C and C++ are foundation programming languages in the fields of automation, robotics and general embedded systems. This module introduces fundamental programming skills through modern C and C++. The module emphasises both principles and practice, technical and soft skills, and uses professional software and hardware tools. Students develop code using basic programming techniques with good programming style, perform algorithm design, and consider applications and performance.

Learning Outcomes

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

1. Develop and debug basic programs incorporating fundamental programming principles and techniques.
2. Select, use and test modern C & C++ core language and standard library features, using professional software and hardware development tools.
3. Apply basic algorithm design and documentation techniques.
4. Design & debug code to address unforeseen tasks.
5. Display an appreciation of good programming practice, style and ethics.
6. Describe applications and principles of C & C++.

Indicative Syllabus

- Introduction to a C & C++ development environment, tools and build process.
- Creating projects, files and source code in a widely used professional development environment, such as Microsoft Visual Studio C++.
- Introduction to the C & C++ core languages and standard libraries, focussing on modern C++. Use of common keywords and features.
- Programming basics, including input/output, data types, control structures, loops, functions.
- Introduction to object-oriented concepts and example code.
- Basic algorithm design techniques, such as pseudo-code, flowcharts, state machines.
- Principles of test, designing for test and test code development.
- Debugging guidelines and techniques. Active debugging and problem-solving.
- C & C++ good programming practice, programming style guidelines.
- Programming ethics considerations.
- Applications of C & C++, including reference to embedded applications and controlling electronic devices in the context of the overall programme.
- Principles and philosophies of design in C & C++, including reference to performance.

Teaching and Learning Strategy

The teaching and learning strategy promotes deep learning with active learning practice. There is an emphasis on principles and underlying meanings, and in applying knowledge in new and different contexts. Laboratory and practical work with authentic exercises develops transferable skills, using industry standard tools and techniques. Independent learning is encouraged and a collaborative learning environment is fostered throughout.
Assessment Strategy

Assessment is continuous assessment based, and comprises a number of different elements. These include formative and summative quiz style assessments, C & C++ related assignments and formative and summative practical coding exams. A variety of questions styles are used to target the module learning outcomes. Rubrics are used for assignments and exams.

Repeat Assessment Strategies

Students can repeat the module in the Autumn session, usually by taking a repeat practical coding exam.

<table>
<thead>
<tr>
<th>Indicative Coursework and Continuous Assessment:</th>
<th>100 %</th>
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<tbody>
<tr>
<td><strong>Form</strong></td>
<td><strong>Title</strong></td>
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<td>Quiz</td>
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<td>Assessment</td>
<td>Coding Exam</td>
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Blended Delivery Mode Average Weekly Workload:

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<th>Type</th>
<th>Description</th>
<th>Location</th>
<th>Hours</th>
<th>Frequency</th>
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<td>Engineering Laboratory</td>
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<td>Fortnightly</td>
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<td>Online</td>
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<td>Weekly</td>
<td>1.00</td>
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Required Reading Book List


Online Resources

https://en.cppreference.com/w/
https://isocpp.github.io/CppCoreGuidelines/CppCoreGuidelines

Other Resources

Other resources are available through the module's Moodle site.

Programme Membership

GA_EAURG_B07 202000 Bachelor of Engineering in Automation & Robotics
GA_EAURG_C06 202000 Higher Certificate in Engineering in Automation & Robotics