

Summary Information

Module Code	6572USST
Formal Module Title	Signals and Systems with Real World Applications
Owning School	Engineering
Career	Undergraduate
Credits	10
Academic level	FHEQ Level 6
Grading Schema	40

Module Contacts**Module Leader**

Contact Name	Applies to all offerings	Offerings
Dante Matellini	Yes	N/A

Module Team Member

Contact Name	Applies to all offerings	Offerings
---------------------	---------------------------------	------------------

Partner Module Team

Contact Name	Applies to all offerings	Offerings
---------------------	---------------------------------	------------------

Teaching Responsibility

LJMU Schools involved in Delivery
LJMU Partner Taught

Partner Teaching Institution

Institution Name
University of Shanghai For Science and Technology

Learning Methods

Learning Method Type	Hours
Lecture	11
Practical	11

Module Offering(s)

Offering Code	Location	Start Month	Duration
SEP-PAR	PAR	September	12 Weeks

Aims and Outcomes

Aims	This module is intended to provide students with a good appreciation of the mathematical concepts necessary to apply digital signal and image processing algorithms to a range of engineering problems.
-------------	---

Learning Outcomes

After completing the module the student should be able to:

Code	Description
MLO1	Characterise analogue and digital systems using appropriate transforms, impulse response and convolution
MLO2	Design and implement digital filters
MLO3	Process and compress images using appropriate techniques
MLO4	Apply DSP to a range of applications

Module Content

Outline Syllabus

Signals and Systems - Foundations, Architecture Requirements and Characteristics
Use of MATLAB
Fundamentals – Linear Systems, Convolution and Properties of Convolution
Transforms – Fourier: CTFT, DTFT, DFT, FFT; Laplace and Z-transforms
Digital Filters - Basic Concepts
Finite Impulse Response filters (FIR) - Design, Fourier Series Approximation
Analogue Prototypes - Butterworth, Chebyshev, Elliptic; Analogue-To-Analogue Transforms
Infinite Impulse Response filters (IIR) - Design, Bilinear, Impulse Invariant
Transforms
Digital Filters - Implementation, Algorithms & Finite Word Effects
ADCs & DACs - Sample and Hold, Antialiasing
Multirate Signal Processing – Interpolation and Decimation
Time Frequency Analysis – Short term Fourier series, Wavelets, Filter-Banks
2D Signal Processing – Representation of images, image compression, 2D
transforms

Module Overview

Additional Information

This module will provide students with a sound grasp of the theory and applications of modern signal and image processing.

UNESCO Sustainable Development Goals
Quality Education
Gender Equality
Industry, Innovation and Infrastructure
Partnerships for the Goals

UK SPEC AHEP 4

CEng.

M1 Apply a comprehensive knowledge of mathematics, statistics, natural science and engineering principles to the solution of complex problems. Much of the knowledge will be at the forefront of the particular subject of study and informed by a critical awareness of new developments and the wider context of engineering.

M2 Formulate and analyse complex problems to reach substantiated conclusions. This will involve evaluating available data using first principles of mathematics, statistics, natural science and engineering principles, and using engineering judgment to work with information that may be uncertain or incomplete, discussing the limitations of the techniques employed.

M3 Select and apply appropriate computational and analytical techniques to model complex problems, discussing the limitations of the techniques employed.

M6 Apply an integrated or systems approach to the solution of complex problems.

M12 Use practical laboratory and workshop skills to investigate complex problems.

IEng.

B1 Apply knowledge of mathematics, statistics, natural science and engineering principles to broadly-defined problems. Some of the knowledge will be informed by current developments in the subject of study.

B2 Analyse broadly-defined problems reaching substantiated conclusions using first principles of mathematics, statistics, natural science and engineering principles.

B3 Select and apply appropriate computational and analytical techniques to model broadly-defined problems, recognising the limitations of the techniques employed.

B6 Apply an integrated or systems approach to the solution of broadly-defined problems.

B12 Use practical laboratory and workshop skills to investigate broadly-defined problems.

Assessments

Assignment Category	Assessment Name	Weight	Exam/Test Length (hours)	Learning Outcome Mapping
Report	Report	100	0	MLO1, MLO2, MLO3, MLO4