Module Details

Title:	Fundamental PID Control DRAFT
Module Title:	Fundamental PID Control
Language of Instruction:	English

Module Code:	n/a	Duration:	1 Semester

Credits:	5

NFQ Level:	6

Field of Study:	Engineering & Engineering Trades

Valid From:	Autumn 2021 (September 2021)

Module Delivered In	1 programme(s)

Head of Department:	Eoin Homan

Module Author:	Alan Monks

Teaching & Learning Strategies:	Lectures will incorporate a mixture of presentations, examples, student exercises/problem-solving, question and answer sessions, group discussions and online resources. Appropriate use will be made of Control Workshop/Lab for practical demonstrations and student exercises to promote greater engagement with the learning process by facilitating implementation of concepts explored in the classroom.

Module Aim:	The aim of this module is to provide students with a basic understanding of PID based automatic control system operation and to enable them to adjust controller tuning parameters based on system response in simple single variable applications.

Learning Outcomes

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

LO1	Describe the concept of closed-loop control and the role of individual system components.
LO2	State how specific process characteristics may influence control system response.
LO3	Explain the basic principles of operation of On/Off, P, PI and PID control modes.
LO4	List commonly used final control elements for specified applications.
LO5	Adjust a controller for quarter decay response in Proportional-only mode and introduce Integral and Derivative actions as required.

Pre-requisite learning

Module Recommendations
This is prior learning (or a practical skill) that is recommended before enrolment in this module.

No recommendations listed

Incompatible Modules
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
This is prior learning (or a practical skill) that is mandatory before enrolment in this module is allowed.

Successful completion of the Certificate in Fundamental Process Measurements or equivalent.

Module Content & Assessment

Indicative Content

The Control Loop
Objectives of Automatic Control systems, Open and Closed-Loop Control, Feedback in Control Systems, Loop Block Diagram, System Components.

The Process
Process Characteristics, Process Load - Supply and Demand Side Capacities, Process Lags - Resistance/Capacitance and Dead Time, Process Gain, Process Reaction Curve. Process Disturbances.

Control Modes
On-Off Control; Dead-band, Response, Limitations, Applications. Continuous Control; Proportional, Proportional + Integral and Proportional + Integral + Derivative (3 Term) Control. Response, Limitations, Applications.

Control Valves
Common Valve and Actuator Types, Ancillary Equipment, Control Valve Performance and Applications.

Controller Tuning
Practical Controller Tuning for Quarter Decay Response. Testing Control Loop Response to Process Disturbances. Improving "As Found" Controller Settings.

Assessment Breakdown	%
Continuous Assessment	10.00%
Practical	20.00%
End of Module Formal Examination	70.00%

Continuous Assessment

Assessment Type	Assessment Description	Outcome addressed	% of total	Assessment Date
Short Answer Questions	Online/Classroom based written test	1,2,3	10.00	Week 8

No Project

Practical

Assessment Type	Assessment Description	Outcome addressed	% of total	Assessment Date
Practical/Skills Evaluation	Problem-based controller tuning exercise.	2,3,5	20.00	End-of-Semester

End of Module Formal Examination

Assessment Type	Assessment Description	Outcome addressed	% of total	Assessment Date
Formal Exam	Written examination	1,2,3,4	70.00	End-of-Semester

Reassessment Requirement

Repeat examination
Reassessment of this module will consist of a repeat examination. It is possible that there will also be a requirement to be reassessed in a coursework element.

ITCarlow reserves the right to alter the nature and timings of assessment

Module Workload

This module has no Full Time workload.

Workload: Part Time					
Workload Type	Workload Description	Learning Outcomes	Hours	Frequency	Average Weekly Learner Workload
Lab/Lecture	Exploration of relevant concepts supported by practical demonstration and hands-on student exercises.	1,2,3,4,5	36	12 Weeks per Stage	3.00
Independent Learning	Development of concepts covered in Lab/Lecture through; prescribed reading material, completion of assigned written and problem based questions, use of control simulation software to interact with different "live" control loop applications.	1,2,3,4,5	84	15 Weeks per Stage	5.60
				Total Hours	120.00
				Total Weekly Learner Workload	8.60
				Total Weekly Contact Hours	3.00

Module Resources

Recommended Book Resources

William Bolton 2013, *Instrumentation and Control Systems*, 4th Ed. Ed., Newnes United Kingdom [ISBN: 9780750664325]

Recommended Article/Paper Resources

Tony R. Kuphaldt 2019, Lessons in Industrial Instrumentation
https://www.ibiblio.org/kuphaldt/socratic/sinst/book/liii.pdf

Other Resources

Training and Simulation Software: Wade Associates*PC-Control Lab*, Houston Texas

Module Delivered In

Programme Code	Programme Title
	Certificate in Fundamental PID Control (Draft)

Module Teachers

Module Teachers	
Staff Member	*Staff Email*
No Teacher Staff Assigned	