

Programme Title: BSc(Eng) Internet of Things Engineering



Programme Specification (UG)

Awarding body / institution:	QMUL and Beijing University of Posts and Telecoms (BUPT)
Teaching institution:	QMUL and BUPT
Name of final award and programme title:	BSc(Eng) Internet of Things Engineering
Name of interim award(s):	
Duration of study / period of registration:	4 years
QMUL programme code / UCAS code(s):	H6NI
QAA Benchmark Group:	Engineering, but benchmarks subsumed by UKSPEC
FHEQ Level of Award :	Level 6
Programme accredited by:	Institution of Engineering and Technology
Date Programme Specification approved:	
Responsible School / Institute:	School of Electronic Engineering & Computer Science

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

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

Beijing University of Post and Telecommunications (BUPT)

Programme outline

This programme comes as a response to the increasing research and commercial interest for autonomous and intelligent applications that are based on the principles of the Internet of Things (IoT). This is a comprehensive programme covering all four layer structure which is needed for building complete IoT applications, such as smart grid, smart city, smart home, industrial automation, telemetry, etc.

The programme focuses on computer science's foundation and support, combined with other disciplines, such as microelectronics, communication networks and economics management. It emphasises on the necessary fundamental and practical knowledge for creating, designing, implementing, maintaining, and managing IoT systems. At the same time, it will keep pace with information industry's development in terms of course construction, and constantly adapting to social changes.

In addition to the technology, the programme will also include the key skills aspects already incorporated into the other JP programmes that were specifically commended by the QAA.

Aims of the programme

The programme sets out provide graduates with:

- a solid fundamental knowledge about telecommunication and computer sciences;
- an understanding of network design and network planning principles for IoT;
- a knowledge of theory, methodology and techniques for IoT network assessment and evaluation;
- a good overall understanding of computer and telecoms network development skills.

This new interdisciplinary programme will provide graduates with a broader employment scope, covering the field of telecoms, computer science and related management.

What will you be expected to achieve?

At the end of his/her degree, each student should be able to demonstrate the following abilities:

- the ability to recall factual knowledge and the ability to apply it in familiar and unfamiliar situations;
- the ability to apply scientific, mathematical and software 'tools' to a familiar or unfamiliar situation;
- the ability to use Information Technology as a key tool pervading all aspects of Internet of Things;
- the ability to understand practical issues concerning real systems (whether hardware or software);
- the ability to recognise insufficient existing knowledge and the ability to search for the necessary scientific, mathematical and software 'tools' relevant to that particular issue;
- the ability to work as part of a team;
- the ability to manage time effectively;
- the ability to appreciate the financial background against which decisions are made in industry;
- the ability to show a certain level of reflection on the role of engineering in society;

and the following skills:

- the perceptive skills needed to understand information presented in the form of technical circuit-diagrams, flow-charts and high-level programming languages;
- the practical skills needed to implement a piece of hardware or software and to use laboratory test equipment;
- the analytical skills needed to verify the correct behaviour of a hardware or software system or component and to be able to identify faults;
- the design skills needed to synthesise a design (in hardware and/or software) from a specification (including the choice of the best option from a range of alternatives), to implement the design and to evaluate the design against the original specification;
- the written and oral communication skills needed to present information, in particular written information, effectively;
- the critical reasoning skills needed to appraise a particular topic;
- the ability to research and troubleshoot complex issues in such system systematically and communicate their conclusions clearly to specialist and non-specialist audiences.

Context-based aims and objectives:

- To be able to identify and apply the key communications principles (e.g. Shannon equations, queuing theory and information theory) for communications between devices, sensors, actuators and machines at any time in anywhere;
- To be able to use mathematics and statistics to systematic analysis hardware and software IoT systems e.g. use of complex numbers, matrix algebra, differential equations and transform theory to analysis and design the medium access and network routing protocols;
- To be able to apply relevant signal and information processing techniques to analyse and extract sensor information into useful representation for IoT applications;
- To be able to develop, provide and maintain IoT services, infrastructure and products for society, within the constraints imposed by economic, legal, social, cultural and environmental considerations;
- To be able to discuss the current and emerging concept e.g. cloud computing, Web and services middleware, for development of interaction IoT application;
- To be able to identify issues and requirements in the practice of IoT engineering activities, such as ethical issues and safety (e.g. hearing damage prevention);
- To be able to demonstrate the use of appropriate design methodology, programming tools and techniques necessary for structuring IoT applications;

• To be able to apply essential business management skills for managerial careers in IoT industry and other technology-driven companies at the global level.

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

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

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

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

Academic Content:

A 1	The theory, principles, concepts and methodologies that are fundamental to Internet of Things engineering
A 2	The role of business processes in Internet of Things engineering and how that impact the technical development
A 3	The knowledge and skills to design and development applications in the context of Internet of Things engineering, including understanding of some major examples in the society

Disciplinary Skills - able to:

B 1	Analyse and solve technical problems effectively, both individually and as part of a team
B 2	Understand and apply technical project management techniques and skills
B 3	Demonstrate awareness and understanding of the historical, social, professional, industrial and ethical context of Internet of Things engineering
B 4	Operate a wide range of development hardwares and softwares, as well as testing and analytical equipment

Attributes:

C 1	Connect information and ideas within the broader context of the discipline of Internet of Things engineering
C 2	Communicate technical details effectively to a variety of audiences, both through production of well-written technical reports and through oral presentation and/or demonstration

C 3	Engage critically with knowledge, taking responsibility for both personal and professional development.
C 4	Manage time and prioritize tasks by working to strict deadlines while achieving clarity of communication, both with peers and with academic staff.
C 5	Competent in the use of information/computer-based technology, and in the manipulation and analysis of quantitative data

How will you learn?

All taught courses involve lectures, problem solving coursework, laboratory work, case study and independent study. Lectures are used to introduce principles and methods and also to illustrate how they can be applied in practice. Coursework allows students to develop their skills in problem solving and to gain practical experience. Laboratory work provide students with the guidance and help while solving a problem using a wide range of tools and techniques. This allows students to learn-by-doing in order to complement the lectures. QM Graduate Attributes are available for all JP students to identify students' attributes and develop students' knowledge, skills and behaviour that employers' value.

How will you be assessed?

The assessment of the taught course units takes place through a written examination and practical coursework. Some courses also include in-class tests as a component in assessment.

The final year project is examined on the basis of a written report, a formal oral presentation, and a demonstration of the piece of software or hardware developed by the student. In addition to the final year project, other modules introduce projects and group working skills.

Examinations must contribute at least 70% of the overall marks to satisfy IET Accreditation.

How is the programme structured?

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

Most modules are shown with a value of 15 credits. This is to simplify the procedure to fit the QM system. EBU modules are actually 44 contact hours instead of 33 so should count for more than 15 credits; BBx modules use Chinese credits that do not map exactly to QM credits. CBx modules are co-delivered by QM and BUPT. Personal Development Plan & Entrepreneurial Skills is marked as a Core module with no credits as it forms part of Engineering Environment which is a mix of QM and BUPT modules. Engineering Environment is worth 15 credits and counts 5% towards the award of Honours.

In addition there are more modules than in a degree in London in order to satisfy Chinese requirements - the module load is not symmetrical across semesters as the technical modules are balanced with the Chinese compulsory modules not shown. All modules are taught in English and every module must be passed for a degree to awarded (Chinese regulations) - so are all shown as core.

JP programme has two parts: technical content and compulsory courses. The degree is awarded on the basis of the technical content, but the compulsory part must be passed to get a degree to comply with Chinese MoE requirements.

Only modules shown on the QM transcript counting towards the award of Honours are included; Chinese compulsory courses are not shown in detail, nor are short summer semester modules, but these must all be passed for the award of the degree so a pass/fail module is included to allow that to be handled at QM.

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Module Title	Module Code	Credits	Level	Module Selection Status	Academic Year of Study	Semester
Personal Development Plan & Entrepreneurial Skills 1	EBC3002	0	3	Core	1	Semesters 1 & 2
New Horizons English 1	BBC4031	15	4	Core	1	Semester 1
Advanced Mathematics 1	BBC4911	15	4	Core	1	Semester 1
Linear Algebra	BBC4913	15	4	Core	1	Semester 1
Computer Fundamentals and Programming	BBC3502	15	3	Core	1	Semester 1
New Horizons English 2	BBC4032	15	4	Core	1	Semester 2
Introduction to Electronic Systems	BBC4102	15	4	Core	1	Semester 2
Advanced Mathematics 2	BBC4921	15	4	Core	1	Semester 2
Physics C	BBC4924	15	4	Core	1	Semester 2

Academic Year of Study FT - Year 2

Module Title	Module Code	Credits	Level	Module Selection Status	Academic Year of Study	Semester
Personal Development Plan & Entrepreneurial Skills 2	EBC4002	0	4	Core	2	Semesters 1 & 2
Discrete Mathematics	BBC4114	15	4	Core	2	Semester 1
Signals and Systems	EBU4375	15	4	Core	2	Semester 1
Introduction to Internet of Things	BBC5200	15	5	Core	2	Semester 1
Data Structures	BBU4208	15	4	Core	2	Semester 1
Introductory Java Programming	EBU4201	15	4	Core	2	Semester 2

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Module Title	Module Code	Credits	Level	Module Selection Status	Academic Year of Study	Semester
Probability Theory and Stochastic Processes	BBC4941	15	4	Core	2	Semester 2
Product Development and Management	EBU5607	15	5	Core	2	Semester 2
Database Systems	EBU5503	15	5	Core	2	Semester 2
Digital Circuit Design	EBU4202	15	4	Core	2	Semester 2
Communication Skills 1	BBC4106	5	4	Core	2	Semester 1
Communication Skills 2	BBC4107	10	4	Core	2	Semester 2

Academic Year of Study FT - Year 3

Module Title	Module Code	Credits	Level	Module Selection Status	Academic Year of Study	Semester
Personal Development Plan & Entrepreneurial Skills 3	EBC5002	0	5	Core	3	Semesters 1 & 2
Communication and Networks	EBU5212	15	5	Core	3	Semester 1
Machine Learning	CBU5201	15	5	Core	3	Semester 1
Cryptography and Cyber Security	EBU6010	15	6	Core	3	Semester 1
Operating systems	EBU5204	15	5	Core	3	Semester 1
Middleware	EBU6501	15	6	Core	3	Semester 1
Software Engineering	EBU6304	15	6	Core	3	Semester 2
Embedded Systems	EBU5477	15	5	Core	3	Semester 2
Wireless Sensor Networks	BBC6406	15	6	Core	3	Semester 2

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Module Title	Module Code	Credits	Level	Module Selection Status	Academic Year of Study	Semester
Sensors and Radio Frequency Identification (RFID)	EBU6408	15	6	Core	3	Semester 2

Academic Year of Study FT - Year 4

Module Title	Module Code	Credits	Level	Module Selection Status	Academic Year of Study	Semester
Cloud Computing	EBU6502	15	6	Core	4	Semester 1
Smart Infrastructure and Data Architecture	EBU6504	15	6	Core	4	Semester 1
Internet of Things Engineering Practice	BBC6201	15	6	Core	4	Semester 1
Engineering Environment (IoT)	EBC6012	15	6	Core	4	Semester 1
Chinese Compulsory Topics	BBF6000	0	6	Core	4	Semester 1
Project	BBC6521	30	6	Core	4	Semesters 1 & 2

What are the entry requirements?

Pass the minimum entry requirements for BUPT. As a national key university, all entrants to BUPT must score above the top line in the Chinese national entrance examinations. In addition, BUPT's requirement is much higher than that and the level is approximately equivalent to the top 2-3% of the population in China of that age group.

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

The Staff-Student Liaison Committee (SSLC) provides a formal means of communication and discussion between QM and BUPT and JP students. The committee consists of student representatives from each year in JP together with appropriate representation from staff within the QM and BUPT. It is designed to respond to the needs of students, as well as act as a forum for discussing programme and module developments. SSCLs meet twice a semester.

The JP operates an Academic Committee which is responsible under the contract and MoE licence for all matters relating to the delivery of taught programmes at school level including monitoring the application of relevant QM policies and reviewing all proposals for module and programme approval and amendment before submission to Taught Programmes Board. Student views are incorporated in this Committee's work in a number of ways, such as through student membership, or consideration of student surveys.

The JP operates an Annual Programme Review of the taught undergraduate provision. The process is normally organised with the Director and co-Director of JP who responsible for the completion of the school's Annual Programme Reviews. Schools/ institutes are required to produce a separate Annual Programme Review for undergraduate programmes using the relevant Undergraduate Annual Programme Review process. Students' views are considered in this process through analysis of the module evaluations and SSLC comments. In addition BUPT conducts a biannual review of all programmes.

What academic support is available?

Induction and pastoral support is provided through BUPT. Students are organised into "classes" of 30 as in the usual Chinese model. Each class has a tutor who provides pastoral support. One male and one female tutor sleep on campus every night so there is 24/7 access to pastoral support.

Feedback mechanisms from students are: (i) directly to the lecturers (ii) to their tutor (as described above) and (iii) through an SSLC that meets twice a semester. Because of the large numbers of students, a separate SSLC is held for each cohort.

For every module, whether taught by QM or BUPT, formal office hour or tutorial slots are provided. In addition QM staff can give advice and supervision remotely using a variety of techniques including Skype, Microsoft Teams and Zoom conferencing system.

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

This module will be delivered to BUPT JP students at BUPT campus. The learning outcomes for the module are clearly stated in the module descriptor. The teaching is expected to be delivered in person at BUPT campus. The lectures will not be recorded but all electronic materials will be available on QMPlus, including the reading list. The SensusAccess tool will be used if necessary.

A specific disabled students support that complies with Chinese law is applied to this programme since the students are physically in China.

Programme-specific rules and facts

The Special Regulations for the JP apply to this programme.

Links with employers, placement opportunities and transferable skills

There is an industrial advisory committee consisting of senior staff from the Chinese Telecommunications industry. An Industrial Liaison officer is part of the JP team to develop links with industry and industrial projects, to ensure that projects are appropriate and to monitor their progress. A good industrial project provides excellent experience for an engineering undergraduate. There is a compulsory internship for all year 3 summer students and frequent invited industry lectures to year 3 and 4 students.

To date the JP has a record of 100% employment or PG education with most JP graduates (>80%) go on to PG education.

Programme Specification Approval

Person completing Programme Specification:

Na Yao

Programme Title: BSc(Eng) Internet of Things Engineering

Person responsible for management of programme:

Michael Chai

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

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