Programme Specification and Curriculum Map for
BEng Honours Mobile Systems and Communication Engineering

1. Programme title	BEng (Hons) Mobile Systems and Communication Engineering
2. Awarding institution	Middlesex University
3. Teaching institution	Middlesex University
4. Programme accredited by	N/A
5. Final qualification	BEng (Hons)
6. Academic year	2014/2015
7. Language of study	English
8. Mode of study	Full Time/ Part Time

9. Criteria for admission to the programme

- Students should normally have the equivalent of 240 UCAS entry points to gain entry to level 4. All candidates should possess at least grade C in GCSE maths and English language, or equivalent.
- Mature applicants with relevant work experience are also welcome to apply.
- For direct entry to levels 5 & 6 the student is required to pass 120 credits at levels 4 & 5, respectively, and demonstrate the programme learning outcomes have been met at these level by, for example, the attainment of industrially based qualifications or experience.
- Mature applicants with relevant work experience are also welcome to apply for Direct entry at levels 3, 4 and 5. These applicants are required to submit a portfolio of work experience to show evidence of achieving relevant learning outcomes, and these will vary depending on both the programme and level the student is applying for. Evidence should comprise the applicant's own work and may include documents you have written, procedures you have designed, proposals you have drafted, electronic resources, photographs, video etc or information gathered from others about you such as statements from employers, certificates of in-house courses completed. Further guidance may be obtained from the Programme

Leader or Director of Programmes.

International students who have not been taught in the English medium must show evidence of proven ability in English such as TOEFL grade 550 or IELTS grade 6.0. The University provides pre-sessional English language courses throughout the year for candidates who do not meet the English requirements.

University policies supporting students with disabilities apply, as described in the University Regulations, 'Information for students with disabilities'.
For further information, visit the learning resources web site at:
http://www.lr.mdx.ac.uk/lang/index.htm.

10. Aims of the programme

The impact of mobile communication systems in many aspects of everyday life are increasingly evident, and sometimes they are assume critical importance The scope for developing innovative, useful applications appears virtually unlimited. This programme explores a range of wireless communication engineering and principles that permit the design of wireless systems and mobile wireless networks. Besides that, this programme engage you in computer engineering such as embedded Linux systems, which is regards as the main computation platform for modern consumer electronics including mobile handset, Television, washing machine etc.

The BEng programme aims to produce fledgling practitioners in the area 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. In particular, MEng graduates will possess highly marketable skills and experience in design and implementation permitting entry to specialist areas within the computer systems engineering sector as well as to the network sector as a whole.

BEng graduates will possess an understanding of key operational and technical aspects of contemporary wireless communication principles, mobile communication systems, mobile wireless networks,, embedded Linux systems and applications, and the use of peripheral devices including sensors and of potential communication security issues, mechanisms and policies; they will appreciate new developments and emergent trends within the area and the standards required of a

professional computer systems engineer, and will be able to design, implement and test systems using Industry-standard platforms and development tools as well as having a wide range of practical network skills in demand and valued highly by the network sector.

The programme has been designed to enable progression to postgraduate study and as preparation for a variety of careers in the computer based system This programme aims to produce competent practitioners capable of playing an active role in formulating solutions to problems arising, and meeting the challenges and opportunities arising in contemporary industrial and commercial practice.

Students will develop core design capabilities, which are developed and enhanced progressively through the course.

This programme explores the principles underlying the design and implementation of up-to-date computer systems needed in a variety of problem domains and provides the opportunity of realising such systems.

The general programme aims are:

- To develop detailed knowledge of wireless communications principles (channel, microwave/RF, wireless signal processing techniques, digital communication, software radio), which are the foundation for the design and development of mobile communication systems (GSM, UMTS, LTE) and wireless network (WiFi, WiMAX, Mobile ad hoc Networks, Wireless Sensor Networks), and mobile wireless network planning and optimisation.
- To develop detailed knowledge of data communication networks including IP networks, ATM networks, fibre optics, which are the backbone of modern landline and wireless communication infrastructure.
- To develop a detailed knowledge of real-time systems embedded Linux hardware and software which are the foundation for the design and implementation of modern computer systems (embedded Linux, real-time systems);
- To develop an understanding of industry-standard tools and techniques required for the design and development of wireless communication systems, communication networks, and embedded Linux hardware and applications.
- To develop an appreciation and awareness of such current and

emergent systems, and the insight into the requirements and standards.

11. Programme outcomes

A. Knowledge and understanding

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

1. The principles and methodology underpinning the development of wireless communication systems, communication networks and computer systems, and the problem analysis and solution of relevant engineering problem;
2. The principles, computational concepts, scientific and engineering principles and methods needed to model, simulate, analyse wireless communication systems and networks, and the application of computer systems both hardware and software to implement wireless systems with an appropriate understanding of relevant criteria of quality and performance.
3. 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;
4. The significance, role and function of computer communication practitioners within society and the operational, material environment within which they will be expected to practise;
5. The business, organisational and management techniques relevant to those engaging in enterprise and the production of communications systems, products and processes.
6. The *general* concepts and principles of design methodology specific to particular computer systems products and processes and how to apply these;

Teaching/learning methods

In general, students will gain knowledge and understanding via teaching and learning strategies based on a wide variety of learning sessions including supervised laboratories and workshops, the setting of practical tasks including individual problem solving and design, discussion, peer cooperation in problem-solving and practical exercise, encouragement of asking of questions and open-mindedness, lectures to present key concepts which are then typically applied in seminars case

studies/examples and laboratory work, timely summative and formative feedback, coursework and laboratory work.

This programme has been expressly designed to offer the opportunity of academic progression between levels of study and within identifiable themes.

At Level 4, modules address the conceptual, technical and mathematical underpinnings of the study of computer systems including processor architecture, operating systems, programming, networks, electronic circuits, communication signals and systems; these involve practical application of key concepts at this intellectual level.

Outcomes A1 and A2 are first introduced in contexts relating to hardware systems and introduction to software and problem solving typically by means of integrated lectures, seminars and workshops or laboratories; students are thus encouraged and actively motivated to understand the relevance to the development and analysis of small applications. Set tasks and small-system project-based work will be used to engender confidence and proficiency within the particular topics addressed. Outcomes A4 and A5 are addressed, but not explicitly assessed at this academic level.

Outcomes A1, A2 and A6 are generally explicitly addressed – but at Level 4 - to motivate a sound initial understanding of concepts and principles of engineering mathematic, computational, electronics, communication signals and systems, and to place technical topics into a wider context of small scale systems. Learning materials are designed to relate to key hardware and software concepts.

Problem solving, and mini-design tasks and project work are used systematically in seminars and labs to stimulate, reinforce and deepen understanding; students are given the opportunity of applying theory in practice in network, digital or wireless laboratory tasks, and seminars.

Outcomes A4 and A5 are addressed in the context of explaining and illustrating module content. A1 involves design and implementation tasks at a small scale: electronic circuits, communication signals and systems, and data communication networks.

At this academic level there is horizontal integration of learning materials; for example, networking concepts and terminology are introduced in one module and, in another, simple but real-life scenarios are used to deepen and refine understanding through student engagement in practical applications at topic level.

At Level 5, further material further addressing outcomes A1, A2 and A6 is introduced by lectures, seminars and is frequently applied in laboratory-based tasks as appropriate. Topics introduced typically involve an increasingly systems-level content and orientation and there is an increasing level of preparation for design, problem solving and analysis skills expected as measured by the demands of coursework and seminar-based tasks.

Progressively increasing levels of appreciation and determination of quality and performance (A2) aspects of products, processes larger-scale of hardware and software systems is encouraged and expected in coursework, seminar work and coursework.

Outcomes A1 and A2 are underpinned by the introduction of a range of engineering principles relevant to system construction and design at the level of increasingly larger-scale system development as well as deploying the application of fundamental principles.

Students undertake group project work that explicitly addresses the development of outcomes A3-A6 by focussing on aspects of the complete project life cycle of a system relevant to the focus of their programme. The project is designed to allow students to integrate and contextualise their A3-A6 understanding and abilities in a supportive and semi-structured environment.
A6 is assessed as appropriate to subject across all four modules taken.

At Level 6, support is given to students to consolidate their understanding of new material relating to outcomes A1, A2, A3 and A5 and to take greater responsibility for the selection and choice of concepts, principles and methodology needed to analyse, synthesise and evaluate particular systems, processes and products in a range of contexts directly relevant to the programme's core focus and content.

Individual project work addresses A3- A6 in which student learning will include an appreciation of the open-endedness and incompleteness of

knowledge in practical computer communications problems at system level.

In general, learning materials and teaching acknowledge the diverse cultural background of students on this programme and are intended to permit equality of access.

Assessment Method

Outcomes A1, A2 and A6 are assessed using coursework and laboratory assignments involving a range of problem-solving, design, analysis, modelling and simulation tasks individual and group work (including presentations and formal reports of work undertaken) increasingly framed at system level, through the programme multiple choice questions, presentations of work-in-progress, and unseen written examinations at Levels 5 and 6.

Outcomes A3, A4 and A5 are explicitly assessed at Levels 5 and 6 but not explicitly at Level 4. Outcomes A3-A6 and A1-A2 as appropriate are assessed at Level 6 by means of the individual project, i.e., by interim deliverable, final project report, and viva/demonstration as appropriate.

Typically a module itself involves a variety of assessment types to target students' differing learning styles. Written formative feedback is given on return of coursework and formative feedback is given within seminars and laboratories.

Formative feedback is provided for each unseen written examinations in the form of generic formal module reports.

B. Cognitive (thinking) 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. Apply a systems approach by mean of information, concepts, arguments, assumptions and evidence derived from a wide variety of sources to engineering problems.

Solve technical problems creatively in problem-solving and design contexts drawing on techniques or concepts some of which are at the forefront of wireless systems/networks development or research and to deal with issues creatively in the presence of incomplete data;

3. Adopt a integrative systems approach to design activity and problem solving which defers to external influences on the design process: 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;

4. Conduct analysis of systems, devices and components requiring RF and signal processing solutions and to relate analysis to the design of new mobile systems, components and processes and to modify an existing system, component or process.

Teaching/learning methods

Skill development within this programme is intended to be progressive across all study levels. A variety of digital, wireless, network, computer and software laboratories provide environments and tools for system simulation, design, implementation, and test are used to foster the development of practical skills specified by B1-B5 through a range of laboratory and/or seminar-based tasks typically relying on learning-in-action. Supportive environments allow the development of B1-B5; formative feedback on performance of B1-B5 development is offered by tutors within laboratories and seminars prior to assessment, and then more formal feedback is offered.

At Level 5, B6 is assessed across all modules; students are taught how to operate specialist equipment effectively and safely and to respect rules of conduct in laboratories.

Assessment Method

Student's cognitive skills are typically summatively assessed by combinations of practical assignments, group and individual presentations, laboratory exercises, production of design documentation and specific demonstration of work and in part unseen written examinations. Formative feedback (both individual and generic) is given in general with returned assessed coursework. Verbal feedback is

given by tutors for presentations; generic feedback on examination performance is given in the form of a module report.

A5 – group project at level 5, but elements of development at level 4;
A6 – explicitly assessed through assignments based on taught material at Level 5; assessed mainly through individual project work at Level 6
A7 – addressed in laboratory work and assignments at levels 5 and 6

C. Practical skills

On completion of the programme the successful student will be able to:

1. Use specialist design and development systems and tools safely and effectively in the systems development; model and analyse mobile system problems; simulate, synthesise and test such systems and processes;

2. Conduct modelling, simulations, and experimental tasks with minimal guidance, and report effectively on findings;

3. Use technical literature effectively and conduct a *specialist* literature search effectively; plan and conduct a technical investigation using a wide range of technical literature

4. 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;

5. Design and develop embedded components, systems, processes and applications using industry-standard programming languages with consideration of technical requirements and constraints including environment and sustainability limitations, health and safety and risk issues, and the ability to manage the design process and evaluation of outcomes.

6. Design and develop wireless signal processing components and systems using embedded hardware and software with consideration of technical requirements and constraints including environment and sustainability limitations, health and safety and risk issues, and the ability to manage the design process and evaluation of outcomes.

Teaching/learning methods

Opportunities for developing subject-specific skills are aligned with supervised laboratory tasks in which a range of tasks are set, ranging from the use of packet analysers and network modelling tools to industry-standard hardware prototyping and development systems, in which students experience both hardware and software development life cycles

At Level 4
C1: At level 4 students will exercise subject level skills in undertaking small-scale simulation, design and implementation tasks.
C2: tasks undertaken in laboratory sessions with preliminary seminar support.
C3 and C4: small system simulation and programming exercises are introduced across all modules within a laboratory-based programme.

At Level 5, students will engage in tasks addressing outcomes C1,C2,C4 and C5 by developing skills acquired at Level 4 further, skills in using development and test environments, together with gaining further experience in the prototyping and modelling of systems, and in debugging relatively complex systems consisting of both hardware and software subsystems.

Outcome C6 is addressed in all Level 5 modules as appropriate; preparation for commissioning and researching for project work takes place in the research and group project-based module at Level 5. Outcome C7 is addressed across all Level 5 modules, in the production of a small-to-medium scale hardware, software or integrated system.

At Level 6, practical skills will be developed across the four modules taken. Outcome C7 typically will be addressed in the individual project module; outcomes C1-C7 will be addressed in Level 6 modules.

Assessment Method
Assessment of such skills will take place via laboratory sessions and via coursework tasks based on the production of a computer-based system, software and hardware subsystems. Prior to assessment of subject-specific skills, students will receive formative feedback. Typically laboratory based work will result in a formal report in which documentation of steps taken, results and an evaluation form part which will be assessed

D. Graduate Skills

On completion of the programme the successful student will be able to:

1. 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;
2. Deploy the general principles of design techniques specific to particular wireless systems and computer communications products and processes.
3. Knowledge of mathematical skills and understanding to tasks requiring modelling, system analysis and problem-solving.
4. Learn effectively for life-long personal and career development and to reflect on progress of learning; demonstrate leadership skills and initiative.
5. 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;

Teaching/learning methods

Students acquire graduate skills through seminar and laboratory work, presentations, lab-based tasks, written assignments

Assessment method

Students' graduate skills are assessed by a variety of assessment types are tare typically used for each of the intended skills outcomes. These include seminar-based assessment, multiple-choice questions and coursework, laboratory tasks taking place in learning environments including specialist development tools or equipment, as appropriate, group and individual projects, and mini projects.

Reports reflecting research undertaken at all levels of study are assessed and formative feedback provided. Individual and group project research presentations are assessed.

Skills outcomes D1-D6 are designed to reflect the University's Graduate Skills requirements. These skills are initially addressed, and many opportunities provided for their development through small-group activities providing the student with the opportunity of contributing to their Personal Development Portfolios (PDPs)

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

12. 1 Overall structure of the programme

The BEng programme can be taken in three modes (a) full-time, (b) part-time and (c) thick-sandwich mode. In full-time mode, the programme will take three years to complete; in part-time mode the BEng programme will take a minimum of six years to complete and (c) will take a minimum of four years to complete. The programme is structured into three academic levels.

Each module is worth 30 credit points and so you need gain 120 credit points to progress to the next level. In part-time mode, you will take a maximum of 60 credit points in any academic year (which is defined to be the period from September to the following September). In thick sandwich mode you will spend a year on a placement module after having completed the first two academic levels, and then resume your studies by taking the specified level 6 modules. Even though the placement module is credit-rated (worth 120 credit points) it does not contribute to the number of credits you need to gain your honours degree award, but leads to a certificate of industrial achievement in its own right.

In this programme all modules are compulsory and you need 360 credit points to graduate with honours.

For direct entry to levels 5 & 6 the student is required to pass the equivalent of 120 credits specified in the programme specification at levels 4 & 5, respectively, and demonstrate the programme learning outcomes have been met at these levels, for example by the attainment of industrially-based qualifications or experience

Mature applicants with relevant work experience are also welcome to apply for Direct entry at levels 3, 4 and 5. These applicants are required to submit a portfolio of work experience to show evidence of achieving relevant learning outcomes, and these will vary depending on both the programme and level the student is applying for. Evidence should comprise the applicant's own work and may include documents you have written, procedures you have designed, proposals you have drafted, electronic resources, photographs, video etc or information gathered from others about you such as statements from employers, certificates of in-house courses completed. Further guidance may be

obtained from the Programme Leader or Director of Programmes.

If, on completion of your studies you fail to obtain the 360 credit points required by the BEng programme, you may be eligible for graduating with non-honours, i.e. an ordinary, degree, if you have obtained 300 credit points, at least of which 60 credit points are at Level 6.

12.2 Levels and modules		
Level 4		
COMPULSORY	**OPTIONAL**	**PROGRESSION REQUIREMENTS**
Students must take all of the following: **CCE1000** Computer Systems Architecture and Operating Systems **CCE1010** Programming and Problem Solving for Communications **CCE1020** Fundamentals of Science, Technology, Engineering and Mathematics **CCE1040** Fundamentals of Electronics and Communication Engineering	N/A	Students must pass 120 credit points to progress to level five full-time study or level five part-time study
Level 5		
COMPULSORY	**OPTIONAL**	**PROGRESSION REQUIREMENTS**
Students must take all of the following: **CCE2080** Radio Frequency and Microwave Engineering **CCE2090** Real-time Wireless Signal Processing and Software Radio **CCE2060** Research Methodology and Professional Project Management **CCE2020** Protocols and Network Performance Modelling	N/A	Students must pass at least 180 credit points (including 60 at level 5) in order to be eligible to enrol on modules at level 6, and at least 210 credits (including 90 at level 5) in order to be eligible to enrol on the level 6 individual project module.

Level 6		
COMPULSORY	**OPTIONAL**	**PROGRESSION REQUIREMENTS**
Students must take all of the following: **CCE3140** Digital Communications **CCE3010** Embedded Linux Systems and Application Development **CCE3090** Mobile Wireless Networks: Planning and Optimisation **CCE3050** Individual Project	N/A	In order to graduate with an honours degree i.e. with a BEng Hons Mobile Systems and Communication Engineering award, students must have achieved 360 credit points, or to graduate with an ordinary degree, 300 credit points with a minimum of 60 credit points at Level 6

12.3 Non-compensatable modules (note statement in 12.2 regarding FHEQ levels)	
Module level	***Module code***
Level 5	**CCE2060** Research Methodology and Professional Project Development
Level 6	**CCE3050** Individual project

13.Curriculum map for BEng Hons Mobile Systems and Communication 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		Practical skills	
A1	The principles and methodology underpinning the development of wireless communication systems, communication networks and computer systems, and the problem analysis and solution of relevant engineering problem;	C1	Use specialist design and development systems and tools safely and effectively in the systems development; model and analyse mobile system problems; simulate, synthesise and test such systems and processes.
A2	The principles, computational concepts, scientific and engineering principles and methods needed to model, simulate, analyse wireless communication systems and networks, and the application of computer systems both hardware and software to implement wireless systems with an appropriate understanding of relevant criteria of quality and performance.	C2	Conduct modelling, simulations, and experimental tasks with minimal guidance, and report effectively on findings; (C)
A3	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;	C3	Use technical literature effectively and conduct a specialist literature search effectively; plan and conduct a technical investigation using a wide range of technical literature
A4	The significance, role and function of computer communication practitioners within society and the operational, material environment within which they will be expected to practise;	C4	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;

A5	The business, organisational and management techniques relevant to those engaging in enterprise and the production of communications systems, products and processes.	C5	Design and develop embedded components, systems, processes and applications using industry-standard programming languages with consideration of technical requirements and constraints including environment and sustainability limitations, health and safety and risk issues, and the ability to manage the design process and evaluation of outcomes.
A6	The general concepts and principles of design methodology specific to particular computer systems products and processes and how to apply these;	C6	Design and develop wireless signal processing components and systems using embedded hardware and software with consideration of technical requirements and constraints including environment and sustainability limitations, health and safety and risk issues, and the ability to manage the design process and evaluation of outcomes.
Cognitive skills		**Graduate Skills**	
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;	D1	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.
B2	pply system approach by mean of information, concepts, arguments, assumptions and evidence derived from a wide variety of sources to engineering problems.	D2	Deploy the general principles of design techniques specific to particular wireless systems and computer communications products and processes.
B3	Solve technical problems creatively in problem-solving and design contexts drawing on techniques or concepts	D3	Knowledge of mathematical skills and understanding to tasks requiring modelling, system analysis and problem-

	some of which are at the forefront of wireless systems/networks development or research and to deal with issues creatively in the presence of incomplete data;		solving.
B4	Adopt a integrative systems approach to design activity and problem solving which defers to external influences on the design process: 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;	D4	Learn effectively for life-long personal and career development and to reflect on progress of learning; demonstrate leadership skills and initiative.
B5	Conduct analysis of systems, devices and components requiring RF and signal processing solutions and to relate analysis to the design of new mobile systems, components and processes and to modify an existing system, component or process.	D5	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;

Module Title	Module Code and Level	Programme outcomes																				
		A1	A2	A3	A4	A5	A6	B1	B2	B3	B4	B5	C1	C2	C3	C4	C5	C6	D1	D2	D3	D4	D5
Computer Systems Architecture and Operating Systems	CCE1000	X					X	X					X		X						X		X
Programming and Problem Solving for Communication	CCE1010	X	X				X	X		X			X								X		X
Fundamentals of Science, Technology, Engineering and Mathematics	CCE1020	X	X				X	X		X	X		X	X							X		X
Fundamentals of Electronics and Communication Engineering	CCE1040	X	X				X	X	X	X			X	X					X	X	X		X
Network Protocols and Performance Modelling	CCE2020	X	X				x	X	X				X	X							X		X
Research Methodology and Professional Project Development	CCE2060			X	X	X		X	X	X	X				X	X			X			X	X
Radio Frequency and Microwave Engineering	CCE2080	X	X			X		X					X	X						X	X		X
Real-time Wireless Signal Processing and Software Radio	CCE2090	X	X				X	X	X	X		X	X	X		X		X	X	X			X
Individual Project	CCE3050			X	X	X		X	X		X	X		X	X	X	X	X	X			X	X
Mobile Wireless Networks: Planning and Optimisation	CCE3090	X	X				X	X	X	X			X	X		X	X				X		X
Embedded Linux System and Application Development	CCE3010	X	X				X	X	X	X	X	X	X	X			X	X	X	X			
Digital Communications	CCE3140	X	X				X	X	X	X		X	X	X	X			X		X	X		X
Industrial Placement Module	CCE3200			X	X	X			X		X								X				X

14. 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 www.mdx.ac.uk/regulations/.
- Practical aspects of the programme are often assessed via coursework that may be carried out using specialist software and may include lab tests.
- Theoretical material is assessed by coursework and examinations.
- Grades are awarded on the standard University scale of 1–20, with Grade 1 being the highest. To pass a module all components, both coursework and examination, must be passed individually with a minimum grade of 16. Failure in one of the components will result in the failure of the module.

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

15. Placement opportunities, requirements and support (if applicable)

All Undergraduate students have the opportunity to go on Industrial Placement. Industrial Placements are encouraged as this valuable experience enhances a student's future career prospects. Additionally students normally achieve better results in their final year. In brief:

- The placement provides a years' experience as an appropriately paid graduate trainee.
- Industrial placement is conditional on the successful completion of all modules at Level 4 and Level 5, therefore students need 240 credits before they are able to embark on an industrial placement.
- Obtaining a placement is co-ordinated through the Campus Placement Office.
- For Undergraduate programmes, students wishing to undertake a placement position must register for CCE3200.
- Each placement will be assigned to an industrial tutor who will visit the student on placement.
- On graduation the degree will be qualified with the term "…with approved industrial experience".

The placement option is not available to direct-entry students in their final year.

16. Future careers (if applicable)

All programmes in the School of Science and Technology – their curricula and learning outcomes – have been designed with an emphasis on currency and the relevance to future employment.

- Graduates can enter telecommunication industry as mobile systems developers, deployment engineers, network engineers, network planning and optimisation engineers, field applications engineers, sales engineers.
- Graduates can enter embedded systems industry as embedded hardware, firmware drivers, and embedded applications developers.
- Over 20% of students pursue further postgraduate study or research.

The employer links with the School are encouraged in a number of ways e.g. by inviting practitioners from industry as guest speakers in lectures; through links with companies where students are employed as part of their Industrial placement and through alumni both in the UK and overseas Campus Careers Offices can be found on each campus for advice, support and guidance – or go to www.intra.mdx.ac.uk/annex/careers/coreered.htm

17. Particular support for learning (if applicable)

The School's Teaching and Learning Strategy is compliant with those of the University, in seeking to develop learner autonomy and resource-based learning.

18. JACS code (or other relevant coding system)	I100/H100 – 40% / 60% split
19. Relevant QAA subject benchmark group(s)	Computing / Engineering

20. Reference points

The following reference points were used in designing the programme:

- QAA Computing subject benchmark statements, Computing (2007) and Engineering (2010)
- QAA Framework for Higher Education Qualifications in England, Wales and Northern Ireland

- QAA/QAAS guidelines for programme specifications
- QAA Code of Practice for the assurance of academic quality and standards in HE
- University Regulations
- IET Handbook for Learning Outcomes Handbook Incorporating UK-SPEC for Bachelors and MEng Degree Programmes (2008)
- British Computer Society (BCS) Guidelines for Exemption and Accreditation
- Module Narratives
- Middlesex University and School of Engineering and Information Sciences Teaching Learning and Assessment policies and strategies
- University policy on equal opportunities.

21. Other information

Middlesex University has formal links with 250 institutions world-wide, including student exchange agreements with more than 100 institutions. Currently a number of students both from the UK/EU and overseas take part in such exchanges. For further details please visit http://www.europe.mdx.ac.uk/

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 student programme handbook and the University Regulations.