Study Abroad Programme

The module description below is from the 2019/20 academic year and is subject to change, and for the use of study abroad students only.

<table>
<thead>
<tr>
<th>Module name</th>
<th>Programming and Mathematics for Artificial Intelligence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Module code</td>
<td>IN3063</td>
</tr>
<tr>
<td>School</td>
<td>SMCSE</td>
</tr>
<tr>
<td>Department or equivalent</td>
<td>Department of Computer Science</td>
</tr>
<tr>
<td>UK credits</td>
<td>15</td>
</tr>
<tr>
<td>ECTS</td>
<td>7.5</td>
</tr>
<tr>
<td>Level</td>
<td>6</td>
</tr>
<tr>
<td>Delivery location (partnership programmes only)</td>
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</table>

**MODULE SUMMARY**

Module outline and aims

The main purpose of the module is for you to gain fundamental programming and mathematical skills for studying specialist Artificial Intelligence topics. The paradigm used is object-oriented programming, and Python the guiding programming language. Other languages such as MATLAB and statistical software packages will be used as required.

The mathematics covered in the module are two-fold: (a) On the one hand, you will be introduced to linear algebra in order to understand basic programming structures used in simulation, as well as calculus methods that are at the root of training algorithms in nature-inspired Artificial Intelligence; (b) on the other hand, statistics and probability theory are used to formulate sound experimental hypotheses and designs as well as to analyse results.

You will be introduced to basic concepts of theory of computation and computational complexity, which will enable you to decide which algorithms are more efficient in modelling cognitive processes and in solving Artificial Intelligence problems.

You can see the module as a practical introduction to research methods used in Artificial Intelligence.
Content outline

1. Python for Artificial Intelligence.
2. Principles of MATLAB.
3. Linear algebra.
5. Probability theory and statistics.
6. Graph theory.
7. Abstract algebra.
8. Theory of computation, including computational complexity.

WHAT WILL I BE EXPECTED TO ACHIEVE?

On successful completion of this module, you will be expected to be able to:

Knowledge and understanding:

- Formulate Artificial Intelligence problems mathematically.
- Develop Artificial Intelligence algorithms.
- Analyse and critically evaluate the complexity of Artificial Intelligence solutions.
- Formulate and test experimental hypothesis in an Artificial Intelligence context.

Skills:

- Solve real-world practical Artificial Intelligence problems with Python.
- Demonstrate relevant knowledge of theory, practices and tools for the specification, design, implementation and evaluation of Artificial Intelligence systems.

Values and attitudes:
• Recognise the ethical issues that arise in artificial intelligence environment and use appropriate professional and legal practices.

**HOW WILL I LEARN?**

The key aspects of the module are introduced in lectures and through tutorials and laboratory sessions to support you with programming tasks and mathematical exercises. You are expected to continue to study in your own time by completing exercises, checking your efforts against solutions that are released subsequently and reading literature that is introduced in class and online. The reading list is a key resource that should form the basis of independent study. Formative feedback will be given on completion of the tasks carried out in the laboratory sessions, and in connection with self-study.

*Teaching pattern:*

<table>
<thead>
<tr>
<th>Teaching component</th>
<th>Teaching type</th>
<th>Contact hours</th>
<th>Self-directed study hours</th>
<th>Placement hours</th>
<th>Total student learning hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laboratory-based tutorials</td>
<td>Practical classes and workshops</td>
<td>10</td>
<td>40</td>
<td>0</td>
<td>50</td>
</tr>
<tr>
<td>Lectures</td>
<td>Lecture</td>
<td>20</td>
<td>80</td>
<td>0</td>
<td>100</td>
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<tr>
<td>Totals:</td>
<td></td>
<td>30</td>
<td>120</td>
<td></td>
<td>150</td>
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</table>
WHAT TYPES OF ASSESSMENT AND FEEDBACK CAN I EXPECT?

Assessments

Your work will be assessed with a written assignment (2,000 words, excluding figures and tables). The assignment will consist of incremental tasks through which you demonstrate your knowledge of how to design, implement and test Artificial Neural Networks and on which you will receive formative feedback over the duration of the module.

Assessment pattern:

<table>
<thead>
<tr>
<th>Assessment component</th>
<th>Assessment type</th>
<th>Weighting</th>
<th>Minimum qualifying mark</th>
<th>Pass/Fail?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Written assignment</td>
<td>Report</td>
<td>100</td>
<td>0</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Assessment criteria

Assessment Criteria are descriptions of the skills, knowledge or attributes you need to demonstrate in order to complete an assessment successfully and Grade-Related Criteria are descriptions of the skills, knowledge or attributes you need to demonstrate to achieve a certain grade or mark in an assessment. Assessment Criteria and Grade-Related Criteria for module assessments will be made available to you prior to an assessment taking place. More information will be available from the module leader.

Feedback on assessment

Following an assessment, you will be given your marks and feedback in line with the Assessment Regulations and Policy. More information on the timing and type of feedback that will be provided for each assessment will be available from the module leader.
Assessment Regulations

The Pass mark for the module is 50%. Any minimum qualifying marks for specific assessments are listed in the table above. The weighting of the different components can also be found above. You need to achieve a mark of 50% in each assessed component to pass. The Programme Specification contains information on what happens if you fail the module.

INDICATIVE READING LIST


