ELECTRONIC CIRCUITS - 2024/5

Module code: EEE1025

Module Overview

The module offers an introduction to circuit theory and analogue electronics.

Module provider

Computer Science and Electronic Eng

Module Leader

JAYAWARDENA Imalka (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 1

Prerequisites / Co-requisites

None.

Module content

Indicative content includes the following.

Part A - Circuit Theory

DC circuits – Current and voltage definitions, Passive sign convention and circuit elements, Combining.

resistive elements in series and parallel. Kirchhoff's laws and Ohm's law. Anatomy of a circuit, Network reduction, Introduction to mesh and nodal analysis .

AC circuits I – Time dependent signals, average and RMS values. Capacitance and inductance, energy storage elements, simple AC steady-state sinusoidal analysis.

AC Circuits II - Phasor diagrams, definition of complex impedance, AC circuit analysis with complex numbers.

RL, RC and RLC circuits - Frequency response of RLC circuits, simple filter and band-pass circuits, resonance and Q-factor, use of Bode plots, use of differential equations and their solutions. Time response (natural and step responses). Introduction to second order circuits.

Revision problem classes

Part B - Analogue Electronics

Fundamentals

Resistive networks, voltage and current sources, Thevenin and Norton equivalent circuits, current and voltage division, input resistance, output resistance, coupling and decoupling capacitors, maximum power transfer, RMS and power dissipation, current limiting and over voltage protection.

Components and active devices – Components vs elements and circuit modelling, real and ideal elements. Introduction to sensors and actuators, self-generating vs modulating type sensors, simple circuit interfacing.

Diodes and Diode circuits – Diode characteristics and equations, ideal vs real. Signal conditioning, clamping and clipping, rectification and peak detection, photodiodes, LEDs, Zener diodes, voltage stabilisation, voltage reference, power supplies.

Assessment pattern

Assessment type	Unit of assessment	Weighting
Coursework	Tutorial Peer Assessment Scheme	10
Examination Online	2hr Online (Open Book) Exam within 4 hr window	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 following:

· That you can recognise common electronics components and circuits, recognise the purpose of a circuit. and analyse the properties of electronics systems. This involves both analytical and recognition skills.

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

- Three sets of problems assessed via the Tutorial Peer Assessment System (TPAS).
- A 2-hour online, open-book examination in a 4-hour window.

For exact TPAS submission dates, see the Departmental assessment calendar issued to you.

The examination is essential to judge the level of understanding of this basic theory and the TPAS encourages independent learning and provides a regular test of progress throughout the semester.

Formative assessment and feedback

For the module, students will receive formative assessment/feedback in the following ways.

- During lectures, by question and answer sessions and discussion
- During tutorials/tutorial classes
- During meetings with the module coordinator and other contributors
- Via the Year 1 Tutorial Peer Assessment Systems
- By means of unassessed tutorial problem sheets (with answers/model solutions)
- The TPAS coursework is designed to help you develop your resourcefulness and resilience by asking questions based on taught material and how to generalize that material.
- During supervised laboratory sessions in module EEE1027 “Laboratories, Design and Professional Studies 1”

Module aims

- Introduce the fundamentals of circuit analysis and analogue electronics. It is a basic introduction to electronic theory for a set of electronics based programmes.
- The module is needed to provide the basic underpinning theory of electronics on which future years and modules will build. These modules include: EEE1034 Electrical Science I;, EEE2033 Circuits, Control And Communications, EEE2045 Electrical Science II. It provides key steps in developing digital capabilities with introduction to electronic components of digital systems and access to digital learning system with the surreylearn environment which provides lecture material and support with formative assessment with a range of feedback questions for each element of the module.
- It provides the underlying theory for practical laboratory work carried out in modules such as: EEE1027 Laboratories, Design & Professional Studies I, EEE1028 Laboratories, Design & Professional Studies II, EEE2036 Laboratories, Design & Professional Studies III and EEE2037 Laboratories, Design & Professional Studies IV.
- It's contribution to learning is an understanding of the basic concepts that are used and built upon in future years
- It provides an introduction to resources to support learning and their use to develop a resilient approach to learning.
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Learning outcomes

Ref		Attributes Developed	
001	Understand and be able to demonstrate personal competence in applying basic analytical techniques (including Ohm's Law, Kirchhoff's Laws and Mesh/Nodal analysis) to determine the currents and voltages in simple electronic circuits.	KC	C1
002	Understand the response of reactive components to AC signals by applying knowledge of complex impedance.	KC	C1
003	Understand analytical techniques to determine the frequency response of combinations of resistive/reactive elements including RL, RC and RLC circuits and be able to apply them.	KC	C1
004	Demonstrate the ability to simplify circuits to produce Norton and Thevenin equivalents and understand the underlying principles to do this.	KC	C1
005	Develop an understanding and ability to apply the concept of input impedance and output impedances of analogue circuits and components.	KC	C1
006	Understand the electrical characteristics of diodes and analyse simple analogue circuits containing these elements and be able to discuss and explain them.	KC	C2
007	Understand the operation of simple power supply circuits and specify components for a given performance and be able to discuss and explain them.	KC	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 achieve the following aims:

- communicate knowledge and information on basic electronic circuits
- engage students in the analysis and understanding of basic electronic circuits through a combination of theory lectures, tutorials problem sheets.
- communicate knowledge on ethical behaviour in work environment through lectures;
- communicate information on opportunities in electronic engineering paths through lectures.

You should complete the course with a thorough grounding in elementary analogue electronics. The material is listed above. The level of experience is at introductory university level and designed to prepare you for later parts of your course.

Learning and teaching methods include a set of face to face and recorded lectures, tutorials with lecturers, optional formative problem sheets with answers sheets and problem classes, tutor peer assessment system of summative assessment, online resources, link to recommended textbook available in library. In summary:

- Lectures problem classes – these are both during lectures and at tutorials run by the lecturers where students are supported in using the material you have learned to solve new problems, thus developing your resourcefulness and resilience.

- Tutorial problems with peer marking formative test – this is the Tutorial Peer Assessment System (TPAS) system which involves three problem sheets (the first a couple of weeks into term, the second in the middle and the third at the end) which are marked by your peers in a tutorial class. Marks are then discussed with your personal tutor

- Feedback – this is based on the TPAS marks and the tutorial sessions with the lecturers.

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: EEE1025

Other information

We are 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 three areas:

Digital Capabilities: The module helps develop your digital capabilities from your interaction with the digital teaching systems. Also the material taught provides the basis for understanding digital systems in terms of their underlying electronics. This underlying electronics includes resistors, inductors and capacitors and their circuits which are the building blocks of all digital systems.

Employability: basic electronics knowledge is essential for a range of careers and this module coupled with later modules in this area provides the student with this. Electronics knowledge makes available careers in electronic and electrical engineering, computing, artificial intelligence, general engineering and areas of physical sciences.

Resourcefulness and Resilience: In terms of resourcefulness and resilience students are provided with the means to, and encouraged to look at, a range of sources for information and, for the optional more challenging problems set, to go beyond the taught examples. For instance, in coursework and examinations we ask questions on applications of theories such as Thevenin and Norton models of complex circuits. We also provide more challenging optional questions that combine this with other aspects of the course such as network modelling. Formative feedback throughout the module using problems sheets and the TPAS coursework help you to develop your resourcefulness and resilience.

The pillars of Sustainability and Global and Cultural Intelligence are not addressed directly in this year 1 course on the engineering fundamentals but are developed throughout later modules in the course.

Programmes this module appears in

Programme	Semester	Classification	Qualifying conditions
Astronautics and Space Engineering BEng (Hons)	1	Compulsory	A weighted aggregate mark of 40% is required to pass the module
Astronautics and Space Engineering MEng	1	Compulsory	A weighted aggregate mark of 40% is required to pass the module
Computer and Internet Engineering BEng (Hons)	1	Compulsory	A weighted aggregate mark of 40% is required to pass the module
Computer and Internet Engineering MEng	1	Compulsory	A weighted aggregate mark of 40% is required to pass the module
Electrical and Electronic Engineering BEng (Hons)	1	Compulsory	A weighted aggregate mark of 40% is required to pass the module
Electrical and Electronic Engineering MEng	1	Compulsory	A weighted aggregate mark of 40% is required to pass the module
Electronic Engineering BEng (Hons)	1	Compulsory	A weighted aggregate mark of 40% is required to pass the module
Electronic Engineering MEng	1	Compulsory	A weighted aggregate mark of 40% is required to pass the module
Electronic Engineering with Computer Systems BEng (Hons)	1	Compulsory	A weighted aggregate mark of 40% is required to pass the module
Electronic Engineering with Computer Systems MEng	1	Compulsory	A weighted aggregate mark of 40% is required to pass the module