Module Code	**EEU33C01**
Module Name	Signals and Systems
ECTS Weighting[1]	5 ECTS
Semester taught	Semester 1
Module Coordinator	Dr. W. Dowling
Module Learning Outcomes with reference to the Graduate Attributes and how they are developed in discipline	On successful completion of this module, students should be able to: 1. Represent both continuous-time and discrete-time periodic signals as a Fourier series. 2. Use the Fourier transform and the Laplace transform to analyse continuous time signals and systems. 3. Use the discrete-time Fourier transform and the z-transform to analyse discrete-time signals and systems. 4. Determine the impulse response, step response and frequency response of both continuous-time and discrete-time systems and determine the response of the LTI system to any input signal. Determine the stability of a feedback system. **Graduate Attributes: levels of attainment** To act responsibly - Enhanced To think independently - Attained To develop continuously - Enhanced To communicate effectively - Enhanced
Module Content	Please provide a brief overview of the module of no more than 350 words written so that someone outside of your discipline will understand it. Continuous-Time Signals and Systems • Linearity, time-invariance, impulse response of a linear time-invariant (LTI) system; the convolution integral; properties of LTI systems; unit step response. • Laplace Transform; properties of the Laplace transform; transfer function of LTI system; poles, zeros and stability of an LTI system, the Fourier transform and its properties. • Frequency response; steady state response; low-pass and high-pass filtering.

[1] TEP Glossary

	• Representation of a continuous-time signal by its samples; the sampling theorem; reconstruction of a continuous-time signal from its samples. Discrete-Time Signals and Systems • The unit-impulse response of an LTI discrete-time system; the convolution sum; properties of discrete-time LTI systems; unit step response. • Fourier series representation of discrete-time periodic signals; properties of discrete-time Fourier series. • The discrete-time Fourier transform (DTFT); properties of the DTFT. • The z-transform; region of convergence for the z-transform; inverse z-transform; properties of the z-transform. • Causality; Stability; LTI systems characterized by linear constant-coefficient difference equations. • FIR and IIR filters. Introduction to Control Systems. • Linear Feedback Systems; closed-loop system function.
Teaching and Learning Methods	3 lectures and 1 tutorial per week.

Assessment Details[2]
Please include the following:

- **Assessment Component**
- **Assessment description**
- **Learning Outcome(s) addressed**
- **% of total**
- **Assessment due date**

Assessment Component	Assessment Description	LO Addressed	% of total	Week due
Annual Written Examination	2-hour Written Examination	1,2,3,4	70	Exam week
In-class test	In-class test	1,2,4	20	8
Matlab-based laboratory	Matlab-based exercises in Blackboard	1,2	10	Report due 2 weeks after lab

[2] TEP Guidelines on Workload and Assessment

Reassessment Requirements	The overall module mark at the Supplemental examinations will be determined solely on the basis of the written examination.
Contact Hours and Indicative Student Workload[2]	**Contact hours: 44** **Independent Study (preparation for course and review of materials): 60** **Independent Study (preparation for assessment, incl. completion of assessment): 21**
Recommended Reading List	A. V. Oppenheim, A. S. Willsky with S. H. Nawab, Signals and Systems, 2nd Ed., Pearson, 2013
Module Pre-requisite	2E1 Engineering Mathematics III 2E2 Engineering Mathematics IV
Module Co-requisite	
Module Website	
Are other Schools/Departments involved in the delivery of this module? If yes, please provide details.	No
Module Approval Date	21 September 2021
Approved by	W. Dowling
Academic Start Year	
Academic Year of Date	