MATHEMATICS II: ENGINEERING MATHEMATICS - 2024/5

Module code: EEE1032

Module Overview

The ability to use mathematics with confidence underpins a successful engineering degree. This module provides students with some of the basic understanding and skills in mathematics needed to follow a degree programme in modern engineering. The content is specifically related to topics associated with electronic engineering.

Module provider

Computer Science and Electronic Eng

Module Leader

JACKSON Philip (CS & EE)

Number of Credits: 15

ECTS Credits: 7.5

Framework: FHEQ Level 4

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

Overall student workload

Independent Learning Hours: 88

Lecture Hours: 11

Tutorial Hours: 11

Guided Learning: 10

Captured Content: 30

Module Availability

Semester 2

Prerequisites / Co-requisites

None.

Module content

Indicative content includes the following.

Part A – Signals

Representation of signals in the time and frequency domains (Fourier series, signal spectra and bandwidth), discrete signals, signal power and energy, introduction to noise and S/N, the decibel scale. Applications in signal processing and communications.

Introduction to Fourier methods. Calculation of the Fourier series of a periodic function. Representation of a Fourier series in complex form. Introduction to the Fourier transform.

Part B – Engineering Mechanics and Ordinary Differential Equations

Motion in 3D: kinematics, forces, dynamics, Newton's laws, changes in momentum, equilibrium.

Work and power: conservative forces, kinetic energy, potential energy.

Rotational motion: kinematics, moments, dynamics, angular inertia and angular momentum, general equilibrium.

Classification of differential equations. First order differential equations with variables separable, and the use of an integrating factor. First and second order linear differential equations with constant coefficients (homogeneous and non-homogeneous where the RHS is an exponential, trigonometric or polynomial function).

Assessment pattern

Assessment type	Unit of assessment	Weighting
Coursework	TUTORIAL PEER ASSESSMENT SCHEME	10
Examination	INVIGILATED 2HR EXAM	90

Alternative Assessment

A student required to resit the TPAS unit of assessment is required to re-submit written answers to all TPAS questions relevant to the module. This re-submission is assessed by the TPAS Coordinator on a pass-fail basis only.

Assessment Strategy

The assessment strategy for this module is designed to provide students with the opportunity to demonstrate the learning outcomes. The exam will assess students' knowledge and assimilation of the terminology, concepts and details of the mathematics relevant to first year Engineers in the fields of signals and mechanics.

Thus, the summative assessment for this module consists of the following.

1. Coursework assessed via the Year 1 Tutorial Peer Assessment System (TPAS)

There are THREE TPAS Cycles associated with this module. EACH Cycle involves:

- a take-away written assignment consisting of technical questions to be answered, with solutions submitted as coursework;
- an in-class assignment requiring a student to mark the script of a colleague.

In Semester 2, TPAS covers this module and module EEE1034. Thus, formally the two modules between them have six associated TPAS assignments. Marks are allocated on a "per question" basis and are amalgamated to give a "total for TPAS". For exact TPAS submission dates, see the assessment calendar issued to you.

2. By a written examination

Formative assessment and feedback

Students will receive formative assessment / feedback in the following ways:

· During lectures, by informal question and answer sessions, multiple-choice diagnostic tests, and by discussing in-class exercises.

· By means of unassessed tutorial problem sheets (these will be discussed in the lectures, and selected answers/model solutions will be made available via SurreyLearn).

· Online tests in SurreyLearn.

· Via the Year 1 Tutorial Peer Assessment Scheme (three marked assignments), including discussion during tutorials (part summative and part formative assessment).

Module aims

- This module introduces signals, mechanics, and ordinary differential equations, and aims to give students the knowledge to apply mathematics to practical engineering problems. The module also aims to provide opportunities for students to learn about the Surrey Pillars listed below.

Learning outcomes

Ref		Attributes Developed	
001	Apply mathematics to the description of signals and related ideas.	KCT	C1
002	Use the concept of decibels.	KCT	C1
003	Calculate Fourier series and Fourier transforms of signals, and describe their significance.	KCT	C2
004	Apply mathematical methods to simple problems in mechanics.	KCT	C2
005	Solve simple differential equations and apply them to problems in mechanics.	KCT	C2

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 provide students with the knowledge and understanding defined in the module learning outcomes. Students will develop their cognitive skills by developing their ability to apply existing and new mathematical knowledge in new situations.

Learning and teaching methods include the following:

- Lectures: including in-class exercises and discussions
- Tutorial Peer Assessment Scheme tutorials (shared with module EEE1034 Electrical Science I), together with guided answering of questions
- Self-study and work on tutorial problem sheets, including discussions during lectures.

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: EEE1032

Other information

- Digital capabilities: By understanding digital signal representations; by learning how mobile communication works
- Employability: By learning how signals are transmitted and utilized in modern telecommunication systems (e.g., 5G)
- Global and cultural capabilities: By understanding global-scale telecommunication
- Resourcefulness and resilience: By understanding complicated maths concepts; by learning to derive complex maths equations using differentiation and integration.
- Sustainability: By learning about encoding and compressing digital signals that results in reduced energy costs during transmission.

Programmes this module appears in

Programme	Semester	Classification	Qualifying conditions
Astronautics and Space Engineering BEng (Hons)	2	Compulsory	A weighted aggregate mark of 40% is required to pass the module
Astronautics and Space Engineering MEng	2	Compulsory	A weighted aggregate mark of 40% is required to pass the module
Computer and Internet Engineering BEng (Hons)	2	Compulsory	A weighted aggregate mark of 40% is required to pass the module
Computer and Internet Engineering MEng	2	Compulsory	A weighted aggregate mark of 40% is required to pass the module
Electrical and Electronic Engineering BEng (Hons)	2	Compulsory	A weighted aggregate mark of 40% is required to pass the module
Electrical and Electronic Engineering MEng	2	Compulsory	A weighted aggregate mark of 40% is required to pass the module
Electronic Engineering BEng (Hons)	2	Compulsory	A weighted aggregate mark of 40% is required to pass the module
Electronic Engineering MEng	2	Compulsory	A weighted aggregate mark of 40% is required to pass the module
Electronic Engineering with Computer Systems BEng (Hons)	2	Compulsory	A weighted aggregate mark of 40% is required to pass the module
Electronic Engineering with Computer Systems MEng	2	Compulsory	A weighted aggregate mark of 40% is required to pass the module