COMPUTER SYSTEMS ENGINEERING/ELECTRONIC AND COMMUNICATIONS ENGINEERING

Canterbury
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 the 24 Russell Group universities.

Kent was ranked 13th for Electronic and Electrical Engineering in The Guardian University Guide 2017. Studying Computer Systems Engineering or Electronic and Communications Engineering at Kent gives you a great opportunity to play an active part in developing state-of-the-art systems, working at the cutting edge of technology.

World-leading research
In the Research Excellence Framework (REF) 2014, 98% of Kent’s research in engineering was judged to be of international quality. The School of Engineering and Digital Arts (EDA) is actively engaged in topical research, consistently winning funding from UK research councils, European research programmes and government agencies.

We have a broad range of research groups including: Communications; Instrumentation, Control and Embedded Systems; and Intelligent Interactions. The School also regularly hosts research seminars and conferences.

Inspirational teaching
Spectacular advances in electronics, computing and communications have made a huge impact on modern life. Our BEng and MEng courses are based on leading-edge research topics, which is vital in a field that advances so quickly. The School has 34 lecturers, with both academic and industrial experience, and we also employ visiting lecturers to provide a more specialist view.

A global outlook
Kent has a reputation as the UK’s European university and has developed international partnerships with a number of prestigious institutions. We have an international community on campus with 37% of Kent’s academics coming from outside the UK and students representing 148 different nationalities. Kent is ranked in the top 10% of the world’s universities for international outlook according to the Times Higher Education (THE).

Professional recognition
For over 30 years, our BEng and MEng courses in Electronic and Communications Engineering and Computer Systems Engineering have been accredited by the Institution of Engineering and Technology (IET), which enables

DID YOU KNOW?
Kent was ranked 1st in the UK for overall student satisfaction in Electronic and Electrical Engineering in the National Student Survey 2015.
Flexible entry options
For first-year entry to our BEng and MEng degree programmes, we accept a range of UK and overseas qualifications. Direct entry can be made to the second year of our degree programmes by suitably qualified candidates. The School also offers a foundation year, ideal for students who have studied alternative subject areas and who wish to refocus their studies. The foundation year is also designed for overseas applicants or mature students whose education ceased before A-level standard. See p11 for details.

A year in industry
All the School’s BEng and MEng programmes can incorporate an additional year spent in industry. The placement year occurs between the second and third years of study and is suitable for anyone who wants to experience life in a commercial environment. It gives you valuable industrial experience, enhances your employability and allows you to evaluate a potential employer as well as earn some money. For more details, see p17.

Flexible entry options
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Student sponsorship
The School encourages you to consider industrial sponsorship. As well as the financial benefits such sponsorship brings, it also offers the possibility of vacation employment, giving experience of the industrial environment and the prospect of a job at the end of the degree. A sponsored student may also choose to complete a final-year project that is linked to the company. This is a chance to gain an insight into the challenges and rewards of working in a commercial organisation.

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 challenging economic environment. During your studies, you develop key skills considered essential for a successful career. For more information on the careers help we provide at Kent, please go to p8 or visit www.kent.ac.uk/employability
SUPERB STUDENT EXPERIENCE

Based on a scenic and well-located campus, you have the use of excellent systems and resources.

We have recently invested over £1.5m on updating our teaching and computer laboratories. You become part of a modern School, with access to state-of-the-art facilities, enabling you to have an enjoyable and expansive student experience.

The School benefits from a 120-seat, multi-purpose engineering laboratory and four air-conditioned computer suites featuring around 150 high-end computers. As well as extensive professional CAD and development software, we also have PCB and surface-mount facilities. Specialist facilities include a large anechoic chamber, 3D body scanner and motion-capture studio.

The School also has a well-equipped mechanical workshop, staffed with skilled mechanical engineers and technicians. In addition to traditional engineering, facilities exist for digital media production, including screen-based media and digital publishing.

Beautiful green campus
Our campus is set in a stunning location. It has plenty of green and tranquil spaces, both lawns and wooded areas, and is set on a hill with a view of the city and Canterbury Cathedral.

For entertainment, the campus has its own cinema, theatre, concert hall and student nightclub. It has a reputation for being a very friendly university with a cosmopolitan environment. There are many restaurants, cafés and bars on campus and a sports centre and gym. Everything you need on campus is within walking distance including a general store, banks, a bookshop, a medical centre and a pharmacy. From campus, it is a 25-minute walk or a short bus-ride into town.

Excellent study resources
The study resources on campus are excellent. The Templeman Library has a wide range of publications, films and images. There are also over a thousand PCs on campus and a range of support services for help or advice. Kent’s Student Learning Advisory Service provides advice on effective learning and study skills. For details, see www.kent.ac.uk/uelt/learning

Attractive location
Canterbury is a lovely city with medieval buildings, lively bars and atmospheric pubs, and a wide range of shops. The attractive 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.

Kent Extra
Kent Extra is an excellent way to get more from your time at university. It provides opportunities to enhance your knowledge, learn new skills and improve your CV. You can do this in many ways, for example by attending one of our summer schools; by volunteering; or by taking a Study Plus course in an area that interests you. For details, see www.kent.ac.uk/kentextra
Do you have any future career plans?
Yes – at the beginning of this year I talked to one of my lecturers about wanting to do a PhD. Then, one day, I was sitting in the social area and he came over to me and asked me whether I’d like to do some work related to Kent’s wheelchair research for my final-year project. Overnight I couldn’t sleep. Of course I really wanted to do it! It is a fantastic opportunity to be part of something bigger and hopefully it will take me closer to my PhD.

How is the project going?
The brief was to create a brain-controlled interface that could classify EEG data (representing brain activity) into four directions. These results could then be sent to the microcontrollers in the wheelchair which would turn the chair accordingly. The problem is that brain signals are so noisy, which makes it difficult to find patterns. I don’t expect to complete the task but that’s how research tends to work: it moves slowly towards the goal.

Any advice for potential students?
Talk to your lecturers! That seems really daunting at first but Kent is completely different to being at school. If you’re open with the academics, they’ll be open with you. I actually got my summer internship from talking to one of my lecturers; they can provide you with so many opportunities.

Student Profile

Krisha Kanumuru is in the final year of her BEng (Hons) in Electronic and Communications Engineering.

What attracted you to studying at Kent?
During my childhood I’ve been all over the world – I lived in America for six years and in England for three years and I’ve always loved Kent. I did check out the league tables too – and Kent was always first choice for me. I just preferred it over any other university.

How would you describe your fellow students?
I don’t think there have been any modules that I didn’t enjoy. I’ve loved everything. The second year is a challenge because the pace is much faster. We started the group projects and I was group leader and it’s hard to delegate tasks and do your own work. But now I feel that I can get a lot done in a short space of time, which is important to know. It definitely prepares you for the pressures of work.

How would you describe the degree?
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What do you think about the level of support in your studies?
There’s a lot of support. If you go to the lecturers they will definitely help you out. And it’s nice to sit and have a chat with them about engineering – your project, your future. That’s what they are there for; to help you grow into the person you should be.

Have you done any extra-curricular activities at Kent?
I’m not in many societies but I like being involved in what the School does. I’m a Student Ambassador for the School and get involved in Open Days, talking to students about coming to Kent. I also did a summer internship: I was working with one of the lecturers and had to create a software system using LabVIEW to control a laser. I think it made me appreciate the kind of things we learn at Kent – how they can be used in a real project.
Kent equips you with essential skills to give you a competitive advantage when it comes to getting a job. Six months after graduation in 2015, more than 95% of Kent graduates were in work or further study.

The fields of computer technology, telecommunications and consumer electronics are rapidly evolving, so expertise in these fields is in great demand.

Graduate career paths
In recent years, graduates from our Engineering programmes have found employment in careers as varied as developing the next generation of mobile telephones, creating animated human models, managing the ground segment of a new broadcasting satellite system, and employing computer-based techniques in a hospital environment.

Many graduates have also extended their studies by registering for MSc and PhD programmes. Examples of their research include the remote monitoring of patients in their own homes, the design of small satellites and the development of improved computer-aided integrated circuit design tools.

Key transferable skills
Studying for a degree is not just about mastering your subject area. These days employers are also looking for a range of key skills, and we encourage you to develop these within your degree programme. The ability to analyse situations, troubleshoot problems, and construct written and verbal presentations are all valuable skills, no matter what career path you choose.

Careers advice
Our 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.

Further information
For more information on the careers help we provide at Kent, please see www.kent.ac.uk/employability.
Did you get the chance to pursue your own interests?
The yearly projects were probably my favourite part of the degree. They allowed you to explore different areas; you were free to investigate your own methods under the guidance of your supervisors.

How would you describe your fellow students?
You’re surrounded by like-minded people who often have the same interests as you, so making friends is very easy. There was definitely a team ethic in my year; we’d meet to work through problems together and that often led to a night out.

What about the other activities on offer at Kent?
I was a part of the Kent Amateur Football League and President of the Italian Society, which was a good opportunity to learn more about Italian culture (mainly the food). What I really loved about Kent was the diversity of the students. I learnt so much about various cultures: I don’t feel I would have had the same experience at some other universities.

What careers advice did you receive at Kent?
Engineers are very much in demand and that meant I could look for the position I really wanted, rather than just getting a foot in the door. The Careers and Employability Service was very good at explaining this, and how I could use it to my advantage.

In what way has your degree helped you in your career?
The course didn’t just teach me the technical knowledge needed to be an engineer, it taught me how to solve problems and how to approach engineering challenges. That is probably the most valuable skill. And I was also able to gain project management, presentation and communication skills.

How would you describe your current role?
My current role is a mix of technical and business development – exactly what I was looking for. Some days I am supporting customers, either by consulting on the hardware and software they need, or by working with them to write new software. I also teach technical courses to customers across Europe and manage internal projects to help improve the efficiency of the company. What I most enjoy about my job is the diversity – I can be involved in anything from the aerospace industry to Formula 1 cars, mobile phones or even CERN. It’s a constant learning experience.

Any plans for the future?
I’m part of my company’s Engineering Leadership Programme and so I hope to be in a leadership role within a technical team, driving projects forward to deliver innovative products. I am also determined to help make a product which makes a lasting positive impact on the world.

Scott Broadley graduated in 2015 with an MEng (Hons) in Electronic and Communications Engineering. He works as an Applications Engineer at National Instruments.
Choosing Your Programme

The focus of the degree programmes the School offers ranges from design, through programming to specialist engineering.

The BEng and MEng degrees are fully accredited by the Institution of Engineering and Technology (IET). The MEng programmes also meet the educational requirements for Chartered Engineer (CEng) status. Within this leaflet, we provide details of the following degrees.

Electronic and Communications Engineering
This programme, which is offered full-time as either a three-year BEng or four-year MEng course, teaches all aspects of electronic engineering, allowing its graduates to enter any branch of electronics. Its syllabus includes analogue and digital circuits and systems, mobile and other communications, and computing for electronics.

Computer Systems Engineering
In this programme, you develop the skills and expertise needed to design computer systems. This includes up-to-date detailed knowledge of computer hardware and software, and background knowledge of electronics, communications systems and control theory. The programme is offered full-time as either a three-year BEng or four-year MEng course and is jointly taught by the School of Engineering and Digital Arts and the School of Computing.

Other degree programmes
The following degrees are also available within our School. For details, see the relevant leaflet – www.kent.ac.uk/studying/leaflets

Bioengineering
This three-year, full-time BEng programme is offered jointly with the School of Biosciences. It draws on the School of Engineering and Digital Art’s expertise in developing medical-electronic systems and its research synergies with the School of Biosciences. The programme produces engineers with a solid knowledge in biology and medical science, opening up career opportunities in the bioengineering industry and the NHS.

Electronic and Computer Systems
This programme is designed for candidates who already have 240 credits from modules equivalent to those on our Stage 1 and 2 Electronic and Communications Engineering programme. You study full-time for a year to gain the same level of qualification as students taking a three-year degree.

Multimedia Technology and Design
This programme gives you the opportunity to develop in-depth knowledge in areas such as web design, DVD authoring, 3D modelling, special effects and compositing, and opens up the possibility of a future career in fields such as film animation, multimedia production and website creation.

Digital Arts
This programme provides you with practical skills, creative thinking and design expertise through an exploration of modules in website design, digital photography, moving image, graphic design, 3D modelling and animation, digital portfolio production and design for print. It can be taken as a three-year BA or a four-year MArt degree.

Flexible entry routes
Foundation Year
This programme is for students who do not have the qualifications needed for direct entry to the first year of our degree programmes. It covers electronics, computing, physics and mathematics. If you successfully complete the foundation year, you can go on to take either the Electronic and Communications Engineering or Computer Systems Engineering programmes. You may also be considered for the Bioengineering degree programme if you have an A level in Biology (or equivalent).

International Students
The International Foundation Programme (IFP) is for international students. Passing the electronics pathway of the Kent IFP with an overall mark of 60% or over guarantees you entry on to the first year of the relevant degree programmes. For more details, see www.kent.ac.uk/ifp
FOUNDATION YEAR

The Foundation Year is designed for those students who do not have the qualifications for direct entry to our degree programmes.

All the teaching is on campus, so you can take part in all student activities. The teaching is mainly conducted by the University’s academic staff and consists of lectures, example classes and laboratory sessions. 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 engineering design.

Analogue Electronics
This module introduces you to the basic electronic components and their applications in real-life electronic circuits and systems.

Calculus
Both differential and integral calculus are vital to an engineering degree. You also examine simple applications in electronics and physics.

Electrical Principles and Measurements
Supported by practical laboratory work and example classes, you explore the theory and practice of performing and assessing electronic measurements.

Electromagnetics for Engineers
In order to understand modern electronic and communications systems, you explore the basic principles of electromagnetism. Practical work and example classes assist your learning.

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

Introduction to Programming using MATLAB
This introductory module looks at computer programming and its practical application in the field of electronics. During the module, you gain a working knowledge of the MATLAB programming language.

Semiconductor and Digital Electronics
You look at the principles of digital electronics and digital systems, and examine some of today’s most important electronic semiconductor devices.

If you successfully complete the Foundation Year, you can go to the first year (Stage 1) of any of our BEng programmes (see left). Please note that an A level (or equivalent) in Biology or Chemistry is also required for Bioengineering.

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

The modules you study during your Foundation Year are:

• Algebra and Arithmetic
• Analogue Electronics
• Calculus
• Electrical Principles and Measurements
• Electromagnetics for Engineers
• Graphs, Geometry and Trigonometry
• Introduction to Programming using MATLAB
• Semiconductor and Digital Electronics.

For those who need it, there is also instruction in English.
STUDYING AT STAGE 1

Stage 1 is the first year of your degree programme. All the core material is presented using lectures, supervisions, assignments and laboratory classes.

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

All students take the following compulsory modules:
- Digital Technologies
- Engineering Mathematics
- Engineering Analysis
- Introduction to Electronics
- Robotics Project.

Students in Electronic and Communications Engineering take:
- Computer Systems
- Electronic Circuits
- Introduction to Programming.

Students in Computer Systems Engineering take:
- Computer Systems
- Introduction to Object-Oriented Programming
- Databases and the Web.

Modules: Stage 1

Computer Systems

This module provides you with an understanding of the fundamental behaviour and components (hardware and software) of a typical computer system, and how these collaborate to manage resources and provide services. Starting with a Microsoft/Intel PC attached to the internet via a Local Area Network, you explore two strands: systems architecture and operating systems and communications. Quite apart from the academic value of this module, the knowledge gained is useful to anyone using a PC.

Databases and the Web

This module introduces databases and SQL, focusing on their use as a source for content for websites. You look at creating static content for websites using HTML(5) and controlling their appearance using CSS. You then learn how to use PHP to integrate static and dynamic content for websites. Other options include securing dynamic websites and using JavaScript to help improve web content by making it more interactive and easy to maintain.

Digital Technologies

Here, you learn the necessary theoretical background to understand the operation of large-scale digital systems and to develop the necessary skills to design the logic of moderately complex digital circuits. The module forms an introduction to the fundamental theory underlying modern digital technology, covering both combinatorial and sequential logic systems. The techniques introduced form the basis for future modules. No previous knowledge of digital systems is assumed.

Electronic Circuits

In this module, you expand on your knowledge from Introduction to Electronics to gain a rigorous understanding of the fundamentals of electric circuits with alternating currents. Introduced to basic electronic devices such as diodes and transistors, you learn how they work and what properties they have, and how to analyse and design circuits with these devices. This module mixes traditional lectures with computer-aided design tools.

Engineering Mathematics

Mathematics is the fundamental language of engineering, allowing complex ideas to be formulated and developed. This module provides you with the sound basis of mathematical techniques and methods required by almost all other modules on the School’s engineering courses. Topics covered include functions and graphs, set theory, complex numbers, calculus, matrices and vectors, and probability. The lectures are supported by assessed example classes, taken in small groups.

Engineering Analysis

This module expands the introductory mathematics covered in Engineering Mathematics and provides you with the appropriate mathematical tools necessary for the further study of electronic and computer systems. Topics covered include differential equations, the Fourier series, partial differentiation,
Laplace, Poisson and wave equations, which are used to solve problems in the areas of signals, systems and electromagnetic fields. The lectures are supported by assessed example classes, taken in small groups.

**Introduction to Electronics**

Electronics hardware consists of various components and devices interconnected in such a way that they perform specific functions. Here you learn about the main electronic components, how they work, what properties they have and their main usage, and gain the practical skills to perform simple measurements and tests. This module also includes a mini-project in which you gain practical laboratory experience in the design and construction of a circuit.

**Introduction to Object-Oriented Programming**

Software pervades many aspects of most professional fields and sciences, and an understanding of the development of software applications is useful as a basis for many disciplines. This module covers the development of simple software systems. You gain an understanding of the software development process, and learn to design and implement applications in a popular object-oriented programming language.

**Introduction to Programming**

The module provides you with an introduction to the basic knowledge required to understand, design and write computer programs and the basic principles underlying the process of software engineering. No previous programming experience is assumed, and the module proceeds via a sequence of lectures supported by simple exercises designed to give practical experience of the concepts introduced.

**Robotics Project**

This module is designed to provide experience in the practical and management aspects of project work. It is supported by a lecture course and weekly supervisions. After an initial hands-on introduction to soldering, use of bench equipment and the computer-aided design and manufacture of a printed circuit board, you start the robotics project. This consists of constructing a robot that incorporates an additional circuit board of your own design and software of your own devising.
STUDYING AT STAGE 2

Stage 2 is the second year of your degree programme.

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

All students take the following modules:
• Computer Interfacing
• Signals and Systems.

Students in Electronic and Communications Engineering also take:
• Communications Principles
• Digital Implementation
• Electronic Instrumentation and Measurement Systems
• Further Object-Oriented Programming
• Image Analysis and Applications
• Microcomputer Engineering.

Students in Computer Systems Engineering also take:
• Communications Principles
• Digital Implementation
• Electronic Instrumentation and Measurement Systems
• Microcomputer Engineering
• Microwave Circuits and Electromagnetic Waves.

Modules: Stage 2

Communications Principles
This module provides the fundamental knowledge required to understand communication systems. It concentrates mainly on signal transmission in the presence of impairments and how modulation, coding and detection schemes can mitigate against these impairments. The module also introduces you to some core concepts in modern communication networks.

Computer Interfacing
Here, you engage in a major practical project involving both computer hardware and software and a series of supporting lectures, working in a group of four on an allocated application. Applications range from a weather monitoring system to controlling a simple robot. This project provides an opportunity for you to gain experience not only in technical areas such as PC-based data acquisition, computer interfacing and visual programming but also in transferable skills such as team working, project management, technical presentation and report writing.

DID YOU KNOW?
The School recently celebrated 30 years of continuous accreditation by the Institution of Engineering and Technology.
Digital Implementation
This module provides you with an overview of modern digital system implementation. Introducing the hardware description language VHDL, the module then uses a subset of VHDL, to enable the development of moderately complex behavioural and structural models of digital components. Practical work associated with this module is performed using a Windows-based VHDL compiler and simulator. The exercises complement the lecture material and provide you with the necessary skills to use VHDL in your third-year project.

Electronic and RF Circuit Design
This module introduces you to design concepts and develops your analysis skills for important electronic and radio frequency communications circuits. It builds on introductory general circuit analysis ideas.

Electronic Instrumentation and Measurement Systems
Covering such technical topics as the principles of measurement and instrumentation, sensors and transducers, signal conditioning and data presentation elements, this module teaches you the role of the various elements of a measurement system and how to specify and evaluate it for a given application. You design, construct and test two basic measurement systems using common sensors and electronic components and also undertake a substantial review of measurement techniques for a specific industrial application.

Further Object-Oriented Programming
This module builds on the Stage 1 introductory module to provide a deeper understanding of, and familiarity with, object-oriented program design and implementation. More advanced features of object-orientation, such as inheritance, abstract classes, nested classes, graphical-user interfaces (GUIs), exceptions, input-output are covered. These allow an application-level view of design and implementation to be explored. Throughout the module, there is an emphasis on quality of application and the need for a professional approach to software development.

Image Analysis and Applications
You learn about images and image processing, image analysis, security and biometrics. You also discover how neural networks can be used as architectures for image analysis.

Microwave Circuits and Electromagnetic Waves
In this module, you are introduced to the concepts of guided and free space transmission as well as microwave circuit fundamentals. You learn about the structures that guide pulsed, RF and microwave signals; and gain an understanding of EM wave behaviour in free space and at dielectric boundaries. The module also covers EM guiding structures, both metallic and dielectric, as well as the basic design, matching and stability of RF amplifiers and the circuits involved in the process of high-frequency signal transmission.

Signals and Systems
You are introduced to basic methods and techniques for describing and analysing continuous and discrete time signals and systems. You explore notions of linear time-invariant systems and their impulse response. The convolution operation is illustrated as a means for describing the behaviour of such systems. The connection between continuous and discrete time signals is explained through the introduction of the sampling theorem.
Our Electronic and Communications Engineering and Computer Systems Engineering programmes offer a year in industry. This is taken between Stages 2 and 3.

Study and career benefits
Employers are very keen to employ graduates who already have work experience, so this year can greatly enhance your job prospects by providing you with real commercial experience. It also allows you to evaluate a particular career path, and gain knowledge of the working environment. If your placement is a success, you may even be offered a job with the same employer after graduation.

The practical experience can also be put to good use in your final year of study, helping you to gain a better degree. It gives you a sense of how the theory works in practice and improves your skills in many areas.

Finding a placement
The School has a dedicated placement officer, who works with the University’s Careers and Employability Service to assist you in identifying businesses and organisations offering placements. Information about opportunities will be made available to you, and the website of the Careers and Employability Service provides helpful material about opportunities and applications.

The Careers and Employability Service also provides support in writing CVs and developing skills for placement applications and interviews. It also provides a reference bank of students who have completed successful placements in industry while studying at Kent.

There are frequent visits to Kent by companies who present their placement opportunities and also interview candidates.

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

Keeping in touch with Kent
The University maintains close contact with you during your year away. The industrial placement year is assessed by a combination of employer feedback and academic evaluation. You are required to keep a log of your training and work experience during the year and to write a report on your placement experience.
STUDYING AT STAGE 3

Stage 3 is the final year of study for our BEng degrees.

At this stage you are able to specialise in areas of interest. Please note that the module lists below are not fixed as new modules are always in development and choices are updated yearly. See www.kent.ac.uk/ug for the most up-to-date information.

All students take the following:
• Product Development
• Project.

Other modules vary according to your programme, as listed below.

Electronic and Communications Engineering:
• Communication Systems
• Digital Communications Systems
You also choose two modules from:
• Digital Signal Processing and Control
• Digital Systems Design
• Embedded Computer Systems.

Computer Systems Engineering:
• Digital Signal Processing and Control
• Embedded Computer Systems.

You also choose one module from:
• Computer Security and Cryptography
• Digital Systems Design
• Computer Networks and Communications
• Computing Law and Professional Responsibility.

Modules: Stage 3

Communication Systems
This module covers the principles of modern communication systems and how they are applied. You gain specialist knowledge of current systems, including optical, microwave and satellite systems. In addition, you are made aware of the available products, systems, technologies and techniques in the field of communication systems.

Computer Networks and Communications
You learn about the various hardware and software components within current technology, looking at how these are organised and how they work. This includes network architecture and protocol layers, and includes details of the technologies, algorithms and protocols in use. You then take an in-depth look at a number of advanced topics in the area of computer communications, including details of current practice, some of the outstanding issues to be solved, and what is considered to be state-of-the art.

Computing Law and Professional Responsibility
Topics you explore include data privacy legislation, as well as aspects of criminal law related to networked computer use, including new anti-terrorism legislation. You also examine areas of importance within professional life, including the vendor-client relationship and professional responsibilities, health and safety issues and professional organisations.
Computer Security and Cryptography

The importance of computer security has increased greatly in recent years. Here, you cover a range of security systems, from commercial to industrial, and gain an understanding of the main techniques and technologies underlying security, including authentication, encryption and watermarking.

Digital Communications Systems

You build on your knowledge of digital communications gained in the Stage 2 module Communication Principles. You explore the capacity of communication channels and systems, and the use of coding techniques to use the available capacity in the presence of errors. You also examine protocols for the internet, modern telecommunications and local networks; and fibre-optic systems that are crucial for providing the capacity of today's internet.

Digital Signal Processing and Control

You build on the knowledge gained in the Stage 2 module, Signals and Systems, and apply it to modelling and manipulation of basic control systems. This includes the Laplace Transform and its use in describing control systems as well as Bode plots and Root Locus analysis. These concepts are applied to classical control problems and simple robotic systems are used to illustrate the importance of these concepts in modern control systems.

Digital Systems Design

Continuing from the Stage 2 module Digital Implementation, you look at how to design and implement large scale digital systems; reliable digital systems using synchronous design techniques; as well as systems that are easily testable and use a range of software tools that synthesise digital systems using VHDL.

Product Development

In this module, you examine the development of commercial electronic and software products, covering design, production techniques, reliability and the commercial aspects of a company.

Embedded Computer Systems

You learn the theory and practice of employing computers as the control and organisational centre of an electronic or mechanical system, and examine issues related to time-critical systems. The module also exposes you to practical embedded systems design through substantial practical work. One assignment uses a microcomputer programmed in C to control the ignition timing of a simulated petrol engine.

Project

Your individual project allows you to explore an area of particular interest. Projects in the Computer Systems Engineering programme may cover either the computing or electronics subject areas.
Stage 4 is the final stage for those taking our MEng degrees. Whatever your chosen degree programme, the topics that you cover involve a significant amount of specialisation.

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

All students take the following compulsory modules:
- Strategy
- Systems Group Project.

Other modules vary according to your programme, as listed below.

Electronic and Communications Engineering:
- Communication Networks
- DSP and Digital TV.

You also choose two modules from:
- Advanced Control Systems
- Broadband Networks
- Reconfigurable Architectures
- Signal and Communication Theory 2
- Wireless/Mobile Communications.

Computer Systems Engineering:
- Embedded Real-Time Operating Systems
- Reconfigurable Architectures.

You also choose one module from:
- Biometric Technologies

**Modules: Stage 4**

**Advanced Control Systems**
This module is concerned with the design of practical feedback controllers. Feedback is used in a control system to enhance the performance of the plant or process, and to reduce the sensitivity of the system to uncertainty from external effects and model uncertainty. If the performance specifications are achieved in the presence of the expected uncertainties, then the control is said to be robust. This module provides an overview of a number of techniques for robust control, with an emphasis on design and simulation to enhance learning.

**Biometric Technologies**
You gain a detailed treatment of the implementation of biometric systems, including examples, and an analysis of modality-specific features and feature extraction, selection and classification strategies. Topics covered in the module include: state-of-the-art in sensor technologies; spoofing and counter-measures; and analytical approaches to the performance of biometric systems.

**Broadband Networks**
This module provides you with knowledge of broadband network operation, from access networks (xDSL, UWB, WiMAX, DOCSIS) to multi-service provision in IP networks using differentiated services, MPLS, reservation protocols (such as RSVP) and protocols for real-time information transfer (RTP/RTCP), to optical networking and switching. Seminars from industry-linked speakers stimulate interest in particular areas.
Communication Networks
This module takes you through communication network protocols, as used in local-area networks and wide-area networks. It includes the protocols used in the wireless LAN (WiFi) standards, Ethernets and IP networks. The analysis of network performance is also covered. A network simulator (OPNET) is used to reinforce the material, and to provide you with a means of ‘visualising’ protocol operation and network performance.

DSP and Digital TV
In this module, you cover the fundamentals of digital signal processing. You look at the representation and processing of signals in the digital domain and the design of digital filters. Extensive use of MATLAB enables you to grasp the concepts more readily and the theoretical material is illustrated by applications such as JPEG and MPEG image and audio compression standards.

Embedded Real-Time Operating Systems
This module introduces real-time operating systems (RTOS) and their implementation and use in embedded systems. The concepts of scheduling algorithms, threads, multitasking and interprocess communication are discussed in detail using practical examples and case studies. It includes advanced topics in hardware/software co-design together with a review of compilation technologies and compiler techniques for specialised architectures.

Reconfigurable Architectures
Here, you are introduced to some fundamental and advanced computer and reconfigurable computing architectures, including CISC, RISC and VLIW. FPGA technology is used as the basis for describing different forms of reconfigurable computing architectures that are becoming increasingly important in many consumer and industrial applications. Specific emphasis is given to the understanding of computer arithmetic architectures and methods, which are used in the design of embedded systems. The module uses practical design examples using both C and VHDL to illustrate the material.

Strategy
What actions can employees pursue in order to achieve superior performance for their organisation, relative to their competitors? Within this module, you gain a theoretical understanding of strategic management and learn how these concepts can be put into practice. This includes examining the implementation of strategies across a range of industry contexts and various kinds of organisations (including those within the non-profit and public sector).

Systems Group Project
This is the MEng final project that accounts for half of the work of this year and is conducted on a group basis. It involves the application of technical skills and knowledge, and requires group and project management skills.

Wireless/Mobile Communications
Here, you concentrate on the latest mobile and wireless communication technologies, techniques and protocols, covering cellular networks from GSM to 3G and 4G mobile systems. The latest protocols for next generation wireless networks, and the techniques which will enable them, such as microcellular mobile concepts and interference, adaptive modulation and coding, soft handoff, wireless multiple access techniques, multiuser detection, multiuser diversity/scheduling, wireless resource allocation and MIMO systems, are covered.
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 further 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 the 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

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

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

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

For the latest information on studying at the School of Engineering and Digital Arts, please see www.edu.kent.ac.uk
Location
Canterbury

Award
BEng (Hons), MEng

Degree programmes
• Computer Systems Engineering BEng (H618)
• Computer Systems Engineering BEng including a Foundation Year (H614)
• Computer Systems Engineering BEng with a Year in Industry (H615)
• Computer Systems Engineering MEng (H613)
• Computer Systems Engineering MEng with a Year in Industry (H617)
• Electronic and Communications Engineering BEng including a Foundation Year (H605)
• Electronic and Communications Engineering BEng (H619)
• Electronic and Communications Engineering BEng with a Year in Industry (H604)
• Electronic and Communications Engineering MEng (H607)
• Electronic and Communications Engineering MEng with a Year in Industry (H608)

Entry requirements
BEng/BEng with a Year in Industry
H604, H615, H618, H619: BBB at A level inc Mathematics and a science/technology subject (Physics, Computing or Electronics) at grade B.
IB Diploma 34 points inc Mathematics (not Mathematics Studies) 5 at HL or 6 at SL, and 5 at HL or 6 at SL in a science subject; or IB Diploma with 15 points at Higher inc Mathematics (not Mathematics Studies) 5 at HL or 6 at SL, and 5 at HL or 6 at SL in a science subject.
BTEC Level 3 Extended Diploma Engineering: DDD inc Further Mathematics for Technicians module.

BEng/MEng direct entry to second year
Successful completion of the first year of an appropriate degree-level course; an appropriate HND qualification; an appropriate overseas diploma (equivalent to a BTEC HND).

BEng one-year intensive top-up programme
H691: Please contact the Admissions Officer.

Foundation Year
H614, H605: DDD at A level; GCSE Mathematics and Science grade C. For IB requirements, contact the Admissions Officer.

Year in industry
You have the option of spending a year working in industry between Stages 2 and 3. See p17.

Professional recognition
Accredited by the Institution of Engineering and Technology (IET).

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