

## Course record information

|   |  |
|---|--|
| <b>Name and level of final award</b>                                    | <ul style="list-style-type: none"> <li>• Bachelor of Engineering with Honours - Software Engineering with Electronics</li> <li>• Bachelor of Engineering with Honours - Software Engineering with Electronics with Industrial Experience</li> <li>• Bachelor of Engineering with Honours - Software Engineering with Electronics with International Experience</li> </ul> <p>The award is Bologna FQ-EHEA first cycle degree or diploma compatible</p> |
| <b>Name and level of intermediate awards</b>                            | <ul style="list-style-type: none"> <li>• Bachelor of Engineering (BEng) - Software Engineering with Electronics</li> <li>• Diploma of Higher Education (Dip HE) - Software Engineering with Electronics</li> <li>• Certificate of Higher Education (CertHE) - Software Engineering with Electronics</li> </ul>   |
| <b>Awarding body/institution</b>  | University of Westminster  |
| <b>Teaching institution</b>   | University of Westminster  |
| <b>Status of awarding body/institution</b>                              | Recognised Body  |
| <b>Location of delivery</b>   | Primary: Central London  |
| <b>Language of delivery and assessment</b>                              | English  |
| <b>QAA subject benchmarking group(s)</b>                                | Computing  |
| <b>Professional statutory or regulatory body</b>                        | British Computer Society (BCS) (Pending: Please see page 12 for further information)   |
| <b>Westminster course title, mode of attendance and standard length</b> | <ul style="list-style-type: none"> <li>• Software Engineering with Electronics, Full-time, September start - 3 years standard length with an optional year abroad or placement</li> </ul>  |
| <b>Valid for cohorts</b>  | From 2023/4  |

## Admissions requirements

There are standard minimum entry requirements for all undergraduate courses. Students are advised to check the standard requirements for the most up-to-date information. For most courses a decision will be made on the basis of your application form alone. However, for some courses the selection process may include an interview to demonstrate your strengths in addition to any formal entry requirements. More information can be found here: <https://www.westminster.ac.uk/study/undergraduate/how-to-apply>

## Recognition of Prior Learning

Applicants with prior certificated or experiential learning at the same level of the qualification for which they wish to apply are advised to visit the following page for further information:

<https://www.westminster.ac.uk/current-students/guides-and-policies/student-matters/recognition-of-prior-learning>

## Aims of the programme

The BEng Software Engineering with Electronics course is designed for students that wish to enter the world of computer systems engineering, where a mix of hardware and software skills is highly advantageous if not essential in today's job market. The course is developed with reference to QAA Subject Benchmark for Computing (March 2022) and the Engineering Council Accreditation of Higher Education Programmes (AHEP), fourth edition.

The programme aims to:

- Provide you, the student, with practical know-how of hardware, software, and data security so that you will be able to design, build and code reliable, environmentally sustainable low power and high-performance secure solutions that include both hardware and software components.
- Understand professional codes of conduct and how these relate to ethical issues and broader considerations such as the environment, relevant law, and wider societal and commercial concerns in the real-world.
- Provide an environment where you will be able to collaborate, develop generic transferable employability skills including project management, risk management, teamwork, leadership, entrepreneurship and written and oral communication.
- Be industry focused and relevant using industrial practice within teaching and extra curricula activities.
- Support development of the wider skills and behaviours for professional communication, collaborative working and reflective practice that are respectful, accessible, and inclusive of all.
- Provide an exciting, enjoyable, and rewarding learning experience which will serve as a solid foundation for a professional engineering career.

In an era when intelligent computer systems are set to become ever more pervasive in our society the need for software development engineers to have a deep understanding of the physical realities of the machines and interfaces they use is becoming ever greater. To meet this need the BEng Software Engineering with Electronics course is very distinct in its focus and delivery when compared to traditional course offerings in the area of software engineering. Unlike a typical software engineering course or computer science course, whose teaching is focused on the application layer, the BEng Software Engineering with Electronics course is focused on the underlying hardware and system layer that all computer systems run on whether they are a Internet of Things (IoT) smart sensing device, an autonomous robot, a smart home hub or a medical imaging machine.

Through the course you will develop essential practical and theoretical hardware engineering know-how in addition to supporting software skill sets. This will include the development of practical lab bench prototyping skills, the teaching and definition of low-power solutions and the hands-on development of time critical real-time solutions. The combination of these skills will enable you to; build hardware and write code that will, for example, enable you to develop a product that will sense and monitor properties of the real-world, develop sustainable engineering solutions, develop intelligent machines that are aware of their surroundings or control hardware in a safe, sustainable, timely and power efficient manner.

In particular you will gain a deep understanding of the physical realities of the hardware/ software boundary point or to be more specific you will gain an in-depth knowledge of the embedded systems engineering discipline from which you will be able to apply your knowledge to the development of products in various application areas such as robotics, intelligent systems, smart homes and cities, machine learning, systems programming and Internet of Things (IoT).

The communication and interpersonal skills necessary for operation in a diverse and inclusive professional engineering environment are an important part of the course and will allow you to adapt to future changes in technology. Alongside technical skills you will also develop a range of professional skills. There are four specific modules which support the development of professional transferable skills through group and individual work: Trends in Computing (professional practice module) and Microcontroller Project in Year 1, work-based learning module Embedded Systems Project in Year 2 and the Individual Project in Year 3. In other modules you will also be encouraged to work collaboratively, manage your time successfully, work in teams in different roles and present and defend work to peers and tutors. Above all the course aims to inspire students of all backgrounds and genders to become professional engineers.

## Employment and further study opportunities

University of Westminster graduates will be able to demonstrate the following five Graduate Attributes:

- Critical and creative thinkers
- Literate and effective communicator
- Entrepreneurial
- Global in outlook and engaged in communities
- Social, ethically and environmentally aware

University of Westminster courses capitalise on the benefits that London as a global city and as a major creative, intellectual and technology hub has to offer for the learning environment and experience of our students.

The BEng Software Engineering with Electronics course has:

- Career development skills, embedded in all levels;
- Opportunities for placements and work-related learning activities;
- Staff membership which continues to widen and strengthen the University's links with employers in all sectors;
- A curriculum highly relevant to the current and future needs of industry;
- Career education and guidance activities that actively engage employers.

The University and the course team consider that employability is an important attribute of any successful graduate. Throughout the course from Year 1 onwards you will be offered a multitude of help and support to enhance your employability, find and secure placement opportunities and plan your career through regular workshops and events organised by the Career Development Centre and the course team. Examples of this support include practise job interview and CV writing skill development sessions and extra-curricular activities to encourage you to further engage with the employability services of the university.

The course will focus on the development of practical know-how and broader transferable employability-related skills such as critical thinking, leadership, teamwork, communication, presentation, and report writing to ensure that you are prepared and ready to enter the world of work when you graduate.

Mastery of the technical skill sets important when working in the computer systems engineering sector will be developed through hands-on work in laboratories, workshops, seminars, and group projects. All modules have a strong hands-on practical element where foundation knowledge and theory are put into practice in laboratory-based seminars. Project work is found in the Microcontroller Project (Year 1), work-based Embedded Systems Project (Year 2) and Individual Project (Year 3). In particular the work-based project in Year 2 will provide you with an opportunity to work within a small team on a project that is informed by industrial practice. In addition, the project-based modules will allow you to put theory into practise and improve your transferable employability skills such as costing, project management, risk management, quality management, leadership, communication, time-planning and teamwork.

After completing the second year of your study you will have the opportunity to take a year in industry and gain work experience (work placement). This will increase your chances of employability after graduation and further develop broader skill sets such as time management often championed by employers.

Furthermore, you can choose to undertake an international experience year as part of your degree at one of our partner overseas institutions such as Institute of Informatics (IIT), Sri Lanka or Westminster International University in Tashkent (WIUT). You will study and reside in the country of a host institution during the year. The content of your study is agreed upon through a Learning Agreement between you, the home institution and the School of Computer Science and Engineering.

Dependent on your chosen option modules and the successful completion of the course you will become a high-quality graduate able to work as: a computer systems engineer, an embedded systems engineer, a firmware engineer, a software engineer, a robotics engineer or a Internet of Things (IoT) development engineer.

Specific roles include:

- **Computer engineers** are typically responsible for developing, testing and evaluating software either for computer systems and/or software for controlling and connecting various devices and machines that are different from traditional computers.
- **Systems engineers** monitor the performance of systems that control a variety of processes and continually assess all stages of operations to ensure that a problem is solved. Such engineers may work in virtually any industry, from software development and robotics to other parts of engineering.
- **Software engineers** tend to develop software at the application layer using platforms such as Android or write programs at the systems layer normally targeting standard operating systems such as Windows and Unix. Sometimes they also write code to work with embedded system platforms.
- **Embedded system engineers, Firmware engineers** and **Robotics engineers** code, debug, test and write corresponding documentation, work largely with hardware, and often need to develop or configure a custom based operating system unique to a given hardware platform.

Alternatively, you may wish to carry on to further study at Masters or Doctorate level. We offer many Master courses in computer science and data security. As a graduate of this course, you shall be capable and prepared for continuing your education at postgraduate level. We can offer you advice on this once you have completed your studies.

## What will you be expected to achieve?

Learning outcomes are statements on what successful students have achieved as the result of learning. These are threshold statements of achievement the learning outcomes broadly fall into four categories:

- The overall knowledge and understanding you will gain from your course (KU)
- Graduate attributes are characteristics that you will have developed during the duration of your course (GA)
- Professional and personal practice learning outcomes are specific skills that you will be expected to have gained on successful completion of the course (PPP)
- Key transferable skills that you will be expected to have gained on successful completion of the course. (KTS)

**Level 4 course learning outcomes:** upon completion of Level 4 you will be able to:

- LO4.1 Select and apply knowledge, principles, tools and methodologies to design, implement, model and evaluate software, hardware solutions and more complex embedded system solutions ( KU GA KTS )
- LO4.2 Design, implement, debug and test, simple programs in high-level and low-level languages given prescribed methods ( KU GA PPP )
- LO4.3 Represent in words, mathematics and diagrams electronic, software and mathematical concepts, and use these in the description and analysis of simple systems ( KU KTS )
- LO4.4 Demonstrate a knowledge and understanding of current technology and trending future technology in computer systems, electronics, cybersecurity, design tools and techniques as taught ( KU GA )
- LO4.5 Gather and assimilate information, with some guidance, and apply it appropriately and then communicate complex technical information succinctly and accurately, by means of presentations, written reports, appropriate diagrams and discussion ( GA KTS )
- LO4.6 Plan work and reflect on self-learning required for structured group tasks, given direction and guidance and demonstrate creativity in the production of practical products and documentation keeping to set deadlines ( GA KTS )
- LO4.7 Demonstrate a knowledge and understanding of the role of professional bodies and of a professional engineer to ensure that risks and the resulting impacts of these risks are recognized and mitigated. ( GA PPP KTS )
- LO4.8 Demonstrate an awareness of continuing professional development and the importance and benefits of supporting equality, diversity and inclusion ( GA PPP KTS )
- LO4.9 Demonstrate an awareness of the importance of sustainable engineering practice and ethical engineering practice; work within a laboratory setting in a safe and ethical manner ( GA PPP )

**Level 5 course learning outcomes:** upon completion of Level 5 you will be able to:

- LO5.1 Select and apply computational techniques and engineering processes to specify, analyse, test, model and/or select computer system interfaces, programming methodologies or algorithmic solutions; recognising their limitations ( KU GA PPP )
- LO5.2 Demonstrate knowledge of and put into practice the use of systems architecture, systems programming and algorithmic solutions including the use of data structures or the underlying principles of operating systems ( KU GA )
- LO5.3 Use a rapid prototyping platform to develop and validate an embedded systems solution that will monitor sensory input data and/or efficiently control hardware ( GA KTS SS )
- LO5.4 Adopt an integrated or systems approach to a complex engineering problem considering technical and broader requirements as appropriate and selecting well-defined methods in the modelling, design, implementation, debugging and/or testing of systems ( KU GA PPP )
- LO5.5 Work on structured group tasks and adopt a holistic approach to these tasks that mitigate security risks whilst recognising and taking on different roles within a group including leadership ( GA PPP KTS )
- LO5.6 Recognise the responsibilities and benefits of equality, diversity and inclusion, adopt an inclusive approach and collaborate in the production of a complex practical product, communicating and documenting complex engineering matters effectively ( GA PPP KTS )
- LO5.7 Explain, demonstrate familiarity with and apply knowledge of the commercial context of engineering, intellectual property rights, project management, quality management and risk management in the context of a complex problem ( GA PPP KTS )
- LO5.8 Evaluate the environmental and societal impact of engineering solutions and where possible engineer solutions that minimise adverse impact; identify and analyse ethical concerns, make reasoned ethical choices, adhere to professional codes of conduct. ( KU GA PPP KTS )
- LO5.9 Demonstrate good coding know-how and practice in the use of object orientated programming tools and

languages including the use of sockets ( KU GA )

**Additional Year course learning outcomes:** upon completion of Additional Year you will be able to:

- 1EY.1 Enable personal development by devising a programme of international study that complements the content of the home degree programme and/or develops other interests. ( GA PPP KTS )
- 1EY.2 Appreciate the challenges and opportunities of studying/ working in an international context. ( GA PPP KTS )
- 1EY.3 Demonstrate an understanding of, and respect for, the cultural norms and differences of the host country at a societal level as part of an inclusive, global ( GA PPP KTS )
- 1PY.1 Experience commercial application of engineering knowhow and identify the factors affecting products and services in IT industry ( KU GA PPP KTS )
- 1PY.2 Demonstrate the acquisition of a range of professional, practical and key-transferrable skills relevant to the fields of computing ( KU GA PPP KTS )
- 1PY.3 Take personal responsibility for directing your own learning and future career making the best use of the opportunities, experiences and people that were available to you during your placement year. ( GA PPP KTS )
- 1PY.4 Draw upon the diverse approaches, perspectives, knowledge and experience of a diverse workforce, treating all individuals with respect and recognising their contribution to the host organisation ( KU GA PPP KTS )

**Level 6 course learning outcomes:** upon completion of Level 6 you will be able to:

- LO6.1 Apply appropriate analytical methods to model the problem or choose and formulate cost and effectiveness of a given set of solutions, and then select and implement the most viable solution based on specific constraints recognising where appropriate the implications of any techniques or solutions deployed. ( GA PPP )
- LO6.2 Critically analyse solutions where appropriate in the context of industry codes-of-practice, commercial matters, legal matters and ethics; engage with the needs of communities taking account of the societal, cultural, ethical issues so as to understand and identify new opportunities and ways to minimise the impact of any issues identified. ( GA PPP KTS )
- LO6.3 Apply a strong understanding of information security and the mechanisms, principles, and design of modern day computer system solutions and their relation to contemporary solutions, to the selection, design, implementation and configuration of secure ethical computer systems. ( KU GA SS )
- LO6.4 Design, develop and provide the necessary software and/or hardware solutions for a given real-time computer system and be able to critically evaluate the resultant solution in conjunction with published solutions; ( KU GA KTS SS )
- LO6.5 Critically assess published material and formulate arguments and solutions to problems and then effectively communicate the complex technical information succinctly and accurately, by means of presentations, written reports, appropriate diagrams and discussion. ( GA PPP KTS )
- LO6.6 Deploy engineering and computing skills with fluency; applying practical engineering skills, combining theory and experience and the use of other relevant knowledge and skills; taking account where possible professional codes of conduct and ethical considerations. ( GA PPP KTS )
- LO6.7 Practice life-long learning and entrepreneurial skills using independent and creative thought through the gathering and assimilation of information gained through practical work using log-books, minutes of meetings and other novel methods. ( GA PPP KTS )
- LO6.8 Recognise and assess risk pertaining to a given problem including those related to the environment, sustainability, society, health and safety and regulation and suggest ways to mitigate this risk. ( GA PPP )

## How will you learn?

### Learning methods

The BEng Honours Software Engineering with Electronics course uses a variety of teaching and assessment methods, to ensure that every student on the course is empowered to fulfil their full potential and achieve the best outcome they possibly can.

A principal aim of the course is to equip you for professional life, or higher study, relevant to your current programme of study. To this end the course is organised into a collection of learning opportunities (modules) at various levels which are directly related to the aims and learning outcomes of the course. These modules are the building blocks of your course. Each module consists of learning activities which are delivered over a number of weeks. These learning activities are designed to help you achieve the knowledge and skills related to your subject area of software engineering and electronic engineering.

A fundamental principle underlying the learning process and teaching methods used on this course is “learning-through-practice”. That is, to learn and understand the engineering skills and techniques required, students need to acquire skills

through doing. This approach applies to both practical skills, which you will learn through project and laboratory work as well as to analytical skills, which you will learn by applying taught principles to problem-solving tasks. These problem-solving tasks will often involve the use of laboratory bench equipment, practical circuits, electrical components and microcontroller-based development systems or software tools to enter a design solution or simulate the functional behaviour of a given implementation.

Much of the learning is achieved through active participation in taught interactive practical sessions. At the end of these sessions feedback will be given. For example, laboratories typically form formative assessment components where you will be given support to complete the tasks described. At the end of these formative sessions you will be given written, verbal, qualitative feedback or a mixture of these to help you understand how well you have performed the task and how to improve it. These formative sessions are used as part of a teaching delivery framework aimed at developing your confidence and abilities to undertake the final summative assessment components for a given module. In general lecturers will provide written and/or verbal feedback on students' work throughout the course and feedback may be given individually or to the class collectively.

In order to develop general and transferable skills you will undertake a number of different activities such as group work that will help develop team working, collaborative and interpersonal skills and time management. You will be required to present and defend your work which will allow you to critically reflect on your learning and also allow you to develop your ability to concisely and clearly present your work.

### **How is Equality, Diversity, and Inclusivity (EDI) addressed in your course**

The principles of Equality, Diversity and Inclusivity lay at the heart of the BEng Honours Software Engineering with Electronics course. The course design ensures that you will have a learning experience that is flexible, respects diversity, encourages active participation and considers students varying needs. For example, the course will encourage and enable you to tailor your learning according to your career ambitions, cultural identity and individual aspirations by allowing you to choose a final year project specialisation within the broad area of computer systems, express your own unique evidenced based views of various societal and ethical issues, develop your own practical solutions to a given problem set and select option modules that will enable you to specialise or gain greater confidence in various application areas of computer systems. Through this myriad of opportunities and choices the course will equip you with the technical and employability skills required to work in a changing and diverse world. Above all you should be reassured that the course team aims to eliminate all arbitrary barriers to your learning and to work with you to achieve your best outcome.

The learning methods employed by the BEng Software Engineering with Electronics course are underpinned by three key principles. These are:

- Provision of a learning environment, both physical and digital, that is equitable, diverse and inclusive and which allows you to learn flexibly with materials that will be available to you in a number of learning context and at any time such as mobile and home environments;
- Provision of a supportive and safe learning environment, based on mutual trust and respect, where students are empowered to act as partners in their transformative learning experiences;
- Provision of a forward-looking course curriculum that is work-place relevant, current and authentic.

Practically, you will see this working in the following ways, for example:

- Teaching materials are, where possible, designed to be inclusive for all.
- Where possible, the assignment of students to groups will be done in such a way as to ensure there is a mix of abilities, gender and cultures within the group.
- The active development of mutual trust and respect between students and between staff and students.
- The celebration and encouragement of diversity through the core delivery of the course and extra-curricular activities.
- Emphasis on skill-based learning using a learn-by-practise approach; use of current and industry standard tools chains and methodologies; industry supported projects such as the WBL project;
- The teaching of broader concerns, concepts and skills such as the environment and project management that values inclusivity and diversity.
- A curriculum that is current, global in outlook and targeted at application areas that address real-world challenges.

### **Teaching methods**

We tailor our teaching methods to both the diversity of the subject matter as well as the diversity of our students' to ensure that we maximise the effectiveness of our teaching. We aim to make our students ready for employment by exposing them to tools and techniques relevant and practised by industry.

The range of teaching methods you will experience will include:

- Lectures, seminars, and workshop sessions

- Projects (small groups, large groups and individual)
- Laboratories and computer-aided engineering
- Formative assessment including online quizzes
- Problem sheets, investigations, and design problems
- Individual supervision
- Online learning material

Lectures are used to support your learning. Within the lecture sessions you will be introduced to fundamentals, concepts and development methodologies and strategies. Lectures also have the advantage of showing you how different topics and facts interrelate with each other. Within lectures there will be interactive and participatory work to help monitor and encourage active engagement.

Seminars are used to provide a firm grounding in the theory, methods and tools used for a given module. Within these seminars you will be encouraged to collaborate and/or work in groups. Typically, these seminars will be practical in nature and will help you develop skills and understanding of how to apply knowledge covered in lectures to solve real problems. For example, you may be given a task to write code for a particular problem. During the seminars the tutors will monitor your progress and provide feedback and guidance on your work.

Practical workshops maybe led by or informed by industry experts (alongside academic staff), these maybe onsite or online. In these sessions you will work alone or in groups, undertaking industry focused work or will be guided on how to complete a given milestone for a more long-term element of work such as a group project.

Laboratories are effectively a practical seminar session. In these laboratory sessions you will be using software tools, lab bench equipment, mechanical construction tools, embedded system development platforms or electronic circuit prototyping tools and components to carry out practical tasks to solve real-world problems. Whilst in these sessions you will be actively encouraged to observe laboratory ethics and/or data security rules. In some instances, virtual or simulation tools maybe used within a laboratory to enable greater accessibility and flexibility by allowing work to be completed remotely as required.

To further support remote learning some modules will employ the use of online quizzes to test your understanding and provide automatic feedback. The key purpose of such online quizzes is to allow you to practise knowledge at home and to provide you with an understanding of how successful your learning has been. It also allows tutors to diagnostically verify your understanding and tailor teaching in order to address any gaps. Through this feedback you can identify where to focus your learning effort.

Throughout the course, authentic assessment is used to help you practise skills required by industry. This includes investigative research-based problems and more practical project led problems. Within the course you will be asked to produce solutions and artefacts based on the requirements of typical real-world scenarios and products.

The final year project module is designed to unify and integrate skills and knowledge gained in the taught learning modules. The final project module provides the opportunity to put into practise and extend what has been learnt to solve a broader more complex and significant engineering problem. To support you in successfully completing the project, you will be allocated a supervisor who is a member of academic staff.

To increase accessibility of the learning material and ensure that a diverse range of learners can participate on the course each module will provide the following online support: access to teaching materials, online reading lists, discussion boards, virtual study rooms for students to collaborate and where applicable, space for individual and group online meetings. Individual support for each module will be available from the modules teaching staff.

At key stages in your academic studies, the decisions you will need to make such as choice of option modules and choice of individual project will be guided when required by your personal tutor. Students will also be academically supported by module leaders and the course leader during their studies.

The teaching methods described above are more effective when coupled with independent study time where you take more control of your own learning. To help enable you to maximise the benefits of self-study we introduce, explain to you, and develop your understanding of concepts and skill sets required for continual professional development (CPD). This is achieved using group-based activities, a framework of taught content, extracurricular events and assessment styles that encourage the planning and reporting of material that is self-learnt.

## Assessment methods

Assessments and feedback are an integral part of the learning process and enable you to gauge your progress in relation to learning outcomes, reflect on what you have learnt, identify areas in which you are strong and areas in which you need to improve and help you make informed decisions on the pace and focus of your own independent learning.

The guiding principles of assessment design and its associated feedback within the BEng Software Engineering with Electronics course are Purpose, Progression and Personalisation.

Purpose:

- assessment is authentic, meaning that it provides the chance to apply knowledge and competencies required within industry to solve real-world problems;
- the assessment method(s) used are clearly relevant to the module's learning outcomes;
- consideration is given to the amount of effort and time required to complete the task(s) and to maintain a balanced assessment load.

Progression:

- the choice of assessment method(s) employed provides an opportunity for new learning and contributes to the learning process;
- assessments are clearly related to the overall pattern of the course, they are developmental and not unnecessarily repetitive;
- less familiar types of assessments are prepared for using formative work such as practise laboratories.

Personalisation:

- you are able to make the assessment you own through design and implementation choices;
- timely feedback is given for all assessments;
- guidance on how you can improve your performance in the future is given, either individually or as part of a group.

As well as ensuring that students have met the learning outcomes per module, assessment will, where possible and appropriate, be:

- **demonstrative** (helping students to learn – evaluation of current knowledge);
- **rigorous** (for correct and efficient solutions);
- **challenging** (requiring deep understanding and analytical ability);
- **workplace relevant** (tasks directly relating to industry and skills valued by employers),

On the BEng Software Engineering with Electronics course all assessments and feedback mechanisms are designed to form part of the learning experience and will take a variety of forms. The complexity and style of assessment for example will range from small tasks that might be completed within a seminar session to more complex and larger tasks which might be completed over an entire semester within a group. The challenge of an assessment will be varied for example assessments may involve the design and production of a real-world artefact or the data collection and analysis of a specific signal captured by a sensor. Some assessments are designed to be completed individually whereas other assessments may require students to work as part of a team, emulating as closely as possible the environment students will face in a professional setting.

Each module has both formative and summative assessment types. Formative assessment does not contribute to your overall grades. Formative assessment helps you establish where you are in your learning journey, what you have learnt so far, and where you may have to improve. Formative assessment can be used diagnostically by tutors to enable them to dynamically target their teaching to address any gaps in knowledge. Formative assessment can take the form of a test, quiz, reflective session or group activity.

All summative assessments that contribute to final grades will be assessed against clear assessment criteria stated in module descriptors. These assessment criteria are directly linked to the modules learning outcomes, and they will be used to evaluate the submitted work and to produce written feedback. The BEng Software Engineering with Electronics course provides inclusive, engaging and authentic assessment and feedback strategies to help provide equal opportunities, cater for different learning styles and to best support the student to successfully complete the course.

|   |   |
|---|---|
| Example of Summative assessments used in the course |   |
| Practical Coursework / Practical based portfolio    | You will be expected to complete lab tasks following lab guidelines, demonstrate competency in the safe, secure and ethical use of tools and either answer specific questions about the labs (Coursework) or analyse your results based on a given scenario (Portfolio). This type of assessment is used to assess the technical skills you acquired during the term and your ability to apply your knowledge gained in the correct context following the correct procedures and standards. |

|  |  |
|--|--|
| Group<br>Presentation<br>with/without<br>Group<br>Coursework | You will be working in a group, typically of 3 to 4 members, investigating a specific problem, implementing a product or researching a specific topic. You will be expected to give a presentation to demonstrate your group work. This is usually followed by a brief discussion and questions and answers with your peers and instructor. Generally, you will need to discuss in detail what the group has achieved, and how, and also how the work and the team member responsibilities were distributed. You will also in some cases be expected to write a technical design report. This type of authentic assessment is used to assess your ability to work in teams in a context that closely matches typical teamwork activities found in industry. This demonstrate that you are able to be productive and complete your given tasks in a timely manner. This assessment generally has both a group and an individual mark component. |
| ICT (exam<br>conditions)                                     | You will be expected to sit an in-class test under timed conditions. Typically, these in-class tests can be a closed-book or open-book where you will have access to certain materials. This assessment is used to assess understanding of fundamental concepts, ability to apply theory to a range of problems and to substantiate ownership of work. Tests help ensure you can demonstrate that you have developed a deep understanding of the subject which enables you to cope with complex problems that require deep insight in order to provide secure and optimal solutions. This time-constrained assessment is authentic in that it verifies that you will have sufficient depth and coverage of knowledge in order to successfully solve typical time-critical engineering problems. It also helps you prepare for other professional exams and training.   |
| Lab test   | You will be expected to complete a specific lab task in the lab. This will be in most cases a timed activity where you are given instructions and a set of tasks to complete. This type of assessment is used to assess and evaluate your technical skills and/or ownership of work submitted.   |
| Coursework<br>Case study                                     | You will be required to work on a scenario that illustrates a specific problem. You will have to study this problem and assess it and take decisions or make recommendations. This will require research and analysis and potentially implementation in order for you to produce an assessment and recommendation. This type of assessment is used to assess your understanding of topics related to your module and how you can apply your knowledge to a given scenario. This type of assessment usually requires you to evaluate your given solution or method and justify your answers.  |
| Research essay   | You will be expected to conduct in-depth research on a specific topic. This involves examining various resources, concepts and ideas about the topic you are researching. This type of assessment is used to assess your ability to critically evaluate research material and concisely summarise, formulating your own recommendations and suggestions depending on the context.  |
| Oral<br>Assessment<br>and/or Individual<br>Presentation      | You will be expected to present in a form of either a presentation or discussion on a given topic. This could also be a part of your dissertation where you will be expected to sit a viva voce assessment to defend your work.<br><br>This type of assessment is used to assess the authenticity of your work and give you an opportunity to explain the reasoning of the choices, methods and principles used in your work. This assesses a wide range of practical, analytical, and interpretative skills that demonstrate your understanding of the topic and your reflection.   |
| Artefact   | You will be expected to produce a product such as a robotic device, electronic circuit, code implementation or a document containing a set of recommendation and guidelines that demonstrate your ability to innovate to provide solutions to a given problem. This assessment is used to assess your ability to produce quality artefacts as this is an essential requirement in the workplace.   |
| Report   | You will be expected to produce a document that outlines activities you have undertaken. This can be for lab work that you have completed, a work experience and work placement that you undertook, your reflective comments about a specific topic or a description of the design processes used for a given artefact. This type of assessment is used to evaluate how you can convey technical matters about activities you have conducted in an academic, concise, and justified manner.  |

|              |  |
|--------------|--|
| Dissertation | This will probably be the biggest document you will have to produce for your entire studies. You will be expected to produce an extended piece of written work, that contains substantial evidence of research, investigations, and possibly implementation, all related to a specific problem you have chosen. Dissertations are the result of your independent work, carried out under the guidance of a supervisor. This type of assessment is used to verify that you have developed a sound understanding of the course material and are able to utilise the skills and knowledge gained in order to produce an independent and substantial project that successfully meets the given requirements. |
|--------------|--|

| Graduate Attribute                            | Evident in Course Outcomes  |
|---|---|
| Critical and creative thinker                 | LO4.1, LO4.2, LO4.3, LO4.4, LO4.7, LO5.1, LO5.2, LO5.3, LO5.4, LO5.8, LO5.9, LO6.1, LO6.2, LO6.3, LO6.4, LO6.5, LO6.6, LO6.7, LO6.8 |
| Literate and effective communicator           | LO4.3, LO4.5, LO4.6, LO5.6, LO6.5   |
| Entrepreneurial                               | 1EY.2, 1PY.1, 1PY.2, 1PY.3, LO4.4, LO4.6, LO4.7, LO4.8, LO5.4, LO5.5, LO5.7, LO6.2, LO6.7   |
| Global in outlook and engaged in communities  | 1EY.1, 1EY.2, 1EY.3, LO4.7, LO4.8, LO5.6, LO5.7, LO5.8, LO6.2   |
| Socially, ethically and environmentally aware | 1PY.4, LO4.7, LO4.9, LO5.4, LO5.6, LO5.8, LO6.2, LO6.3, LO6.6, LO6.8  |

## Course Structure

This section shows the core and option modules available as part of the course and their credit value. Full-time Undergraduate students study 120 credits per year. Course structures can be subject to change each academic year following feedback from a variety of sources.

Modules are described as:

- **Core** modules are compulsory and must be undertaken by all students on the course.
- **Option** modules give you a choice of modules and are normally related to your subject area.
- **Electives**: are modules from across the either the whole University or your College. Such modules allow you to broaden your academic experience. For example, where electives are indicated you may choose to commence the study of a foreign language alongside your course modules (and take this through to the final year), thereby adding further value to your degree.
- Additional information may also be included above each level for example where you must choose one of two specific modules.

## Modules

### Level 4

| Module Code | Module Title                               | Status | UK credit | ECTS |
|-------------|--|--------|-----------|------|
| 4ELEN010W   | Applied Mathematics                        | Core   | 20        | 10   |
| 4ELEN002W   | Computer Organisation and Digital Systems  | Core   | 20        | 10   |
| 4ELEN007W   | Microcontroller Project                    | Core   | 20        | 10   |
| 4ELEN011W   | Principles and Fundamentals of Electronics | Core   | 20        | 10   |
| 4NTCM004W   | Programming Methodology I                  | Core   | 20        | 10   |
| 4COSC003W   | Trends in Computer Science                 | Core   | 20        | 10   |

## Level 5

| Module Code | Module Title                                  | Status   | UK credit | ECTS |
|-------------|---|----------|-----------|------|
| 5SENG003W   | Algorithms: Theory, Design and Implementation | Core     | 20        | 10   |
| 5ELEN020W   | Embedded Systems Project (WBL)                | Core     | 20        | 10   |
| 5SENG006W   | Object Oriented Programming (C++)             | Core     | 20        | 10   |
| 5ELEN016W   | Operating Systems                             | Core     | 20        | 10   |
| 5ELEN021W   | Sensors and Signals                           | Core     | 20        | 10   |
| 5DATA002W   | Machine Learning and Data Mining              | Option   | 20        | 10   |
| 5COSC023W   | Mobile Application Development                | Option   | 20        | 10   |
| 5ELEN018W   | Robotic Principles                            | Option   | 20        | 10   |
| 5COSC024W   | Server-Side Web Development                   | Option   | 20        | 10   |
|             |   | Elective | 20        | 10   |

## Additional Year

When the Computer Science and Engineering (CS&E) Industrial Placement Year is taken the award of BEng (Honours) Software Engineering with Electronics with Industrial Experience is available. When the CS&E International Study Year is taken the award of BEng (Honours) Software Engineering with Electronics with International Experience is available.

| Module Code | Module Title  | Status | UK credit | ECTS |
|-------------|---|--------|-----------|------|
| 5COSC028W   | Computer Science and Engineering Industrial Placement | Option | 120       | 60   |
| 5COSC027W   | Computer Science and Engineering International Year   | Option | 120       | 60   |

## Level 6

| Module Code | Module Title   | Status   | UK credit | ECTS |
|-------------|--|----------|-----------|------|
| 6COSC019W   | Cyber Security   | Core     | 20        | 10   |
| 6ELEN012W   | Individual Project                                       | Core     | 40        | 20   |
| 6ELEN015W   | Real-Time Embedded Systems                               | Core     | 20        | 10   |
| 6COSC020W   | Applied AI   | Option   | 20        | 10   |
| 6ELEN018W   | Applied Robotics   | Option   | 20        | 10   |
| 6ELEN019W   | Field Programmable Gate Array (FPGA) based System Design | Option   | 20        | 10   |
| 6NTCM009W   | Internet of Things                                       | Option   | 20        | 10   |
| 6ELEN017W   | Operating Systems and Drivers                            | Option   | 20        | 10   |
|             |  | Elective | 20        | 10   |

Please note: Not all option modules will necessarily be offered in any one year. In addition, timetabling and limited spaces may mean you cannot register for your first choice of option modules.

## Professional body accreditation or other external references

The course has been designed with reference to:

- QAASubject Benchmark for Computing
- Engineering Council Accreditation of Higher Education Programmes (AHEP), fourth edition
- QAAGuidelines for Preparing Programme Specifications
- SEECredit Level Descriptors for Further and Higher Education

The British Computer Society (BCS) professional accreditation ensures independent validation that the course meets high standards set by the profession. It also benchmarks the course against those of other institutions both nationally and internationally and supports the continued improvement of the course, highlighting areas of best practice across institutions. For you as a student being on an accredited course provides a pathway to professional registrations such as Chartered IT Professional (CITP), Chartered or Incorporated Engineer (CEng/IEng) and Registered IT Technician (RITech).

BEng (Honours) Software Engineering with Electronics is intended to fulfil the educational requirements of BCS for the CITP and partial CEng. Due to the 5-year accreditation timeline the course will be considered for the accreditation in 2027. The accreditation will be backdated to include the first intake from September 2023. On successful completion of this process your course will become accredited in 2027.

## Course management

The BEng Software Engineering with Electronics course is under the School of Computer Science and Engineering and the management structure supporting the course is as follows:

- the Course Leader is responsible for day to day running and overall management of the course and development of the curriculum;
- the Head of School holds academic responsibility for the course and other courses within the School;
- the Head of the College of Design, Creative and Digital Industries, holds overall responsibility for the course, and for the other courses run by the College.

## Academic regulations

The current Handbook of Academic Regulations is available at [westminster.ac.uk/academic-regulations](https://www.westminster.ac.uk/academic-regulations).

Course specific regulations apply to some courses.

## Academic Support

Upon arrival, an induction programme will introduce you to the staff responsible for the course, the campus on which you will be studying, the Library and IT facilities, additional support available and to your Campus Registry. You will be provided with the Course Handbook, which provides detailed information about the course. Each course has a course leader or Director of Studies. All students enrolled on a full-time course and part time students registered for more than 60 credits a year have a personal tutor, who provides advice and guidance on academic matters. The University uses a Virtual Learning Environment called Blackboard where students access their course materials, and can communicate and collaborate with staff and other students. Further information on Blackboard can be found at <https://www.westminster.ac.uk/current-students/studies/your-student-journey/when-you-arrive/blackboard>

The Academic Learning Development Centre supports students in developing the skills required for higher education. As well as online resources in Blackboard, students have the opportunity to attend Study Skills workshops and one to one appointments. Further information on the Academic Learning Development Centre can be found at [westminster.ac.uk/academic-learning-development](https://www.westminster.ac.uk/academic-learning-development).

Learning support includes four libraries, each holding a collection of resources related to the subjects taught at that site. Students can search the entire library collection online through the Library Search service to find and reserve printed books, and access electronic resources (databases, e-journals, e-books). Students can choose to study in the libraries, which have areas for silent and group study, desktop computers, laptops for loan, photocopying and printing services. They can also choose from several computer rooms at each campus where desktop computers are available with the general and specialist software that supports the courses taught in their College. Students can also securely connect their own laptops and mobile devices to the University wireless network.

## Support Services

The University of Westminster Student and Academic Services department provide advice and guidance on accommodation, financial and legal matters, personal counselling, health and disability issues, careers, specialist advice for international students and the chaplaincy providing multi-faith guidance. Further information on the advice available to students can be found at <https://www.westminster.ac.uk/student-advice>

The University of Westminster Students' Union also provides a range of facilities to support students during their time at the University. Further information on UWSU can be found at <https://www.westminster.ac.uk/students-union>

## **How do we ensure the quality of our courses and continuous improvement?**

The course was initially approved by a University Validation Panel. University Panels normally include internal peers from the University, academic(s) from another university, a representative from industry and a Student Advisor.

The course is also monitored each year by the College to ensure it is running effectively and that issues which might affect the student experience have been appropriately addressed. Staff will consider evidence about the course, including the evidence of student surveys, student progression and achievement and reports from external examiners, in order to evaluate the effectiveness of the course and make changes where necessary.

A Course revalidation takes place periodically to ensure that the curriculum is up-to-date and that the skills gained on the course continue to be relevant to employers. Students meet with revalidation panels to provide feedback on their experiences. Student feedback from previous years is also part of the evidence used to assess how the course has been running.

## **How do we act on student feedback?**

Student feedback is important to the University and student views are taken seriously. Student feedback is gathered in a variety of ways.

- Through student engagement activities at Course/Module level, students have the opportunity to express their voice in the running of their course. Course representatives are elected to expressly represent the views of their peers. The University and the Students' Union work together to provide a full induction to the role of the course representatives.
- There are also School Representatives appointed jointly by the University and the Students' Union who meet with senior School staff to discuss wider issues affecting student experience across the School. Student representatives are also represented on key College and University committees.;
- All students are invited to complete a questionnaire before the end of each module. The feedback from this will inform the module leader on the effectiveness of the module and highlight areas that could be enhanced.
- Final year Undergraduate students will be asked to complete the National Student Survey which helps to inform the national university league tables.

This programme specification provides a concise summary of the main features of the course and the learning outcomes that a student might reasonably be expected to achieve and demonstrate, if they take full advantage of the learning opportunities that are provided. This specification is supplemented by the Course Handbook, Module proforma and Module Handbooks provided to students. Copyright in this document belongs to the University of Westminster. All rights are reserved. This document is for personal use only and may not be reproduced or used for any other purpose, either in whole or in part, without the prior written consent of the University of Westminster. All copies of this document must incorporate this Copyright Notice – 2022©