# LIVERPOOL JOHN MOORES UNIVERSITY

# Digital Signal Processing

# Module Information

## 2022.01, Approved

## Summary Information

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|---|---|
| Module Code | 6501ICBTBE |
| Formal Module Title | Digital Signal Processing |
| Owning School | Pharmacy & Biomolecular Sciences |
| Career | Undergraduate |
| Credits | 10 |
| Academic level | FHEQ Level 6 |
| Grading Schema | 40 |

**Teaching Responsibility**

| LJMU Schools involved in Delivery |
|---|
| LJMU Partner Taught |

**Partner Teaching Institution**

| Institution Name |
|---|
| International College of Business and Technology |

## Learning Methods

| Learning Method Type | Hours |
|---|---|
| Lecture | 30 |
| Practical | 6 |
| Tutorial | 9 |

## Module Offering(s)

| Display Name | Location | Start Month | Duration Number Duration Unit |
|---|---|---|---|
| SEP-PAR | PAR | September | 12 Weeks |

# Aims and Outcomes

| Aims | To develop learners' understanding of engineering signal conversion and digital signal processing. It will also develop the skills needed to modify or update existing electronics or biomedical engineering systems using digital signal processing techniques, and to design engineering applications that use digital signal processing (DSP) techniques. |
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**After completing the module the student should be able to:**

**Learning Outcomes**

| Code | Number | Description |
|------|--------|-------------|
| MLO1 | 1 | Investigate and identify the fundamental concepts and types of digital signal processing. |
| MLO2 | 2 | Evaluate and solve problems related data conversion techniques for signals. |
| MLO3 | 3 | Solve problems related digital signal processing techniques for engineering signals. |
| MLO4 | 4 | Investigate, evaluate and analyse DSP techniques used in engineering. Simulate and analyse DSP techniques using a suitable software such as MATLAB. |

# Module Content

| Outline Syllabus | Conversion of engineering signals from one form to anotherData conversion: analogue and digital signals; sampling theorem; analogue to digital conversion (ADC); digital to analogue conversion (DAC); coding; quantization; aliasing error; pre-filtering or anti-aliasing filtering.Spectra: Fourier transform (FT) representation of discrete time signals; recovery of original analogue signal from its discrete form using appropriate filtering.Standard digital signal processing techniquesDigital filtering: building blocks for DSP operations; Z-transforms; inverse Z-transforms; implementation models of finite impulse response (FIR) filters; implementation models of infinite impulse response (IIR) filters; digital resonator. Convolution; correlation.Models of digital signal processing used in industryCurrent applications: block diagrams to explain the embedded features of DSP in applications, e.g. mobile phones, radar, digital radio, digital cameras DSP versus microprocessors: advantages of using dedicated DSP devices; architectures; operating systems; choice of DSPs; choice of DSP platforms.Understand the use of computer simulation to design engineering applications of digital signal processingDigital filter design: design of FIR digital filters; design of IIR digital filters Adaptive filter: least mean square algorithm; gradient descent adaptation; noise cancellation; equalization Computer simulation: digital filters, e.g., FIR, IIR, adaptive |
|------|---|
| Module Overview | |
| Additional Information | This module is part of the Level 6 of the BEng(Hons) in Biomedical Engineering |

# Assessments

| Assignment Category | Assessment Name | Weight | Exam/Test Length (hours) | Module Learning Outcome Mapping |
|---------------------|-----------------|--------|--------------------------|--------------------------------|
| Exam | Examination | 70 | 2 | MLO1, MLO2, MLO3 |
| Essay | Coursework Assignment | 30 | 0 | MLO4 |

# Module Contacts

**Module Leader**

| Contact Name | Applies to all offerings | Offerings |
|---|---|---|
| Katie Evans | Yes | N/A |

**Partner Module Team**

| Contact Name | Applies to all offerings | Offerings |
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