

MEng Artificial Intelligence
For students entering Part 1 in 2013/4

UCAS code: GH7P

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| Awarding Institution: | University of Reading |
| Teaching Institution: | University of Reading |
| Relevant QAA subject Benchmarking group(s): | Computing, Engineering |
| Faculty: | Science Faculty |
| Programme length: | 4 years |
| Date of specification: | 22/Jul/2014 |
| Programme Director: | Dr John Bowen |
| Programme Advisor: | Dr Richard Mitchell |
| Board of Studies: | UG Systems Engineering |
| Accreditation: | British Computer Society Institute of Engineering and Technology (IET) Institution of Measurement and Control (InstMC) |

Summary of programme aims

The programme aims to give a thorough degree level understanding of intelligence and intelligent systems. Drawing on the animal aspects of intelligence, involving psychology and cognition, the programme covers the intelligent control of robots and machines, as well as the use of naturally inspired algorithms to solve complex real-world problems.

The programme aims to combine an understanding of intelligent systems in general, both technological and biological, with a knowledge of relevant modern technologies, theories and techniques; to produce good practically oriented graduates whose systems grounding allows them to work in an academic, research or industrial environment, as individuals or as part of a team.

This MEng programme gives in-depth coverage of Artificial Intelligence, fulfilling all of the educational requirements necessary to achieve Chartered Engineer (CEng) and Chartered IT Professional (CITP) status.

Transferable skills

During the course of their studies at Reading, all students will be expected to enhance their academic and personal transferable skills. In following this programme, students will have had the opportunity to develop such skills, in particular relating to communication, interpersonal skills, learning skills, numeracy, self-management, use of IT and problem-solving and will have been encouraged to further develop and enhance the full set of skills through a variety of opportunities available outside their curriculum.

As part of this programme students are expected to have gained experience and show competence in the following transferable skills: IT (word-processing, using standard and mathematical software, scientific programming), scientific writing, oral presentation, team-working, problem-solving, use of library resources, time-management, career planning and management, and business awareness.

Programme content

The profile which follows states which modules must be taken (the compulsory part), together with one or more lists of modules from which the student must make a selection (theselected modules). Students must choose such additional modules as they wish, in consultation with their programme adviser, to make 120 credits in each Part. The number of credits for each module is shown after its title.

Part 1 (three terms)

Compulsory modules

| <i>Code</i> | <i>Module title</i> | <i>Credits</i> | <i>Level</i> |
|-------------|---------------------------|----------------|--------------|
| SE1PR11 | Programming | 20 | 4 |
| SE1SE11 | Software Engineering | 20 | 4 |
| SE1CA11 | Computer Applications | 20 | 4 |
| SE1CC11 | Cybernetics and Circuits | 20 | 4 |
| SE1FC11 | Fundamentals of Computing | 20 | 4 |

Students with A-level Maths grade B or above (or equivalent) must take:

| | | | |
|---------|-------------------------|----|---|
| SE1EM11 | Engineering Mathematics | 20 | 4 |
|---------|-------------------------|----|---|

Otherwise students must take:

| | | | |
|---------|----------------------------------|----|---|
| SEIMC12 | Mathematics for Computer Science | 20 | 4 |
|---------|----------------------------------|----|---|

Part 2 (three terms)

Compulsory modules

| <i>Code</i> | <i>Module title</i> | <i>Credits</i> | <i>Level</i> |
|-------------|--|----------------|--------------|
| SE2SM11 | System Design and Project Management | 20 | 5 |
| SE2SP11 | Signal Processing | 20 | 5 |
| SE2EM11 | Embedded Microprocessors and Digital Systems | 20 | 5 |
| SE2DB11 | Databases | 10 | 5 |
| SE2NE11 | Neuroscience | 10 | 5 |
| SE2NN11 | Neural Networks | 10 | 5 |
| SE2MI11 | Machine Intelligence | 10 | 5 |

Optional modules:

| | | | |
|----------|-------------------------------------|----|---|
| SE2EA 11 | Essential Algorithms | 10 | 5 |
| SE2JA 11 | Java | 20 | 5 |
| SE2RS11 | Robotic Systems | 10 | 5 |
| LA1XX1 | Institution Wide Language Programme | 20 | 4 |

Part 3 (three terms)

Compulsory modules

| <i>Code</i> | <i>Module title</i> | <i>Credits</i> | <i>Level</i> |
|-------------|--|----------------|--------------|
| SE3GP11 | MEng Group Project | 40 | 6 |
| SE3SL11 | Social, Legal and Ethical Aspects of Science and Engineering | 10 | 6 |
| SE3LM11 | Law and Management | 10 | 6 |
| SE3CN11 | Computer Networking | 20 | 6 |
| SE3MH11 | Modern Heuristics | 10 | 6 |
| SE3EC11 | Evolutionary Computation | 10 | 6 |

Optional modules

Select modules worth 20 credits from:

| | | | |
|---------|---------------------------------------|----|---|
| SE3MM11 | Machines in Motion | 10 | 6 |
| SE3VR11 | Virtual Reality | 10 | 6 |
| SE3IA11 | Image Analysis | 10 | 6 |
| SE3SE11 | Sustainable Electrical Energy | 10 | 6 |
| SE3CM14 | Computational Methods in Neuroscience | 10 | 6 |
| SE3DM11 | Data Mining | 10 | 6 |

Part 4 (three terms)

Compulsory modules

| <i>Code</i> | <i>Module title</i> | <i>Credits</i> | <i>Level</i> |
|-------------|--|----------------|--------------|
| SEMSI14 | Swarm Intelligence and Artificial Life | 10 | 7 |

| | | | |
|-------------------|--------------------------|----|---|
| SEMM14 | Mind as Motion | 10 | 7 |
| SEMNN14 | Advanced Neural Networks | 10 | 7 |
| <i>And either</i> | | | |
| SE4IP11 | Industrial Project | 60 | 7 |
| <i>or both</i> | | | |
| SE4RP11 | Research Project | 50 | 7 |
| SEMRS14 | Research Studies | 10 | 7 |

Optional modules

Select modules worth 30 credits from:

| | | | |
|---------|-------------------------------------|----|---|
| SEMMI14 | Medical Image and Signal Processing | 10 | 7 |
| SEMMI14 | Visual Intelligence | 10 | 7 |
| SEMSP12 | Signal Processing | 10 | 7 |
| MMM038 | Practice of Entrepreneurship | 20 | 7 |

Progression requirements

In order to progress from Part 1 to Part 2, a student shall normally be required to achieve the following at Part 1:

- an overall weighted average of 40% over 120 credits; and
- a mark of at least 40% in individual modules amounting to not less than 100 credits; and
- a mark of at least 30% in individual modules amounting to not less than 120 credits.

Students who have failed or are not qualified to progress to Part 2 are permitted one re-sit examination in each failed module. The mark used for the purposes of progression will be the higher of the mark obtained in the original examination and the mark obtained in the re-examination.

Students who do not meet the above requirement but gain a threshold performance at Part 1 may be eligible to transfer to another programme or to leave with a CertHE. To gain a threshold performance at Part 1 a student shall normally be required to achieve:

- an overall average of 40% over 120 credits taken in Part 1; and
- a mark of at least 30% in individual modules amounting to not less than 100 credits.

In order to progress from Part 2 to Part 3, a student shall normally be required to achieve the following in Part 2:

- an overall weighted average of at least 50% over 120 credits; and
- a mark of at least 40% in individual modules amounting to not less than 100 credits; and
- a mark of at least 30% in individual modules amounting to not less than 120 credits.

Students who fail to progress are permitted one re-sit examination in each module in which they obtain less than 50%. For any module attempted in a re-sit examination the maximum mark carried forward into the final degree classification will be the higher of (a) the first attempt mark and (b) the lower of 40 and the mark achieved in the re-examination.

Students who do not meet the above requirements for progression to Part 3 but gain a threshold performance may be eligible to transfer to another programme or leave with a DipHE. To gain a threshold performance at Part 2 a student shall normally be required to achieve:

- an overall average of 40% over 120 credits taken in Part 2; and
- a mark of at least 40% in individual modules amounting to not less than 80 credits; and
- a mark of at least 30% in individual modules amounting to not less than 120 credits.

In order to progress from Part 3 to Part 4, a student shall normally be required to achieve the following in Part 3:

- an overall weighted average of at least 50% over 120 credits, and
- a mark of at least 40% in individual modules amounting to not less than 100 credits;
- a mark of at least 30% in individual modules amounting to not less than 120 credits;
- a mark of at least 40% in SE3GP11 project module.

Students who fail to progress are permitted one re-sit examination in each module in which they obtain less than 50%. For any module attempted in a re-sit examination the maximum mark carried forward into the final degree classification will be the higher of (a) the first attempt mark and (b) the lower of 40 and the mark achieved in the re-examination.

Students who do not meet the above requirements for progression to Part 4 will be eligible for the award of BSc/BEng if they achieve:

- a mark of at least 40% in individual modules amounting to not less than 80 credits; and
- a mark of at least 40% in the Part 3 major project module.

To be eligible for honours, a student shall normally be required to have satisfied all of the above progression requirements and to achieve the following in Part 4:

- a mark of at least 50% in individual modules amounting to not less than 80 credits;
- a mark of at least 50% at first attempt in the Part 4 major project module.

In addition students must achieve a 2:2 or above in order to graduate with an IET and InstMC accredited degree. Students who fail the degree are permitted one re-sit examination (for a Pass degree) in each Part 4 module in which they have achieved less than 50%. For any such module which is attempted in a re-examination, the mark carried forward into the final degree assessment will be the higher of the original mark and the mark in the re-examination.

Assessment and classification

The University's honours classification scheme is:

| <i>Mark</i> | <i>Interpretation</i> |
|-------------|------------------------|
| 70% - 100% | First class |
| 60% - 69% | Upper Second class |
| 50% - 59% | Lower Second class |
| 40% - 49% | Third class |
| 35% - 39% | Below Honours Standard |
| 0% - 34% | Fail |

For the University-wide framework for classification, which includes details of the classification method, please see: www.reading.ac.uk/internal/exams/Policies/exa-class.aspx.

The weighting of the Parts/Years in the calculation of the degree classification is

Integrated Masters programmes

Part 2 20%
Part 3 40%
Part 4 40%

Teaching is organised in modules that typically involve lectures and tutorial or laboratory practicals. Most modules are assessed by a mixture of coursework and formal examination. Some modules, for example the Part 3 project, are assessed only as coursework. Details are given in the relevant module description.

Admission requirements

Entrants to this programme are normally required to have obtained:

Grade B or better in Combined Science and grade B or better in Mathematics at GCSE; and achieved

Grades AAB in three A level subjects including a grade A in Maths and a science.

International Baccalaureate: 35 points overall including 6,6 in Maths and a science both at higher level.

Admissions Tutor: Dr Etienne Roesch

Support for students and their learning

University support for students and their learning falls into two categories. Learning support is provided by a wide array of services across the University, including: the University Library, the Careers, Placement and Experience Centre (CPEC), In-session English Support Programme, the Study Advice and Mathematics Support Centre teams, IT Services and the Student Access to Independent Learning (S@il) computer-based teaching and learning facilities. There are language laboratory facilities both for those students studying on a language degree and for those taking modules offered by the Institution-wide Language Programme. Student guidance and welfare support is provided by Personal Tutors, School Senior Tutors, the Students' Union, the Medical Practice and advisers in the Student Services Centre. The Student Services Centre is housed in the Carrington Building and offers advice on accommodation, careers, disability, finance, and wellbeing, academic

issues (eg problems with module selection) and exam related queries. Students can get key information and guidance from the team of Helpdesk Advisers, or make an appointment with a specialist adviser; Student Services also offer drop-in sessions and runs workshops and seminars on a range of topics. For more information see www.reading.ac.uk/student

Within the providing School additional support is given through practical laboratory classes. The development of problem-solving skills is assisted by appropriate assignment and project work. There is a Programme Adviser to offer advice on the choice of modules within the programme. Course handbooks are provided for each Part of the course: these give more details about the modules which make up the degree. In addition, the School produces a Handbook for Students, which provides general information about the staff and facilities within the School.

Career learning

In the School of Systems Engineering (SSE), students are given strong support on career management/learning throughout their course.

- Students are introduced to the Placement & Careers Team in their fresher's week, where they receive information of how the team supports their Careers/Placement.
- At the end of their first year all students attend a one week intensive course, where a combination of presentations and workshops take place in: Placement/Graduate Job Search, using Social Media, Application Preparation & Research, Writing CVs & Covering Letters and completing Application Forms, Psychometric Testing (Numerical, Verbal & Diagrammatical Reasoning Tests), Competency Based Interviewing, Group Exercises & Presentations and Placement Presentations from 40+ employers.
- In the second year, students are prepared and encouraged to apply for a placement (either a three month summer Internship or a 12 month Industry placement).
- In the final year, students' graduate applications are supported by the Placement & Career Team with the following activities:
 1. Organising an SSE Placement/Graduate Fair & Company presentations and source Placement & Graduate positions and send these out to the students
 2. Arranging on site Interviews, Selection Skill Workshops with Employers & Placement Team
 3. 1 - 1 Career/Placement support meetings (Monday & Tuesday 9:30 to 12 and Thursday 2 to 4:30 pm)

Career prospects

Career prospects are good as the course is very relevant to today's high technology society and, because the course is not dependent upon any one industry, graduates are employed in a variety of areas. Some graduates join large companies, often IT based companies; others join smaller companies and consultancies; and some choose to further their research interests either in the School or at other Universities.

Opportunities for study abroad

As part of the degree programme students have the opportunity to study abroad at an institution with which the University has a valid agreement.

Placement opportunities

Placement opportunities are available as part of the Industrial Project module.

Programme Outcomes

The programme provides opportunities for students to develop and demonstrate knowledge and understanding, skills, qualities and other attributes in the following areas:

Knowledge and Understanding

A. Knowledge and understanding of:

1. Appropriate mathematical techniques.
2. Information technology.
3. Design of systems.
4. Aspects of computer and human intelligence.
5. Business context.
6. Engineering practice.

Teaching/learning methods and strategies

The knowledge required for the basic topics is obtained via lectures, tutorials, laboratory practicals, assignments and project work. Appropriate IT packages are taught. Laboratory demonstrators and project supervisors advise students, and feedback is provided on all continually assessed work. As the course progresses students are expected to

show greater initiative.

Assessment

Most knowledge is tested through a combination of practicals, assignments and formal examinations. Students write reports on many assignments after Part 1, and may also make oral presentations of their work.

Skills and other attributes

B. Intellectual skills - able to:

1. Select and apply appropriate scientific principles, mathematics and computer based methods for analysing systems.
2. Organise tasks into a structured form.
3. Understand the evolving state of knowledge in a rapidly developing area.
4. Transfer appropriate knowledge and methods from one topic within the subject to another.
5. Plan, conduct and write a report on a project or assignment.
6. Prepare and give an oral presentation.

C. Practical skills - able to:

1. Use appropriate mathematical methods or IT tools;
2. Program a computer to solve problems;
3. Use relevant laboratory equipment; and analyse the results critically;
4. Manage a project;
5. Present work.
6. Conduct research in intelligent systems.

D. Transferable skills - able to:

1. Use IT tools
2. Acquire, manipulate and process data;
3. Use creativity and innovation;
4. Solve problems;
5. Communicate scientific ideas;
6. Give oral presentations;
7. Work as part of a team;
8. Use information resources;
9. Manage time.

Teaching/learning methods and strategies

Appropriate mathematical, scientific and IT skills and tools are taught in lectures and problems to be solved are given as projects or assignments. Written and oral presentations are required for various assignments and projects.

Assessment

1-4 (see left box) are assessed partly by examination and partly by project or assignment work. 5 and 6 are assessed as part of project work.

Teaching/learning methods and strategies

Mathematics and IT tools are introduced in lectures and their use is assessed by examinations and assignments. Programming assignments are set and students may write programs as part of other projects. Laboratory practicals and projects are used for 3 and projects are used for 4, 5 and 6.

Assessment

1 is tested in coursework and in examinations. 2, 5 and 6 are tested by assignments and projects. 3 is assessed by practicals and sometimes in projects. 4 is assessed through project work. 6 is also assessed in many Part 4 modules.

Teaching/learning methods and strategies

IT methods are taught partly in lectures, but mainly through laboratory sessions and assignments. Data skills are acquired in the laboratory and through project work. Creativity, innovation, problem solving, team working, time management and presentations are learnt in projects. Use of information resources such as the library and IT is learnt through projects and assignments.

Assessment

Some skills such as the ability to use IT tools and the ability to communicate orally and in written form are directly assessed in assignments or projects. Other skills such as time management are not directly assessed but their effective use will enhance a student's overall performance.

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 he/she takes full advantage of the learning opportunities that are provided. More detailed information on the learning outcomes, content and teaching, learning and assessment methods of each module can be found in the module description and in the programme handbook. The University reserves the right to modify this specification in unforeseen circumstances, or where the process of academic development and feedback from students, quality assurance process or external sources, such as professional bodies, requires a change to be made. In such circumstances, a revised specification will be issued.