Article I. BEng Hons Computer Systems Engineering

Programme Specification

1. Programme title	BEng Hons Computer Systems Engineering
2. Awarding institution	Middlesex University
3. Teaching institution	Middlesex University (Hendon, Dubai)
4. Details of accreditation by professional/statutory/regulatory body	
5. Final qualification(s) available	BEng Hons Computer Systems Engineering DipHE Computer Systems Engineering CertHE Computer Systems Engineering
6. Year of validation / last review **Year of amendment**	2019/2020
7. Language of study	English
8. Mode of study	Full-Time/TKSW

9. Criteria for admission to the programme

Admission to the BEng (Hons) Computer Systems Engineering programme will require 112 UCAS points including 80 points from at least two science or numerate based subjects and GCSE English and Maths at grade C or above. In addition, Middlesex University general entry requirements apply as outlined in the university's regulation B2. Applicants whose first language is not English are required to achieve 6.0 in IELTS overall (with a minimum of 5.5 in each component) or an equivalent qualification recognised by Middlesex University. The equivalence of qualifications from outside UK will be determined according to NARIC guidelines. We welcome applicants with a wide variety of educational experience including: A/AS levels, AVCE, BTEC National Diploma, Access Certificates, Scottish Highers, Irish Leaving Certificates (Higher Level), International Baccalaureate and a large number of equivalent home and overseas qualifications. Application from mature applicants with suitable life skills and experiences are also welcomed.

University policies supporting students with disabilities apply, as described in the University Regulations, 'Information for students with disabilities'.

10. Aims of the programme

This programme aims to produce fledgling practitioners in computer systems engineering who have been exposed to an engineering ethos and are thus aware of the importance of designing and implementing a system on-time and within-budget. More specifically, the programme aims to explore the concepts, principles and practices underlying the design and implementation of up-to-date real-world computer systems including those operating at Internet scale, and development needed in a variety of problem domains. The programme provides the students with the opportunity of learning how to develop such systems on our industry gauge equipment. In addition, the programme takes a practice-based approach and it has a focus on real-time systems where students are introduced to the development of hardware and software facilitating real-time performance. The programme makes use of a variety of innovative learning activities and assessment strategies to engage the students in the learning process and help them develop confident interpersonal and communication skills, problem solving and group/team work skills as required by the industry. This programme provides an optional placement year where students can further enhance their skills by working in the industry.

11. Programme outcomes*

A. Knowledge and understanding

On completion of this programme the successful student will have knowledge and understanding of :

1. The laws, principles and concepts of mathematics, including logic, discrete and real-valued mathematics) underpinning the development of computer systems and the analysis and solution of relevant engineering problems;

2. The principal computational concepts, scientific and engineering principles required to analyse and model routine computer systems, products and processes and collect and interpret data needed by the solution of routine design problems and to recognise their limitations

3. Criteria of quality and performance relevant to computer systems engineering design, construction or operational contexts;

Teaching/learning methods

Students gain knowledge and understanding through a variety of teaching, learning and assessment strategies. The delivery method includes staff-led interactive workshops to discuss theoretical material, which are supported by guided practice-based laboratory activities to apply the learnt theories by ways of simulations and experiments. Students gain their understanding through a combination of workshops, laboratory activities, seminar discussions, small group and individual exercises and assignments, and individual projects. Throughout their studies, students are encouraged to undertake independent study both to supplement and consolidate what is being learned, and to broaden their individual knowledge and understanding of the subject. Critical evaluation and selection of techniques and solutions engage the students in relating theory to practice.

Assessment methods

Students' knowledge and understanding is assessed by means of a wide variety of techniques including coursework assessment, laboratory experimentation,

4. The relevance and ramifications of a range of professional, legal, managerial, business, organisational, ethical, social and sustainability considerations relevant to the practice of the computer based systems professional; 5. The significance, role and function of computer systems engineering practitioners within society and the operational, material environment within which they will be expected to practise; 6. The business, organisational and management techniques relevant to those engaging in enterprise and the production of computer systems, products and processes. 7. The core concepts and principles of design methodology specific to particular computer communications products and processes and how to apply these; 8. Use of a systems approach to solving computer systems engineering problems and the evaluation of the limitations of such solutions in practice.	analysis and synthesis tasks, and tests, problem-solving exercises, modelling and simulation tasks, seminar work (including presentations, formal reports of work undertaken or work-in-progress, dialogue) all of which are framed at progressively more complex systems-based content. Typically, each module involves a variety of assessment techniques to take into account students' differing learning styles.
B. Skills On completion of this programme the successful student will be able to: 1. Engage effectively in tasks requiring initial problem identification and to effectively apply relevant engineering principles and techniques appropriate to the analysis and solution of a range of technical problems arising out of either well-defined or underdetermined scenarios typical in application contexts found in the sector, use of creativity and innovation in practical contexts; 2. Integrate a broad understanding of computer systems engineering, related subjects, mathematics, design and	**Teaching/learning methods** Students develop a range of skills through a wide variety of teaching, learning and assessment strategies. Skills development takes place using practice-based workshop sessions combining lectures with seminars and laboratories and through design projects, simulation and testing, problem solving activities, modelling tools to industry-standard hardware prototyping, technical presentations and through report and project writing. **Assessment methods** Students' skills are assessed by a combination of practical assignments,

business practice to formulate solutions to unfamiliar computer systems engineering problems; acquire and critically evaluate technical information, concepts arguments and assumptions and evidence derived from a wide variety of sources; to abstract from such information, to correctly apply those concepts and restate arguments and assumptions in a variety of ways appropriate for a given cognitive end or purposes; 3. Critically evaluate information, concepts, arguments and assumptions and evidence derived from a wide variety of sources; to abstract from such information, to correctly apply those concepts and restate arguments and assumptions in a variety of ways appropriate for a given cognitive end or purpose; 4. Solve technical problems creatively in problem-solving and design contexts drawing on techniques or concepts some of which are at the forefront of computer systems development or research and to deal with issues creatively in the presence of incomplete data; 5. Analyse computer communication systems, devices and components; relate such analysis to the design of new systems and processes and to modify an existing system, component or process, evaluate the performance of existing systems and components through analytical methods and modelling techniques, 6. Adopt an integrative systems approach to design activity and problem solving which defers to economical, ethical, social, and human-computer interaction principle; design a new computer system or adapt a system to provide for a new or changed operational need.	group and individual presentations, laboratory exercises, production of design documentation and specific demonstration of work and in part, class tests, dialogue in workshops, and presentations, and reports reflecting research undertaken at all levels of study. Typically, each module involves a variety of assessment techniques to take into account students' differing learning styles. Formative feedback / assessment (both individual and generic) is given prior to submission of work for summative assessment. Summative feedback is issued generally with returned assessed coursework, or by email, or online. Verbal feedback is also given by tutors.

7. Use specialist digital, wireless and network laboratory equipment safely and effectively in all phases of computer systems development 8. Conduct experiments, simulations and modelling tasks with minimal guidance, and report effectively on findings; 9. Use technical literature effectively and conduct a specialist literature search effectively; plan and conduct a technical investigation using a wide range of technical literature 10. Co-design moderately complex systems using a range of high-level software, and hardware description and languages; design and implement a range of programs written in a range of industry-standard programming languages, as appropriate, to initialise, control and configure hardware and network applications; analyse and develop a range of high-performance Internet-based communication platforms and applications 11. Document design and analytical work appropriately; commission, research, and sustain individual project activity and to report on findings in a defensible fashion relying on minimal supervision; 12. Develop and evaluate range of computer-based systems or processes typically involving the substantive integration of hardware and software components and fulfilling a given set of requirements; document design and analytical work appropriately. 13. Work effectively both autonomously in independent project-oriented activity and co-operatively as a member of a group or project-team, and manage time and other resources;	

14. Apply mathematical skills and understanding to tasks requiring modelling, system analysis and problem-solving; 15. Learn effectively for life-long personal and career development and to reflect on progress of learning; 16. Communicate effectively and explain technical information, concepts, arguments, design information effectively, using a variety of media, and range of methods appropriate to a given type of audience or communication objective; 17. Conduct research effectively, drawing on a wide variety of sources (including libraries, the Internet and electronic catalogues) under minimal direction, and be proficient in the use of referencing sources of information. 18. Deploy the general design, implementation and test principles or techniques appropriate for the development of particular computer communication system product or process and apply a scientific approach to problem solving.	

12. Programme structure (levels, modules, credits and progression requirements)

12. 1 Overall structure of the programme

Year 1				
AY	**PDE1110** Computing and Electronic Engineering Skills and Projects 1 [30]	**PDE1120** Fundamentals of Electronics and Communication Engineering [30]	**PDE1130** Programming Paradigms for Physical Computing and Internet of Things [30]	**PDE1140** Practical Applications of Mathematics for Engineering [30]
Year 2				
A Y	**PDE2100** Computer Systems Engineering Projects 2 [30]	**PDE2101** Engineering Software Development [30]	**PDE2102** Digital System Design [30]	**PDE2103** Signal Processing and Communications [30]

Year 3	**PDE3250** - Industrial Placement (compulsory for TKSW only) [120]	
Year 3/4		
Term 1	**PDE3111** System-on-Chip Design and Implementation [30]	**PDE3113** Internetworking Systems and Development [30]
Term 2	**PDE3112** Major Project [60]	

12.2 Levels and modules		
Level 4		
COMPULSORY	OPTIONAL	PROGRESSION REQUIREMENTS
Students must take all of the following: PDE1110 Computing and Electronic Engineering Skills and Projects 1 [30] PDE1120 Fundamentals of Electronics and Communication Engineering [30] PDE1130 Programming Paradigms for Physical Computing and Internet of Things [30] PDE1140 Practical Applications of Mathematics for Engineering [30]	N/A	Students must pass all level 4 modules to progress.
Level 5		
COMPULSORY	OPTIONAL	PROGRESSION REQUIREMENTS

Students must take all of the following: PDE2100 Computer Systems Engineering Projects 2 [30] PDE2101 Engineering Software Development [30] PDE2102 Digital System Design [30] PDE2103 Signal Processing and Communications [30]	N/A	TKSW mode: -To progress on to a placement year students must pass all modules. Full time mode: To progress onto level 6, students must pass all modules..
Level 6 TKSW mode only		
COMPULSORY	OPTIONAL	PROGRESSION REQUIREMENTS
TKSW mode only Students must take PDE3250 Industrial Placement	N/A	N/A
Level 6		
COMPULSORY	OPTIONAL	PROGRESSION REQUIREMENTS
Students must take all of the following: PDE3111 System-on-Chip Design and Implementation [30] PDE3113 Internetworking Systems and Development [30] PDE3112 Major Project [60]	N/A	N/A

12.3 Non-compensatable modules	
Module level	**Module code**
6	PDE3112

13. Information about assessment regulations

Information on how the University formal assessment regulations work, including details of how award classifications are determined, can be found in the University Regulations at

https://www.mdx.ac.uk/about-us/policies/university-regulations

All modules will require that your complete an amount of coursework as part of your assessment. Coursework can include written work, such as essays, exercises, laboratory logbooks, projects, dissertations, portfolios of written work etc., however it can also include non-written work such as demonstrations, presentations, viva, etc.

The University has a 1-20 grading scale, with grade 1 being the highest grade. Level 4 modules, which do not contribute to the final classification are awarded a Y grade (ungraded pass).

To pass a module, the overall module grade should be a minimumof 16. Due to professional body requirements grade 18s are non-compensable.

For additional information on assessment and how learning outcomes are assessed please refer to the individual module narratives for this programme.

14. Placement opportunities, requirements and support

Students on the TKSW mode take a placement (36 to 48 weeks) at the end of year 2. A dedicated Employability Advisor helps in the search for an appropriate employer and provides students with appropriate Placement. They also provide students with appropriate guidance and support in preparation for, during and after placement. The placement forms the basis for an assessed report based on the organisation. At the start of the placement, students are allocated an individual supervisor who provides support and advice for the duration of the project. Students following a TKSW placement year are supported through the process of securing a placement, which includes the legal and QAA requirements for placement learning, via tutorial support and the University Placement office. Students that complete the placement on TKSW mode will receive an additional qualification referred to as Diploma of Industrial Studies.

15. Future careers / progression

BEng Computer Systems Engineering graduates will have excellent career prospects; the range of potential employers will be vast across the private, public and not-for-profit sectors. The breadth of opportunities available after completing a computer systems engineering degree is immense. Careers range from computing systems or associated industries such as computer design, wireless networking, design automation, robotics, embedded systems, machine intelligence etc. within the UK, as well as to Europe and the overseas market. To support students in this activity during their studies students are encouraged to develop a commercial approach to engineering and communication systems via projects with industrial partners and industrial placements. Middlesex University is a Cisco Local Academy and Arm, Opnet and Xilinx University partners, Huawei approved 5G training center, LABVIEW Academy with students having access to high-quality specialist digital and wireless laboratories equipped with industry standard software, hardware and tools. Students undertake contextual studies into the nature and

contexts of the profession. Students interact with a variety of guest lecturers with professional backgrounds from both academia and industry. They are supported in developing their exit portfolio, a CV and a career entry plan. Through these experiences students come to understand engineering in a commercial context, the nature of the engineering industries and to plan for their own career entry and development. Our graduates have followed a wide range of career paths, some of them are currently working for companies such as: McLaren Automative, GoMedia Services Ltd., Imagine Software Ltd., MarQuest Ltd, Innovery S.p.A, CDW, etc.

16. Particular support for learning (if applicable)

The Faculty's Teaching and Learning approach is used across the programme to promote learner autonomy and practice-based learning which are in line with the University's general strategy.

In support of the students' learning experience:

- All new students go through an induction programme and some have early diagnostic numeric and literacy testing before starting their programme. Library and Student Support (LSS) provide workshops for those students needing additional support in these areas.
- Students are allocated a personal email account and secure online storage.
- New and existing students are given module handbooks for each module they study. Copies of all module handbooks can be found on MyLearning, a web-based online learning platform where learning materials are provided to further support learning.
- Additionally each student will receive a free core e-book for each module they study.
- Extensive library facilities are available on all campuses. MyUniHub pages are available as learning resources.
- Students can access advice and support on a wide range of issues from the UniHelp Student Information Desk.
- Placements are supported by Placement Offices and Faculty academics; please refer to section 14 of this programme specification
- High-quality specialist network, software, digital and wireless laboratories equipped with industry standard software, hardware and tools as appropriate, for practice-based teaching as well as self-study. Middlesex University is a Cisco Local Academy and Arm, Opnet and Xilinx University partners, Huawei approved 5G training center, LABVIEW Academy.
- Teaching staff are available for each subject offering personal academic advice and help if needed. Staff availability for this purpose is posted outside staff office doors.
- Students are also allocated Personal Tutors for support and guidance throughout the entire duration of the Programme

- Productive and informed support from technical staff is also available as well as support can be provided by Graduate Academic Assistants (GAAs) and Student Learning Assistants (SLAs)
- Formative feedback is given throughout the modules at appropriate stages and on completion of student coursework
- Research activities of academic staff feed into the teaching programme, which can provide individual students with ad-hoc opportunities to work with academics on some aspect of research

Middlesex University encourages and supports students with disabilities. Some practical aspects of Science and Technology programmes may present challenges to students with particular disabilities. Students are encouraged to visit our campuses at any time to evaluate facilities and talk in confidence about their needs. If we know students' individual needs we will be able to provide for them more easily. For further information contact the Disability Support Service (email: disability@mdx.ac.uk).

17. JACS code (or other relevant coding system)	H650
18. Relevant QAA subject benchmark group(s)	Computing/Engineering

19. Reference points

The following reference points were used in designing the programme:

- QAA Engineering subject benchmark statement (2019)
- QAA Computing subject benchmark statement (2019)
- QAA Framework for Higher Education Qualifications in England, Wales and Northern Ireland;
- Middlesex University Regulations;
- Middlesex University Learning and Quality Enhancement Handbook;
- UK Standard for Professional Engineering Competence; Chartered Engineer and Incorporated Engineer Standard, Engineering Council UK, 2014;
- UK Standard for Professional Engineering Competence; The Accreditation of Higher Education Programmes, Engineering Council UK, 2014
- QAA guidelines for programme specifications
- QAA Code of Practice for the assurance of academic quality and standards in HE
- University policy on equal opportunities.

20. Other information

http://www.mdx.ac.uk/about-us/policies/academic-quality/handbook/

Please note programme specifications provide a concise summary of the main features of the programme and the learning outcomes that a typical student might reasonably be expected to achieve if s/he takes full advantage of the learning opportunities that are provided. More detailed information about the programme can be found in the rest of your programme handbook and the university regulations.

Curriculum map for BEng Hons Computer Systems Engineering

This section shows the highest level at which programme outcomes are to be achieved by all graduates, and maps programme learning outcomes against the modules in which they are assessed.

Programme learning outcomes

Knowledge and Understanding		**Skills**	
A1	The laws, principles and concepts of mathematics, including logic, discrete and real-valued mathematics) underpinning the development of computer systems and the analysis and solution of relevant engineering problems;	B1	Engage effectively in tasks requiring initial problem identification and to effectively apply relevant engineering principles and techniques appropriate to the analysis and solution of a range of technical problems arising out of either well-defined or underdetermined scenarios typical in application contexts found in the sector, use of creativity and innovation in practical contexts;
A2	The principal computational concepts, scientific and engineering principles required to analyse and model routine computer systems, products and processes and collect and interpret data needed by the solution of routine design problems and to recognise their limitations.	B2	Integrate a broad understanding of computer systems engineering, related subjects, mathematics, design and business practice to formulate solutions to unfamiliar computer systems engineering problems; acquire and critically evaluate technical information, concepts arguments and assumptions and evidence derived from a wide variety of sources; to abstract from such information, to correctly apply those concepts and restate arguments and assumptions in a variety of ways appropriate for a given cognitive end or purposes;
A3	Criteria of quality and performance relevant to computer systems engineering design, construction or operational contexts	B3	Critically evaluate information, concepts, arguments and assumptions and evidence derived from a wide variety of sources; to abstract from such information, to correctly apply those concepts and restate arguments and assumptions in a variety of ways appropriate for a given cognitive end or purpose;
A4	The relevance and ramifications of a range of professional, legal, managerial, business, organisational, ethical, social and sustainability considerations relevant to the practice of the computer based systems professional;	B4	Solve technical problems creatively in problem-solving and design contexts drawing on techniques or concepts some of which are at the forefront of computer systems development or research and to deal with issues creatively in the presence of incomplete data;
A5	The significance, role and function of computer systems engineering practitioners within society and the operational, material environment within which they will be expected to practise;	B5	Analyse computer communication systems, devices and components; relate such analysis to the design of new systems and processes and to modify an existing system, component or process, evaluate the performance of existing systems and components through analytical methods and modelling techniques;
A6	The business, organisational and management techniques relevant to those engaging in enterprise and the production of computer systems, products and processes	B6	Adopt an integrative systems approach to design activity and problem solving which defers to economical, ethical, social, and human-

			computer interaction principle; design a new computer system or adapt a system to provide for a new or changed operational need.
A7	The core concepts and principles of design methodology specific to particular computer communications products and processes and how to apply these;	B7	Use specialist digital, wireless and network laboratory equipment safely and effectively in all phases of computer systems development;
A8	Use of a systems approach to solving computer systems engineering problems and the evaluation of the limitations of such solutions in practice.	B8	Conduct experiments, simulations and modelling tasks with minimal guidance, and report effectively on findings;
		B9	Use technical literature effectively and conduct a specialist literature search effectively; plan and conduct a technical investigation using a wide range of technical literature
		B10	Co-design moderately complex systems using a range of high-level software, and hardware description and languages; design and implement a range of programs written in a range of industry-standard programming languages, as appropriate, to initialise, control and configure hardware and network applications; analyse and develop a range of high-performance Internet-based communication platforms and applications
		B11	Document design and analytical work appropriately; commission, research, and sustain individual project activity and to report on findings in a defensible fashion relying on minimal supervision;
		B12	Develop and evaluate range of computer-based systems or processes typically involving the substantive integration of hardware and software components and fulfilling a given set of requirements; document design and analytical work appropriately.
		B13	Work effectively both autonomously in independent project-oriented activity and co-operatively as a member of a group or project-team, and manage time and other resources;
		B14	Apply mathematical skills and understanding to tasks requiring modelling, system analysis and problem-solving;
		B15	Learn effectively for life-long personal and career development and to reflect on progress of learning;
		B16	Communicate effectively and explain technical information, concepts, arguments, design information effectively, using a variety of media,

			and range of methods appropriate to a given type of audience or communication objective;
		B17	Conduct research effectively, drawing on a wide variety of sources (including libraries, the Internet and electronic catalogues) under minimal direction, and be proficient in the use of referencing sources of information.
		B18	Deploy the general design, implementation and test principles or techniques appropriate for the development of particular computer communication system product or process and apply a scientific approach to problem solving.

Programme outcomes																								
A1	A2	A3	A4	A5	A6	A7	A8	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	B11	B12	B13	B14	B15	B16	B17	B18
Highest level achieved by all graduates																									
6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6

Module Title	Module Code by Level	A1	A2	A3	A4	A5	A6	A7	A8	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	B11	B12	B13	B14	B15	B16	B17	B18
Computing and Electronic Engineering Skills and Projects 1	PDE1110	✓	✓	✓				✓	✓	✓		✓	✓	✓	✓	✓		✓		✓	✓	✓	✓	✓	✓	✓	✓
Fundamentals of Electronics and Communication Engineering	PDE1120			✓				✓		✓				✓		✓				✓		✓		✓	✓		
Programming Paradigms for Physical Computing and Internet of Things	PDE1130	✓	✓	✓				✓	✓	✓		✓	✓	✓	✓	✓				✓	✓	✓		✓	✓	✓	

Practical Applications of Mathematics for Engineering	PDE1140	✓	✓	✓				✓		✓	✓		✓			✓				✓		✓	✓	✓			
Computer Systems Engineering Projects 2	PDE2100			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Engineering Software Development	PDE2101		✓	✓				✓	✓	✓			✓		✓	✓			✓	✓	✓	✓				✓	
Digital System Design	PDE2102	✓	✓	✓				✓	✓	✓	✓			✓	✓	✓	✓		✓	✓	✓	✓	✓				✓
Signal Processing and Communications	PDE2103	✓	✓	✓				✓	✓	✓			✓	✓	✓	✓	✓		✓	✓	✓	✓	✓			✓	
Industrial Placement	PDE3250				✓	✓	✓			✓		✓	✓	✓		✓		✓		✓	✓	✓	✓	✓	✓	✓	✓
System-on-Chip-Design and Implementation	PDE3111	✓	✓	✓				✓	✓	✓	✓		✓		✓	✓	✓		✓	✓	✓	✓	✓				✓
Internetworking Systems and Development	PDE3113		✓	✓				✓	✓	✓		✓		✓	✓	✓	✓			✓	✓	✓				✓	
Major Project	PDE3112				✓	✓	✓			✓	✓	✓			✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓