SYST H4606: Systems Analysis

Module Title:	Systems Analysis
Language of Instruction:	English

Credits:	10

NFQ Level:	8

Module Delivered In	No Programmes

Teaching & Learning Strategies:	Lectures and Laboratory Practicals using software simulation tools

Module Aim:	To introduce the students to the mathematical methods and tools to analyse signals and systems in the time and frequency domains with application to engineering problems.

Learning Outcomes	
On successful completion of this module the learner should be able to:	
LO1	Describe an engineering system in mathematical terms.
LO2	Analyse the system and predict its performance.
LO3	Simulate the system using appropriate mathematical techniques.
LO4	Understand the relationship between time and frequency domain models of dynamic systems.
LO5	Understand the relationship between continuous-time and discrete time models.

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.*
Students should have completed CW527 or equivalent. They should also have knowledge of a relevant computer programming language.

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Module Content & Assessment

Indicative Content
Introduction to Signals & Systems Signals- Continuous - Time Signals - Discrete-Time Signals; Systems- Properties of Systems -Block diagrams - Signal Flow graphs
Mathematical Modelling of Physical Systems Mathematical Models; Use of differential equations- First order systems; - Higher order systems
Linear Time-Invariant Systems Impulse Representation of Signals; Convolution; Properties of LTI Systems; Causality; Stability; Difference Equations- Block Diagrams
Fourier Analysis Fourier series applied to Periodic Signals; The Fourier Transform; The Discrete Fourier Transform; Applications
Sampling The Sampling Theorem; Reconstruction of a signal; Aliasing; Sampling in the Frequency Domain; Decimation & Interpolation
The Laplace Transform Applications of the Laplace Transform; Region of convergence; The Inverse transform; Geometric Evaluation of the Fourier Transform from a pole-zero plot; Initial & Final value Theorems
The z-Transform Region of convergence; The inverse z-Transform; Geometric evaluation of the z-Transform; Properties of the z-Transform; Transformations between continuous-time and discrete-time systems.
Filtering Ideal filters; Non-ideal filters; Continuous-Time filter; Design techniques; Discrete-Time filter; Design techniques
Linear Feedback Systems Applications of feedback- Reasons for using feedback; Block Diagram representation of Control Systems; Transfer Functions; Sensitivity Analysis; System responses - Time responses -Frequency responses; Stability - Gain and Phase Margins

Assessment Breakdown	%
Continuous Assessment	20.00%
Practical	20.00%
End of Module Formal Examination	60.00%

Continuous Assessment

Assessment Type	*Assessment Description*	*Outcome addressed*	*% of total*	*Assessment Date*
Examination	Students are required to sit a written mid- term examination.	1,2,3,4,5	20.00	Sem 1 End

No Project

Practical

Assessment Type	*Assessment Description*	*Outcome addressed*	*% of total*	*Assessment Date*
Practical/Skills Evaluation	Students are required to complete a series of laboratory exercises; reports are submitted on each of these experiments.	1,2,3,4,5	20.00	Every Week

End of Module Formal Examination

Assessment Type	*Assessment Description*	*Outcome addressed*	*% of total*	*Assessment Date*
Formal Exam	The students are required to sit an end of the module examination.	1,2,3,4,5	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	Every Week	2.00
Laboratory	Every Week	2.00
Tutorial	Every Week	1.00
Estimated Learner Hours	Every Week	2.00
	Total Hours	7.00