

PROGRAMME SPECIFICATION

for the award of

MSc Software Engineering

Managed by the Faculty of Technology, Design and Environment

delivered by Department of Computing and Communication Technologies

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| Date approved: | Date approval confirmed, on recommendation of University validation panel or other authorised body. |
| Applies to students commencing study in: | September 2018 |

RECORD OF UPDATES

| Date amended* | Nature of amendment** | Reason for amendment** |
|----------------------|---|--------------------------------------|
| July 2016 | Transferred to new template, removal of TOEFL | CMA Compliance, change to admissions |
| October 2016 | Checked for errors and amended by Subject Coordinator and Programme Lead. | Subject specialist knowledge. |
| November 2017 | Module list changed | Module list changed |

SECTION 1: GENERAL INFORMATION

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| Awarding body: | Oxford Brookes University |
| Teaching institution and location: | Oxford Brookes University, Wheatley Campus |
| Language of study: | English |
| Final award: | MSc |
| Programme title: | Software Engineering |
| Interim exit awards and award titles available: | Postgraduate Diploma Software Engineering Postgraduate Certificate Software Engineering Postgraduate Certificate Software Engineering Research Project |
| Brookes course code: | CM85 |
| UCAS code: | P035437 |
| JACS code: | I300 |
| HECoS code: | 100374 |
| Mode of delivery: | Full-time (face to face/on-campus) Part-time (face to face/on-campus) *Sandwich mode (full-time) *Sandwich mode (part-time) |
| Mode/s and duration of study: | PG Cert Full time – minimum 1 semester, maximum 5 years PG Cert Part time – minimum 2 semesters, maximum 5 years PG Dip Full Time - minimum 2 semesters, maximum 5 years PG Dip Part Time - minimum 4 semesters, maximum 5 years MSc Full Time - minimum 1 year, maximum 5 years MSc Part Time - minimum 2 years, maximum 5 years MSc Full Time study with Full Time placement - minimum 2 years, maximum 5 years MSc Part Time study with Full Time placement - minimum 3 years, maximum 5 years |
| QAA subject benchmark statement/s which apply to the programme: | Masters' degrees in computing (2011) http://www.qaa.ac.uk/Publications/InformationAndGuidance/Documents/QAA386_Computing.pdf |
| Professional accreditation attached to the programme: | BCS accreditation for Chartered IT Professional Further Learning (http://www.bcs.org/category/10972) Partial BCS accreditation for Chartered Engineer (http://www.bcs.org/category/16268) |
| University Regulations: | The programme conforms to the University Regulations for the year of entry as published/archived at: http://www.brookes.ac.uk/regulations/ |

SECTION 2: WHY STUDY THIS PROGRAMME?

Software is at the heart of the modern world and drives computer systems. To be effective, computer systems require robust, reliable and efficient software of a high quality. Studying Software Engineering equips students with the skills needed to produce high quality software, regardless of the area in which the software is to be used. The MSc in Software Engineering degree course is designed to teach a professional approach to the entire process of developing software, from the initial gathering of requirements, through the design of the functionality and human interface, to the implementation of the final product.

In addition to the normal award of an MSc, the course is offered with the awards of Postgraduate Diploma and Postgraduate Certificate for those who wish to learn a particular aspect of the discipline. Students who have previous experience of research and study methods, and wish to undertake study which is linked to a particular aspect of their employment, also have the opportunity to study for a Postgraduate Certificate Software Engineering Research Project.

The design of our programmes is informed by state-of-the-art research being undertaken in the department. For example, Professor Hong Zhu and Dr Ian Bayley are internationally renowned academics, outstanding in the fields of design patterns, requirements engineering and software testing. Students on the course will also be given the opportunity to undertake an intensive course on compiler construction from one of Europe's leading authorities in the field.

The programme is designed to produce successful software engineers who will have an understanding of software engineering principles and their application, design skills, knowledge of good management practice, computing science and mathematical formalism.

The MSc course is structured to provide a coherent programme of study in software engineering, building upon the students' previous knowledge in computing, which will enable students to apply advanced processes and techniques used in engineering software solutions. Students will have covered the theoretical knowledge in lectures and will have used this knowledge to extend their practical and technical skills in the practical sessions. Students will have been given the opportunity to undertake research on key concepts in software engineering under guidance from staff in the department's Dependable Systems Research Centre. The dissertation will provide an opportunity to put into practice the range of theory and practical skills that have been acquired.

The Postgraduate Diploma course is structured to provide a coherent programme of study in software engineering, building upon the students' previous knowledge in computing, which will enable students to apply advanced processes and techniques used in engineering software solutions. Students will have covered the theoretical knowledge in lectures and will have used this knowledge to extend their practical and technical skills in the practical sessions.

The Postgraduate Certificate course provides students in software engineering with opportunities to build upon the students' previous knowledge in computing to enhance their skills and expertise in their chosen area of software engineering. Students will have covered the theoretical knowledge in lectures and will have used this knowledge to extend their practical and technical skills in the practical sessions.

Please refer to the following link to view the staff profiles within the Department of Computing and Communication Technologies:

<http://cct.brookes.ac.uk/staff/index.html>

SECTION 3: PROGRAMME LEARNING OUTCOMES

On successful completion of the programme, graduates will demonstrate the following Brookes Attributes:

3.1 ACADEMIC LITERACY

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| A13 | Critically appraise emerging technologies and techniques and identify and assess the potential benefits for future systems. |
| A18 | Critically evaluate programming languages as abstraction layers in order to create optimal solutions to real world problems. |
| A19 | Critically evaluate and analyse the properties of software to determine characteristics such as efficiency, correctness and testability. |
| A22 | Analyse and apply the process and techniques necessary for the management and production of software projects, taking into consideration customer requirements, quality assurance, risk assessment, development schedules and costs. |

3.2 RESEARCH LITERACY

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| R01 | Demonstrate self-direction and originality in planning and managing a research project and synthesising relevant research based materials in the organisation of the project. |
| R03 | Critically analyse research based material and synthesise an independent perspective on the subject based on an evaluation of research techniques. |
| R06 | Analyse and review the latest research papers in the field of software engineering, identifying the most important contributions and trends. |
| R07 | Understand and participate in the process of peer review and publishing academic work. |

3.3 CRITICAL SELF-AWARENESS AND PERSONAL LITERACY

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| C01 | Evaluate and reflect on the evolution of their strengths and weaknesses across the range of subject based competences involved in the domain. |
| C02 | Participate in, and direct group activities and recognise and evaluate the importance of teamwork, time management, initiative, personal responsibility and accountability in delivering successful solutions. |
| C03 | Create solutions to problems, acting autonomously, and make decisions in challenging situations in planning, implementing and delivering tasks in a given time scale. |

3.4 DIGITAL AND INFORMATION LITERACY

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| D01 | Identify digital information sources from which information is acquired for further analysis (e.g. Open linked data, SPARQL endpoints). |
| D02 | Demonstrate effective skills and practices necessary to become a confident, agile adopter of a range of technologies for personal, academic and professional use. |
| D03 | Create a solution to a complex problem using existing, appropriate software tools. |

3.5 ACTIVE CITIZENSHIP

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| G01 | Identify and analyse risk, reliability, legal, social, environmental, professional and ethical issues relevant to research and problem solving in the domain. |
| G02 | Evaluate the impact of the development, use and maintenance of computer and communication systems in economic, political, cultural and social contexts in both national and international settings. |

SECTION 4: CURRICULUM CONTENT & STRUCTURE

4.1 PROGRAMME STRUCTURE AND REQUIREMENTS:

Requirements for an MSc:

| Code | Module Title | Credits | Level | Status | Coursework: Exam ratio |
|--------|---|---------|-------|------------------------|-------------------------------|
| P00990 | Research, Scholarship and Professional Skills | 20 | 7 | Compulsory | 100% Coursework |
| P00410 | Secure Systems Architecture | 20 | 7 | Compulsory | 50% Coursework:50% Exam |
| P00401 | <i>Advanced Software Engineering</i> | 20 | 7 | Compulsory | 50% Coursework:50% Exam |
| P00404 | <i>Advanced Software Development</i> | 20 | 7 | Compulsory | 100% Coursework |
| P00400 | Paradigms of Programming | 20 | 7 | Alternative compulsory | 100% Coursework |
| P00488 | Compiler Construction | 20 | 7 | Alternative compulsory | 100% Coursework |
| P00998 | Dissertation in Computing subjects | 60 | 7 | Compulsory | 100% Coursework |
| P00503 | Secure Programming | 20 | 7 | Compulsory | 50% Coursework:50% Exam |
| P00014 | Independent Study II | 20 | 7 | Optional | 100% Coursework |

Requirements for an MSc in Sandwich mode:

| Code | Module Title | Credits | Level | Status | Coursework: Exam ratio |
|--------|---|---------|-------|------------|-------------------------------|
| P00990 | Research, Scholarship and Professional Skills | 20 | 7 | Compulsory | 100% Coursework |
| P00410 | Secure Systems Architecture | 20 | 7 | Compulsory | 50% Coursework:50% Exam |
| P00401 | <i>Advanced Software Engineering</i> | 20 | 7 | Compulsory | 50% Coursework:50% Exam |

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| P00404 | <i>Advanced Software Development</i> | 20 | 7 | Compulsory | 100% Coursework |
| P00400 | Paradigms of Programming | 20 | 7 | Alternative compulsory | 100% Coursework |
| P00488 | Compiler Construction | 20 | 7 | Alternative compulsory | 100% Coursework |
| P00998 | Dissertation in Computing subjects | 60 | 7 | Compulsory | 100% Coursework |
| P00991 | Work Experience Project | 0 | 7 | Compulsory for students on sandwich mode | 100% Coursework |
| P00503 | Secure Programming | 20 | 7 | Compulsory | 50% Coursework:50% Exam |
| P00014 | Independent Study II | 20 | 7 | Optional | 100% Coursework |

Requirements for Postgraduate Diploma:

| Code | Module Title | Credits | Level | Status | Coursework: Exam ratio |
|--------|---|---------|-------|------------|-------------------------|
| P00990 | Research, Scholarship and Professional Skills | 20 | 7 | Compulsory | 100% Coursework |
| P00410 | Secure Systems Architecture | 20 | 7 | Optional | 50% Coursework:50% Exam |
| P00401 | <i>Advanced Software Engineering</i> | 20 | 7 | Compulsory | 50% Coursework:50% Exam |
| P00404 | <i>Advanced Software Development</i> | 20 | 7 | Compulsory | 100% Coursework |
| P00400 | Paradigms of Programming | 20 | 7 | Optional | 100% Coursework |
| P00488 | Compiler Construction | 20 | 7 | Optional | 100% Coursework |
| P00998 | Dissertation in Computing subjects | 60 | 7 | Optional | 100% Coursework |
| P00503 | Secure Programming | 20 | 7 | Optional | 50% Coursework:50% Exam |
| P00014 | Independent Study II | 20 | 7 | Optional | 100% Coursework |

Requirements for Postgraduate Certificate:

| Code | Module Title | Credits | Level | Status | Coursework: Exam ratio |
|--------|---|---------|-------|----------|-------------------------|
| P00990 | Research, Scholarship and Professional Skills | 20 | 7 | Optional | 100% Coursework |
| P00410 | Secure Systems Architecture | 20 | 7 | Optional | 50% Coursework:50% Exam |
| P00401 | <i>Advanced Software Engineering</i> | 20 | 7 | Optional | 50% Coursework:50% Exam |
| P00404 | <i>Advanced Software Development</i> | 20 | 7 | Optional | 100% Coursework |
| P00400 | Paradigms of Programming | 20 | 7 | Optional | 100% Coursework |
| P00488 | Compiler Construction | 20 | 7 | Optional | 100% |

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|--------|----------------------|----|---|----------|-------------------------------|
| | | | | | Coursework |
| P00503 | Secure Programming | 20 | 7 | Optional | 50% Coursework:50% Exam |
| P00014 | Independent Study II | 20 | 7 | Optional | 100% Coursework |

Requirements for Postgraduate Certificate Computing Research Project:

| Code | Module Title | Credits | Level | Status | Coursework: Exam ratio |
|--------|------------------------------------|---------|-------|------------|---------------------------|
| P00998 | Dissertation in Computing subjects | 60 | 7 | Compulsory | 100% Coursework |

4.2 PROGRESSION AND AWARD REQUIREMENTS

The following modules are acceptable for the programme. Students must pass all modules marked 'Compulsory', at least one module from those marked 'Alternative Compulsory' as well as meeting the university rules for postgraduate programmes.

Students studying for an MSc must complete at least 180 credits worth of modules.

Students studying for a Postgraduate Diploma must complete at least 120 credits worth of modules.

Students studying for a Postgraduate Certificate must complete at least 60 credits worth of modules.

Students who choose to progress from a Postgraduate Certificate to a Postgraduate Diploma may be required to take additional credits, over the 120 normally required for a Postgraduate Diploma, in order to ensure that they have completed all the compulsory modules for the Postgraduate Diploma.

4.3 PROFESSIONAL REQUIREMENTS

Students who pass the MSc will meet the requirements for BCS Accreditation for Chartered IT Professional Further Learning (<http://www.bcs.org/category/10972>) and partial BCS accreditation for Chartered Engineer (<http://www.bcs.org/category/16268>)

SECTION 5: TEACHING AND ASSESSMENT

Students will attend lectures to acquire the knowledge and understanding of the key concepts in both Software Engineering and computing modules.

Practical elements of the course will enable students to practice essential skills in a variety of contexts and build a wide set of experiences on which to reflect and develop professional expertise. For more technical skills, including programming, the practical elements will be based around laboratory classes, allowing students to experiment with the technology in a controlled environment. Dependent on the choice of modules, it is likely that a larger proportion of the assessment for these types of modules will be coursework.

Several modules will include an element of team working, enabling students to collaborate with their peers thus developing an awareness of their own abilities as reflected by feedback from others. Teamwork will also be used to assess the students' acquisition of personal and inter-personal skills, so important for this degree, and equally important for most career paths in the industry.

Modules have 10 learning hours per module credit. For the 20 credit taught modules, this is 200 learning hours, for the dissertation, this is 600 learning hours. Learning hours are broken down in contact and non-contact hours. For taught modules this normally consist of 4 hours contact per week, divided into 2 hours of lecture and 2 hours of practical/tutorial work. Exceptions to this are –

- P00014 Independent Study 2 – This module is guided learning and will run in a variety of modes. It is only available to students in exceptional circumstances.

- P00990 Research, Scholarship and Professional Skills – This module has 2-4 hours of lecture per week, plus seminars as needed.
- P00404 Advanced Software Development – On this module the students work in software development teams supported by staff. There are 2 hours of lecture for the first 8 weeks. The remaining 32 contact hours are allocated as tutorial and support time as needed by each development team.
- P00488 Compiler Construction – This module is run as a 1 week long intensive boot camp with additional support outside of that week.

Students on the dissertation will arrange supervision sessions with their supervisor(s) as needed. It is expected that each student will contact their supervisor(s) at least once every 2 weeks during the dissertation period.

The mix of coursework to exam will vary depending on the modules chosen and is given for each module in section 4.1. For an MSc, for the compulsory modules this will be – dissertation, P00990, P00404, P00400, P00488 – 100% coursework; P00401, P00410 – 50% coursework:50% exam.

Academic Literacy will be assessed through a mixture of examination and coursework, testing the students' ability to explain key concepts and to apply them to practical problem solving.

Research literacy is primarily assessed in the *Research, Scholarship and Professional Skills* module and the Dissertation module, but students will have learnt and practised these skills in a number of other modules.

Self-awareness and Personal Literacy will be supported through the ongoing use of reflection, which is assessed in courseworks, and culminates in the assessed reflective component of the dissertation.

Digital and Information Literacy is fundamental to the academic content of this degree and will be a distinguishing feature of graduates from the programme. In particular, the use of software tools for system development will be taught and assessed throughout many of the modules. Part of the assessment for these modules will be based on the students' ability to locate, read and evaluate appropriate documentation for software tools, as well as their ability to document their own software and system artefacts.

Effective and innovative use of ICT is also a key part of the department's strategy. The department uses a variety of VLE's (tailored to what is being taught) and makes extensive use of eBooks, online videos, podcasts and other electronic resources. The department has also developed ICT systems to help with the delivery of teaching (e.g. web accessible virtual machines, XML and SVG based teaching documentation that can be easily transformed for a variety of accessible media), learning (e.g. twitter to encourage group working, survey monkey feedback by students at the end of each lecture on the module to gauge student comprehension) and assessment (e.g. systems for automating feedback).

Graduates from this programme will develop a career in a world that is increasingly dependent on information technology and in which major social, political and economic endeavours are enabled by the technology. Students will develop an awareness of their Active Citizenship through the core modules of the programme, especially those emphasising the evolution of modern computing technology and current research directions.

By paying due regard to the Oxford Brookes University's Assessment Compact, the assessments on this programme have been designed to develop the learning of technical skills, shaped by the underlying theory and requirements of the industry. Assessment does not present students with a set of hurdles, but rather guides them through the staged acquisition of a complex set of professional skills so that, by the time they graduate, they are ready to play an effective role in their chosen career. Feedback on the assessment tasks will be provided in a timely manner, emphasising the achievement of the learning outcomes of the modules and the programme. Students will be encouraged to relate the assessment tasks with professional activities and to relate their achievements with professional standards. Where appropriate, self- and peer- assessment will be used to encourage students to involve themselves in their own professional development.

The department is committed to inclusivity and diversity in its teaching. By the very nature of the discipline, virtually all of our teaching material is available in an accessible format and, where possible, we follow best practice guidelines and make our electronic material available before the lectures. We also use electronic references and eBooks to further enhance accessibility. Inclusivity and diversity is also embedded in what we teach. All new students have a lecture on inclusivity and diversity as part of their induction, and important inclusivity and diversity topics, such as the need for accessibility and internationalisation, and how to achieve them, are taught on a variety of modules throughout the degree.

SECTION 6: ADMISSION TO THE PROGRAMME

6.1 ENTRY REQUIREMENTS

The University's standard requirements are

<http://www.brookes.ac.uk/studying-at-brookes/how-to-apply/entry-requirements/postgraduate-courses/>

Typical offers are given for:-

An Undergraduate Degree, 2.2 in computing, mathematics, engineering or a science-related subject in which good programming skills have been developed. Applicants, whose first degree is not in these areas, but who have worked in a related industry, and have obtained good relevant experience and programming skills, can also be considered.

Specific entry requirements for MSc Software Engineering, Postgraduate Diploma Software Engineering and Postgraduate Certificate Software Engineering are:-

- If the first language is not English, evidence is required of a minimum IELTS score of 6.0 or equivalent.

Specific entry requirements for Postgraduate Certificate Software Engineering Research Project are:-

- Previous relevant experience in research and study methods at the appropriate level.
- If the first language is not English, evidence is required of a minimum IELTS score of 6.0 or equivalent.

SECTION 7: PREPARATION FOR EMPLOYMENT

Graduates from the programme will be ideally equipped for a career in the computing industry. Graduates are employed across a whole range of careers, from development roles in small software houses, to the activities of IT departments in large, multinational corporations, to more specialist roles for providers of IT and telecommunications services. These include technical roles, including software design and development, specialist product support and infrastructure and security management roles.

According to research conducted by e-skills UK and the National Sector Skills Council for IT and Telecommunications, the IT professional workforce in the UK has almost doubled since 1994 and is likely to continue growing at 5-8 times the average employment growth for the coming decade. Recent graduates from this programme have been employed by, for example, Sophos, Logica, Jaguar/Land Rover and IBM. Specific job titles include Software Developer, Project Manager, Business Analyst and Web Developer.

Many modules use guest speakers from industry to illustrate the practical application of the module material. Potential employers are keen to talk to a wide spectrum of students and they will discuss the nature of their industry as well as how the students might contribute to the companies.

The Department maintains close links with the University's Careers Office. Themed 'mini' careers fairs are organised by the Department, with technology being a common theme. Students are encouraged to use the facilities offered which include CV workshops, practice interviews and assessment-centre activities.

An Industrial Liaison Board is run within the Department, with senior employees of regional and representative organisations as members. The board is consulted on major initiatives within the Department, including programme revalidations, possible research partnerships, future trends and directions and the feasibility of new course offerings.

An alumni organisation has recently been formed in the Department. The aim of this organisation is to invite ex-students, who are now in a variety of technical and managerial roles, to network with each other and with our current students. It is anticipated that this organisation will be of great benefit to students starting out in their careers, as well as for more senior alumni looking to use the skills and expertise of the staff and students in the Department.

Research centres within the Department are actively involved with Knowledge Transfer Partnerships and other links with employer organisations. One of the spin-offs from these activities is the on-campus presence of industrial-based experts in fields closely related to our degree offerings.

At the University level, there are dedicated support services both for specific groups of students, such as Oxford Brookes International and the Disability Advisory Service, and for all students such as Upgrade, the university's study skills development/support service. A full range of support services is offered to students seeking graduate roles and to those looking for placements. Support includes placement officers, and careers advisers and counsellors, and all students are strongly encouraged to take advantage of these support services.

The department has a placement support team consisting of Kashi Basu, the academic placement co-ordinator, and Andy King, the partnership and placements manager. Academics, from relevant subject areas, also act as placement supervisors and help to maintain contact between the student and the University when the student is on placement. Support also includes placement workshops, clinic sessions and talks from placement officers and careers advisers and all students are strongly encouraged to take advantage of these services. Information, on past placement recruiters and jobs adverts, will also be posted on the Department of Computing and Communication Technologies' placement dashboard on Moodle.

All placement students are allocated an academic supervisor. The supervisor will normally visit the student in the company, twice during the period of the placement. At the first visit, the supervisor ensures that appropriate training is being provided including Health and Safety training. The student will give a review of their work, supported by a log book of activities. The supervisor will also have a discussion with the industry line manager and resolve any issues that have arisen. The second visit will take place towards the end of the placement and the student will give a presentation on a selected part of their work. The student will submit a completed log book and the line manager will fill out a report to summarise their view on the student's performance. If any problems arise during the placement, the student (or the line manager) can contact the academic supervisor and additional meetings can be arranged, as required, to address and resolve the issues.