ES2H5-15 Signal Processing

26/27

Department
School of Engineering
Level
Undergraduate Level 2
Module leader
Viji Ahanathapillai
Credit value
15
Module duration
10 weeks
Assessment
30% coursework, 70% exam
Study location
University of Warwick main campus, Coventry

Description

Module web page

Module aims

The module aims to introduce signal processing to 2nd year students. It aims to develop the student's ability to: Select and apply appropriate mathematical methods for modelling and analysing signals and systems; Understand the scientific principles underlying the generation and classification of signals; Use practical skills to measure and analyse real-world signals; Select and apply appropriate computer based methods for modelling signals and systems; Design signal processing systems to meet a target specification.

Outline syllabus

This is an indicative module outline only to give an indication of the sort of topics that may be covered. Actual sessions held may differ.

Analogue Signals and Systems: Time domain and s-domain representation of continuous-time signals; Linear time-invariant systems; Laplace transform; Analogue system transfer functions; Analogue system stability; Fourier transform and analogue frequency response; Analogue filter design and specification; Fourier series for periodic analogue signals; Computational modelling of analogue signals and systems

Digital Signals and Systems: Time-domain and z-domain representation of discrete-time signals; Signal conversion between analogue and digital representations; Sampling and aliasing; Linear shift-invariant systems; Z-transform; Digital system transfer functions; Digital system stability; Discrete-time Fourier transform and digital frequency response; Finite impulse response and infinite impulse response filters; Digital filter design and specification; Discrete Fourier Transform and evaluation with the Fast Fourier Transform; Computational modelling of digital signals and systems

Random Signal Processing: Random variable properties and variable distributions; Random signals; Signal estimation; Correlation.

Learning outcomes

By the end of the module, students should be able to:

- 1. Apply mathematical methods to analyse deterministic and random signals and to analyse processing systems [C1, M1].
- 2. Use signal processing systems to classify signals and extract key features [C1, M1].
- 3. Identify and discuss key practical issues in signal processing [C12, M12].
- 4. Design signal processing systems to meet given specifications [C1, M1].
- 5. Implement and model signals, filters, and processing systems using computational tools [C3, M3, C3, M3].

Indicative reading list

Reading lists can be found in Talis

Subject specific skills

- Ability to conceive, make and realise a component, product, system or process
- Ability to be pragmatic, taking a systematic approach and the logical and practical steps necessary for, often complex, concepts to become reality

Transferable skills

- Numeracy: apply mathematical and computational methods to communicate parameters, model and optimize solutions
- Apply problem solving skills, information retrieval, and the effective use of general IT facilities

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Study

Study time

Type	Required
Lectures	18 sessions of 1 hour (12%)
Practical classes	3 sessions of 2 hours (4%)
Other activity	1 hour (1%)
Private study	125 hours (83%)
Total	150 hours

Private study description

Guided independent learning, coursework submission, final exam study

Other activity description

1 x1hr Online support for coursework

Costs

No further costs have been identified for this module.

Assessment

You must pass all assessment components to pass the module.

Assessment group D1

	Weighting	Study time	Eligible for self-certification
Assessment component			
Lab Assignment	30%		Yes (extension)
Assignment submission supported by laboratory activities and using both hardware and software. Submission consists of a written report (maximum length of 5 pages) in addition to written code files and code output.			
Reassessment component is the same			
Assessment component			
Centrally-timetabled examination (On-campus)	70%		No

	Weighting	Study time	Eligible for self-certification

- Answerbook Pink (12 page)
- Students may use a calculator
- Engineering Data Book 8th Edition

Reassessment component is the same

Feedback on assessment

- Model solutions to past papers.
- Individual and cohort-level feedback on assignments.
- Support through advice and feedback hours.
- Cohort-level feedback on final exam.

Past exam papers for ES2H5

Availability

Anti-requisite modules

If you take this module, you cannot also take:

- ES98G-15 Signal Processing
- ES3C5-15 Signal Processing

Courses

This module is Core for:

- Year 2 of UESA-H161 BEng Biomedical Systems Engineering
- Year 2 of UESA-H63W BEng Electronic Engineering
- Year 2 of UESA-H113 BEng Engineering
- Year 2 of UESA-HH35 BEng Systems Engineering
- Year 2 of UESA-H163 MEng Biomedical Systems Engineering
- Year 2 of UESA-H63X MEng Electronic Engineering
- Year 2 of UESA-H114 MEng Engineering
- UESA-HH31 MEng Systems Engineering
    - Year 2 of HH31 Systems Engineering
    - Year 2 of HH35 Systems Engineering
- Year 2 of UESA-H605 Undergraduate Electrical and Electronic Engineering
- Year 2 of UESA-H606 Undergraduate Electrical and Electronic Engineering MEng