

MSc in Intelligent Telecommunications Engineering

Programme Specification



1. Programme title	Intelligent Telecommunications Engineering
2. Awarding institution	Middlesex University
3. Teaching institution	<i>Middlesex University, HENDON</i>
4. Details of accreditation by professional/statutory/regulatory body	
5. Final qualification	MSc. Intelligent Telecommunications Engineering PGCert Intelligent Telecommunications Engineering PGDip Intelligent Telecommunications Engineering
6. Year of validation Year of amendment	2021
7. Language of study	English
8. Mode of study	Full-time and Part-time

9. Criteria for admission to the programme

A minimum of a lower second-class Honours degree (UK), or an equivalent overseas qualification in Computer Science or in a Science or Engineering subject. Candidates with other degrees/qualifications but with relevant work experience will also be considered and are encouraged to apply.

Applicants whose first language is not English are required to achieve 6.5 in IELTS overall (with a minimum of 6.0 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. Applications from mature applicants with suitable

life skills and experience 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

The programme aims to:

- Provide students with the skills that enables them to develop their competence in related fields such as digital communication systems and wireless/mobile networks
- Provide the knowledge required to develop original ideas and solve complex problems based on advanced knowledge of the principles and methodologies of wireless communications and internetworking
- Enable currently practicing Engineers and Scientists to renew their qualifications and learn new related technologies in the fields of telecommunications and next generation networks as required for continued professional development
- A balance of theory, advanced practical skills and experience to enable students to develop a sound knowledge and analytical ability to formulate sound judgements in the area of intelligent communication systems and advanced telecommunications engineering.
- Provide an opportunity to conduct project work in well-equipped laboratory facilities for the simulation, practical experimentation and analysis of telecommunications related technologies.

MSc graduates from this programme will possess highly marketable skills as well as advanced knowledge and level of expertise in the design, implementation and testing of advanced wireless communication and networking systems, permitting entry to advanced specialist areas within the telecommunications sector. They will be able to appreciate new and emerging trends within the sector like 5G and beyond networks, artificial intelligence and machine learning, smart communication systems, Internet of Things (IoT) and smart factories/industry 4.0.

11. Programme outcomes*

A. Knowledge and understanding

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

1. Theoretical and practical knowledge of telecommunications systems associated with 4G, 5G and next generation mobile networks
2. Demonstrate an ability to analyse the techniques of wireless communications and to evaluate

Teaching/learning methods

Students gain knowledge and understanding through:

- Combined delivery methods like Lecture, Seminar and Laboratory based Workshops (outcomes 1-8),
- Group and individual research, presentations and written reports (outcomes 1-8),
- Individual and group design work (outcomes 2, 3 and 8).

<p>and compare their system-level performance</p> <ol style="list-style-type: none"> 3. Different tools utilised to evaluate the operation of systems in intelligent communication environments 4. Fundamental technologies related to transmission, switching and signalling 5. Advanced concepts of mobile communication systems and related applications and services including optimisation 6. Communication protocols for smart communication systems, for e.g., Industry 4.0, Vehicular Networks, Network Function Virtualisation (NFV) and IoT. 7. Design and implementation issues of effective security strategies to minimise the effects of attacks and provide enhanced cyber security services 8. Architecture of next generation networks and intelligent/smart networks. 	<ul style="list-style-type: none"> • Individual major project. Student would be expected and encouraged to undertake independent reading both to supplement and consolidate what is being taught/learnt and to broaden their individual knowledge and understanding of the subject (outcomes 1-8). <p>Assessment methods Students' knowledge and understanding is assessed by</p> <ul style="list-style-type: none"> • Unseen Examination (outcomes 1, 4, 5, 6) • Laboratory sessions and practical assignments (outcomes 2, 3, 4, 7, 8) • Final major project dissertation (Outcomes 1-8) • A wide variety of practical laboratory experimentation, analysis and synthesis tasks, and tests, problem-solving exercises, modelling and simulation tasks is considered as part of different modules. • Other ways of assessment include presentations, formal reports of work undertaken, dialogue, etc.
<p>B. Skills On completion of this programme the successful student will be able to:</p> <ol style="list-style-type: none"> 1. Devise solutions to a variety of technical problems related to wireless communication systems 2. Use numerical tools systematically to analyse wireless/mobile communication systems competently 3. Assemble and test or simulate communication systems and be able to measure parameters to analyse the performance of such systems 4. Use different research methods to develop competent solutions or provide alternative methods to further enhance next generation networks and/or intelligent environments. 	<p>Teaching/learning methods Students gain cognitive skills (B1-B4) through:</p> <ul style="list-style-type: none"> • self- directed, resource-based learning; small group discussions and numerical exercises in workshops (outcomes 1, 2, 4) • laboratory sessions; demonstration software and research project (outcomes 3, 4). • group and individual research, presentations and written reports (outcomes 1, 4). • Individual major project (outcomes 1-4) <p>Students gain practical skills (B5-B10) through:</p> <ul style="list-style-type: none"> • traditional lecture delivery (outcomes 5 and 8), • group and individual research, presentations and written reports (outcomes 5-10),

<ol style="list-style-type: none"> 5. Build or analyse wireless/mobile network components in aiding resolving a specific task 6. Critically evaluate the needs for next generation networks, with respect to mobile/wireless communication technologies. 7. Have a critical and clear underpinning of fundamental theories and techniques for appraising user interfaces and practical design skills for effective user interactions 8. Make informed decisions using existing datasets on appropriate measures to improve existing infrastructure in widespread deployment of wireless/mobile technologies. 9. Demonstrate management skills and techniques in project leadership 10. Develop/co-design complex communications systems using different hardware and/or software simulation tools 11. Acquire and apply relevant numerical and analytical skills. 12. Analyse a problem systematically and implement effective solutions both individually and within a team 13. Communicate effectively with peers and senior managers in writing, verbally and through graphical representation 14. Apply gained knowledge and skills in wireless/mobile systems to enhance telecommunication environments 15. Learn independently in familiar and unfamiliar situations with critical enquiry 16. Plan and apply lifelong self-learning effectively for the purpose of continuing professional development as well as personal achievements 	<ul style="list-style-type: none"> • small group and individual exercises (outcomes 5-10), • laboratory sessions (outcomes 5-8), • Individual project (outcomes 5-10: depending on project title). <p>Students acquire graduate skills (B11-B16) through:</p> <ul style="list-style-type: none"> • small group and individual presentations and workshop exercises (outcomes 11-14), • laboratory sessions (outcomes 11-13 and 16) • major individual project (outcomes 11 and 13-16) <p>Analysis, design and problem-solving skills are further developed through various design activities as well as case studies, and extensive computer laboratory sessions. Feedback is given to students on all assessed coursework as well as written exams (in the form of exam reports).</p> <p>Assessment methods</p> <p>Students' cognitive and practical skills (B1-B10) are assessed by a combination of practical assignments, group and individual presentations, laboratory exercises, production of design documentation and specific demonstration of work and in part, class tests etc.</p> <p>Students' graduate skills (B11-B16) are assessed by a variety of assessment types that are typically used for each of the intended graduate skills outcomes. These include seminar-based assessment, in-class tests, laboratory tasks taking place in learning environments including specialist development tools or equipment, as appropriate, group and individual projects, module relevant mini projects and unseen examinations.</p>
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12. Programme structure (levels, modules, credits and progression requirements)

12. 1 Overall structure of the programme

Full-Time

Autumn Term	PDE4821 Digital Communication Systems (30 credits)	PDE4830 Mobile Communications (30 credits)	PDE4825 Intelligent Environments & IoT (15 credits)	PDE4850 Advanced Topics in Communication Systems (30 credits)	
Winter/ Spring Term			CST4560 Network Security Mechanisms (15 credits)		PDE4899 Postgraduate Project in Telecommunications (60 credits)
Summer Term					

Part-Time

	Year 1			Year 2		
Autumn Term	PDE4821 Digital Communication Systems (30 credits)	PDE4830 Mobile Communications (30 credits)	PDE4825 Intelligent Environments & IoT (15 credits)	PDE4850 Advanced Topics in Communication Systems (30 credits)		
Winter/ Spring Term			CST4560 Network Security Mechanisms (15 credits)		PDE4899 Postgraduate Project in Telecommunications (60 credits)	
Summer Term						

Students must successfully complete all the modules of the taught part of the programme and get their formal proposal for PDE4899 approved by their supervisor before they can continue their Postgraduate Project Module (PDE4899).

Examinations for the relevant taught modules take place at the end of the Spring Terms only, with a reassessment opportunity before the start of the Autumn Term of the next academic year. There are no examinations at the end of the Autumn Term.

The general teaching and learning strategy are a workshop based integrated lecture, tutorial or lab-based session. All the required material including lecture notes, module handbook, handouts, tutorial material, practical laboratory activities and extended exercises for private study will be available via MyLearning (Moodle-based DLE).

All project proposals must be approved by the assigned project supervisor (part of the academic team delegated by the Programme Leader). Students must pass all the taught modules before they can progress to the project.

12.2 Levels and modules

Starting in academic year 2010/11 the University is changing the way it references modules to state the level of study in which these are delivered. This is to comply with the national Framework for Higher Education Qualifications. This implementation will be a gradual process whilst records are updated. Therefore, the old coding is bracketed below.

Level 7 (4)

COMPULSORY	OPTIONAL	PROGRESSION REQUIREMENTS
Students must take all of the following: PDE4821 PDE4825 PDE4830 CST4560 PDE4850 PDE4899		Students must pass all taught modules before they can progress to the dissertation stage To pass modules students must pass all components of assessments (examinations and coursework)

12.3 Non-compensatable modules (note statement in 12.2 regarding FHEQ levels)

Module level	Module code
Level 7	PDE4899

13. Information about assessment regulations

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

<https://www.mdx.ac.uk/about-us/policies/>

Grades are awarded on the standard university scale of 1-20, with Grade 1 being the highest. To pass a taught module, all the main components; coursework (including lab work) and/or examination must be passed individually. Progression from the module can only be achieved when all the components, examination and/or coursework are individually passed with a minimum grade of 16. Due to professional body requirements, grade 18 is non-compensable.

Practical aspects of the programme may be assessed by laboratory assignments, lab tests and coursework tasks.

Theoretical and critical review material is normally assessed by coursework and unseen examinations.

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

14. Placement opportunities, requirements and support

There have been occasions where, our industry contact would require students to work on specific projects. This would create opportunities for placement on the student's major project. However, this is an ad hoc arrangement between the industry contact, the student and the project supervisor. There are no formal arrangements required.

15. Future careers / progression

Graduates of this programme will become:

Engineers, managers and technical specialists in high-growth sectors such as electronic information systems, network engineering, information communications, telecommunications, wireless design and deployment.

Students would also be well placed to find employment in fields such as network administration, network design and modelling, Internet Service Providers (ISP) and higher education.

Previous students have been working in places like British Telecom (BT) UK, F5 Networks UK, Viavi Solutions UK, iWireless Solutions Ltd. UK, Quantum Black UK, Hadean UK, ZS Associates - India, Baobab Circle - Nigeria, Orange - Dominican Republic, etc.

Some graduates enter into a PhD programme at different institutions in relevant area of research.

16. Particular support for learning (if applicable)

At a postgraduate level, students are expected to be independent and responsible for their own academic and personal life. However, the university aims to provide significant assistance in case the students require it.

In support of the students' learning experience:

- All students go through an induction programme the week before their learning and teaching activities begin
- Students are allocated a personal email account and secure online storage
- Copies of all module handbooks can be found on MyLearning, the university's online learning platform, where learning materials are provided to further enhance learning
- The tutors would direct the studies and advise the students on what is required to cover in any given module. It is essential that students seek advice from academic staff after class, during their office hours or by email/call
- General educational guidance, clarification of university regulations and help with planning the programme is available from the student support team via the UniHelp
- 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 centre and LABVIEW Academy.

- Formative feedback is given throughout the modules at appropriate stages and on completion of student coursework
- Every student coming to the university would receive an electronic copy of their core textbook assigned to every module
- Research activities of academic staff feed into the teaching programme, thus, at times providing some students with opportunities to work with academics of some aspects of their research
- Careers Advice (MDXWorks), Accommodation Services, Childcare Services and Sport and Leisure and further information can be obtained from Middlesex University's Students Union (MUSU). <https://www.mdxsu.com/>

Middlesex University encourages and supports students with disabilities. Specialist advice is available from the Disability Support Service (disability@mdx.ac.uk). 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.

17. JACS code (or other relevant coding system)	HECoS – 100159 – 75% 100365 – 25%
18. Relevant QAA subject benchmark group(s)	Computing and Engineering Master's

19. Reference points

The following reference guidance notes were used in designing and reviewing this programme:

- QAA Framework for HE in England, Wales and NI
- QAA Subject Benchmarks (Computing and Engineering Master's)
- UK Standard for Professional Engineering Competence (UKSPEC)
- Middlesex University's Policy, Regulations and Guidelines
- Middlesex University's Learning and Quality Enhancement Handbook
- QAA Code of Practice for the assurance of academic quality and standards in HE
- Chartered Engineer and Incorporated Engineer Standard, Engineering Council UK, 2014
- Accreditation information pack, Institute of Engineering and Technology (IET)
- Middlesex University policy on equal opportunities

20. Other information

In recent years, academics relevant to this programme have been actively seeking external research funding from the British Council, EPSRC, EU-H2020 etc. They have been successfully publishing their research findings in high impact factor journals like:

- IEEE Transactions on Vehicular Technology, Communications
- IEEE Communications Surveys and Tutorials, IEEE Access, IEEE Systems
- IET Letters
- Various Springer and Elsevier Journals

Alongside being research active, the academics are also involved in performing external examiner roles at various levels across UK universities.

The Faculty of Science and Technology recently received the “Huawei Approved 5G Training Partner” authorisation. As part of this, the faculty will receive hardware and training material which would be available for students to use as part of their study at Middlesex University.

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 *MSc Intelligent Telecommunications 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	
A1	Theoretical and practical knowledge of telecommunications systems associated with 4G, 5G and next generation mobile networks
A2	Demonstrate an ability to analyse the techniques of wireless communications and to evaluate and compare their system-level performance
A3	Different tools utilised to evaluate systems in intelligent communication environments
A4	Fundamental technologies related to transmission, switching and signalling
A5	Advanced concepts of mobile communication systems and related services including optimisation
A6	Communication protocols for smart communication systems, for e.g., Industry 4.0, Vehicular Networks, Network Function Virtualisation (NFV) and IoT.
A7	Design and implementation issues of effective security strategies to minimise the effects of attacks and provide enhanced cyber security services
A8	Architecture of next generation networks and intelligent/smart environments
Skills	
B1	Devise solutions to a variety of technical problems related to wireless communication systems
B2	Use numerical tools to analyse wireless/mobile communication systems competently
B3	Assemble and test or simulate communication systems and be able to measure parameters to analyse the performance of such systems
B4	Use different research methods to develop competent solutions to further enhance next generation networks and/or intelligent environments
B5	Build or analyse wireless/mobile network components in aiding resolving a specific task
B6	Critically evaluate the needs for next generation networks, with respect to mobile/wireless communication technologies.
B7	Have a critical and clear underpinning of fundamental theories and techniques for appraising user interfaces and practical design skills for effective user interactions

B8	Make informed decisions using existing datasets on appropriate measures to improve existing infrastructure in widespread deployment of wireless/mobile technologies.
B9	Demonstrate management skills and techniques in project leadership
B10	Develop/co-design complex communication systems using different hardware and/or software simulation tools
B11	Acquire and apply relevant numerical and analytical skills.
B12	Analyse a problem systematically and implement effective solutions both individually and within a team
B13	Communicate effectively with peers and senior managers in writing, verbally and through graphical representation
B14	Apply gained knowledge and skills in wireless/mobile systems to enhance telecommunication environments
B15	Learn independently in familiar and unfamiliar situations with open-mindedness and in the spirit of critical enquiry
B16	Plan and enjoy lifelong self-learning effectively for the purpose of continuing professional development as well as personal achievements

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		
Highest level achieved by all graduates																									
7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7		

Module Title	Module Code by Level	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
Digital Communication Systems	PDE4821	√		√	√	√			√	√	√	√				√			√	√	√		√	√	
Intelligent Environments & IoT	PDE4825	√	√	√		√	√	√	√		√	√	√	√		√			√	√		√	√	√	
Mobile Communications	PDE4830	√	√		√	√	√	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√	√	
Advanced Topics in Communication Systems	PDE4850	√	√	√	√	√	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√		√	√
Network Security Mechanisms	CST4560		√				√		√	√				√		√	√		√	√		√	√	√	
Postgraduate Project in Telecommunications	PDE4899			√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√		√	√	√	