PHYS H4007: Control System Design

Module Title:	Control System Design
Language of Instruction:	English

Credits:	5

NFQ Level:	8

Module Delivered In	1 programme(s)

Module Aim:	To analyse the behaviour and control of dynamic systems. To design control strategies to modify the responses of dynamic systems.

Learning Outcomes	
On successful completion of this module the learner should be able to:	
LO1	Define the performance characteristics of a control system.
LO2	Design a control strategy in order to achieve the required system specifications.
LO3	Demonstrate open-loop systems and select and tune appropriate closed-loop, P, PI and PID controllers modelled in Matlab.
LO4	Analyse the operation and performance of a feedback control system.

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.*
No requirements listed

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Module Content & Assessment

Indicative Content
Review of control systems Applications of feedback control Reasons for using feedback The design process
System modelling Experimental methods Mathematical modelling -Use of differential equations -Use of Laplace Transforms -Poles and zeros Block diagrams -Block diagram reduction -Disturbance inputs -Transfer functions Signal flow graphs
Time response Transient and steady state responses -First and higher order responses -Time delay -Specifications
Frequency response Introduction Frequency response specifications -System gain in dB -Bandwidth -Effect of system order -Resonance Frequency response diagrams -Bode diagrams. First & higher order systems. Time delay. -Closed loop
System stability The Bode Stability Criterion -Gain & phase margins Nyquist Analysis Transfer functions and pole-zero plots -Closed loop response The Routh-Hurwitz Criterion
Sensitivity Open and closed loop systems Parameter variations
Servo Systems Components of a servo control system -Specifications -Responses System responses to standard inputs Design examples and component selection Application areas - Robot systems

Assessment Breakdown	%
Continuous Assessment	10.00%
Practical	30.00%
End of Module Formal Examination	60.00%

Continuous Assessment

Assessment Type	*Assessment Description*	*Outcome addressed*	*% of total*	*Assessment Date*
Short Answer Questions	n/a	1,4	10.00	Week 4

No Project

Practical

Assessment Type	*Assessment Description*	*Outcome addressed*	*% of total*	*Assessment Date*
Practical/Skills Evaluation	Matlab Practicals	1,2,3,4	30.00	Every Week

End of Module Formal Examination

Assessment Type	*Assessment Description*	*Outcome addressed*	*% of total*	*Assessment Date*
Formal Exam	n/a	1,2,4	60.00	End-of-Semester

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

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Module Workload

Workload: Full Time		
Workload Type	*Frequency*	*Average Weekly Learner Workload*
Lecture	12 Weeks per Stage	3.00
Lab/Lecture	12 Weeks per Stage	2.00
Independent Learning	15 Weeks per Stage	5.13
	Total Hours	137.00

Module Delivered In

Programme Code	Programme	Semester	Delivery
CW_EMMEC_B	Bachelor of Engineering (Honours) in Mechanical Engineering	7	Mandatory