

## Programme Specification (UG)

Awarding body / institution:	Queen Mary University of London
Teaching institution:	Queen Mary University of London
Name of final award and programme title:	BSc Digital & Technology Solutions (Software Engineer)
Name of interim award(s):	N/A
Duration of study / period of registration:	4 years professional pathway PT
QMUL programme code / UCAS code(s):	G4DE
QAA Benchmark Group:	Computing
FHEQ Level of Award :	Level 6
Programme accredited by:	TechSkills
Date Programme Specification approved:	
Responsible School / Institute:	School of Electronic Engineering & Computer Science

Schools / Institutes which will also be involved in teaching part of the programme:

Collaborative institution(s) / organisation(s) involved in delivering the programme:

### Programme outline

This programme has been developed under the auspices of the government's degree apprenticeship initiative (see, for example, <https://www.gov.uk/government/publications/apprenticeship-standard-digital-technology-solutions-professional>). Degree apprenticeships are intended to capitalise on the strengths of both higher education and vocational education. The model is that the degree apprentice is employed in a substantive job role, while also pursuing a degree.

A recent BIS factsheet highlights the advantages of the initiative for employers, degree apprentices and HEIs. Employers can attract new talent who might otherwise not apply to them until they have studied for a degree - this allows the employer to shape their development as they work. Degree apprentices will be free from significant debt, since their studies are funded by the government / their employer, and get a head start in their chosen profession compared with their peers. HEIs can develop and strengthen links with local employers, and get access to a wider range of mature and motivated students.

The Digital and Technology Solutions degree apprenticeships are being supported by Tech Partnership (formerly e-Skills UK) under the Tech Industry Gold framework - see <https://www.thetechpartnership.com/recruit-and-train/degree-apprenticeships/>. All degrees endorsed by Tech Partnership must combine coverage of the following components:

1. Technology
2. Project management

- 3. Personal and interpersonal skills
- 4. Business skills

The Tech Industry Gold undergraduate skills requirements curriculum has been designed with input from leading employers to ensure it is relevant to the needs of today's businesses. Employers involved include Accenture, BT, Capgemini, CA Technologies, Cisco Systems, Enternships, IBM, Logica, Ministry of Justice, and the NHS. Employers already taking on degree apprentices include: Accenture, Bright Future, BT, Capgemini, CGI, Ford, Fujitsu, GlaxoSmithKline, HMRC, HP, IBM, Lloyds Banking Group and Thales.

## Aims of the programme

The Digital and Technology Solutions degree apprenticeship is centred on a real job within business that extends the learning beyond the classroom and into the workplace. The principal aim is to integrate academic learning at degree level and on-the-job practical training to provide a holistic programme of education and training to meet the skills needs of employers now and into the future.

More specifically, this programme aims to:

- \* Give the degree apprentices the opportunity to gain experience in the workplace with top employers while earning their degree
- \* Help the degree apprentices to grow practical technology expertise with project management, interpersonal and business skills
- \* Help new-start degree apprentices to kick-start their position in the jobs market by earning the relevant experience that leading employers are looking for, meaning that they are fully equipped with the academic knowledge and work experience needed to get ahead when they graduate
- \* Help degree apprentices who are already employed find new opportunities for career progression
- \* Widen participation and relieve fees pressure on students
- \* Offer study opportunities tailored to the jobs market through the roles of Business Analyst, Data Analyst, IT Consultant and Software Engineer.

## What will you be expected to achieve?

Through studying this programme, a typical degree apprentice is expected to develop the following core characteristics, identified in the QAA Benchmark Statement for Computing 2007:

- \* Understanding of computing and information systems, including awareness of underlying concepts, analytical ability and knowledge of related operational issues
- \* Ability in computational thinking
- \* A balance of theoretical knowledge and practical competencies, such that practical experience is supported by an understanding of the underlying principles
- \* Transferable skills developed in the context of computing but applicable in many other contexts

The degree apprentices then supplement these core characteristics with exposure to industry standard, tailored training and larger-scale problem-solving in their employment.

The above characteristics also map to the areas identified in the SEEC Credit Level Descriptors 2010, which are:

- \* Development of Knowledge and Understanding
- \* Cognitive/Intellectual skills
- \* Practical skills
- \* Key/transferable skills

The educational approach taken in the programme is incremental development through levels 4, 5 and 6 (see the Framework for Higher Education Qualifications in England, Wales and Northern Ireland 2008), culminating in:

- \* Knowledge at the boundaries of the discipline, including state-of-the-art
- \* Advanced critical analysis techniques and problem-solving skills
- \* Ability to evaluate evidence, arguments and assumptions, and reach sound conclusions
- \* Ability to make decisions in novel, complex and unpredictable circumstances
- \* Effective communication in a range of situations and with a range of stakeholders
- \* A strong sense of personal and professional responsibility

The programme has a strong emphasis on graduate attributes, as summarised in the QMUL Statement of Graduate Attributes. In

addition, unusually, the degree apprentice has the opportunity to put these attributes into practice in their employment context simultaneously, thereby reinforcing their importance.

**Please note that the following information is only applicable to students who commenced their Level 4 studies in 2017/18, or 2018/19**

In each year of undergraduate study, students are required to study modules to the value of at least 10 credits, which align to one or more of the following themes:

- networking
- multi- and inter-disciplinarity
- international perspectives
- enterprising perspectives.

These modules will be identified through the Module Directory, and / or by your School or Institute as your studies progress.

Academic Content:	
A 1	Understanding of business operations, procedures and culture applicable to a sustainable career as a Digital & Technology Solutions professional
A 2	Critical understanding and analysis of the theoretical, conceptual and practical issues central to the practice of developing, implementing and maintaining technology solutions
A 3	A real workplace learning pedagogy in order to develop the competences required by employers
A 4	Knowledge of project, people and resource management principles and techniques

Disciplinary Skills - able to:	
B 1	Demonstrate competence and independence in technology solutions to form a solid foundation for further development
B 2	Identify, select, apply and evaluate advanced problem-solving and modelling skills appropriate to developing technology solutions for business
B 3	Demonstrate advanced practical skills in the chosen area of IT occupational competence
B 4	Appreciate the challenges associated with industry standard methodologies, processes, techniques and tools associated with the chosen area of IT occupational competence

Attributes:	
C 1	Able to engage effectively with staff all levels in the organisation

C 2	Motivated to learn from experience in a technology solutions project oriented environment
C 3	Able to manage own personal and professional development
C 4	Able to display initiative and resilience in the face of new challenges

## How will you learn?

The programme contains a mixture of campus-based and work-based modules. Degree apprentices will study their campus-based modules alongside degree apprentices from other employers and students from related campus-based programmes, to ensure that they experience academic life more broadly, and avoid isolation. The teaching and learning strategies are tailored to the learning outcomes of the different modules.

For campus-based modules, strategies include lectures, lab and tutorial sessions, practical and library-based research, presentations and group work. Lectures are used to introduce principles and methods and also to illustrate how they can be applied in practice, e.g. through examples and case studies. Lab and tutorial sessions will allow students to put these theoretical principles and methods into practice. Practical and library-based research will allow them to develop skills in review, investigative methods and critical analysis. Presentations and group work will enhance their team-working and communication skills. Learning materials will be hosted on Queen Mary's tailored virtual learning environment, QMPlus. This will also provide access to announcement and discussion forums used for asynchronous support. The overall profile of teaching and learning strategies is designed to foster the development of (i) Graduate Attributes, as captured in Queen Mary's Statement of Graduate Attributes and (ii) key skills, as captured in the Tech Partnership endorsement criteria.

For work-context modules, learning materials comparable to those for the equivalent campus-based module are provided, along with appropriate additional study guidance. Supplementary workshop based or tailored individual support is provided through supervision by the module lecturer. Asynchronous and synchronous support may be provided, as appropriate.

The degree apprentices are also assigned an academic adviser / tutor, who is responsible for determining any additional individual / small group academic support needs, in conjunction with the relevant employer(s). Support is tailored and flexible as far as possible, e.g. through measures such as Skype sessions with TAs, "online office hours" for key staff, and employability-linked support to help the degree apprentices understand the links between their study and employment, as well as implications for their personal and professional development.

## How will you be assessed?

Campus-based modules are usually assessed through a combination of examination and coursework, as appropriate for the content and focus of each individual module. Laboratory-based modules are often assessed through practical coursework, while more theoretical modules may be assessed through in-class tests, exercise sheets or written assignments.

Assessment for work-context modules is project-based, with QMUL and the employer each contributing 45% to the assessment profile, and the remaining 10% consisting of an oral presentation. QMUL applies standardised project marking criteria, as used in other project-based modules in the School. The employer evaluates the degree apprentice's performance against objectives that are agreed with the degree apprentice, aligned with module learning outcomes and contextualised in the degree apprentice's specific workplace situation. This process is akin to the tried and tested process used in the School's Industrial Experience Placement projects, and may be moderated by the School as necessary.

In addition to summative assessment, the programme provides regular opportunities for formative feedback, e.g. through the submission of a draft report for project-based modules. The School has a feedback policy, which stipulates standard requirements for acceptable types and timing of feedback. The School also uses the TurnItIn plagiarism detection system, and students will have the opportunity to submit some formative assignments to TurnItIn for feedback on the correctness and effectiveness of their referencing.

## How is the programme structured?

Please specify the structure of the programme diets for all variants of the programme (e.g. full-time, part-time - if applicable). The description should be sufficiently detailed to fully define the structure of the diet.

### Year 1 Modules

#### Semester 1

ECS401A Procedural Programming (15 credits)  
ECS419A Information Systems Analysis (15 credits)  
ECS427W Professional and Research Practice (worked based) (15 credits)

#### Semester 2

ECS430A Computer Systems and Networks (15 credits)  
ECS414A Object Oriented Programming (15 credits) (pre requisite for ECS639A)  
ECS432W Organisation Environment and Decision Making (work based) (15 credits)

### Year 2 Modules

#### Semester 3

ECS505W Software Engineering (work based) (15 credits)  
ECS519A Database Systems (15 credits) (pre requisite for ECSS650A)  
ECS524A Internet Protocols and Applications (15 credits)

#### Semester 4

ECS506W Software Engineering Project (work based) (15 credits)  
ECS518A Operating Systems (15 credits)  
ECS529A Algorithms and Data Structures (15 credits)

### Year 3 Modules

#### Semester 5

ECS640A Big Data Processing (15 credits)  
ECS6XXA Ethics Regulation and Law in Advanced Digital Information Processing and Decision Making (15 credits)  
ECS646W Software Development and Quality (work based) (15 credits)

#### Semester 6

ECS522W Graphical User Interfaces (work based) (15 credits)  
ECS6XXA Artificial Intelligence (15 credits)  
ECS647A Bayesian Decision and Risk Analysis (15 credits)

### Final Year Module

#### Semester 7

ECS655A Security Engineering (15 credits)  
ECS650A Semi-Structured Data and Advanced Data Modelling (15 credits) (pre requisite ECS519A Database Systems)

#### Semester 8

ECS639A Web Programming (15 credits) (pre requisite ECS414A Object Oriented Programming)  
ECS659A Neural Networks and Deep Learning (15 credits)

#### Semester 7 and 8

ECS635W Project (work based) (30 credits) (pre requisite for ECS698A)  
ECS698A End Point Assessment Module (15 credits) (pre requisite ECS635W)

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Module Title	Module Code	Credits	Level	Module Selection Status	Academic Year of Study	Semester
Procedural Programming	ECS401A	15	4	Compulsory	1	Semester 1
Information Systems Analysis	ECS419A	15	4	Compulsory	1	Semester 1
Professional Research Practice	ECS427W	15	4	Compulsory	1	Semester 1
Object Oriented Programming	ECS414A	15	4	Compulsory	1	Semester 2
Computer Systems and Networks	ECS430A	15	4	Compulsory	1	Semester 2
Organisation Environment & Decision Making (Work Based)	ECS432W	15	4	Compulsory	1	Semester 2

Academic Year of Study FT - Year 2

Module Title	Module Code	Credits	Level	Module Selection Status	Academic Year of Study	Semester
Database Systems	ECS519A	15	5	Compulsory	2	Semester 1
Internet Protocols and Applications	ECS524A	15	5	Compulsory	2	Semester 1
Software Engineering	ECS505W	15	5	Compulsory	2	Semester 1
Operating Systems	ECS518A	15	5	Compulsory	2	Semester 2
Algorithms and Data Structures	ECS529A	15	5	Compulsory	2	Semester 2
Software Engineering Project	ECS506W	15	5	Compulsory	2	Semester 2

Academic Year of Study FT - Year 3

Module Title	Module Code	Credits	Level	Module Selection Status	Academic Year of Study	Semester
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Module Title	Module Code	Credits	Level	Module Selection Status	Academic Year of Study	Semester
Big Data Processing	ECS640A	15	5	Compulsory	3	Semester 1
Ethics Regulation and Law in Advanced Digital Information Processing and Decision Making	ECS6XXA	15	6	Compulsory	3	Semester 1
Software Development and Quality	ECS646W	15	6	Compulsory	3	Semester 1
Bayesian Decision and Risk Analysis	ECS647A	15	6	Compulsory	3	Semester 2
Artificial Intelligence	ECS6XXA	15	6	Compulsory	3	Semester 2
Graphical User Interfaces	ECS522W	15	5	Compulsory	3	Semester 2

Academic Year of Study FT - Year 4

Module Title	Module Code	Credits	Level	Module Selection Status	Academic Year of Study	Semester
Project	ECS635W	30	6	Compulsory	4	Semesters 1 & 2
Semi Structured Data and Advanced Data Modelling	ECS650A	15	6	Compulsory	4	Semester 1
Security Engineering	ECS655A	15	6	Compulsory	4	Semester 1
Neural Networks and Deep Learning	ECS659A	15	6	Compulsory	4	Semester 2
Web Programming	ECS639A	15	6	Compulsory	4	Semester 2
End Point Assessment Module	ECS698A	15	6	Compulsory	4	Semesters 1 & 2

**What are the entry requirements?**

Further information about the entry requirements for this programme can be found at:

<http://www.eecs.qmul.ac.uk/undergraduates/entry-requirements/>

## How will the quality of the programme be managed and enhanced? How do we listen to and act on your feedback?

EECS has a Teaching and Learning Committee (TLC) structure which enables programmes to be both managed and enhanced.

The Structure allows for subject level teaching groups and programme coordinators to regularly evaluate the content and delivery of each programme. Feedback from module evaluations and SSLC meetings are fed into these groups and this provides an opportunity for student feedback to be incorporated into the programmes.

Additionally, programme coordinators work with the Director of Education to ensure each programme is current and can be delivered effectively.

The Student-Staff Liaison Committee provides a formal means of communication and discussion between the School and its students. The committee consists of student representatives from each cohort, together with appropriate representation from School staff. It is designed to respond to the needs of students, as well as act as a forum for discussing programme and module developments. Student-Staff Liaison Committees meet four times a year, twice in each teaching semester.

Each semester, students are invited to complete a web-based module questionnaire for each of their taught modules, and the results are fed back through the SSLC meetings. The results are also made available on the student intranet, as are the minutes of the SSLC meetings. Any actions necessary are taken forward by the relevant Senior Tutor, who chairs the SSLC, and general issues are discussed and actioned through the School's Student Experience Learning Teaching And Assessment (SETLA) Committee .

The School's Teaching and Learning Committee (TLC) advises the Director of Education on all matters relating to the delivery of taught programmes at school level including monitoring the application of relevant QM policies and reviewing all proposals for module and programme approval and amendment before submission to Taught Programmes Board. Student views are incorporated in this Committee's work in a number of ways, including through student membership and consideration of student surveys and module questionnaires.

The School participates in the College's Annual Programme Review process, which supports strategic planning and operational issues for all undergraduate and taught postgraduate programmes. The APR includes consideration of the School's Taught Programmes Action Plan, which records progress on learning and teaching related actions on a rolling basis. Students' views are considered in the APR process through analysis of the NSS and module questionnaires, among other data.

## What academic support is available?

### Personal Tutor

All students are allocated a personal tutor for each academic year. Tutors are members of academic staff who provide advice and support to students. They have two main roles: academic and pastoral. First year students will meet their tutor for a weekly tutorial.

In their academic capacity, tutors advise on, and approve, programmes of study.

If a student is considering changing their programme of study, or taking a module that does not appear on your recommended programme, they must discuss this with their tutor. Any other academic-related concerns, e.g. general academic progress, should be discussed with their tutor in the first instance. In EECS, the role of tutor is separate from that of Senior Tutor.

In their pastoral capacity, tutors are the first point of contact in case of personal problems or concerns. Tutors recognise that personal problems can severely affect a student's academic performance, and they will provide a sympathetic and non judgmental ear, as well as practical help. They can also direct students to other College support services, where appropriate.

Discussions with students will always be treated in confidence. However, in cases where academic performance is affected by personal problems, the School must be officially informed, and tutors can also guide students through the correct procedures for doing this.

Tutors can be asked to provide academic references for students for job and other applications after leaving university, and this is another good reason for building and maintaining a good student/tutor relationship.

### Senior Tutor

The School has two Senior Tutors. A Senior Tutor is a member of the academic staff who acts as a further point of reference for problems and decisions faced by students. Like tutors, the Senior Tutor has two main roles: academic and pastoral. Students

should usually contact their own tutor first for advice, but a tutor may recommend that a student consult the Senior Tutor for either academic or pastoral reasons. If a student finds difficulty talking to their own tutor, they may consult the Senior Tutor directly. The Senior Tutor also serves as the Chair of the Student-Staff Liaison Committee (SSLC).

#### Employer Support

All degree apprentices have a line manager / task manager at their employer, who has been involved in the recruitment decision and is also responsible for ensuring that the degree apprentice has sufficient time to attend classes on the required days and to keep up with their studies on a regular basis. The line manager / task manager works with the degree apprentice's academic adviser / tutor at QMUL to ensure that the degree apprentice can see the interaction between their everyday employment and their degree, address any problems that the degree apprentice encounters in their studies, and refer the degree apprentice on to more specialised support if needed. Many larger employers also have a separate mentor system for the employees, through which training and development needs are identified - the mentor is included in the discussion loop between QMUL and employer, as appropriate.

### How inclusive is the programme for all students, including those with disabilities?

Queen Mary has a central Disability and Dyslexia Service (DDS) that offers support for all students with disabilities, specific learning difficulties and mental health issues. The DDS supports all Queen Mary students: full-time, part-time, undergraduate, postgraduate, UK and international at all campuses and all sites.

Students can access advice, guidance and support in the following areas:

- Finding out if you have a specific learning difficulty like dyslexia
- Applying for funding through the Disabled Students' Allowance (DSA)
- Arranging DSA assessments of need
- Special arrangements in examinations
- Accessing loaned equipment (e.g. digital recorders)
- Specialist one-to-one "study skills" tuition
- Ensuring access to course materials in alternative formats (e.g. Braille)
- Providing educational support workers (e.g. note-takers, readers, library assistants)
- Mentoring support for students with mental health issues and conditions on the autistic spectrum.

### Programme-specific rules and facts

The programme is structured around a "professional pathway" model, in which the degree apprentices take 90 credits per academic year, in order to accommodate their work commitments. In each academic year, students take 60 credits of campus-based modules and 30 credits of work-based modules.

Further information on the Academic Regulations can be found at <http://www.arcs.qmul.ac.uk/policy>

In addition to this the programme does have special regulations (further details are available in the Academic Regulations):

1. There is a requirement for students to achieve a minimum mark of 30.0 in every module, and to pass the project outright (in addition to the standard award rules) in order to achieve the intended, accredited, award.
2. The exit award and the field of study of the exit award will be dictated by the specific modules passed and failed by a student.

### Links with employers, placement opportunities and transferable skills

The framework for this degree apprenticeship has been developed by Tech Partnership as a collaboration between some of the UK's leading companies and universities. It offers the degree apprentices a unique opportunity to contextualise their academic study in their workplace environment.

Transferable skills are developed through a variety of means, including embedding of QM Graduate Attributes in taught modules and the project, together with the opportunity to participate in extra-curricular activities, e.g. the School's EECS++ Society, the School's Annual Programming Competition and external competitions with support from the School.

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An Employer Links Management Committee (ELM) oversees the strategic development of the programme and monitors its future progress, with a particular focus on listening to employers' perspectives. ELM also has oversight of other relevant School initiatives, to ensure joined-up thinking and sharing of good practice. ELM includes representatives from EECS and the School of Business and Management, Tech Partnership and employers involved in relevant QMUL initiatives. ELM meets at least annually at QMUL, with necessary communication between meetings being conducted electronically, by email or conference call as appropriate.

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## Programme Specification Approval

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**Person completing Programme Specification:**

Dr Eranjan Udayanga Padumadasa

**Person responsible for management of programme:**

Dr Eranjan Udayanga Padumadasa

**Date Programme Specification produced / amended by School / Institute Learning and Teaching Committee:**

10 August 2022

**Date Programme Specification approved by Taught Programmes Board:**