Module Specification

Signal Processing and Circuits

Version: 2023-24, v4.0, 15 Mar 2023

Contents

Part 1: Information

Module title: Signal Processing and Circuits

Module code: UFMFMA-15-2

Level: Level 5

For implementation from: 2023-24

UWE credit rating: 15

ECTS credit rating: 7.5

Faculty: Faculty of Environment & Technology

Department: FET Dept of Engineering Design & Mathematics

Partner institutions: None

Field: Engineering, Design and Mathematics

Module type: Module

Pre-requisites: Electrical and Electronic Principles A 2023-24

Excluded combinations: None

Co-requisites: None

Continuing professional development: No

Professional, statutory or regulatory body requirements: None

Part 2: Description

Overview: Not applicable

Features: Not applicable

Educational aims: In addition to Learning Outcomes, the educational experience may explore, develop, and practise but not formally discretely assess the following:

Develop competence in problem identification, analysis, design and implementation

(D4, D6)

Understanding of the need for a high level of professional and ethical conduct (S5)

Outline syllabus: Signal Analysis:

Signals: Definition; deterministic (periodic and aperiodic) random; signal sources; information; mathematical representation of basic deterministic signals.

Phasors: Graphical addition of sinusoids; definition of a phasor; phasor impedance and transfer functions of RLC networks.

Power:

Dc and rms values; power factor; real, reactive and apparent power in RLC networks.

Laplace transforms:

Definition; transforms of common signals; use of tables; solution of ordinary differential equations; partial fractions; generalised impedance and transfer functions of RLC networks; pole/zero diagrams; network time response; forced and natural modes; time constant; stability; second order response; use of standard second order response chart.

Network analysis: RLC network analysis using Laplace transforms; step and sinusoidal response.

Frequency response:

Frequency response from Laplace transfer function; bandwidth in relation to time constant; definition of dB; Bode plots with straight line approximation; Nyquist plots, resonance.

Fourier series: Trigonometric and phasor form; power spectrum.

Fourier transform: Derivation from Fourier series; Fourier transform of common signals; inverse spreading principle; relation to Laplace transforms; Parseval's theorem; energy spectral density.

Convolution: The convolution integral; graphical convolution;

Filters:

Filter classification LP, HP, BP; 2nd and higher order; transfer functions; Butterwoth and Chebychev approximations; normalised prototypes; scaling; passive and active realisations

Systems Electronics:

Operational amplifiers: Non-ideal operational amplifiers; current sources; current mirrors; offset; bias; drift; noise; gain-bandwidth; rise time.

Part 3: Teaching and learning methods

Teaching and learning methods: Contact time: 36 hours

Assimilation and skill development: 70 hours

Undertaking coursework : 20 hours

Exam preparation: 24 hours

Total study time: 150 hours

The module will be delivered using a combination of lectures and laboratory work. Tutorials will be incorporated into the lectures. Laboratory work will involve the

design and build of analogue electronic circuits. The focus will be on filter design. Relevant ethical issues will be highlighted and students will be encouraged to consider these further through directed reading.

Module Learning outcomes: On successful completion of this module students will achieve the following learning outcomes.

MO1 Knowledge and understanding of the basic mathematical principles as applied to the description and analysis of analogue systems (US2)

MO2 An understanding of engineering principles as applied to analogue systems and the ability to assess their performances (E1, E2)

MO3 Competence in using technical literature and the ability to obtain documentation from various sources (P4)

MO4 Demonstrate competence in combining theory and experience as well as acquired engineering skills and the ability to apply these competencies to practical engineering problems (P1)

Hours to be allocated: 150

Contact hours:

Independent study/self-guided study = 114 hours

Face-to-face learning = 36 hours

Total = 150

Reading list: The reading list for this module can be accessed at readinglists.uwe.ac.uk via the following link https://uwe.rl.talis.com/modules/ufmfma-15-2.html

Part 4: Assessment

Assessment strategy: A formal exam that contributes 50% towards the final mark of the module. The examination is summative and assesses the students' understanding of concepts and techniques, and their ability to apply them in relatively straightforward problems.

A lab-based group project that contributes 50% towards the final mark of the module.

Formative assessment will be provided as oral feedback throughout the laboratory sessions particularly with respect to the lab exercises and the logbook entries.

The resit will follow the same format.

Assessment tasks:

Examination (Online) (First Sit)
Description: Online Exam (24 hours)
Weighting: 50 %
Final assessment: Yes
Group work: No
Learning outcomes tested: MO1, MO2

Project (First Sit)
Description: Small scale group project (group size of 4-6) - group report submission (5,000 words)
Weighting: 50 %
Final assessment: No
Group work: Yes
Learning outcomes tested: MO2, MO3, MO4

Examination (Online) (Resit)
Description: Online Exam (24 hours)
Weighting: 50 %
Final assessment: Yes
Group work: No
Learning outcomes tested: MO1, MO2

Project (Resit)
Description: Small scale group project - group report submission (5,000 words)

Weighting: 50 %

Final assessment: No

Group work: Yes

Learning outcomes tested: MO2, MO3, MO4

Part 5: Contributes towards

This module contributes towards the following programmes of study:

Electrical and Electronic Engineering [AustonSingapore] BEng (Hons) 2023-24

Electronics and Telecommunication Engineering {Foundation} [Feb][FT][GCET][4yrs] BEng (Hons) 2021-22

Electronics and Telecommunication Engineering {Foundation} [Oct][FT][GCET][4yrs] BEng (Hons) 2021-22

Instrumentation and Control Engineering {Foundation} [Feb][FT][GCET][4yrs] BEng (Hons) 2021-22

Instrumentation and Control Engineering {Foundation} [Oct][FT][GCET][4yrs] BEng (Hons) 2021-22

Mechatronics [Sep][PT][UCS][3yrs] FdSc 2021-22

Mechatronics [Sep][PT][GlosColl][3yrs] FdSc 2021-22

Electronic Engineering [Sep][PT][Frenchay][6yrs] - Not Running BEng (Hons) 2020-21

Instrumentation and Control Engineering {Foundation} [Oct][PT][GCET][8yrs] BEng (Hons) 2019-20

Instrumentation and Control Engineering {Foundation} [Feb][PT][GCET][8yrs] BEng (Hons) 2019-20