### Module Description

This module is a follow on element of system modelling in Automation 2. This will provide the student with knowledge of full system modelling for both schematic and visualisation of fully automated industrial applications and cell design. The student will be able to create schematic diagrams along with 3D model to completely simulate the automated process using Automation Studio. Using this simulation software, the student will be able to analyse and optimise their circuit design along with cell layout.

This module will also provide the student with knowledge of robotics and vision theory.
- **Robotics:** Investigating robotic capability, technology and anatomy, industrial use.
- **Vision systems:** Exploring typical application areas of vision systems, as well as general machine vision information.

### Learning Outcomes

**On completion of this module the learner will/should be able to:**

1. Construct schematic diagrams for basic industrial automated applications using the correct standards in pneumatic, hydraulic, electrical, electro-pneumatics, electro-hydraulics areas using software.

2. Analyse and optimise of circuit design.

3. 3D modelling of cell design. Complete automation of cell and equipment used including valves, sensors, actuators, motors, robots etc.

4. Report the industrial uses, feasibility and cost effectiveness of robotic systems.

5. Illustrate and discuss robotics technology and anatomy.

6. Develop and simulate advanced robotic program using inputs and outputs.

7. Describe the industrial uses of vision systems.

8. Integrate robotics/vision systems with additional sensors/actuators.

### Indicative Syllabus

- **Schematic generation of pneumatic, hydraulic, electrical, electro-pneumatics, electro-hydraulics using automation studio.**
- **Analyse and optimise of circuit design.**
- **3D modelling of cell design. Complete automation of cell and equipment used including valves, sensors, actuators, motors, robots etc.**

**Industrial uses of robotic systems:** Applications, physical construction, end effector, controller, programming unit. Benefits repeatability, accuracy, speed, cost, health and safety, production.

**Describe robotics technology and anatomy:** Robotic terminology, Standard geometry of a robotic system. Type of robot pick and place, loading and unloading, robot arm configurations, linear movements, revolving movements, linear joints, revolving joints, robot design working envelope, payload, speed of operation, weight restrictions.

**Visions systems:** Applications, terminology and types of visions systems. Set up, installation and calibration of vision system hardware and software. Using vision systems to measure and read positioning of objects.
Teaching and Learning Strategy

The module is divided into theory and practical sessions.

In the theory elements students learn the fundamentals of schematic symbols and diagrams, robotics and vision. Theory elements are delivered through lecture based and online classes which the student must engage through participation in peer learning teaching techniques, observation techniques, peer reviews, active learning strategies, student centred learning discussions, and use of online learning technologies.

In the practical elements, students learn to design and simulate electrical/electro-pneumatic circuits. Also in the practical elements, the students simulate advance robotic programs using inputs and outputs and the integration of robotics with a vision system. Practical elements include:

- Structured workshops on software
- Hands-on, interactive workshops on practical elements which including working as an individual, group work, case study exercises and problem-based and design-led teaching and learning.

Independent Study: Study of provided module material with the primary goal to develop understanding of the module content via self centred learning. In addition to the weekly lectures/tutorials/labs, it is expected that students will also have to invest approximately 90 to 140 hours of independent study for completion of this module.

Assessment Strategy

The knowledge the learner obtains will be assessed via a combination of formal exams/quizzes and in class based computer/practical assessments. The practical assessments are designed to develop the engineering problem solving skills of the learner through both problem and project based learning. Formal labs assess both software and practical elements of the module. Software programs are submitted and practical evaluation of relevant circuits are completed.

Repeat Assessment Strategies

A repeat exam will be available in autumn which will cover the percentage of marks obtained in the final assessment. The marks obtained in the coursework throughout the year cannot be repeated via a repeat autumn examination and thus will be carried forward from the previous attempt.

Indicative Coursework and Continuous Assessment:

<table>
<thead>
<tr>
<th>Form</th>
<th>Title</th>
<th>Percent</th>
<th>Week (Indicative)</th>
<th>Learning Outcomes</th>
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<tr>
<td>Assessment</td>
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<td>40 %</td>
<td>End of Term</td>
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<tr>
<td>Assessment</td>
<td>Quizzes</td>
<td>30 %</td>
<td>OnGoing</td>
<td>1,2,3,4,5,6,7</td>
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<td>Practical Evaluation</td>
<td>Labs</td>
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Blended Delivery Mode Average Weekly Workload:

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<td>Practical</td>
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<td>Laboratory</td>
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Required Reading Book List


Programme Membership

GA_EAURG_B07 202000 Bachelor of Engineering in Automation & Robotics