ELECTRONICS AND EMBEDDED SYSTEMS - 2024/5

Module code: ENG2137

Module Overview

This module serves to provide knowledge and experience on the use of analogue and digital systems for the measurement and control of electronic systems with applications to both mechanical and medical engineering.

Module provider

Mechanical Engineering Sciences

Module Leader

HE Yinglong (Mech Eng Sci)

Number of Credits: 15

ECTS Credits: 7.5

Framework: FHEQ Level 5

Module cap (Maximum number of students): N/A

Overall student workload

Independent Learning Hours: 73

Lecture Hours: 24

Tutorial Hours: 6

Laboratory Hours: 12

Guided Learning: 11

Captured Content: 24

Module Availability

Semester 2

Prerequisites / Co-requisites

N/A

Module content

Introduction to Instrumentation.

Amplifiers, noise and filters.

Sampling. Analogue to digital and digital to analogue conversion.

Binary and digital. Logic.

Microprocessors and Programming

Practical work: implementation and testing of an instrumentation system.

Assessment pattern

Assessment type	Unit of assessment	Weighting
Coursework	LABORATORY REPORT	40
Examination	EXAM (2HRS)	60

Alternative Assessment

N/A

Assessment Strategy

The assessment strategy is designed to provide students with the opportunity to demonstrate both subject-specific knowledge (via direct examination) and analytical and practical skills (via the performance of a lab-based project and assessment of the report)

Thus, the summative assessment for this module consists of: ·

Coursework: lab report [Learning outcomes 5, 6]

Examination [Learning outcomes 1-6] ·

Formative assessment and feedback:

Student feedback is provided through verbal discussion during tutorials in the first half of the course, and during laboratory sessions during the second half.

Module aims

- A systematic understanding and critical awareness of the importance of instrumentation.
- A comprehensive understanding of the electronics associated with the use of instrumentation.
- A knowledge of basic amplification and filtering circuits.
- A comprehensive understanding of the importance of noise and their sources.
- A knowledge of analogue to digital and digital to analogue conversion and a comprehensive understanding of their need.
- A basic understanding of microprocessors and microcontrollers.
- An introduction to programming microprocessors in C.
- Some practical experience of implementing an instrumentation system.

Learning outcomes

		Attributes Developed
001	Define the terms describing the use of instrumentation	K
002	Describe basic analogue and digital systems including bridge circuits, logic gates and amplifiers and Design simple amplification circuits	K
003	Identify sources of noise in electronic systems and propose remedial action	CKP
004	Specify sampling rates and resolution for data acquisition systems	C
005	Write basic programs in a variant of the C programming language and programme a microcontroller, which will measure a dynamically changing physical quantity	KT
006	Analyse the performance of an instrumentation system	KP

Attributes Developed

C - Cognitive/analytical

K - Subject knowledge

T - Transferable skills

P - Professional/Practical skills

Methods of Teaching / Learning

The learning and teaching strategy is designed to ensure that students are able both to acquire subject-specific knowledge, and to learn to apply it in real-world examples. This is delivered through lectures focussed on delivering examples of instrumentation use in a broader engineering context, coupled with laboratory sessions where students use problem-based learning to

The learning and teaching methods are as follows. This module will be delivered by:

Lectures

Structured tutorials based on prepared notes and question sessions

Labs

Indicated Lecture Hours (which may also include seminars, tutorials, workshops and other contact time) are approximate and may include in-class tests where one or more of these are an assessment on the module. In-class tests are scheduled/organised separately to taught content and will be published on to student personal timetables, where they apply to taken modules, as soon as they are finalised by central administration. This will usually be after the initial publication of the teaching timetable for the relevant semester.

Reading list

https://readinglists.surrey.ac.uk
Upon accessing the reading list, please search for the module using the module code: ENG2137

Other information

The School of Mechanical Engineering Sciences is committed to developing graduates with strengths in Employability, Digital Capabilities, Global and Cultural Capabilities, Sustainability, and Resourcefulness and Resilience. This module is designed to allow students to develop knowledge, skills, and capabilities in the following areas:

Digital capabilities: Students will become familiar with the basics of the C programming language, as well as how code is interpreted by microprocessors and converted into physical input/output. Students will gain experience of both theoretical circuit design and practical implementation of electronics.

Resourcefulness and resilience: Students will be given a take-home electronics kit and will have to demonstrate independent debugging / problem solving as they create and test a program they design themselves on physical hardware.

Employability: Students will gain experience with widely used programming languages, as well as an ability to work with physical digital circuits. They will become familiar with typical software design procedures.

Programmes this module appears in

Programme	Semester	Classification	Qualifying conditions
Biomedical Engineering BEng (Hons)	2	Compulsory	A weighted aggregate mark of 40% is required to pass the module
Biomedical Engineering MEng	2	Compulsory	A weighted aggregate mark of 40% is required to pass the module
Mechanical Engineering BEng (Hons)	2	Optional	A weighted aggregate mark of 40% is required to pass the module
Mechanical Engineering MEng	2	Optional	A weighted aggregate mark of 40% is required to pass the module