# SYST C3604: Control and Human Interfacing

| | |
|---|---|
| **Module Title:** | Control and Human Interfacing |
| **Language of Instruction:** | English |

| | |
|---|---|
| **Credits:** | 10 |

| | |
|---|---|
| **NFQ Level:** | 7 |

| | |
|---|---|
| **Module Delivered In** | 2 programme(s) |

| | |
|---|---|
| **Teaching & Learning Strategies:** | This module will be delivered through a mix of lectures, laboratory assignments and projects including a professional write up. It will employ a mixture of active/task-based learning, reflective learning and problem-based learning. |

| | |
|---|---|
| **Module Aim:** | The aim of this module is to introduce and develop understanding of control, analysis, and visualisation of programming methods for dynamic systems using Programmable Logic Controllers (PLCs), Human Machine Interfaces (HMI), safely and ethically as used in automated processes across a range of industrial applications. |

| **Learning Outcomes** | |
|---|---|
| *On successful completion of this module the learner should be able to:* | |
| LO1 | Analyse the architecture of automation and control systems. |
| LO2 | Explain the operating principles of control systems (discrete and analog). |
| LO3 | Analyse how different process characteristics contribute to control system response and performance. |
| LO4 | Compare and implement basic control (PLC) and visual (HMI) models using a combination of IEC PLC languages and embedded scripting in an integrated control environment. |
| LO5 | Examine the principles of operation of control (e.g.: On/Off, PID) loops. |
| LO6 | Examine good and safe practice in control system design and development. |
| LO7 | Develop a PLC/HMI project in an integrated control environment. |

| **Pre-requisite learning** |
|---|
| ***Module Recommendations***<br>*This is prior learning (or a practical skill) that is recommended before enrolment in this module.* |
| No recommendations listed |
| ***Incompatible Modules***<br>*These are modules which have learning outcomes that are too similar to the learning outcomes of this module.* |
| No incompatible modules listed |
| ***Co-requisite Modules*** |
| No Co-requisite modules listed |
| ***Requirements***<br>*This is prior learning (or a practical skill) that is mandatory before enrolment in this module is allowed.* |
| No requirements listed |

# SYST C3604: Control and Human Interfacing

## Module Content & Assessment

| Indicative Content |
|---|
| **Architecture**<br>Block diagram (e.g.: process, inputs, outputs, controller, feedback). Elements of control (e.g.: controlled, manipulated, measured, disturbance, error, set point, output). Basic process types, characteristics, and data gathering. Control: On-Off, Proportional, Integral and Derivative (PID), P, PI and PD. Pros and Cons of automated control. |
| **Operation**<br>Describe different control systems (e.g.: numerical, servo, sequential, robotic and process). |
| **Performance**<br>Timing diagrams, ladder diagrams, Boolean expressions, sequential function charts, state diagrams. State the methods used to optimise/tune control systems, self-tuning. |
| **Integrated control environment**<br>Introduction to the architecture (e.g.: memory, I/O) and programming of PLC's using industry standard IEC languages to control basic systems. Safety and ethical use of Automatic Control systems. |
| **Supervisory Control and Data Acquisition (SCADA)**<br>Introduction to, and configuration and scripting of, an HMI to interface between the PLC and the operator. Architecture of a SCADA system (e.g.: PLC linked tags, animated graphics, errors, archiving, alarms, and trends). |
| **Automation Project Design**<br>Develop and implement automation project individually/collaboratively (depending on complexity). |

| Assessment Breakdown | % |
|---|---|
| Project | 40.00% |
| Practical | 20.00% |
| End of Module Formal Examination | 40.00% |

No Continuous Assessment

| Project | | | | |
|---|---|---|---|---|
| *Assessment Type* | *Assessment Description* | *Outcome addressed* | *% of total* | *Assessment Date* |
| Project | A group/solo (depending on complexity) project based on real-world scenarios. | 7 | 40.00 | n/a |

| Practical | | | | |
|---|---|---|---|---|
| *Assessment Type* | *Assessment Description* | *Outcome addressed* | *% of total* | *Assessment Date* |
| Practical/Skills Evaluation | A set of practical exercises to complement the theory elements of the module. | 1,2,3,4,5,6 | 20.00 | n/a |

| End of Module Formal Examination | | | | |
|---|---|---|---|---|
| *Assessment Type* | *Assessment Description* | *Outcome addressed* | *% of total* | *Assessment Date* |
| Formal Exam | A final assessment to evaluate students' learning. | 1,2,3,4,5,6 | 40.00 | End-of-Semester |

No Continuous Assessment

| Project | | | | |
|---|---|---|---|---|
| *Assessment Type* | *Assessment Description* | *Outcome addressed* | *% of total* | *Assessment Date* |
| Project | A group/solo (depending on complexity) project based on real-world scenarios. | 7 | 40.00 | n/a |

| Practical | | | | |
|---|---|---|---|---|
| *Assessment Type* | *Assessment Description* | *Outcome addressed* | *% of total* | *Assessment Date* |
| Practical/Skills Evaluation | A set of practical exercises to complement the theory elements of the module. | 1,2,3,4,5,6 | 20.00 | n/a |

| End of Module Formal Examination | | | | |
|---|---|---|---|---|
| *Assessment Type* | *Assessment Description* | *Outcome addressed* | *% of total* | *Assessment Date* |
| Formal Exam | A final assessment to evaluate students' learning. | 1,2,3,4,5,6 | 40.00 | End-of-Semester |

**SETU Carlow Campus reserves the right to alter the nature and timings of assessment**

# SYST C3604: Control and Human Interfacing

## Module Workload

| **Workload: Full Time** | | |
|---|---|---|
| *Workload Type* | *Frequency* | *Average Weekly Learner Workload* |
| Lecture | Every Week | 5.00 |
| Laboratory | Every Week | 4.00 |
| Independent Learning Time | Every Week | 9.00 |
| | Total Hours | 18.00 |

## Module Delivered In

| Programme Code | Programme | Semester | Delivery |
|---|---|---|---|
| CW_EEROB_B | Bachelor of Engineering (Honours) in Robotics and Automated Systems | 5 | Mandatory |
| CW_EEROO_D | Bachelor of Engineering in Robotics and Automated Systems | 5 | Mandatory |