Plymouth University

Faculty of Science and Engineering
School of Computing Electronics and Mathematics

Programme Specification

MSc Robotics (2558)

September 2016
1. MSc Robotics

**Final award title:** MSc Robotics

**Level 7 Intermediate award title(s)**

- PgCert award requires a minimum of 60 credits
- PgDip award requires a minimum of 120 credits

**UCAS code – n/a**
**JACS code – H670**

2. **Awarding Institution:** University of Plymouth

   **Teaching institution(s):** University of Plymouth

3. **Accrediting body(ies)** IET

   **Summary of specific conditions/regulations:**
   A high fraction of assessment through exams / in-class test, including open problem-solving questions.

   **Date of re-accreditation:** 2015/2016

4. **Distinctive Features of the Programme and the Student Experience**

   The programme includes a mix of topics leading to careers in academic and industry. Semester 1 covers industrial robotic manipulators, control, software engineering and sensors and actuators. Semester 2, covers research results in artificial vision, autonomy, human-robot interaction, speech interfaces and the design of cognitive systems. The project work, in semester 3, will allow the student to explore robotic solutions to current problems in research, industry and society.

   Teaching is underpinned by some of the Faculty of Science and Environment’s major research. This includes for example its Centre for Robotic and Neural Systems (CRNS) and its Marine and Industrial Dynamic Analysis (MIDAS) Research Groups. CRNS and MIDAS staffs have contacts with major UK robotics companies.

5. **Relevant QAA Subject Benchmark Group(s)**

   QAA Subject benchmark: Engineering, Computing

   The programme follows the IET UK-SPEC learning outcomes and integrates those not fully specified with additional QAA learning outcomes (e.g. Key and Transferable skills).
6. Programme Structure

This programme is offered as a one-year, full-time course and as a two-year full-time course with Industrial Placement.

- The first option comprises 3 semesters of study and leads to the awards of Master of Science (MSc).
- The second option comprises 2 semesters of study followed by 1 year of placement (min 48 weeks), followed by 1 semester of MSc Project and leads to the award of MSc accompanied by a Certificate of Professional Training.

Early exit points are PgDip and PgCert.
- The MSc award requires 60 taught credits in the Autumn semester, 60 taught credits in the Spring semester, and an MSc Project of 60 credits i.e., requires a minimum of 180 credits with a minimum mark of 50%.
- The PgCert requires a minimum of 60 taught credits (i.e., excluding the Project) with a minimum mark of 50%.
- The PgDip requires a minimum of 120 credits with a minimum mark of 50%.

The MSc award only, is categorised into following specific grades:

MSc with Distinction: This award is achieved by a student gaining an overall average mark on the programme of study of 70% and above.
MSc with Merit: This award is achieved by a student gaining an overall average mark on the programme of study between 60% and 69.99%.
MSc: This award is achieved by a student gaining an overall mark in the programme of study between 50% and 59.99%

To pass a module requires a student to achieve at least 40% in both the exam and coursework elements and at least 50% in the overall module mark, or 50% overall if a coursework only module.

MSc students will study following core modules:

<table>
<thead>
<tr>
<th>Semester</th>
<th>Module</th>
<th>Subject</th>
<th>Credit</th>
<th>E1 (%)</th>
<th>C1 (%)</th>
<th>T1 (%)</th>
<th>P1 (%)</th>
<th>A1 P/F</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1</td>
<td>ROCO503</td>
<td>Sensors and Actuators</td>
<td>20</td>
<td>50</td>
<td>50</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S1</td>
<td>AINT511</td>
<td>Topics in Intelligent Robotics</td>
<td>20</td>
<td>50</td>
<td>50</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S1</td>
<td>MECH533</td>
<td>Robotics and Control</td>
<td>20</td>
<td>50</td>
<td>50</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S2</td>
<td>SOFT561</td>
<td>Robot Software Engineering</td>
<td>20</td>
<td>70</td>
<td>30</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S2</td>
<td>AINT512</td>
<td>Science &amp; Technology of Human Robot Interaction</td>
<td>20</td>
<td>50</td>
<td>50</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S2</td>
<td>AINT513</td>
<td>Robotic Visual Perception and Autonomy</td>
<td>20</td>
<td>50</td>
<td>50</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AY</td>
<td>PROJ509</td>
<td>MSc Project</td>
<td>60</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Optional Placement (Year 2) – BPIE502 Electrical/Robotics Masters Industrial Placement
7. **Programme Aims**  
The School of Computing Electronics and Mathematics shares the values of the University and supports its mission through the provision of a range of courses relevant to the theory and practice of robotics. Namely:

1. To be informative, challenging and establish a knowledge base suitable for a future career in an engineering based industry.
2. To give students with a variety of entry qualifications an opportunity to realise their potential.
3. To enrich curriculum content and teaching quality through the professional and/or research expertise of staff and industrial links.
4. To encourage and support students whilst they develop and apply technical and generic skills that will facilitate life-long learning and continuing professional development.
5. To produce graduates and postgraduates who can make a significant contribution to their professional field or business.

**This MSc programme specifically aims:**

1. To produce postgraduates with an awareness of the current limits of knowledge in robotics and with the ability to evaluate critically current research and advanced scholarship in robotics.
2. To produce postgraduates who recognise the technical complexity and systems nature of robotics, in addition to its human and socio-economic dimension communicated through a series of invited lectures.
3. To produce postgraduates with the ability to extend first principles and apply creatively a range of skills to the solution of unique design and control robotics problems.
4. To provide postgraduates with a specialist understanding of techniques applicable in robotics, and a depth and breadth of both knowledge and skills sufficient to enable them to work in their chosen specialist subject as well as related engineering areas.
5. Professional and/or industrial training (for those taking the Industrial Placement).

8. **Programme Intended Learning Outcomes**  
On successful completion graduates should have developed:

8.1 **Knowledge and understanding**

1. a critical awareness of current problems and/or new insights, much of which is at, or informed by, the forefront of robotics;
2. a comprehensive understanding of techniques applicable to their own research or advanced scholarship in robotics;
3. originality in the application of knowledge, together with a practical understanding of how established techniques of research and enquiry are used to create and interpret knowledge in robotics;
8.2 Cognitive and intellectual skills
1. the ability to deal with complex robotics problems both systematically and creatively,
2. the ability to make sound judgements in the absence of complete data,
3. the ability to plan, conduct and report on a programme of research,
4. the ability to evaluate designs, processes or products and make improvements.
5. the ability to evaluate critically current research and advanced scholarship in robotics; and to evaluate methodologies and develop critiques of them and, where appropriate, to propose new hypotheses.

8.3 Key and transferable skills
1. the ability to communicate effectively to specialist and non-specialist audiences;
2. the ability to demonstrate self-direction and originality in tackling and solving robotics problems, and act autonomously in managing resources and time at a professional level;
3. the ability to continue to advance their knowledge and understanding of robotics, and to develop new skills to a high level;
4. the ability to work in a team

8.4 Employment related skills
qualities and transferable skills necessary for employment as a roboticist requiring:
1. the exercise of initiative and personal responsibility;
2. a systems approach to decision-making in complex and unpredictable situations;
3. an independent learning ability required for continuing professional development.

8.5 Practical skills
1. the ability to safely plan and execute a series of laboratory/workshop experiments requiring:
   • The generation of data
   • the analysis of results
   • effective literature research
   • the production of technical reports and presentations
2. the ability to use a range of computational tools and packages
3. The ability to use a range of specialist equipment.

9. Admissions Criteria, including APCL, APEL and DAS arrangements
A minimum of a lower second class honours degree (2.2) in a technical subject such as Robotics, Computing, Engineering (Mechanical / Electrical/ Electronic), Physics or Mathematics.

Students with advanced standing who can evidence an academic ability to a similar level may also be considered. All applicants should possess a minimum of grade C in English Language at GCSE level or minimum score of 6.5 in IELTS.

The following are also required: a sound understanding of mathematics (A level), basic skills in electrical engineering, basic knowledge of computer hardware and operating systems, familiarity with a programming language such as C, C++, Java or similar (refresher courses and support is available in these areas, but we need to know any support needs in advance).
APCL and APEL will be handled using standard university guidelines. The admission and assessment of students with disabilities will be considered on a case-by-case basis, in consultation with the Disability Assist Services (DAS).

An Industrial Placement is not guaranteed but assistance will be offered to find a placement. Placements should not normally start before students are fully aware of any resit/repeat requirements. This gives students the opportunity to carefully consider whether or not to withdraw from a placement if they were required to repeat modules. All resit students will be required to complete referred coursework or examinations at the same time as all other students and should be enabled to return to the University to take any referred examinations at the appropriate time. Employers will be made aware of these requirements.

10. Progression criteria for Final and Intermediate Awards
A PgCert award requires a minimum of 60 credits
A PgDip award requires a minimum of 120 credits

11. Exceptions to Regulations
none

12. Transitional Arrangements

<table>
<thead>
<tr>
<th>2015/16 module</th>
<th>2016/17 module</th>
</tr>
</thead>
<tbody>
<tr>
<td>BPIE328</td>
<td>BPIE502</td>
</tr>
</tbody>
</table>
13. Mapping and Appendices:
13.1. ILO’s against Modules Mapping

<table>
<thead>
<tr>
<th>A. Knowledge and Understanding</th>
<th>Modules</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. a critical awareness of current problems and/or new insights, much of which is at, or informed by, the forefront of robotics;</td>
<td>1 MECH533, SOFT561, AINT513, AINT512, ROCO503</td>
</tr>
<tr>
<td>2. a comprehensive understanding of techniques applicable to their own research or advanced scholarship in robotics;</td>
<td>1,2,4 MECH533, AINT513, SOFT561 AINT511,AINT512, AINT513 ROCO503, PROJ509</td>
</tr>
<tr>
<td>3. originality in the application of knowledge, together with a practical understanding of how established techniques of research and enquiry are used to create and interpret knowledge in robotics;</td>
<td>3,5 PROJ509, AINT513, SOFT561, MECH533, AINT511,AINT512, AINT513, ROCO503,</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>B. Cognitive/Intellectual Skills</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. the ability to analyse and solve complex robotics problems both systematically and creatively,</td>
<td>3,4 SOFT561, MECH533, AINT513, PROJ509</td>
</tr>
<tr>
<td>2. the ability to make sound judgements in the absence of complete data,</td>
<td>3,4 MECH533, ROCO503, AINT511, AINT512, AINT513.</td>
</tr>
<tr>
<td>3. the ability to plan, conduct and report a programme of original research,</td>
<td>4,5 PROJ509</td>
</tr>
<tr>
<td>4. the ability to evaluate designs, processes or products and make improvements.</td>
<td>1,3 PROJ509 SOFT561, MECH533, AINT511,AINT512, AINT513 ROCO503</td>
</tr>
<tr>
<td>5. the ability to evaluate critically current research and advanced scholarship in robotics; and to evaluate methodologies and, where appropriate, to propose new hypotheses</td>
<td>1,3,5 PROJ509</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>C. Key/Transferable skills</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. the ability to communicate effectively to specialist and non-specialist audiences;</td>
<td>4,5 PROJ509, AINT511,AINT512</td>
</tr>
<tr>
<td>2. the ability to demonstrate self-direction and originality in tackling and solving robotics problems, and act autonomously managing resources and time at a professional level;</td>
<td>4,5 PROJ509, AINT513, SOFT561, MECH533, AINT511,AINT513, AINT513, ROCO503</td>
</tr>
<tr>
<td>3. the ability to continue to advance their knowledge and understanding of robotics, and to develop new skills to a high level;</td>
<td>4,5 PROJ509</td>
</tr>
<tr>
<td>4. the ability to work effectively in a team</td>
<td>4 AINT511, ROCO503, MECH533</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>D. Employment related skills</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. the exercise of initiative and personal responsibility;</td>
<td>4,5 PROJ509</td>
</tr>
<tr>
<td>2. a systems approach to decision-making in complex and unpredictable situations;</td>
<td>2,3,4,5 ROCO503, AINT512, AINT513, SOFT561.</td>
</tr>
<tr>
<td>3. the independent learning ability required for continuing professional development</td>
<td>4,5 PROJ509</td>
</tr>
</tbody>
</table>
E. Practical Skills

1. The ability to safely plan and execute a series of laboratory/workshop experiments requiring:
   - the generation of data
   - the analysis of results
   - effective literature research
   - the production of technical reports and presentations

2. The ability to use a range of computational tools and packages

3. The ability to use a range of specialist equipment

<table>
<thead>
<tr>
<th>13.2 Assessment against Modules Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Semester</td>
</tr>
<tr>
<td>----------</td>
</tr>
<tr>
<td>S1</td>
</tr>
<tr>
<td>S1</td>
</tr>
<tr>
<td>S1</td>
</tr>
<tr>
<td>S2</td>
</tr>
<tr>
<td>S2</td>
</tr>
<tr>
<td>S2</td>
</tr>
<tr>
<td>AY</td>
</tr>
</tbody>
</table>

13.3 Skills against Modules Mapping
(see 13.1)

13.4 Appendices
None