, we have answered a few of the questions commonly asked by graduate applicants.

**Frequently asked questions**
**Where will I be based?**

STFC operates from three main sites in the UK – the Rutherford Appleton Laboratory (RAL) in Oxfordshire, the Daresbury Laboratory in Cheshire and the UK Astronomy Technology Centre in Edinburgh. However, not all activities are carried out at all of the sites, and the opportunities for microelectronics engineers are located at RAL.

**How does STFC Technology relate to STFC?**

STFC Technology is the part of STFC that focuses on providing advanced engineering capabilities, including microelectronics engineering, to the whole organisation and external customers. Graduate microelectronics engineers within STFC Technology will also be part of the main STFC Graduate Scheme, and interact with other graduates from the whole of STFC and from its various sites.

**How do I apply?**

Application is online via the website, which contains full details of the vacancies and closing dates.

**How will I be selected?**

If your qualifications and interests appear to be a good match to any of our vacancies, you will be invited to RAL for an interview and assessment. You will have a technical interview, be asked to complete some tests and take part in observed small group exercises. There will be plenty of opportunities for you to find out about us and to decide whether we might be the right employer for you. You will have the chance to see our facilities, to meet some of our senior staff and chat informally to recent graduate recruits (to find out what the work is really like!).