LIVERPOOL JOHN MOORES UNIVERSITY

Module Proforma

Approved, 2022.03

Summary Information

Module Code	6401ELE
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
James Gomm	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
Engineering

Learning Methods

Learning Method Type	Hours

Lecture	11
Practical	11

Module Offering(s)

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

Aims and Outcomes

Aims	This module is intended to provide students with a good appreciation of themathematical concepts necessary to apply digital signal and image processingalgorithms 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 CharacteristicsUse of MATLABFundamentals – Linear Systems, Convolution and Properties of ConvolutionTransforms – Fourier: CTFT, DTFT, DFT, FFT; Laplace and Z-transformsDigital Filters - Basic ConceptsFinite Impulse Response filters (FIR) - Design, Fourier Series ApproximationAnalogue Prototypes - Butterworth, Chebyshev, Elliptic; Analogue-To-Analogue TransformsInfinite Impulse Response filters (IIR) - Design, Bilinear, Impulse InvariantTransformsDigital Filters - Implementation, Algorithms & Finite Word EffectsADCs & DACs - Sample and Hold, AntialiasingMultirate Signal Processing – Interpolation and DecimationTime Frequency Analysis – Short term Fourier series, Wavelets, Filter-Banks2D Signal Processing – Representation of images, image compression, 2Dtransforms

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 GoalsQuality EducationGender EqualityIndustry, Innovation and InfrastructurePartnerships for the GoalsUK SPEC AHEP 4CEng.M1 Apply a comprehensive knowledge of mathematics, statistics, natural scienceand engineering principles to the solution of complex problems. Much of theknowledge will be at the forefront of the particular subject of study and informed by acritical 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 engineeringjudgment to work with information that may be uncertain or incomplete, discussingthe limitations of the techniques employed.M3 Select and apply appropriate computational and analytical techniques to modelcomplex 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 engineeringprinciples to broadly-defined problems. Some of the knowledge will be informed bycurrent developments in the subject of study.B2 Analyse broadly-defined problems reaching substantiated conclusions using firstprinciples of mathematics, statistics, natural science and engineering principles.B3 Select and apply appropriate computational and analytical techniques to modelbroadly-defined problems, recognising the limitations of the techniques employed.B6 Apply an integrated or systems approach to the solution of broadly-definedproblems.B12 Use practical laboratory and workshop skills to investigate broadly-definedproblems.

Assessments

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