Swansea University
Prifysgol Abertawe

# FACULTY OF SCIENCE AND ENGINEERING

## UNDERGRADUATE STUDENT HANDBOOK

## YEAR 1 (FHEQ LEVEL 4)

## ELECTRONIC AND ELECTRICAL ENGINEERING DEGREE PROGRAMMES

## SUBJECT SPECIFIC
## (PART TWO OF TWO)
## *MODULE AND COURSE STRUCTURE*
## 2022/23

## DISCLAIMER

The Faculty of Science and Engineering has made all reasonable efforts to ensure that the information contained within this publication is accurate and up-to-date when published but can accept no responsibility for any errors or omissions.

The Faculty of Science and Engineering reserves the right to revise, alter or discontinue degree programmes or modules and to amend regulations and procedures at any time, but every effort will be made to notify interested parties.

It should be noted that not every module listed in this handbook may be available every year, and changes may be made to the details of the modules. You are advised to contact the Faculty of Science and Engineering directly if you require further information.

**The 22-23 academic year begins on 19 September 2022**

Full term dates can be found here

**DATES OF 22-23 TERMS**

19 September 2022 – 16 December 2022

9 January 2023 – 31 March 2023

24 April 2023 – 09 June 2023

**SEMESTER 1**

19 September 2022 – 27 January 2023

**SEMESTER 2**

30 January 2023 – 09 June 2023

**SUMMER**

12 June 2023 – 22 September 2023

## IMPORTANT

Swansea University and the Faculty of Science of Engineering takes any form of **academic misconduct** very seriously. In order to maintain academic integrity and ensure that the quality of an Award from Swansea University is not diminished, it is important to ensure that all students are judged on their ability. No student should have an unfair advantage over another as a result of academic misconduct - whether this is in the form of **Plagiarism**, **Collusion** or **Commissioning**.

It is important that you are aware of the **guidelines** governing Academic Misconduct within the University/Faculty of Science and Engineering and the possible implications. The Faculty of Science and Engineering will not take intent into consideration and in relation to an allegation of academic misconduct - there can be no defence that the offence was committed unintentionally or accidentally.

Please ensure that you read the University webpages covering the topic – procedural guidance here and further information here. You should also read the Faculty Part One handbook fully, in particular the pages that concern Academic Misconduct/Academic Integrity. You should also refer to the Faculty of Science and Engineering proof-reading policy and this can be found on the Community HUB on Canvas, under Course Documents.

**Welcome to the Faculty of Science and Engineering!**

Whether you are a new or a returning student, we could not be happier to be on this journey with you.

This has been a challenging period for everyone. The COVID-19 pandemic has prompted a huge change in society as well as how we deliver our programmes at Swansea University and the way in which you study, research, learn and collaborate. We have been working hard to make sure you will have or continue to having an excellent experience with us.

We have further developed some exciting new approaches that I know you will enjoy, both on campus and online, and we cannot wait to share these with you.

At Swansea University and in the Faculty of Science & Engineering, we believe in working in partnership with students. We work hard to break down barriers and value the contribution of everyone. Our goal is an inclusive community where everyone is respected, and everyone's contributions are valued. Always feel free to talk to academic staff, administrators, and your fellow students - I'm sure you will find many friendly helping hands ready to assist you.

We all know this period of change will continue and we will need to adapt and innovate to continue to be supportive and successful. At Swansea we are committed to making sure our students are fully involved in and informed about our response to challenges.

In the meantime, learn, create, collaborate, and most of all – enjoy yourself!

**Professor Johann (Hans) Sienz**
**Interim Pro-Vice Chancellor/Interim Executive Dean**
**Faculty of Science and Engineering**

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|---|---|
| **Faculty of Science and Engineering** | |
| Interim Pro-Vice Chancellor/Interim Executive Dean | Professor Johann Sienz |
| Head of Operations | Mrs Ruth Bunting |
| Associate Dean – Student Learning and Experience (SLE) | Professor Paul Holland |
| **School of Aerospace, Civil, Electrical, General and Mechanical Engineering**<br>**Head of School: Professor Antonio Gil** | |
| School Education Lead | Professor Cris Arnold |
| Head of Electronic and Electrical Engineering | Professor Vincent Teng |
| Electronic and Electrical Engineering Programme Director | Dr Karin Ennser |
| Year Coordinators | Dr Antonio Martinez Muniz |

## STUDENT SUPPORT

The Faculty of Science and Engineering has two **Reception** areas - Engineering Central (Bay Campus) and Wallace 223c (Singleton Park Campus).

Standard Reception opening hours are Monday-Friday 9am-5pm.

The **Student Support Team** provides dedicated and professional support to all studentsin the Faculty of Science and Engineering. Should you require assistance, have any questions, be unsure what to do or are experiencing difficulties with your studies or in your personal life, our team can offer direct help and advice, plus signpost you to further sources of support within the University. There are lots of ways to get information and contact the team:

**Email:** studentsupport-scienceengineering@swansea.ac.uk (Monday–Friday, 9am–5pm)

**Call:** +44 (0) 1792 295514 and 01792 6062522 (Monday-Friday, 10am–12pm, 2–4pm).

**Zoom:** By appointment. Students can email, and if appropriate we will share a link to our Zoom calendar for students to select a date/time to meet.

The current student **webpages** also contain useful information and links to otherresources:

https://myuni.swansea.ac.uk/fse/coe-student-info/

## READING LISTS

Reading lists for each module are available on the course Canvas page and are also accessible via http://ifindreading.swan.ac.uk/. We've removed reading lists from the 22-23 handbooks to ensure that you have access to the most up-to-date versions. Access to print material in the library may be limited due to CV-19; your reading lists will link to on-line material whenever possible. We do not expect you to purchase textbooks, unless it is a specified key text for the course.

## THE DIFFERENCE BETWEEN COMPULSORY AND CORE MODULES

**Compulsory modules** must be **pursued** by a student.

**Core modules** must not only be **pursued**, but also **passed** before a student can proceed to the next level of study or qualify for an award. Failures in core modules must be redeemed.

Further information can be found under "Modular Terminology" on the following link - https://myuni.swansea.ac.uk/academic-life/academic-regulations/taught-guidance/essential-info-taught-students/your-programme-explained/

## Supporting Your Studies

- Centre for Academic Success
- Faculty of Science and Engineering- Student Support

## Supporting Your Professional Development

As a first-year student studying *Electronic and Electrical Engineering* at Swansea University you are startinga journey which we hope will end with Engineering Council registration as either an Incorporated Engineer (IEng) or Chartered Engineer (CEng).

Each of the Bachelor of Engineering (BEng) programmes covered by this handbook has been accredited by the Institution of Engineering and Technology (IET) on behalf of the Engineering Council for the purpose of fully meeting the academic requirement for registration as an Incorporated Engineer (IEng) and partially meeting the academic requirement for registration as a Chartered Engineer (CEng).

Each of the Integrated Masters (MEng) programmes covered by this handbook has been accredited by the Institution of Engineering and Technology (IET) on behalf of the Engineering Council for the purpose of fully meeting the academic requirement for registration as a Chartered Engineer (CEng).

What this means for you is that the learning outcomes of each year of your programme of study has been carefully designed to align with Version 3 of the Engineering Council's Accreditation of Higher Education Programmes (AHEP) which forms the educational foundation for the UK Standard for Professional Engineering Competence (UK-SPEC).

The knowledge and skills you will have demonstrated by completing your programme of study are defined by achieving a set of learning outcomes distributed across the following key areas of competence:

- Science and mathematics
- Engineering analysis
- Design and innovation
- The engineer and society
- Engineering practice

To find out more about Professional Registration and what the AHEP competences are, please refer to the Engineering Council's Student Guide to Professional Registration and the Accreditation of Higher Education Programmes collated learning outcomes

## Progression routes

There are some options you may want to consider if you are currently enrolled on one of the Electronic and Electrical Engineering undergraduate programmes. After the completion of the Year 2, you could trade up to MEng and/or add an optional year: Year in Industry or Study Abroad. Please discuss this with your Academic Mentor and your family or other supporters and if you wish to proceed contact the Faculty Student Support Team (studentsupport-sciencengineering@swansea.ac.uk).

Figure 1 shows the progression routes.

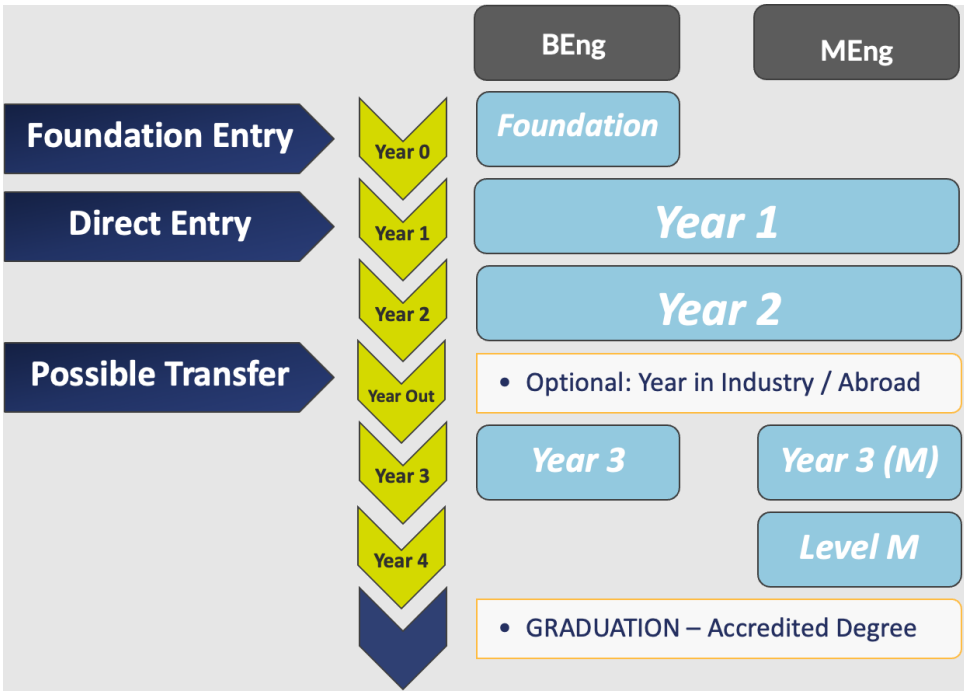


***Figure 1*** *The progression routes*

## Trading up to MEng

If you are currently enrolled on one of the BEng programmes and would like to become a Chartered Engineer, the easiest way to satisfy the academic requirements at Swansea University is to transfer from the BEng to the equivalent MEng programme. This option is open to you until the end of Year 2, providing that your overall average is (or is predicted to be) at least 55%.

## Trading up to Year in Industry

If you are currently enrolled on one of the BEng or MEng programmes and would like to have an industry experience, you can opt to Year in Industry. The Employability Team will assist you on finding a placement and support you through the year.

## Trading up to a Year Abroad

If you wish to study abroad, you may want to consider transferring from a regular BEng or MEng programme to a programme which includes a year abroad.

## The IET – Your Professional Home for Life

As a student at Swansea University, you are privileged to be associated with one of the small groups of universities that have been selected to be Academic Partners of the IET. The most tangible benefit of this is that you can register as a student member of the IET at no cost to yourself for the duration of your study. And as a student member of the IET, you can take *full advantage* of the benefits that membership

of the IET offers. These include an impressive range of services supporting *Networking*, *Professional Development*, *Learning Resources* and *Membership Benefits*. A summary of these is shown on the Get more from your partnership page.

## IET on Campus

IET On Campus is designed to support everyone in the Department of Electronic and Electrical Engineering with students at the heart of it. The IET gives you access to tailored practical, technical, and career-related resources and helps you to create links with industry and other universities, building a platform for you to demonstrate your skills and raise your profile. At Swansea, the local branch of IET on Campus is run by the Electrical & Electronic Engineering Society (E&EESoc) and is supported by the IET South Wales Local Network.

For more information, please join E&EESoc and access their social media channels.

## IET Student Advisor

Dr Chris Jobling (MIET, CEng) is the *IET Student Advisor* for Swansea University. Please get in touch with him if you want to find out more about the AHEP and UKSPEC, the IET, IET student membership, IET Scholarships, Graduate Advantage, IET Communities, or opportunities to get involved with Wales Southwest Local Network as an IET young professional volunteer. He will be happy to help.

Other members of staff associated with the IET at Swansea include:

- Dr Richard Cobley (MIET)
- Dr Timothy Davies (MIET, CEng)
- Dr Augustine Egwebe (MIET)
- Dr Karin Ennser (MIET, CEng)
- Prof Lijie Li (FIET)
- Mr David Moody (MIET)

## UK Electronics Skills Foundation

Swansea University is an academic partner from the UK Electronics Skills Foundation. The partnership means that you can benefit from the UKESF scholarship scheme, competitions, awards and internship programme, which connects the most capable Electronics undergraduates with leading companies in the sector.

UKESF offers opportunities for undergraduates to take advantage of an industry placement, develop their employability skills, generous financial support, and the opportunity to network with professionals in the Electronics sector. Dr Karin Ennser is the *UKESF Student Advisor* for Swansea University. Please contact her if you want to find out more.

## Faculty prizes and progression awards

The Faculty of Science and Engineering awards prizes to the best student in each year and progression awards to students who achieve high averages in each year's programme of studies. These prizes are awarded at a special ceremony and dinner held each year.

# Year 1 (FHEQ Level 4) 2022/23
# Electronic and Electrical Engineering

**BEng Electronic and Electrical Engineering[H602,H605]**
**BEng Electronic and Electrical Engineering with a Year Abroad[H603]**
**MEng Electronic and Electrical Engineering[H606]**
**MEng Electronic and Electrical Engineering with a Year Abroad[H600]**

| Semester 1 Modules | Semester 2 Modules |
|---|---|
| **EG-114**<br>**Engineering Mathematics 1 (Mech & EEE & Engineering)**<br>**10 Credits**<br>**Dr AJ Bruce**<br>**CORE** | **EG-116**<br>**Engineering Mathematics 2 (Mech & EEE & Engineering)**<br>**10 Credits**<br>**Dr S Salim**<br>**CORE** |
| **EG-133**<br>**Engineering for People Hackathon**<br>**10 Credits**<br>**Prof JC Arnold/Dr WG Bennett/Dr JW Jones/Dr S Potts/...**<br>**CORE** | **EG-142**<br>**Instrumentation and Control**<br>**10 Credits**<br>**Mrs M Ahmed/Dr RJ Cobley**<br>**CORE** |
| **EG-143**<br>**Digital Design**<br>**10 Credits**<br>**Mrs M Ahmed**<br>**CORE** | **EG-150**<br>**Signals and Systems**<br>**10 Credits**<br>**Dr CP Jobling**<br>**CORE** |
| **EG-151**<br>**Microcontrollers**<br>**10 Credits**<br>**Dr CP Jobling/Dr BR Clifford**<br>**CORE** | **EG-152**<br>**Analogue Design**<br>**10 Credits**<br>**Dr AE Martinez Muniz/Mrs M Ahmed**<br>**CORE** |
| **EG-155**<br>**Circuit Analysis**<br>**10 Credits**<br>**Prof PM Holland**<br>**CORE** | **EGA107**<br>**Power Engineering**<br>**10 Credits**<br>**Dr M Monfared**<br>**CORE** |
| **EGA108**<br>**Electrical and Magnetic Properties of Materials**<br>**10 Credits**<br>**Dr AE Martinez Muniz**<br>**CORE** | **EGA121**<br>**Introduction to Electromagnetics**<br>**10 Credits**<br>**Dr AE Martinez Muniz**<br>**CORE** |
| **Total 120 Credits** | |

# Year 1 (FHEQ Level 4) 2022/23
# Electronic and Electrical Engineering
**BEng Electronic and Electrical Engineering with a Year in Industry[H604]**
**MEng Electronic and Electrical Engineering with a Year in Industry[H601]**

| Semester 1 Modules | Semester 2 Modules |
|---|---|
| **EG-114**<br>**Engineering Mathematics 1 (Mech & EEE & Engineering)**<br>**10 Credits**<br>**Dr AJ Bruce**<br>**CORE** | **EG-116**<br>**Engineering Mathematics 2 (Mech & EEE & Engineering)**<br>**10 Credits**<br>**Dr S Salim**<br>**CORE** |
| **EG-133**<br>**Engineering for People Hackathon**<br>**10 Credits**<br>**Prof JC Arnold/Dr WG Bennett/Dr JW Jones/Dr S Potts/...**<br>**CORE** | **EG-135**<br>**Placement Preparation: Science and Engineering Year in Industry**<br>**0 Credits**<br>**Prof GTM Bunting/Dr SA Rolland/Dr V Samaras**<br>**CORE** |
| **EG-143**<br>**Digital Design**<br>**10 Credits**<br>**Mrs M Ahmed**<br>**CORE** | **EG-142**<br>**Instrumentation and Control**<br>**10 Credits**<br>**Mrs M Ahmed/Dr RJ Cobley**<br>**CORE** |
| **EG-151**<br>**Microcontrollers**<br>**10 Credits**<br>**Dr CP Jobling/Dr BR Clifford**<br>**CORE** | **EG-150**<br>**Signals and Systems**<br>**10 Credits**<br>**Dr CP Jobling**<br>**CORE** |
| **EG-155**<br>**Circuit Analysis**<br>**10 Credits**<br>**Prof PM Holland**<br>**CORE** | **EG-152**<br>**Analogue Design**<br>**10 Credits**<br>**Dr AE Martinez Muniz/Mrs M Ahmed**<br>**CORE** |
| **EGA108**<br>**Electrical and Magnetic Properties of Materials**<br>**10 Credits**<br>**Dr AE Martinez Muniz**<br>**CORE** | **EGA107**<br>**Power Engineering**<br>**10 Credits**<br>**Dr M Monfared**<br>**CORE** |
| | **EGA121**<br>**Introduction to Electromagnetics**<br>**10 Credits**<br>**Dr AE Martinez Muniz**<br>**CORE** |
| **Total 120 Credits** | |

# EG-114 Engineering Mathematics 1 (Mech & EEE & Engineering)

**Credits: 10 Session: 2022/23 September-January**

**Pre-requisite Modules:**

**Co-requisite Modules:**

**Lecturer(s):** Dr AJ Bruce

**Format:** Lectures 30 hours
Directed private study 70 hours

Contact Hours will be delivered through a blend of live activities online and on-campus, and may include, for example, lectures, seminars, practical sessions and Academic Mentoring sessions.

**Delivery Method:** All Programmes will employ a blended approach to delivery using the Canvas Digital Learning Platform for live and self-directed online activity, with live and self-directed on-campus activities each week. Students may also have the opportunity to engage with online versions of sessions delivered on-campus

This module will consist of lectures, which concentrate on the mathematical theory, and electronic examples, which concentrate on applying the theory to solve problems.

**Module Aims:** This module (in combination with Engineering Analysis 2B) provides the essential grounding in mathematical analysis techniques for engineering students. This module ensures that all students have a suitable level of analytical skills for subsequent engineering modules.

**Module Content:** Module content:

• Number systems: numbers, algebra and geometry.
• Functions: inverse and composite functions, polynomial functions, rational functions, circular functions, exponential, logarithmic and hyperbolic functions, continuous and discontinuous functions.
• Introduction to complex numbers: The number j, real and imaginary components, Cartesian form, complex conjugate and polar form.
• Differentiation: basic ideas and definition, elementary functions, rules of differentiation, parametric and implicit differentiation, higher derivatives, optimum values.
• Integration: basic ideas and definition, definite and indefinite integrals, techniques of integration, integrals of partial fractions, integration by parts, integration by substitution.
• Linear Algebra: simultaneous equations, Gauss elimination, matrices, rules of matrix algebra, rank and linear dependence, calculation of determinates and eigenvalue problems.

**Intended Learning Outcomes:**
Technical Outcomes
On successful completion of this unit students will be expected, at threshold level, to be able to:
- Demonstrate knowledge of the fundamentals of mathematics, which underpin their engineering degree. (Evaluated in the MyMathLab continuous assessments and the examination.
- Demonstrate a comprehension of the fundamentals of mathematics, which underpin their engineering degree, using the following specific techniques: manipulate algebraic expressions, differentiation (including optimisation of functionals), integration, matrices and Gauss elimination (Evaluated in the examination).

Accreditation Outcomes (AHEP)
- Knowledge and understanding of scientific principles and methodology necessary to underpin their education in their engineering discipline, to enable appreciation of its scientific and engineering context, and to support their understanding of relevant historical, current and future developments and technologies (SM1b)
- Knowledge and understanding of mathematical and statistical methods necessary to underpin their education in their engineering discipline and to enable them to apply mathematical and statistical methods, tools and notations proficiently in the analysis and solution of engineering problems (SM2b)

**Assessment:** Coursework 1 (25%)
Coursework 2 (25%)
Coursework 3 (25%)
Coursework 4 (25%)

**Resit Assessment:** Examination (Resit instrument) (100%)

**Assessment Description:**
Coursework:
4 electronic online tests with randomised coefficients will be set during the semester. There will be an opportunity to practice similar exercises before attempting each test. Each test is an individual piece of coursework.

Coursework 1 - Weighting 25%

Coursework 2 - Weighting 25%

Coursework 3 - Weighting 25%

Coursework 4 - Weighting 25%

Note: Students are required to pass each MyMathLab test with 40% or more. If you do not meet the component level requirements for the module you will receive a QF outcome.

If a student does not pass all required components they will be given one further attempt at failed components during the January assessment period. If the January attempt is not passed students will be offered a supplementary examination in August (subject to regulations).

**Moderation approach to main assessment:** Universal second marking as check or audit

**Assessment Feedback:** Feedback will be provided electronically for each of the assessed tests.

**Failure Redemption:** A supplementary examination will form 100% of the module mark.

**Additional Notes:** Delivery of both teaching and assessment will be blended including live and self-directed activities online and on-campus.

AVAILABLE TO visiting and exchange students.

The Faculty of Science and Engineering has a ZERO TOLERANCE penalty policy for late submission of all coursework and continuous assessment.

# EG-116 Engineering Mathematics 2 (Mech & EEE & Engineering)

**Credits: 10 Session: 2022/23 January-June**

**Pre-requisite Modules:**

**Co-requisite Modules:**

**Lecturer(s):** Dr S Salim

**Format:** Lectures 20 hours
Tutoring classes 10 hours
Directed private study 70 hours

**Delivery Method:** This module will consist of lectures, which concentrate on the mathematical theory, and example classes, which concentrate on applying the theory to solve examples.

**Module Aims:** Module Aims: this module (in combination with Engineering Analysis 1B) provides further grounding in mathematical analysis techniques for Engineering students. The module extends the understanding into more complex analytical methods, focusing on complex numbers, multi-variable functions, series and sequences and differential equations.

**Module Content:**

• Vectors: Physical meaning, components in Cartesian, cylindrical and spherical coordinates magnitude, scalar product, cross product, equations of lines and planes.
• Further complex numbers: manipulation of complex numbers, Cartesian, polar and exponential forms, Euler's formula, relationship between trigonometric and hyperbolic functions, De Moivre's theorem.
• Ordinary differential equations: classification of differential equations, solutions to first order ODE's including separable, linear and more specialised types. Solution to second order ODE's with constant coefficients.
• Functions of more than one variable: visualisation, partial differentiation, integration of lines, surfaces and volumes.
• Sequences and Series: review of arithmetic and geometric sequences and series, limit of a sequence, infinite series and tests of convergence, binomial series, and power series of common functions.

**Intended Learning Outcomes:**

Technical Outcomes
On successful completion of this unit students will be expected, at threshold level, to be able to:
- Demonstrate knowledge of the mathematics, which underpin their engineering degree.
- Demonstrate a comprehension of the mathematics, which underpin their engineering degree, through the use of the following specific techniques: work with complex numbers, manipulate vectors (in Cartesian, cylindrical and spherical coordinates), perform partial differentiation, integrate lines, surfaces and volumes, solve first and second order differential equations and expand real functions into series.

Accreditation Outcomes (AHEP)
- Knowledge and understanding of scientific principles and methodology necessary to underpin their education in their engineering discipline, to enable appreciation of its scientific and engineering context, and to support their understanding of relevant historical, current and future developments and technologies (SM1b)
- Knowledge and understanding of mathematical and statistical methods necessary to underpin their education in their engineering discipline and to enable them to apply mathematical and statistical methods, tools and notations proficiently in the analysis and solution of engineering problems (SM2b)

**Assessment:** Coursework 1 (34%)
Coursework 2 (33%)
Coursework 3 (33%)

**Resit Assessment:** Examination (Resit instrument) (100%)

**Assessment Description:** Coursework (Continuous Assessment):
4 electronic online tests with randomised coefficients will be set during the semester. There will be an opportunity to practice similar exercises before attempting each test. These tests will be each worth 25% of the module mark. Each test is an individual piece of coursework.

Specific rules for passing this module:
This module is assessed by coursework (continuous assessment) in the form of 4 online tests. You must pass each test with at least 40% in order to pass the module. If you do not meet the component level requirements for the module you will receive a QF outcome.

NB – for the 22-23 session due to UCU strike action one of the online electronic tests (CW4) did not run and as a result the assessments for CW1/CW2/CW3 were reweighted to equal value.

If a student does not pass all required components they will be given one further attempt at failed components during the May/June assessment period. If the second attempt in May/June is not passed students will be offered a supplementary examination in August (subject to regulations).

**Moderation approach to main assessment:** Universal second marking as check or audit

**Assessment Feedback:** A feedback form for the examination will be available electronically.

Feedback will be provided electronically for each of the assessed tests.

**Failure Redemption:** A supplementary examination will form 100% of the module mark.

**Additional Notes:** Delivery of both teaching and assessment will be blended including live and self-directed activities online and on-campus.

AVAILABLE TO visiting and exchange students.

The Faculty of Science and Engineering has a ZERO TOLERANCE penalty policy for late submission of all coursework and continuous assessment.

# EG-133 Engineering for People Hackathon

**Credits: 10 Session: 2022/23 September-January**

**Pre-requisite Modules:**

**Co-requisite Modules:**

**Lecturer(s):** Prof JC Arnold, Dr WG Bennett, Dr JW Jones, Dr S Potts, Dr S Salim, Dr N Wint, Dr W Zhang

**Format:** One lecture per week: 10 hours
3-hour group session each week for each discipline: 30 hours
Contact Hours will be delivered through a blend of live on-campus activities online work, and some aspects will take part in Academic Mentoring sessions.

**Delivery Method:** The delivery method is primarily on-Campus, although the 1 hour lecture each week will be recorded and be made available for on-line review. Students are required to participate in the group work sessions and this will require on-campus participation.

**Module Aims:** Engineering is more than understanding technical design, it is often the social, environmental and economic context underpinning engineering solutions that determine success or failure,

This has never been more relevant since the world is currently planning a radical transition to a low carbon economy while facing increased risks due to climate crisis which will bring with it unprecedented change to the world. Engineers will be at the forefront of this, and need to be equipped to tackle open-ended, unstructured and complex problems in collaboration with others.

The module will allow students to explore these issues within their chosen discipline with the following structure:

Each week there will be a 1-hour lecture, introducing engineering thinking and contemporary issues in global engineering design. Most activity will then take place in group-work sessions (3 hours per week), where groups of around 6 students will work in a facilitated way towards a Engineering design solution. Students will be presented with a range of Global Challenges (e.g. access to water/ off-grid energy), and over the course of the term will work to research, design and critique possible engineering solutions.

The groups with the best performance in this module may have opportunities to represent Swansea University in the national Engineers without Borders UK competition.

**Module Content:** 1. Engineering Mindset/ Self Awareness
2. Ethics and Professional Responsibilities and Sustainability
3. Failure and Learning through Mistakes/ Design mindset
4. Design Method
5. Teamwork
6. Positionality and Personal Design Perspectives
7. Reflection

**Intended Learning Outcomes:** The main learning outcomes of this module are:

D2 Define the problem identifying any constraints including environmental and sustainability limitations; ethical, health, safety, security and risk issues; intellectual property; codes of practice and standards

EL1 Understanding of the need for a high level of professional and ethical conduct in engineering and a knowledge of professional codes of conduct

EL4 Understanding of the requirement for engineering activities to promote sustainable development

Supported learning outcomes are:

D1 Be aware of business, customer and user needs, including considerations such as the wider engineering context, public perception and aesthetics

P11 Awareness of team roles and the ability to work as a member of an engineering team

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| **Assessment:** | Coursework 1 (10%)<br>Coursework 2 (10%)<br>Coursework 3 (70%)<br>Coursework 4 (10%) |
| **Resit Assessment:** | Coursework reassessment instrument (100%) |

**Assessment Description:** Coursework 1: (10%)
Team work building tasks - puzzles

Coursework 2: (10%)
Professional development assignments

Coursework 3: Presentation (70%)
The final poster with show all stages of project conception and development:
-need identification
-evaluation criteria
-long list of options
-short list of options

The mark will be given to the group and peer assessment will be used

Coursework 4: A group reflection task (10%)

**Moderation approach to main assessment:** Partial second marking

**Assessment Feedback:** Formal feedback from online test

10% of marks are available for completion of specified professional development course units. There are 5 units for students to complete.
To complete a unit a student must gain 8/10 in the unit test, and they get 5 attempts to sit each unit test. A student can gain 2% for each unit they pass.
When they complete a test canvas will let the students know how many marks out of 10 they have gained. If they have not gained 8/10 they will need to take the test again.

Regular informal feedback given throughout the term, with structured group feedback sessions at intervals, reflecting on progress, including some peer feedback.
Formal feedback on presentation and reflection task will be provided on Canvas.

**Failure Redemption:** Supplementary Assessment to be submitted in August.

Reassessment: Design Reflection & Report (100%)

**Additional Notes:** Delivery of both teaching and assessment will be blended including live and self-directed activities online and on-campus.

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# EG-135 Placement Preparation: Science and Engineering Year in Industry

**Credits: 0 Session: 2022/23 January-June**

**Pre-requisite Modules:**

**Co-requisite Modules:**

**Lecturer(s):** Prof GTM Bunting, Dr SA Rolland, Dr V Samaras

**Format:** 11 hours consisting of a mix of seminars and workshops and drop-in advice sessions. Contact hours will be delivered through a blend of live activities online and on-campus, and may include, for example, lectures, seminars, practical sessions and Academic Mentoring sessions.

**Delivery Method:** All Programmes will employ a blended approach to delivery using the Canvas Digital Learning Platform for live and self-directed online activity, with live and self-directed on-campus activities each week. Students may also have the opportunity to engage with online versions of sessions delivered on-campus

This module is delivered through directed and self-directed learning, careers resources, interactive workshops, reflective learning practice and drop-in advice sessions. The module is delivered on the Bay Campus.

**Module Aims:** This generic cross-disciplinary module is for all students who have enrolled (or transferred) onto the Faculty of Science and Engineering Year in Industry scheme. The module focuses on the underpinning and fundamental requisites required to gain, enter and progress effectively through an industrial placement. Learners will be introduced to a) sourcing placements, CV writing and application techniques; (b) interview techniques - how to pitch yourself and be successful; (c) workplace fundamentals and IP awareness, behaviours and expectations; and (d) key employability skills; getting the most from your Industrial Placement.

**Module Content:** The module will focus on the key requirements to gain and be successful whilst on a placement. Directed and self-directed activity will address the following topics;

1) Industrial Placements - what they are, how to search and how to apply.
2) CV writing, cover letters and application processes.
3) Assessment centres, interview techniques and mock interviews.
4) Recognising and developing employability skills.
5) Reflecting and maximising the placement experience

**Intended Learning Outcomes:** By the end of this module, students should be able to:

1) Demonstrate the essential skills needed to apply for and secure placement opportunities.
2) Perform effectively in an interview process and apply the tools and attributes that make a good interview.
3) Discuss and share what is expected within the workplace including behavioural and professional conduct.
4) Identify personal employability skills and how these will be used in a workplace setting.
5) Express a reflective view of the placement demonstrating the ability to maximise the placement experience in future career decisions

**Assessment:** Participation Exercise (100%)

**Assessment Description:** Not assessed

**Moderation approach to main assessment:** Not applicable

**Assessment Feedback:** Not assessed

**Failure Redemption:** Not assessed

**Additional Notes:** Module to support students on the Year in Industry programmes.

# EG-142 Instrumentation and Control

**Credits: 10 Session: 2022/23 January-June**

**Pre-requisite Modules:**

**Co-requisite Modules:**

**Lecturer(s):** Mrs M Ahmed, Dr RJ Cobley

**Format:** Lectures: 20 hours
Example classes: 3 hours
Revision classes : 2 hours
Directed private study: 25 hours
Personal revision: 50 hours
Contact Hours will be delivered through a blend of live activities online and on-campus, and may include, for example, lectures, seminars, practical sessions and Academic Mentoring sessions.

**Delivery Method:** All Programmes will employ a blended approach to delivery using the Canvas Digital Learning Platform for live and self-directed online activity, with live and self-directed on-campus activities each week. Students may also have the opportunity to engage with online versions of sessions delivered on-campus

Lecture based delivery with PowerPoint notes provided. Additional resource material available on Canvas. This descriptor is provisional for the year 2020-21, with updates expected due to Covid-19.

**Module Aims:** This module introduces the fundamentals of sensors, measurement, instrumentation and control in typical engineering applications.

**Module Content:** Sensors, clipper circuits, rectification, ripple factor, zener diodes, voltage dependent resistors, ac and dc bridges, component tolerances, non-ideal components, operational amplifier circuits, real properties of the op-amp and how that effects instrumentation systems, control, feedback, time and frequency representation of signals, PID controllers, sampling theory, quantisation error, analogue and digital conversion.

**Intended Learning Outcomes:** Technical Outcomes
After completing this module you should be able to:
• Choose the correct sensor for the required physical input, understand the choices, and be able to describe the sensor and its physical method of operation
• Design circuits required to interface sensors in to electrical circuits
• Analyse the performance of sensor circuits in terms of ideal vs non-ideal behaviour, the effect of unwanted impedances, error analysis and linearity
• Design a range of operational amplifier circuits useful for instrumentation systems
• Understand the purpose of Laplace transforms in control systems, to understand the difference between open and closed loop control systems, to understand transient response, and be able to select an appropriate type of control system.
• Understand analogue and digital conversion and be able to perform simple calculations around analogue to digital conversion, including quantisation error and data rate.

Accreditation Outcomes (AHEP)
-Knowledge and understanding of scientific principles and methodology necessary to underpin their education in their engineering discipline, to enable appreciation of its scientific and engineering context, and to support their understanding of relevant historical, current and future developments and technologies (SM1b/SM1p) - Assessed by Examination.
- Knowledge and understanding of mathematical and statistical methods necessary to underpin their education in their engineering discipline and to enable them to apply mathematical and statistical methods, tools and notations proficiently in the analysis and solution of engineering problems (SM2b/SM2p) - Assessed by both Assignment and Examination
- Ability to identify, classify and describe the performance of systems and components through the use of analytical methods and modelling techniques (EA2/EA2p) - Assessed by Examination.

**Assessment:** Examination 1 (70%)
Coursework 1 (30%)

**Resit Assessment:** Examination (Resit instrument) (100%)

**Assessment Description:**
• Examination: Written final exam.
• Coursework: An individual assignment containing a mix of exam style calculation questions and the design of a solution to a given instrumentation problem.

Specific rules for passing this module:
This module is assessed by a combination of examination and continual assessment. In order for the continual assessment marks to count, you must achieve at least 30% in the exam component. If you achieve less than 30% in the exam, then the module mark will be just the exam mark.

**Moderation approach to main assessment:** Universal second marking as check or audit

**Assessment Feedback:** - Written final exam - standard university feedback sheet completed for exam
- Assignment: individually marked and returned to the student electronically

**Failure Redemption:** Failure redemption of this module will be by examination only (100%).

**Additional Notes:** Delivery of both teaching and assessment will be blended including live and self-directed activities online and on-campus.

• Swansea students should have taken EG-152 in order to take this module.
• LIMITED AVAILABLITY to visiting and exchange Students. Visiting and exchange students should have studied a basic electrical circuits course, which covers circuit analysis, current and voltage calculations and resistor networks. A basic understanding of operational amplifier (op-amp) circuits is useful but not essential.
• The Faculty of Science and Engineering has a ZERO TOLERANCE penalty policy for late submission of all coursework and continuous assessment.

This module is assessed by a combination of examination and continual assessment. In order for the continual assessment marks to count, you must achieve at least 30% in the exam component. If you achieve less than 30% in the exam, then the module mark will be just the exam mark.

# EG-143 Digital Design

**Credits: 10 Session: 2022/23 September-January**

**Pre-requisite Modules:**

**Co-requisite Modules:**

**Lecturer(s):** Mrs M Ahmed

**Format:**
Lectures: 10 hours
Example classes: 2 hours
Laboratory work: 20 hours
Directed private study: 20 hours
Personal revision: 48 hours
Contact Hours will be delivered through a blend of live activities online and on-campus, and may include, for example, lectures, seminars, practical sessions and Academic Mentoring sessions.

**Delivery Method:** All lecture content for this course is available on the Canvas Digital Learning Platform. Students work through the self-guided content, taking mini-quizes after each component, which unlock the next lecture. At two points in the course, digital design assessments are released that correspond to the material studied up to that point. These are done using the Multisim software, available on College computers, and available for students to download and use on their own Windows computer. Assignments are submitted through Canvas. At the end, a final Canvas online assessment is delivered.

All instructional and assessment components are delivered online through Canvas, and with the software Multisim. Students can chose to work entirely remotely, and make use of Zoom office hour and support sessions online. Or students may come to socially-distanced in-person drop-in sessions held each week in a PC room. You can use these to ask for help, receive instruction, or, if you bring a pair of headphones with a 3.5 mm jack, you can use these PC lab sessions as protected time to work through the online lectures, quizes and assessments, with in-person support available. Or, students can mix and match between the two. If tightened restrictions from Covid-19 mean PC labs need to be scaled back, these sessions will switch to Zoom. The course is designed to be delivered in a variety of ways, can switch back and forth between online and in-person, and so will be minimally affected by this.

**Module Aims:** To introduce the fundamentals of logic design methods and, implement, test and compare these designs using simulators.

Students who are re-sitting, please note, this module has been re-designed to use a fully blended-learning approach.

**Module Content:** Combinatorial logic design:

- Number systems
- Logic operations
- Truth tables
- Boolean algebra
- Karnaugh maps
- De Morgan's theorem
- Practical logic elements
- PLD implementation of logic
- PLCs and ladder diagrams
- Timing

**Intended Learning Outcomes:** Technical Outcomes
After completing this module you should be able to:
• use decimal, binary and hexadecimal numbers, and convert between them
• apply the basic laws of Boolean algebra to manipulate and simplify logic expressions
• construct the simplest expression for a network output variable
• describe the properties of basic logic and apply them to the implementation of a simple logic network
• use integrated circuit elements to realise a logic network
• to identify potential timing hazards and alter designs to reduce or remove them
• create, test and evaluate logic circuits
• create, test and evaluate ladder logic diagrams
• produce a report comparable with that required of a professional engineer
• to compare and contrast different forms of implementing logic circuits (including discrete logic, silicon, FPGAs, PLDs and PLCs) and select the most appropriate, based on cost and appropriateness to the required design brief

Accreditation Outcomes (AHEP)
- Knowledge and understanding of mathematical and statistical methods necessary to underpin their education in their engineering discipline and to enable them to apply mathematical and statistical methods, tools and notations proficiently in the analysis and solution of engineering problems (SM2p)
- Ability to apply quantitative and computational methods in order to solve engineering problems and to implement appropriate action (EA3p)
- Understand and evaluate business, customer and user needs, including considerations such as the wider engineering context, public perception and aesthetics (D1p)
- Plan and manage the design process, including cost drivers, and evaluate outcomes (D5p)
- Knowledge and understanding of the commercial, economic and social context of engineering processes (ET2p)
- Ability to apply relevant practical and laboratory skills (EP3p)

**Assessment:** Coursework 1 (30%)
Coursework 2 (40%)
Coursework 3 (30%)

**Resit Assessment:** Coursework reassessment instrument (100%)

**Assessment Description:** Coursework 1 and 2 are digital design exercises, carried out in Multisim, submitted online through Canvas.

Coursework 3 is an online Canvas test.

Specific rules for passing this module:
This module is assessed by a combination of examination and continual assessment. Students must achieve 30% in coursework 2 in order for coursework 1 and 3 marks to be included in their final module mark. If students do not achieve 30% in coursework 2, their final module mark will be their coursework 2 mark only.

**Moderation approach to main assessment:** Second marking as sampling or moderation

**Assessment Feedback:** Individual feedback on CW1 and CW2. General feedback on CW3.

**Failure Redemption:** Failure redemption will be by submission of replacement assignment covering CW1 and CW2.

**Additional Notes:** Delivery of both teaching and assessment will be blended including live and self-directed activities online and on-campus.

• NOT AVAILABLE TO Visiting and Exchange Students due to Number Restriction
• Penalty for late submission of continual assessment assignments: ZERO TOLERANCE

This module is assessed by a combination of examination and continual assessment. Students must achieve 30% in coursework 2 in order for coursework 1 and 3 marks to be included in their final module mark. If students do not achieve 30% in coursework 2, their final module mark will be their coursework 2 mark only.

# EG-150 Signals and Systems

**Credits: 10 Session: 2022/23 January-June**

**Pre-requisite Modules:**

**Co-requisite Modules:** EG-114; EG-116

**Lecturer(s):** Dr CP Jobling

**Format:**
Lectures 20 hours
Example classes 6 hours
Revision classes 2 hours
MATLAB lab classes 12 hours
Directed private study 60 hours

Contact Hours will be delivered through
on-campus, lectures, example classes and MATLAB lab sessions.

**Delivery Method:** All Programmes will employ a blended approach to delivery using the Canvas Digital Learning Platform which supports live on-campus teaching and MATLAB laboratories and self-directed online activity. There will be two hours of lectures and a one-hour examples class and a two-hour MATLAB labs will be given in alternate weeks. On-campus lectures and examples classes will be recorded for study, but attendance at the MATLAB laboratories is mandatory.

Lectures- 20 hours
Example classes- 8 hours
Revision classes: 2 hours
MATLAB Labs: 12 hours
Directed private study- 60 hours

**Module Aims:** The module introduces mathematical description of signals in the time domain. and frequency domains. Basic properties of deterministic signals and systems are defined. The concept of frequency and frequency domain description of signals is introduced using Laplace transform ofand the Fourier series representation periodic continuous time signals. The modelling and simulation of systems using transfer functions and block diagrams is introduced.

**Module Content:**

• Signals in time domain: analogue and digital signals, periodic and aperiodic signals, even and odd symmetry signals.
• Waveforms: sines, cosines, exponentials, steps, rectangular and squares, impulses and ramps.
• Time domain operations on waveforms: time scaling, time reversal and time shifting.
• Calculation of waveform properties: energy, power, mean value, R.M.S. value and crest factor.
• Introduction to systems: basic properties.
• Using the Laplace transform for the representation of signals and systems in the complex frequency domain.
• The application of the Laplace transforms in electrical circuit analysis.
• Modelling systems with block diagrams and transfer functions and the concept of feedback.
• Periodic signals representation in the frequency domain: the trigonometric and exponential Fourier series.

**Intended Learning Outcomes:** Technical Outcomes
After completing this module, you should be able to:
• understand concepts of signal and system modelling which is often encountered in other modules
• understand mathematical abstraction such as being able to read, analyze and evaluate mathematical expressions
• define and recognize common waveforms such as impulse and step signals, exponential and rectangular signals
• define properties of systems
• calculate basic properties of deterministic signals in the time domain
• compute the complex-exponential and trigonometric Laplace transform of signals
• use block diagram models, transfer functions and simulation for the computation of system responses
• use the Fourier series to calculate basic properties of periodic signals in the frequency domain

Accreditation Outcomes (AHEP)
- Knowledge and understanding of scientific principles and methodology necessary to underpin their education in their engineering discipline, to enable appreciation of its scientific and engineering context, and to support their understanding of relevant historical, current and future developments and technologies (SM1p)
- Knowledge and understanding of mathematical and statistical methods necessary to underpin their education in their engineering discipline and to enable them to apply mathematical and statistical methods, tools and notations proficiently in the analysis and solution of engineering problems (SM2p)
- Ability to identify, classify and describe the performance of systems and components through the use of analytical methods and modelling techniques (EA2p)
- Work with information that may be incomplete or uncertain and quantify the effect of this on the design (D3p)

**Assessment:** Examination 1 (70%)
Coursework 1 (30%)
**Resit Assessment:** Examination (Resit instrument) (100%)

**Assessment Description:**
Examination: Standard 2 hour exam:

Coursework: MATLAB lab exercises. There will be six assignments worth five marks each. Full details will be published in the assignment brief published on Canvas.

Specific rules for passing this module:
This module is assessed by a combination of examination and continual assessment.
Students must achieve 30% for the final examination. If you achieve less than 30% in the examination the module mark will be just the examination mark

**Moderation approach to main assessment:** Universal second marking as check or audit

**Assessment Feedback:** Continuous feedback during lectures, by announcements on Canvas, feedback from the grading of the coursework exercises. and general feedback after the exam.

**Failure Redemption:** If a student is awarded a resit, failure redemption of this module will be by examination only (100%).

**Additional Notes:** Delivery of both teaching and assessment will be blended including live activities on-campus and self-directed activities online.

• AVAILABLE TO Visiting and Exchange students.

• The Faculty of Science and Engineering has a ZERO TOLERANCE penalty policy for late submission of all coursework and continuous assessment.

• Notes, worked examples and an example examination paper for this module will be found on Canvas in advance of the May/June assessments.

This module is assessed by a combination of continual assessment. and examination. Students must achieve 30% for the final exam. If you achieve less than 30% the module mark will be the examination mark and you will be required to retake the examination in August.

# EG-151 Microcontrollers

**Credits: 10 Session: 2022/23 September-January**

**Pre-requisite Modules:**

**Co-requisite Modules:**

**Lecturer(s):** Dr CP Jobling, Dr BR Clifford

**Format:** Live online classroom events 10 hours
On-campus Laboratory work 40 hours
Directed private study and assessment 50 hours
Contact Hours will be delivered through a blend of live activities online and on-campus, and may include, for example, lectures, seminars, practical sessions and Academic Mentoring sessions.

**Delivery Method:** All Programmes will employ a blended approach to delivery using the Canvas Digital Learning Platform for live and self-directed online activity, with live and self-directed on-campus activities each week. Students may also have the opportunity to engage with online versions of sessions delivered on-campus

Laboratory sessions during the first two weeks of term will be used for a laboratory introduction exercise.
The laboratory introduction is COMPULSORY and must be passed if a student is to work in the laboratory.
Components of the laboratory introduction are as follows:

* Health and safety and safe working during the COVID pandemic
* Breadboard construction exercise
* Circuit Simulation using National Instruments Multisim
* Soldering exercise

Each component will be assessed individually on a pass-fail basis, and the laboratory introduction is worth 15% of the whole module.

On-demand online activities: there will be the equivalent of one lecture a week on the architecture of the target microcontroller.

Knowledge and understanding will be increased via retrieval practice based on weekly formative tests delivered in Canvas.

Live online activities: there will be one hour a week online examples class for group activities in support of the lecture course and designed to address the areas of particular difficulty that have been identified by the formative tests.

On-campus laboratories: there will be two two-hour lab sessions per week.

The lab exercise has been designed to be taken home and can be done completely off-campus if preferred.

The laboratory work will be assessed by means of a lab diary to be submitted in November and is worth 20%.

The lecture course and the laboratory work will be assessed by an online class test worth 35%.

There will be a mini project which will be assessed by a demonstration of the completed project and a short report.

Module assessment components: Laboratory Introduction (15%) + Class test (35%) + Laboratory work (20%) + Mini project (30%)

**Module Aims:** This module introduces basic microcontroller structure and operation. It consists of a lecture course on the architecture and operation of the target microcontroller, and a series of laboratories culminating in a miniproject in which students will apply their experience to a simple practical problem.

**Module Content:** Microprocessor fundamentals: Architecture; instruction execution; basic instructions; simple software design; software development tools.

Practical work: A progressive series of exercises will be carried out, in support of the taught material, leading to a mini project.

**Intended Learning Outcomes:** Technical Outcomes
- Identify, classify and describe the performance of systems and components (EA2p): operation of a microcontroller; computer instructions and their execution are assessed by Class Test.
- Practical and laboratory skills (EP3p): safe-working; social distancing; use of electronic instrumentation; simulation, implementation, and commissioning of an embedded system are assessed by Lab Introduction (Practical).
- Investigate and define the problem: health and safety (D2p); design simple programs in both assembly language and C; design the hardware and software for a simple application. (Assessed by the Lab Introduction (Practical), Lab Exercises and Project)
- Ability to apply computational methods in order to solve engineering problems (EA3p): implement and commission an embedded system; demonstrate the application of the skills developed in the module to design the hardware and software for a simple application is assessed by the Project.

Accreditation Outcomes (AHEP)
Ability to identify, classify and describe the performance of systems and components through the use of analytical methods and modelling techniques (EA2p)
Ability to apply quantitative and computational methods in order to solve engineering problems and to implement appropriate action (EA3p)
Investigate and define the problem, identifying any constraints including environmental and sustainability limitations; ethical, health, safety, security and risk issues; intellectual property; codes of practice and standards (D2p)
Ability to apply relevant practical and laboratory skills (EP3p)

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| **Assessment:** | Online Class Test (35%) |
| | Project (30%) |
| | Laboratory work (20%) |
| | Laboratory work (15%) |
| **Resit Assessment:** | Online Class Test (100%) |

**Assessment Description:** • Practical: This is the laboratory introduction exercise, valued at 15% of the whole module.

• Laboratory work: students will be given a laboratory introduction exercise followed by four laboratory-based exercises to learn the use of the integrated development environment (IDE), skills in programming, and problem-solving. These exercises will involve simple assembly-level programmes with Arduino IDE, followed by an introduction to embedded "C" programming. The exercises will be assessed by a review of a lab diary which is to be kept by each student during the practical sessions and submitted as a complete document in November. There are 20 marks in total for the lab assessment.

• Mini-Project: Each student will be given a practical task to perform with the target microcontroller. They will be required to write a program in "C" language using the Arduino IDE, and test it on the microcontroller boards provided. Assessment will be on how well the task has been achieved, and on a brief report written in a specified format. The mini-project is valued at 30% of the module.

• Class Test: This test will be based on the theoretical component from the weekly on-demand and live online activities, and also on experience gained from the laboratory work. The questions will be a mixture of multiple-choice and single line answers, for example predicting the numerical output of a series of microcontroller instructions. The test will be delivered through the Canvas VLE and is valued at 35% of the module and is an individual assessment.

Specific rules for passing this module:

This module is assessed by a combination of Class Tests and practical assessments. In order for the practical assessment marks to count, you must achieve at least 30% in the Class Test. If you achieve less than 30% in the Class Test, then the module mark will be just the Class Test mark. You will have one attempt to redeem a failure in the class test before the end of semester 1.

**Moderation approach to main assessment:** Universal second marking as check or audit

**Assessment Feedback:** For the formative tests, students receive immediate feedback. For the Class Test, students will receive immediate marks and overall feedback will be delivered in one of the online live sessions within two weeks of the test. For the lab exercises, feedback will be given to students at the time of assessment. Students can always make an appointment with the lecturer to receive personal feedback.

**Failure Redemption:** Failure redemption of this module will be by online Canvas test only (100%).

The failure redemption is only available to students who record sufficient engagement (lab attendance, attendance at scheduled on-line events, and engagement with on-demand materials and during the teaching semester).

**Additional Notes:** Delivery of both teaching and assessment will be blended including live and self-directed activities online and on-campus.

• Laboratory classes or their on-line equivalent are compulsory. Students must have sufficient attendance at laboratory classes or their on-line equivalent in order to be allowed to be assessed for the module.

• The College of Engineering has a ZERO TOLERANCE penalty policy for late submission of all coursework and continuous assessment.

• Previous students have found the following on-line book useful: www.planetpdf.com/codecuts/pdfs/aoa.pdf.

• This module is assessed by a combination of a class test and continual assessment. In order for the continual assessment marks to count, you must achieve at least 30% in the class test. If you achieve less than 30% in the class test, then the module mark will be just the class test mark.

# EG-152 Analogue Design

**Credits: 10 Session: 2022/23 January-June**

**Pre-requisite Modules:**

**Co-requisite Modules:** EG-142; EG-155; EG-168

**Lecturer(s):** Dr AE Martinez Muniz, Mrs M Ahmed

**Format:** Laboratory work 44 hours
Directed private study 56 hours

Contact Hours will be delivered through a blend of live activities online and on-campus, and may include, for example, lectures, seminars, practical sessions and Academic Mentoring sessions.

**Delivery Method:** All Programmes will employ a blended approach to delivery using the Canvas Digital Learning Platform for live and self-directed online activity, with live and self-directed on-campus activities each week. Students may also have the opportunity to engage with online versions of sessions delivered on-campus

Assessment: 100% Continuous Assessment.
Laboratory work 44 hours
Directed private study 56 hours

**Module Aims:** The module covers aspects of Engineering Applications for Level 1 students and all aspects of the design process for analogue circuits. It includes preparation, performance and reporting on a structured series of experiments supporting the taught modules at this level and gives practice in using IT packages to assist with report writing.

**Module Content:**
With the aid of the commercial simulation package, Multisim, the practical laboratory work in this module develops topics such as:
• practical op-amp circuits;
• real circuit components;
• circuit response in the time and frequency domain;
• transient behaviour ;
• filters and oscillator circuits.
• The sequence of practical laboratories will lead to design, construction and testing of a waveform generator.

Practical work includes:
• the preparation, performance and reporting on a structured series of experiments supporting the taught modules at this level;
• practice in using IT packages to assist with report writing and presentations;
• the use of Multisim for circuit design and analysis;
• the construction of a function generator, which is then tested against a specification.

**Intended Learning Outcomes:**
Technical Outcomes
On successful completion of this module students will be expected, at threshold level, to be able to:
- Analyse the response of resistors, capacitors, inductors and op-amps to the application of ac and dc signals.
- Apply Multisim software in the design and analysis of circuits.
- Design circuits to modify or manipulate voltages and currents.

Accreditation Outcomes (AHEP)
- Ability to identify, classify and describe the performances of analogue components and circuits using analytical methods - assessed by Formal Report and Assignment 1 (EA2p)
- Ability to apply quantitative methods and simulation in order to solve and analyse analogue circuits - assessed by Formal Report and Assignment 1 (EA3p)
- Understanding of, and the ability to apply, an integrated or systems approach to solving and analysing analogue circuits - assessed by Assignment 1 (EA4p)
- Communicate their work to technical and non-technical audiences (D6p)
- Knowledge of characteristics of analogue components and circuits - assessed by Assignment 1 (EP2p)
- Understand of the use of technical literature, such as lab workbook - assessed by Formal Report and Assignment 1 (EP4p)

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| **Assessment:** | Report (30%)<br>Assignment 1 (70%) |
| **Resit Assessment:** | Coursework reassessment instrument (100%) |

**Assessment Description:** Students will be assessed on the following components:
i) Report: Formal Report (30%) - Individual assessment
ii) Assignment 1: Lab Diary (60%) - Group assessment
iii) Assignment 2: Printed Circuit Board (10%) - Group assessment
iii) Laboratory work: Pass/Fail - Record of attendance at labs

This module is assessed by three assignments. In order for your Report and Assignment 2 to be included in your module mark you must have achieved a mark of 30% or above in Assignment 1. Re-assessment is by a single piece of coursework.

Laboratory classes are compulsory. Students must have at least 80% attendance at laboratory classes or online equivalents in order to be allowed to be assessed for the module.

Please note that the lab practical work is dependent on the COVID-19 situation. The situation will be reviewed closer to the start date of Teaching Block 2. If the lab practical work cannot be carried out due to COVID-19 restrictions, this module will be based on Multisim.

If you do not meet the requirements of the Pass/Fail component, you will receive a QF outcome. This means that you will be required to repeat the failed component(s), even if your module mark is above 40%.

**Moderation approach to main assessment:** Second marking as sampling or moderation

**Assessment Feedback:** Students will receive feedback through the Faculty Feedback Summary Sheet, which provides both the statistics and analysis of each question.

**Failure Redemption:** If a student is awarded a re-sit at least one piece of coursework will be set.

The failure redemption is only available to students who have at least 80% attendance at laboratory classes during the teaching semester.

**Additional Notes:** Delivery of both teaching and assessment will be blended including live and self-directed activities online and on-campus.

NOT AVAILABLE TO Visiting and Exchange Students due to number restriction.

• Laboratory classes are compulsory. Students must have sufficient attendance at laboratory classes in order to be allowed to be assessed for the module.

The Faculty of Science and Engineering has a ZERO TOLERANCE penalty policy for late submission of all coursework and continuous assessment.

This module is assessed by three assignments. In order for your Report and Assignment 1 to be included in your module mark you must have achieved a mark of 30% or above in Assignment 2. Re-assessment is by a single piece of coursework.

# EG-155 Circuit Analysis

**Credits: 10 Session: 2022/23 September-January**

**Pre-requisite Modules:**

**Co-requisite Modules:**

**Lecturer(s):** Prof PM Holland

**Format:** In-person or Zoom 22 hours
Discussion forum/email 11 hours
Canvas study 22 hours
Independent study 45 hours

Contact Hours will be delivered through a blend of live activities online and on-campus, and may include, for example, lectures, seminars, practical sessions and Academic Mentoring sessions.

**Delivery Method:** All Programmes will employ a blended approach to delivery using the Canvas Digital Learning Platform for live and self-directed online activity, with live and self-directed on-campus activities each week. Students may also have the opportunity to engage with online versions of sessions delivered on-campus

Circuit Analysis is developed as a blended learning module that is delivered online with optional in-person sessions for 2021/2022. There will be a self-contained asynchronous course in Canvas that students will study for 2-3 hours per week. The asynchronous course will be supported by three hours of timetabled in-person or Zoom synchronous class.

Canvas pages will host the asynchronous learning activities in the Canvas course, organised into weekly modules. Learning activities will include text-based theory pages; short theory videos; text-based examples; short video-based examples; online formative and summative quizzes and other online supplementary materials sourced from creative commons resources.

The synchronously delivered hour will consist of a series of different activities including class discussions; icebreakers; consolidation of theory and examples; problem-solving and review/preview of the week completed and the week ahead respectively. The basis for the design of Circuit Analysis is to apply the principles of active learning. The intention is to encourage as much interaction with, and between the students as possible using different learning activity types.

Assessment: 70% Examination and 30% Continual Assessment.

The 30% continual assessment will consist of 10 mini weekly Canvas Tests worth 3% each.
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**Module Aims:** Provides an introduction to analog electrical circuits analysis.

**Module Content:**

• Introduction to circuit characteristics and analysis: resistance, voltage, current, power, a.c. d.c. capacitance, inductance, series and parallel configurations, Ohm's law, Kirchoff's laws, superposition theorem and nodal analysis.
• Ideal operational amplifier circuits including inverting, non-inverting, comparator, differentiator and the integrator.
• Analysis of simple LCR networks energised by AC sources. This will inlcude analysis in the time domain and using complex numbers and phasors in the frequency domain.
• Simplification techniques suitable for both DC and AC analysis such as Thevenin and Source Transformations.
• Practical work supported by EG-152 for EEE students.

**Intended Learning Outcomes:**

Technical Outcomes

- To understand and mathematically describe the physical concepts and parameters associated with voltage, current, resistance, capacitance, inductance, energy and power.
- Simplify and analyse electrical circuits using a range of techniques including resistor reduction, delta-y, Kirchhoff's Laws, Thevenin's theorem, source transformations, superposition and nodal analysis.
- Be able to identify and analyse a range of operational amplifier circuits.
- Determine the transient response of capacitors and inductors.
- Determine the behaviour of LCR circuits energised by AC sources in time domain and frequency domain forms.

Accreditation Outcomes (AHEP)

- Knowledge and understanding of mathematical and statistical methods necessary to underpin their education in their engineering discipline and to enable them to apply mathematical and statistical methods, tools and notations proficiently in the analysis and solution of engineering problems (SM2b/SM2p)
- Understanding of engineering principles and the ability to apply them to analyse key engineering processes (EA1p)

**Assessment:** Examination 1 (70%)
Online Multiple Choice Questions (30%)

**Resit Assessment:** Examination (Resit instrument) (100%)

**Assessment Description:** The assignment is worth 30% of the module marks. It is delivered over the whole semester but broken down into 10 parts that are delivered weekly as individual Canvas tests worth 3% of the module each. The Canvas tests are generally computer marked and will provide automatic feedback. A marked essay question is included during one of the weeks to prepare students for the exam essay questions. Students will answer a variety of questions ranging from multiple-choice, fill in the BLANK to full calculations, numerical value entry and essay style. The component values in some questions may be randomised to encourage individual understanding.

The examination is worth 70% of the module. It is multiple choice consisting of 14 questions. Questions 1-3 are worth 1 mark, questions 4-6 are worth 2 marks, questions 7-9 are worth 3 marks, questions 10-12 are worth 4 marks and questions 13 and 15 are essay style questions worth 20 marks. The examination topics will be those presented directly in the module.

In 2021/2022 the exam will be conducted online.

Specific rules for passing this module:

This module is assessed by a combination of examination and coursework. In order for the coursework marks to count, you have to have a mark of 30% or more in the exam component. If you have less than 30% in the exam, then the final module mark will be just the exam mark.

**Moderation approach to main assessment:** Universal second marking as check or audit

**Assessment Feedback:** For the assignment, students will be able to see their computer marked assignment with feedback that has been written by the module owner for both correct and incorrect answers. There will also be a rubric and specimen answers for any essay questions used. The module coordinator solves the quiz questions in live teaching sessions to help students check their understanding and give feedback on their attempt. They will also receive a generic feedback form at the end of the semester.

For the examination, the students will receive a generic form that tells the student what the common mistakes were. It also lists the mean mark and the number of 1st class, 2:1 class, 2:2 class, 3rd class and fails achieved by the group.

**Failure Redemption:**

If a student is awarded a re-sit, failure redemption of this module will be by examination worth 100% of the module. If you pass the exam but have failed the coursework, you may still fail the module, depending on the marks achieved, so it is important to complete the coursework.

**Additional Notes:** Delivery of both teaching and assessment will be blended including live and self-directed activities online and on-campus.

• AVAILABLE TO to visiting and exchange students.
• PENALTY: ZERO TOLERANCE FOR LATE SUBMISSION

This module is assessed by a combination of examination and coursework. In order for the coursework marks to count, you have to have a mark of 30% or more in the exam component. If you have less than 30% in the exam, then the final module mark will be just the exam mark.
If you pass the exam but have failed the coursework, you may still fail the module, depending on the marks achieved, so it is important to do the coursework.

# EGA107 Power Engineering

**Credits: 10 Session: 2022/23 January-June**

**Pre-requisite Modules:**

**Co-requisite Modules:** EG-114; EG-116

**Lecturer(s):** Dr M Monfared

**Format:** Lectures: 22 hours
Examples: 10 hours
Independent study: 60 hours

Contact Hours will be delivered through a blend of live activities online and on-campus, and may include, for example, lectures and seminars.

**Delivery Method:** All Programmes will employ a blended approach to delivery using the Canvas Digital Learning Platform for live and self-directed online activity, with live and self-directed on-campus activities each week. Students may also have the opportunity to engage with online versions of sessions delivered on-campus

This module will employ lectures with assessment by coursework and examination.

**Module Aims:** This module will provide an introduction to the fundamental topics in electrical power systems.

**Module Content:**

Section 1 – Introduction to Module
Module administration, brief history of electrical engineering, international system of units.

Section 2 – Fundamentals of Electric Circuits
Definitions, Kirchhoff's current and voltage laws, electric power and sign convention, power balance.

Section 3 – Solution of electric circuits
Nodal analysis, Thevenin and Norton equivalents.

Section 4 – Dynamic elements and transients
Energy storage elements, Analysis of circuits containing dynamic elements.

Section 5 – Single-phase power
Single-phase systems configuration, power factor, single-phase power definition.

Section 6 – Three-phase power
Three-phase systems configuration, power factor, three-phase power definition.

**Intended Learning Outcomes:** Technical Outcomes
Upon completion of the module, students should be able to:
• Solve RLC circuits in steady-state.
• Analyse first-order circuits supplied by dc sources in transient operation.
• Solve ac circuits in steady-state operation (both single-phase and three-phase).
• Calculate active and reactive power in single-phase and three-phase circuits.
• Calculate power factor in a circuit and learn methods to improve power factor value.

Accreditation Outcomes (AHEP)
- Knowledge and understanding of scientific principles and methodology necessary to underpin their education in their engineering discipline, to enable appreciation of its scientific and engineering context, and to support their understanding of relevant historical, current and future developments and technologies (assessed by exam). (SM1p)
- Knowledge and understanding of mathematical and statistical methods necessary to underpin their education in their engineering discipline and to enable them to apply mathematical and statistical methods, tools and notations proficiently in the analysis and solution of engineering problems (assessed by online assignment). (SM2p)
- Understanding of engineering principles and the ability to apply them to analyse key engineering processes (assessed by online assignment and exam). (EA1p)
- Ability to identify, classify and describe the performance of systems and components through the use of analytical methods and modelling techniques (assessed by exam). (EA2p)
- Ability to apply quantitative and computational methods in order to solve engineering problems and to implement appropriate action (assessed by online assignment and exam). (EA3p)

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|---|---|
| **Assessment:** | Coursework 1 (5%)<br>Coursework 2 (5%)<br>Coursework 3 (10%)<br>Coursework 4 (5%)<br>Coursework 5 (5%)<br>Examination 1 (70%) |
| **Resit Assessment:** | Examination (Resit instrument) (100%) |

**Assessment Description:** 5% Coursework 1: Section 2 and Section 3
5% Coursework 2: Section 4
10% Coursework 3: Section 5
5% Coursework 4: Section 6
5% Coursework 5: MATLAB onramp
70% Examination

This module is assessed by a combination of examination and assessments. In order for the assessment marks to count, you must achieve at least 30% in the exam component. If you achieve less than 30% in the exam, then the module mark will be just the exam mark.

**Moderation approach to main assessment:** Universal second marking as check or audit

**Assessment Feedback:** Formal feedback lecture following the first assignment; feedback provided during office hour; standard feedback through College of Engineering intranet. Information provided includes average marks, maximum and minimum marks for the exam as a whole and for individual questions.

**Failure Redemption:** Failure Redemption of this module will be by 100% Examination .

**Additional Notes:** Delivery of both teaching and assessment will be blended including live and self-directed activities online and on-campus.

• Penalty for late submission: ZERO tolerance

This module is assessed by a combination of examination and assessment project report. In order for the assessment marks to count, you must achieve at least 30% in the exam component. If you achieve less than 30% in the exam, then the module mark will be just the exam mark.

# EGA108 Electrical and Magnetic Properties of Materials

**Credits: 10 Session: 2022/23 September-January**

**Pre-requisite Modules:**

**Co-requisite Modules:**

**Lecturer(s):** Dr AE Martinez Muniz

**Format:** Lectures 20 hours
Tutorials / Example classes 5 hours
Directed private study 40 hours
Preparation for Assessment 30 hours
Contact Hours will be delivered through a blend of live activities online and on-campus, and may include, for example, lectures, seminars, practical sessions and Academic Mentoring sessions.

**Delivery Method:** All Programmes will employ a blended approach to delivery using the Canvas Digital Learning Platform for live and self-directed online activity, with live and self-directed on-campus activities each week. Students may also have the opportunity to engage with online versions of sessions delivered on-campus

On Campus/online

**Module Aims:** This module covers the underlying physical principles behind the physical properties of electronic materials. It provides the atomistic background to understanding electrical and magnetic properties of solids. It offers an understanding of Ohm's law and conduction in metals and semiconductors. It provides a microscopic understanding of Dielectrics, Piezoelectrics and magnetics materials and their application in technology. The principles developed are used to explore the behaviour of semiconductor devices such as diode, junction transistor and solar cells.

**Module Content:** 1) The quantum theory of matter (waves and particles), photoelectric effects, hydrogen atom spectra (hydrogen-like atoms).
2) One particle in a box, two particles in a box, spin, Pauli exclusion principle.
3) The atomic chemical elements and interatomic bonding.
4) Drude's theory of electrical conduction and 'classical' point of view.
5) The quantum free electron theory of conduction in metals (Sommerfeld). Many particles in a box, Fermi energy.
6) The modern band theory of conduction for semiconductors. Band gap. The relationship between conductivity and temperature is explored.
7) Junctions between different semiconductors (p-n junctions), band diagrams
8) Photovoltaic effect, photocell, solar cell (efficiency) and blackbody radiation.
9) Junction Transistor, band diagram, function and amplification
10) Dielectrics and Piezoelectrics.
11) Magnetic properties of materials: Diamagnetism, Paramagnetism and Ferromagnetism

**Intended Learning Outcomes:**
Accreditation Outcomes (AHEP)
- Knowledge and understanding of scientific principles and methodology necessary to underpin their education in their engineering discipline, to enable appreciation of its scientific and engineering context, and to support their understanding of relevant historical, current and future developments and technologies (SM1p)
- Knowledge and understanding of mathematical and statistical methods necessary to underpin their education in their engineering discipline and to enable them to apply mathematical and statistical methods, tools and notations proficiently in the analysis and solution of engineering problems (SM2p)
- Awareness of relevant legal requirements governing engineering activities, including personnel, health & safety, contracts, intellectual property rights, product safety and liability issues (ET5p)

**Assessment:** Examination 1 (80%)
Assignment 1 (20%)
**Resit Assessment:** Examination (100%)

**Assessment Description:**
The module is assessed with a one day take home exam (or written examination) worth 80%. There will be Canvas assessments worth 20%.

Specific rules for passing this module:

This module is assessed by a combination of examination and continual assessment. In order for the continual assessment marks to count, you must achieve at least 30% in the exam component. If you achieve less than 30% in the exam, then the module mark will be just the exam mark.

**Moderation approach to main assessment:** Universal second marking as check or audit

**Assessment Feedback:**
Standard examination feedback form available for all students after the examination.
Feedback sheets are completed for each assignment. General feedback for the class test will be uploaded to Canvas.

**Failure Redemption:** If a student is awarded a re-sit (supplementary) Failure Redemption of this module will be by 100% exam.

**Additional Notes:** Delivery of both teaching and assessment will be blended including live and self-directed activities online and on-campus.

AVAILABLE FOR Visiting and Exchange Students

This module is assessed by a combination of examination and continual assessment. In order for the continual assessment marks to count, you must achieve at least 30% in the exam component. If you achieve less than 30% in the exam, then the module mark will be just the exam mark.

# EGA121 Introduction to Electromagnetics

**Credits: 10 Session: 2022/23 January-June**

**Pre-requisite Modules:**

**Co-requisite Modules:** EG-114; EG-116

**Lecturer(s):** Dr AE Martinez Muniz

**Format:** Lectures 15 h
Example classes 10 h
Directed private study 75 hours

Contact Hours will be delivered through a blend of live activities online and on-campus, and may include, for example, lectures, seminars, practical sessions and Academic Mentoring sessions.

**Delivery Method:** All Programmes will employ a blended approach to delivery using the Canvas Digital Learning Platform for live and self-directed online activity, with live and self-directed on-campus activities each week. Students may also have the opportunity to engage with online versions of sessions delivered on-campus

On Campus

**Module Aims:** To introduce the student to the basic laws of electromagnetism and their application to electrical engineering.

**Module Content:**

• Vectors Analysis: Vector algebra, orthogonal coordinate system, the transformation between coordinate systems, the gradient of a scalar field, the divergence of a vector field, curl of a vector field. Divergence theorem and Stoke's theorem.
• Maxwell's equation and Lorentz force.
• Electrostatics: Electric forces, charge and current distributions, Electric scalar potential, Gauss's Law, conductors, dielectrics, capacitances, Electrostatic potential energy.
• Magnetostatics: Magnetic forces and torques, The Biot-Savart law, Ampère's Law, Maxwell magnetostatic equations.
• Electromagnets, inductance, magnetic energy.
• Inductive sensors.
• Dynamics Fields: Faraday's Law and Maxwell's equations. Stationary loop in a time-varying field. Transformer and generators, Technological applications. , Lumped elements Derivation of Kirchhoff laws. Maxwell's equations and Pointing's theorem. The Electromagnetic wave.

Bibliography: Chapter: 3,4,5 and 6 of "Fundamental of Applied Electromagnetics" From Ulabi
vol 2 of "The Feynman Lectures on Physics, Richard P. Feynman

**Intended Learning Outcomes:** Technical Outcomes
After completing this module you should be able to:
• Solve basic problems using vector algebra. Represent vectors in different coordinate systems such as spherical and cylindrical.
• Explain the meaning of Div, Grad and Curl and the divergence and Stoke's Theorems. Use these concepts and theorems in computations.
• Apply Gauss, Ampère and Faraday's laws to concrete examples and understand how they relate to the Maxwell's equations.
• Calculate capacitances and inductances for different geometries.
• Use the concept of electric and magnetic fields to understand the functioning of generators and motors and the field interpretation of Kirchhoff's laws.
• Understand the technical underpinning of modern technology applications such as fingerprint imager, magnetic levitation trains, magnetic recording and wireless charging.
• Describe the properties of simple electromagnetic waves and how they derive from Maxwell's equations. Apply the Maxwell equations to wave guides.

Accreditation Outcomes (AHEP)
Knowledge and understanding of scientific principles and methodology necessary to underpin their education in their engineering discipline, to enable appreciation of its scientific and engineering context, and to support their understanding of relevant historical, current and future developments and technologies (SM1b/SM1p)
Knowledge and understanding of mathematical and statistical methods necessary to underpin their education in their engineering discipline and to enable them to apply mathematical and statistical methods, tools and notations proficiently in the analysis and solution of engineering problems (SM2b/SM2p)

**Assessment:** Examination (80%)
Online Class Test (20%)
**Resit Assessment:** Examination (Resit instrument) (100%)

**Assessment Description:**
Written Examination - 80%
Canvas Assessment - 20%. The assessment will be split in two assessments, each worth 10 % of the module.

This module is assessed by a combination of examination and assessment. In order for the assessment marks to count, you must achieve at least 30% in the exam component. If you achieve less than 30% in the exam, then the module mark will be just the exam mark.

**Moderation approach to main assessment:** Universal second marking as check or audit

**Assessment Feedback:** Feedback will be in a standard format. Information provided includes average marks, maximum and minimum marks for the exam as a whole and for individual questions.

**Failure Redemption:**
If a student is awarded a re-sit: Failure Redemption of this module will be by Examination only (100%).

**Additional Notes:** Delivery of both teaching and assessment will be blended including live and self-directed activities online and on-campus.

• AVAILABLE TO to visiting and exchange students.

This module is assessed by a combination of examination and assessment. In order for the assessment marks to count, you must achieve at least 30% in the exam component. If you achieve less than 30% in the exam, then the module mark will be just the exam mark.