# Programme Specification

## MSc Artificial Intelligence (2018-19)

This specification provides a concise summary of the main features of the programme and the learning outcomes that a typical student might reasonably be expected to achieve and demonstrate if s/he takes full advantage of the learning opportunities that are provided.

| | |
|---|---|
| Awarding Institution | University of Southampton |
| Teaching Institution | University of Southampton |
| Mode of Study | Full-time |
| Duration in years | 1 |
| Accreditation details | British Computer Society (BCS) |
| | |
| Final award | Master of Science (MSc) |
| Name of award | Artificial Intelligence |
| Interim Exit awards | Postgraduate Certificate in Higher Education |
| | Postgraduate Diploma in Higher Education |
| | |
| FHEQ level of final award | Level 7 |
| UCAS code | N/A |
| Programme code | 4475 |
| QAA Subject Benchmark or other external reference | Master's Degrees In Computing 2011 |
| Programme Lead | Richard Watson (raw1) |

## Programme Overview

**Brief outline of the programme**

This research-led MSc takes a contemporary approach and covers the fundamental aspects of traditional symbolic and sub-symbolic aspects.

The programme will give you a solid awareness of the key concepts of artificial intelligence. You will also learn the techniques that form the current basis of machine learning and data mining. You will develop a wide-ranging skill set that supports further study or that you can use in application development.

As a result of the leading research being undertaken at Southampton, the course is able to offer a wide range of options that cover state-of-the-art modern techniques, which directly reflect research directions in ECS. These include:

- · intelligent agents
- · computer vision
- · machine learning
- · evolutionary algorithms
- · robotics
- · bio-inspired robotics
- · computational biology
- · computational finance
- · simulation modelling

Your contact hours will vary depending on your module/option choices. Full information about contact hours is provided in individual module profiles.

**Learning and teaching**

1. Staff-led lectures, demonstrations, and seminars.
2. Directed reading.
3. Student-led seminars and presentations.
4. Technical reports, including literature searches and surveys.
5. Specification, design, analysis, implementation and verification exercises.
6. Group design exercises, presentations and reports.
7. Revision for written examinations.
8. Staff and post-graduate supervision of your research project.

**Assessment**

Your achievement is assessed via written examinations and technical reports, student led presentations, design exercises and your dissertation.

# Special Features of the programme

N/A

**Please note:** As a research-led University, we undertake a continuous review of our programmes to ensure quality enhancement and to manage our resources.  As a result, this programme may be revised during a student's period of registration; however, any revision will be balanced against the requirement that the student should receive the educational service expected.  Please read our Disclaimer to see why, when and how changes may be made to a student's programme.

Programmes and major changes to programmes are approved through the University's programme validation process which is described in the University's Quality handbook.

# Educational Aims of the Programme

The aims of the programme are to enable you to:

1) Develop original ideas and solve complex problems in new or unfamiliar environments, based on advanced knowledge of the principles and methodologies of Artificial Intelligence (AI)
2) Integrate knowledge and handle complex ty in this area of computer science, formulating sound judgements with incomplete or limited data
3) Communicate your conclusions and the underpinning knowledge and rationale clearly and unambiguously to specialist and non-specialist audiences
4) Develop your independent learning skills as required for continued professional development

# Programme Learning Outcomes

## Knowledge and Understanding

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

A1.     Scientific and technological principles underlying Artificial Intelligence.

A2.     Specialist tools and techniques used to design, analyse, implement and verify AI systems.

A3.     Current research issues relevant to Artificial Intelligence.

### Teaching and Learning Methods

You will have a variety of opportunities to achieve these learning outcomes. Learning and teaching methods include:
1.      Staff-led lectures, demonstrations, and seminars.
2.      Directed reading.
3.      Student-led seminars and presentations.
4.      Technical reports, including literature searches and surveys.
5.      Specification, design, analysis, implementation and verification exercises.
6.      Group design exercises, presentations and reports.
7.      Revision for written examinations.
8.      Staff and post-graduate supervision of your research project.

### Assessment Methods

Your achievement is assessed as follows. In the case of staff-led lectures and seminars, your knowledge and understanding (outcomes A-C) is assessed through written examinations and technical reports. Your understanding of research issues, and your ability to locate and present technical information (outcome C) is assessed through student-led presentations, technical reports and written examinations, and additionally your dissertation. The research project (outcome C) is assessed through your dissertation, which must include a significant literature survey to set the context for your work, a review of your progress relative to your initial plan, and a critical evaluation and reflection.

## Subject Specific Intellectual and Research Skills

On successful completion of this programme you will be able to:

B1.     Use specialist tools and techniques to specify, design, implement and verify AI systems.

B2.     Model, simulate and analyse the behaviour of (sub-)systems at an appropriate level of detail.

B3.     Acquire new knowledge and understanding through critical reading of research material.

B4.     Apply such knowledge and understanding to specialist design problems.


**Teaching and Learning Methods**


1.      Staff-led lectures, demonstrations, and seminars.
2.      Directed reading.
3.      Student-led seminars and presentations.
4.      Technical reports, including literature searches and surveys.
5.      Specification, design, analysis, implementation and verification exercises.
6.      Group design exercises, presentations and reports.
7.      Revision for written examinations.
8.      Staff and post-graduate supervision of your research project.


**Assessment Methods**


Your achievement is assessed as follows. Your understanding of research issues, and your ability to locate and present technical information (outcome F) is assessed through student-led presentations, technical reports and written examinations, and additionally your dissertation. Your ability to design and implement AI systems, perhaps using novel techniques, (outcomes D, E, G) is developed through design exercises, and additionally your research project, and assessed through technical reports and your dissertation. These reports are expected to include a rationale for your design and implementation decisions and evidence of verification activities. The research project (outcomes F, G) is assessed through your dissertation, which must include a significant literature survey to set the context for your work, a review of your progress relative to your initial plan, and a critical evaluation and reflection.


# Transferable and Generic Skills

On successful completion of this programme you will be able to:


C1.     Use printed and on-line catalogues and databases to locate relevant technical information.

C2.     Present specialist technical information in written and verbal forms.

C3.     Work efficiently and effectively as a member of a project team.

C4.     Work independently on a significant research project.


**Teaching and Learning Methods**


1.      Directed reading.
2.      Student-led seminars and presentations.
3.      Technical reports, including literature searches and surveys.
4.      Specification, design, analysis, implementation and verification exercises.
5.      Group design exercises, presentations and reports.

6.      Staff and post-graduate supervision of your research project.

**Assessment Methods**

Your achievement is assessed as follows. Your understanding of research issues, and your ability to locate and present technical information (outcomes H, I) is assessed through student-led presentations, technical reports and written examinations, and additionally your dissertation. Students are expected to maintain log-books that demonstrate their contribution to group projects (outcome J), and these may also be assessed. The research project (outcomes H, I, K) is assessed through your dissertation, which must include a significant literature survey to set the context for your work, a review of your progress relative to your initial plan, and a critical evaluation and reflection

# Programme Structure

The programme structure table is below:

Information about pre and co-requisites is included in individual module profiles.

**Part I**

Typical course content

The programme consists of eight taught modules, each worth 7.5 ECTS credit points (15 CATS) and an individual research project worth 30 ECTS credit points (60 CATS). Three compulsory modules cover core material for artificial intelligence. Another compulsory module prepares you for your individual research project. Four optional modules can be selected to tailor the programme to your interests. Your research project will enable you to explore in depth some aspect of artificial intelligence: for example you might investigate and evaluate a new AI method, technique or tool, or some key technology underpinning an AI application.

Programme details

The programme runs over three semesters. The first semester consists of three compulsory modules and one optional module. The second semester consists of the compulsory Project Preparation module and three optional modules. All modules are at level 6 or 7 but at most 15 ECTS (30 CATS) can be taken at level 6. Exceptionally well-prepared students may take a relevant option instead of a compulsory module; this requires written permission from their tutor and programme leader. Following the first two semesters of the taught component of the programme, the students will undertake a research project which will be assessed by a degree dissertation.

There are two variations of Machine Learning in semester 1, COMP6245 and COMP6246. One of these should be taken. COMP6245 'Foundations' has a deeper focus on the mathematical foundations of machine learning and aims to serve as a launching point for further study. The practical parts of 'Foundations' focus on understanding how to implement machine learning techniques and understanding how those techniques work. COMP6246 'Technologies' has a technological focus, and allows students to get hands-on experience with modern machine learning techniques. Students studying 'Technologies' will be taught how to use machine learning libraries and tools, and will be expected

to achieve a conceptual understanding of how the different techniques work, as well as an understanding of their advantages and disadvantages. COMP6245 and COMP6246 are mutually exclusive; it is not possible to take both modules. Note that some semester 2 modules have COMP6245 or COMP6246 as a prerequisite (see the module specifications). For 'Foundations' it is assumed that students have prior knowledge of linear algebra (including matrix operations), Calculus (including partial differentiation), probability and statistics. For 'Technologies' students should be comfortable with basic linear algebra and the fundamental concepts of Calculus.

Most modules are shared with our Master of Engineering programmes in Computer Science and our specialist MSc programmes. It should be noted that it may not be possible to run some optional modules if the number of students registered on the module is very small. It should also be noted that optional module choice can be restricted by the University Timetable, which varies from year to year: some optional modules may clash with other optional or compulsory modules. Please be aware that many modules are shared between different cohorts; the class size depends on cohort size, which varies from year to year.

Examinations are held at the end of Semester 1 (January) and at the end of Semester 2 (May/June). Students who have successfully completed 30 ECTS (60 CATS) or 60 ECTS (120 CATS) at the level of the award may exit with a Postgraduate Certificate or Postgraduate Diploma, respectively.

The following is the normal pattern of study for a full-time student, completing the programme within 12 calendar months.

Semester 1:
Four modules, including Foundations of AI, Intelligent Agents and Machine Learning and one optional module. Examinations are held in January.

Semester 2:
Four modules, including Project Preparation and three optional modules. Examinations are held in May/June.

Summer/Semester 3:
You will undertake a research project lasting 3 to 4 months, which is assessed by a 15,000 word dissertation.

The programme structure, including the compulsory and optional modules for each semester, is summarised below. Semester 2 modules may have a semester 1 pre-requisite, which can be checked in the module specifications, hence the choice of semester 1 options can affect the options available in semester 2.

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SEMESTER 1 - select one optional module

COMP6203 - compulsory
COMP6231 - compulsory
COMP6245 or COMP6246 - compulsory
COMP6202 - optional
COMP6223 - optional
ELEC3201 - optional
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SEMESTER 2 - select three optional modules

ELEC6211 - compulsory
COMP3212 - optional
COMP6207 - optional
COMP6208 - optional
COMP6211 - optional
COMP6212 - optional
COMP6215 - optional
COMP6216 - optional
COMP6237 - optional
COMP6247 - optional
COMP6248 - optional
COMP6241 - optional
ELEC6212 - optional
ELEC6213 - optional

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SUMMER

COMP6200 - core
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### Part I Compulsory

| Code | Module Title | ECTS | Type |
| --- | --- | --- | --- |
| COMP6231 | Foundations of Artificial Intelligence | 7.5 | Compulsory |
| COMP6203 | Intelligent Agents | 7.5 | Compulsory |
| ELEC6211 | Project Preparation | 7.5 | Compulsory |

### Part I Compulsory Optional

You must select only one variation of Machine Learning (MSc).

| Code | Module Title | ECTS | Type |
| --- | --- | --- | --- |
| COMP6245 | Foundations of Machine Learning (MSc) | 7.5 | Compulsory |
| COMP6246 | Machine Learning Technologies (MSc) | 7.5 | Compulsory |

### Part I Core

| Code | Module Title | ECTS | Type |
| --- | --- | --- | --- |
| COMP6200 | MSc Project | 30 | Core |

### Part I Optional

Select one semester 1 module (7.5 ECTS/15 CATS) and three semester 2 modules (22.5 ECTS/45 CATS) from the following:

| Code | Module Title | ECTS | Type |
| --- | --- | --- | --- |
| COMP6241 | Advanced Topics in Human-Systems Interaction | 7.5 | Optional |
| COMP6237 | Data Mining | 7.5 | Optional |
| COMP6248 | Deep Learning | 7.5 | Optional |

| COMP6247 | Reinforcement and Online Learning | 7.5 | Optional |
|---|---|---|---|
| COMP6207 | Advanced Intelligent Agents | 7.5 | Optional |
| COMP6208 | Advanced Machine Learning | 7.5 | Optional |
| ELEC6212 | Biologically Inspired Robotics | 7.5 | Optional |
| COMP6211 | Biometrics | 7.5 | Optional |
| COMP3212 | Computational Biology | 7.5 | Optional |
| COMP6212 | Computational Finance | 7.5 | Optional |
| COMP6223 | Computer Vision (MSc) | 7.5 | Optional |
| COMP6202 | Evolution of Complexity | 7.5 | Optional |
| ELEC6213 | Image Processing | 7.5 | Optional |
| ELEC3201 | Robotic Systems | 7.5 | Optional |
| COMP6215 | Semantic Web Technologies | 7.5 | Optional |
| COMP6216 | Simulation Modelling for Computer Science | 7.5 | Optional |

## Progression Requirements

The programme will follow the University's regulations for *Progression, Determination and Classification of Results: Undergraduate and Integrated Masters Programmes* or the University's regulations for *Progression, Determination and Classification of Results: Standalone Masters Programmes* as set out in the General Academic Regulations in the University Calendar: http://www.calendar.soton.ac.uk/sectionIV/sectIV-index.html

## Support for student learning

There are facilities and services to support your learning some of which are accessible to students across the University and some of which will be geared more particularly to students in your particular Faculty or discipline area.

The University provides:
- library resources, including e-books, on-line journals and databases, which are comprehensive and up-to-date; together with assistance from Library staff to enable you to make the best use of these resources
- high speed access to online electronic learning resources on the Internet from dedicated PC Workstations onsite and from your own devices; laptops, smartphones and tablet PCs via the Eduroam wireless network. There is a wide range of application software available from the Student Public Workstations.

- computer accounts which will connect you to a number of learning technologies for example, the Blackboard virtual learning environment (which facilitates online learning and access to specific learning resources)
- standard ICT tools such as Email, secure filestore and calendars.
- access to key information through the MySouthampton Student Mobile Portal which delivers timetables, Module information, Locations, Tutor details, Library account, bus timetables etc. while you are on the move.
- IT support through a comprehensive website, telephone and online ticketed support and a dedicated helpdesk in the Hartley Library.
- Enabling Services offering support services and resources via a triage model to access crisis management, mental health support and counselling. Support includes daily Drop In at Highfield campus at 13.00 – 15.00 (Monday, Wednesday and Friday out of term-time) or via on-line chat on weekdays from 14.00 – 16.00. Arrangements can also be made for meetings via Skype.
- assessment and support (including specialist IT support) facilities if you have a disability, long term health problem or Specific Learning Difficulty (e.g. dyslexia).
- the Student Services Centre (SSC)  to assist you with a range of general enquiries including financial matters, accommodation, exams, graduation, student visas, ID cards
- Career and Employability services, advising on job search, applications, interviews, paid work, volunteering and internship opportunities and getting the most out of your extra-curricular activities alongside your degree programme when writing your CV
- Other support that includes health services (GPs), chaplaincy (for all faiths) and 'out of hours' support for students in Halls and in the local community, (18.00-08.00)
- A Centre for Language Study, providing assistance in the development of English language and study skills for non-native speakers.

The Students' Union provides
- an academic student representation system, consisting of Course Representatives, Academic Presidents, Faculty Officers and the Vice-President Education; SUSU provides training and support for all these representatives, whose role is to represent students' views to the University.
- opportunities for extracurricular activities and volunteering
- an Advice Centre offering free and confidential advice including support if you need to make an academic appeal
- Support for student peer-to-peer groups, such as Nightline.

Associated with your programme you will be able to access:

In the School you will be able to access:

· The tutorial system – you will have a personal tutor whom you can meet on request for advice on your programme and choice of options, or for pastoral support
· A mentor (usually a postgraduate student who has previously taken the course) that sees you weekly
· The ECS senior tutor who provides additional pastoral support
· ECS computer workstations, with a range of manuals and books
· Specialist project laboratories
· Personal email account and web access, including use of on-line collaboration tools
· Helpdesk (programming advisory)
· There are systems for the support of student learning in ECS as well as available from demonstrators who provide additional support for your design projects
· A web-site for each taught module, typically with teaching materials

# Methods for evaluating the quality of teaching and learning

You will have the opportunity to have your say on the quality of the programme in the following ways:

· Completing student evaluation questionnaires for each module of the programme
· Acting as a student representative on various committees, e.g. Staff: Student Liaison Committees, Faculty Programmes Committee OR providing comments to your student representative to feedback on your behalf.
· Serving as a student representative on Faculty Scrutiny Groups for programme validation
· Taking part in programme validation meetings by joining a panel of students to meet with the Faculty Scrutiny Group

The ways in which the quality of your programme is checked, both inside and outside the University, are:

·        Regular module and programme reports which are monitored by the Faculty.
·        Programme validation, normally every five years.
·        External examiners, who produce an annual report.
·        Professional body accreditation/inspection (when applicable)
·        A national evaluation of research – which is relevant since our research activity contributes directly to the quality of your learning experience.
·        Higher Education Review by the Quality Assurance Agency.


Further details on the University's quality assurance processes are given in the *Quality Handbook.*


# Career Opportunities

Graduates from our MSc programme are employed worldwide in development and consultancy roles in a number of leading companies at the forefront of information technology; and some have gone on to doctoral study and University careers, while others have been involved in IT start-ups.  ECS runs a dedicated careers hub which is affiliated with over 100 renowned companies like IBM, ARM, Microsoft Research, Imagination Technologies, Nvidia, Samsung and Google to name a few. Visit our careers hub for more information.


# External Examiner(s) for the programme

Name:          Professor George Coghill - University of Aberdeen


Students must not contact External Examiner(s) directly, and external examiners have been advised to refer any such communications back to the University. Students should raise any general queries about the assessment and examination process for the programme with their Course Representative, for consideration through Staff: Student Liaison Committee in the first instance, and Student representatives on Staff: Student Liaison Committees will have the opportunity to consider external examiners' reports as part of the University's quality assurance process.

External examiners do not have a direct role in determining results for individual students, and students wishing to discuss their own performance in assessment should contact their Personal Academic Tutor in the first instance.


**Please note:** This specification provides a concise summary of the main features of the programme and the learning outcomes that a typical student might reasonably be expected to achieve and demonstrate if s/he takes full advantage of the learning opportunities that are provided. More detailed information can be found in the programme handbook.

# Appendix 1:

Students are responsible for meeting the cost of essential textbooks, and of producing such essays, assignments, laboratory reports and dissertations as are required to fulfil the academic requirements for each programme of study. In addition to this, students registered for this programme also have to pay for:

**Additional Costs**

| Type | Details |
|---|---|
| Stationery | You will be expected to provide your own day-to-day stationary items, e.g. pens, pencils, notebooks, etc). Any specialist stationery items will be specified under the Additional Costs tab of the relevant module profile. |
| Textbooks | Where a module specifies core texts these should generally be available on the reserve list in the library. However due to demand, students may prefer to buy their own copies. These can be purchased from any source.<br><br>Some modules suggest reading texts as optional background reading. The library may hold copies of such texts, or alternatively you may wish to purchase your own copies. Although not essential reading, you may benefit from the additional reading materials for the module. |
| Approved Calculators | Candidates may use calculators in the examination room only as specified by the University and as permitted by the rubric of individual examination papers. The University approved models are Casio FX- 570 and Casio FX-85GT Plus. These may be purchased from any source and no longer need to carry the University logo. |
| Printing and Photocopying Costs | In the majority of cases, coursework such as essays; projects; dissertations is likely to be submitted on line. However, there are some items where it is not possible to submit on line and students will be asked to provide a printed copy. |

In some cases you'll be able to choose modules (which may have different costs associated with that module) which will change the overall cost of a programme to you. Details of such costs will be listed in the Module Profile. Please also ensure you read the section on additional costs in the University's Fees, Charges and Expenses Regulations in the University Calendar available at www.calendar.soton.ac.uk.