Title:	Introduction - Process Control APPROVED
Long Title:	Introduction - Process Control
Module Code:	PHYS6025
Credits:	5
NFQ Level:	Fundamental
Field of Study:	Physics
Valid From:	Semester 1 - 2016/17 (September 2016)
Module Delivered in	7 programme(s)
Module Coordinator:	Donagh OMahony
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Module Description:	Introduction to the fundamental concepts of control for process and automation industries.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Describe the components of simple process control systems.
LO2	Describe the information path of signals within a control system.
LO3	Distinguish between control strategies used in the process and automation industries.
LO4	Analyse laboratory data and compile laboratory reports.

Pre-requisite learning
Module Recommendations *This is prior learning (or a practical skill) that is strongly recommended before enrolment in this module. You may enrol in this module if you have not acquired the recommended learning but you will have considerable difficulty in passing (i.e. achieving the learning outcomes of) the module. While the prior learning is expressed as named CIT module(s) it also allows for learning (in another module or modules) which is equivalent to the learning specified in the named module(s).*
No recommendations listed
Incompatible Modules *These are modules which have learning outcomes that are too similar to the learning outcomes of this module. You may not earn additional credit for the same learning and therefore you may not enrol in this module if you have successfully completed any modules in the incompatible list.*
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. You may not enrol on this module if you have not acquired the learning specified in this section.*
No requirements listed
Co-requisites
No Co Requisites listed

Module Content & Assessment

Indicative Content
Introduction to Control The need for control, block diagrams, open and closed loop control, positive and negative feedback, analog control versus discrete control. Basic control equations and control definitions
Control Modes Principle and function of the controller, discontinuous and continuous modes. Proportional, integral and derivative (PID)concepts. Composite control modes, examples and applications. First order system.
Control Strategy Simple control strategies applicable to the process industries. Time-domain analysis of process output. Zeigler-Nichols tuning methods.
Control Valves The valve as final actuation element, current to pneumatic converters, direct and reverse acting. Valve trim including plugs, seats and positioners. Calculations on valve sizing.
Practical Programme Two position control using thermistor, valve characterisation, PID modelling of flow and temperature, PID control of a cascade control rig, orifice plate flow system and tank level process. Zeigler-Nichols tuning technique

Assessment Breakdown	%
Course Work	50.00%
End of Module Formal Examination	50.00%

Course Work

Assessment Type	*Assessment Description*	*Outcome addressed*	*% of total*	*Assessment Date*
Short Answer Questions	Lecture material delivered between weeks 1 and 4	1,2	10.0	Week 4
Short Answer Questions	Lecture material delivered between weeks 5 and 8	2,3,4	10.0	Week 8
Practical/Skills Evaluation	Practical skills assessment.	4	30.0	Every Second Week

End of Module Formal Examination

Assessment Type	*Assessment Description*	*Outcome addressed*	*% of total*	*Assessment Date*
Formal Exam	End-of-Semester Final Examination	1,2,3	50.0	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.*

The institute reserves the right to alter the nature and timings of assessment

Module Workload

Workload: Full Time				
Workload Type	*Workload Description*	*Hours*	*Frequency*	*Average Weekly Learner Workload*
Lecture	Theory Delivery	3.0	Every Week	3.00
Lab	Practical Programme	2.0	Every Second Week	1.00
Independent & Directed Learning (Non-contact)	Further Study / Development of Delivered Theory	3.0	Every Week	3.00
			Total Hours	8.00
			Total Weekly Learner Workload	7.00
			Total Weekly Contact Hours	4.00

This module has no Part Time workload.

Module Resources

Recommended Book Resources

- **W. Bolton 2013, *Instrumentation and control systems*, 4th Ed., 13, Newnes UK [ISBN: 9780750664325]**
- **W. Bolton 2011, *Control engineering*, 4th Ed., Longman Harlow, Essex [ISBN: 0-582-32773-3]**
- **Dorf and Bisphop 2013, *Modern Control Systems*, 12th Ed., 1 and 2, Pearson U.S.A [ISBN: 9780131383104]**

This module does not have any article/paper resources

Other Resources

- **Website: *Instrument Society of America (ISA)***
  http://www.isa.org/

Module Delivered in

Programme Code	Programme	Semester	Delivery
CR_EMECH_7	Bachelor of Engineering in Mechanical Engineering	2	Elective
CR_SINEN_8	Bachelor of Science (Honours) in Instrument Engineering	4	Mandatory
CR_SPHYS_7	Bachelor of Science in Applied Physics and Instrumentation	4	Mandatory
CR_SINAU_8	Certificate in Advanced Industrial Automation	2	Mandatory
CR_SPRCA_6	Certificate in Process Control and Automation	1	Mandatory
CR_EMECH_6	Higher Certificate in Engineering in Mechanical Engineering	2	Elective
CR_SPHYS_6	Higher Certificate in Science in Applied Physics and Instrumentation	4	Mandatory