

## Liverpool John Moores University

Title: Signal Processing  
Status: Definitive  
Code: **6301ELE** (121437)  
Version Start Date: 01-08-2021

Owning School/Faculty: Engineering  
Teaching School/Faculty: Engineering

Team	Leader
David Harvey	Y
Brahim Benbakhti	

**Academic Level:** FHEQ6  
**Credit Value:** 20  
**Total Delivered Hours:** 57  
**Total Learning Hours:** 200  
**Private Study:** 143

### Delivery Options

Course typically offered: Semester 2

Component	Contact Hours
Lecture	33
Practical	22

**Grading Basis:** 40 %

### Assessment Details

Category	Short Description	Description	Weighting (%)	Exam Duration
Exam	Exam	Exam	70	2
Report	Report	Matlab exercises. 2000 words	30	

### 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:

- 1 Characterise analogue and digital systems using appropriate transforms, impulse response and convolution
- 2 Design and implement digital filters
- 3 Process and compress images using appropriate techniques
- 4 Apply DSP to a range of applications

### **Learning Outcomes of Assessments**

The assessment item list is assessed via the learning outcomes listed:

Exam	1	2	3
Matlab exercises	1	2	4

### **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*

### **Learning Activities**

A series of lectures and tutorials, with some laboratory activities using MATLAB.

### **Notes**

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