LISS1014 Introduction to Robotics and Autonomous Systems

Module Syllabus

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Module summary
Are you interested in robotics, electronics and programming? This module gives you an introduction to robotics and autonomous systems. It involves a mixture of lectures and practical work in the world-class laboratories in the Faculty of Engineering. You will explore the fundamentals of electronics and software development in relation to robotics and develop the control software for a line-following autonomous racing robot. You will also see demonstrations of a wide range of industrial and research robots within the faculty. The module includes a field trip to the Jaguar Land Rover factory, where you will see how robots are used in the car manufacturing industry. This module is suitable if you are an engineering student, or if you have some computer programming experience.

Objectives
The objective of this module is to provide students from a range of STEM background with an introduction to the design, construction and implementation of robotics and autonomous systems.

Learning outcomes
On completing this module, students will:
- Have developed proficiency in C/C++ programming
- Have gained an appreciation and understanding of embedded systems
- Understand the basic building blocks of robots and autonomous systems (RAS)
- Be able to program a microcontroller using C/C++
- Be able to develop software to control robotic platforms
- Have developed algorithms to enable autonomous behaviour
- Have gained an appreciation of the ethical considerations of the role of robots in society
- Understand the current and future trends in robotics

Teaching methods

<table>
<thead>
<tr>
<th>Delivery type</th>
<th>Number</th>
<th>Length hours</th>
<th>Student hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visit</td>
<td>1</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Independent Learning</td>
<td>1</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>Class tests, exams and assessment</td>
<td>1</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Fieldwork</td>
<td></td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Lecture</td>
<td>5</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Practical</td>
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<td>3</td>
<td>18</td>
</tr>
<tr>
<td>Private study hours</td>
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<td>41</td>
</tr>
<tr>
<td>Total Contact hours</td>
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<td></td>
<td>59</td>
</tr>
<tr>
<td>Total hours (100hr per 10 credits)</td>
<td></td>
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<td>100</td>
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</tbody>
</table>

Private study
Private study will include background reading, reading Minerva resources, working on the project code, preparing for assessment, writing an essay.
Methods of assessment

<table>
<thead>
<tr>
<th>Assessment type</th>
<th>Notes</th>
<th>% of formal assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Case Study</td>
<td>1000 words</td>
<td>40</td>
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<tr>
<td>Practical</td>
<td>Line-following robot demonstration</td>
<td>20</td>
</tr>
<tr>
<td>Practical</td>
<td>Project code submission</td>
<td>40</td>
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Late Penalties
University rules on penalties for late submission of coursework require 5 full marks to be deducted for each calendar day that passes after the date of required submission. If coursework is not submitted by the end of 14 calendar days following the prescribed deadline, a grade/mark of zero will be returned for that component.

Module outline

WEEK ONE

Monday - 8th July
Lecture – Robotics and Autonomous Systems
Lecture – Medical and Surgical Robots

Tuesday – 9th July
Lecture – Introduction to Embedded Systems
Lecture – Introduction to C/C++

Wednesday – 10th July
Lab Session – Lab 1
Lab Session – Lab 2

Thursday – 11th July
Module field trip – industrial visit

Friday – 12th July
Lab Session – Lab 3

WEEK TWO

Monday – 15th July
Lecture – Roboethics

Tuesday – 16th July
Lab Session – Lab 4
Lab Session – Lab 5
**Wednesday – 17th July**  
Tour of research laboratories in the school (TBC)

**Thursday – 18th July**  
Lab Session – Lab 6  
Assessment – Project Demonstration