Swansea University
Prifysgol Abertawe

FACULTY OF SCIENCE AND ENGINEERING

UNDERGRADUATE TAUGHT STUDENT HANDBOOK

YEAR 2 (FHEQ LEVEL 5)

ELECTRONIC AND ELECTRICAL ENGINEERING DEGREE PROGRAMMES

SUBJECT SPECIFIC
PART TWO OF TWO
MODULE AND COURSE STRUCTURE
2023-24

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 23-24 academic year begins on 25 September 2023

Full term dates can be found here

DATES OF 23-24 TERMS

25 September 2023 – 15 December 2023

8 January 2024 – 22 March 2024

15 April 2024 – 07 June 2024

SEMESTER 1

25 September 2023 – 29 January 2024

SEMESTER 2

29 January 2024 – 07 June 2024

SUMMER

10 June 2024 – 20 September 2024

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.

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.

At Swansea University and in the Faculty of Science and 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, technical and administrative staff, administrators - I'm sure you will find many friendly helping hands ready to assist you. And make the most of living and working alongside your fellow students.

During your time with us, please learn, create, collaborate, and most of all – enjoy yourself!

Professor David Smith
Pro-Vice-Chancellor and Executive Dean
Faculty of Science and Engineering

Faculty of Science and Engineering	
Pro-Vice-Chancellor and Executive Dean	Professor David Smith
Director of Faculty Operations	Mrs Ruth Bunting
Associate Dean – Student Learning and Experience (SLE)	Professor Laura Roberts
School of Aerospace, Civil, Electrical, General and Mechanical Engineering	
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 Chris Jobling

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 8.30am-4pm.

The **Student Support Team** provides dedicated and professional support to all students in 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 (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 other resources:

https://myuni.swansea.ac.uk/fse/

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 23-24 handbooks to ensure that you have access to the most up-to-date versions.
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 second-year student studying *Electronic and Electrical Engineering* at Swansea University you are continuing a 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.

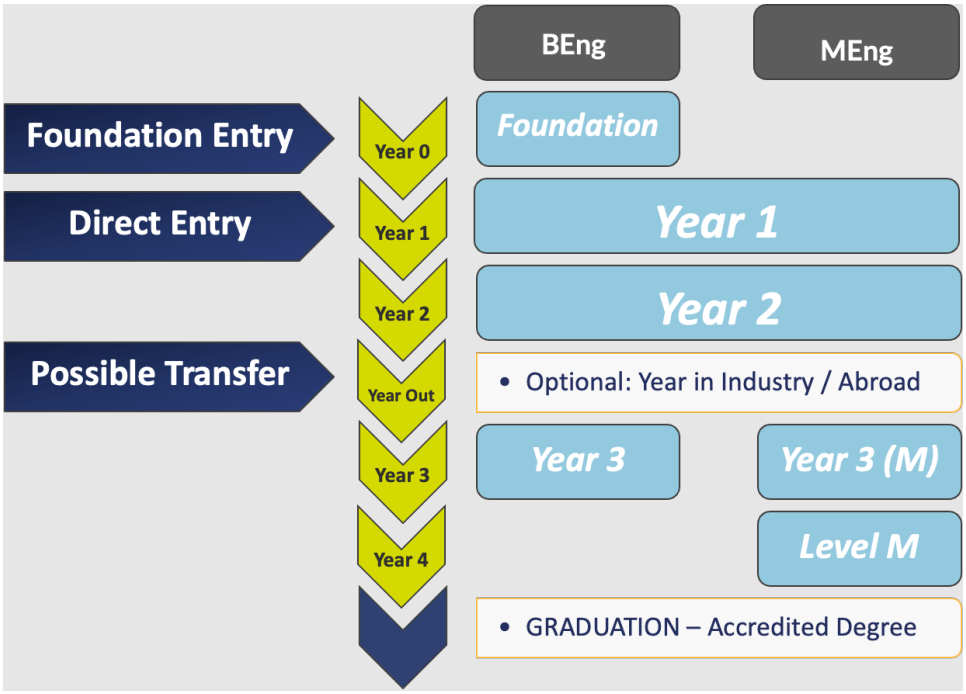

Figure 1 *The progression routes*

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.

In addition, if you are taking part a Year in Industry next year, your experience can be converted into the Engineering Technician (EngTech) qualification. Please contact your IET Student Advisor for details.

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 (EEESoc) and is supported by the IET South Wales Local Network.

For more information, please join EEESoc 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 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.

Prizes

The following prizes are awarded at the end of the academic year:

- *Tim Davies Prize* – The prize is awarded annually to the best Group Design Exercise in Electrical and Electronic Engineering whose project is considered by the Board of Examiners to be of outstanding merit. In the event of no project of high quality the prize will not be awarded.

Faculty prizes and progression awards

The faculty 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 2 (FHEQ Level 5) 2023/24
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-219 **Statistical Methods in Engineering** **10 Credits** **Miss CM Barnes/Prof L Li/Prof P Rees/Dr Y Xuan** **CORE**	**EG-240** **Electronic Circuits** **10 Credits** **Mrs M Ahmed** **CORE**
EG-241 **Electrical Machines** **10 Credits** **Dr A Egwebe** **CORE**	**EG-243** **Control Systems** **10 Credits** **Dr A Egwebe** **CORE**
EG-242 **Electronic Materials and Devices** **10 Credits** **Prof KS Teng** **CORE**	**EG-247** **Digital Signal Processing** **10 Credits** **Dr CP Jobling** **CORE**
EG-244 **Software Engineering** **10 Credits** **Dr JW Jones** **CORE**	**EGA211** **Semiconductor Technology** **10 Credits** **Prof K Kalna** **CORE**
EGA207 **Applied Electromagnetics** **10 Credits** **Dr TGG Maffeis** **CORE**	**EGA223** **Electronic Circuits Laboratory** **5 Credits** **Dr KM Ennser/Mr AG Francis** **CORE**
EGA222 **Electrical Machines Laboratory** **5 Credits** **Dr A Egwebe** **CORE**	
EG-252 **Group Design Exercise** **20 Credits** **Dr T Davies/Mr AG Francis/Dr CP Jobling** **CORE**	
EG-277 **Research Project Preparation** **0 Credits** **Dr AC Tappenden/Dr M Fazeli/Mrs KM Thomas** **CORE**	
Total 120 Credits	

Year 2 (FHEQ Level 5) 2023/24
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-219 **Statistical Methods in Engineering** **10 Credits** **Miss CM Barnes/Prof L Li/Prof P Rees/Dr Y Xuan** **CORE**	**EG-240** **Electronic Circuits** **10 Credits** **Mrs M Ahmed** **CORE**
EG-241 **Electrical Machines** **10 Credits** **Dr A Egwebe** **CORE**	**EG-243** **Control Systems** **10 Credits** **Dr A Egwebe** **CORE**
EG-242 **Electronic Materials and Devices** **10 Credits** **Prof KS Teng** **CORE**	**EG-247** **Digital Signal Processing** **10 Credits** **Dr CP Jobling** **CORE**
EG-244 **Software Engineering** **10 Credits** **Dr JW Jones** **CORE**	**EGA211** **Semiconductor Technology** **10 Credits** **Prof K Kalna** **CORE**
EGA207 **Applied Electromagnetics** **10 Credits** **Dr TGG Maffeis** **CORE**	**EGA223** **Electronic Circuits Laboratory** **5 Credits** **Dr KM Ennser/Mr AG Francis** **CORE**
EGA222 **Electrical Machines Laboratory** **5 Credits** **Dr A Egwebe** **CORE**	
EG-233 **Placement Preparation: Engineering Industrial Year** **0 Credits** **Prof GTM Bunting/Dr SA Rolland/Dr V Samaras**	
EG-252 **Group Design Exercise** **20 Credits** **Dr T Davies/Mr AG Francis/Dr CP Jobling** **CORE**	
EG-277 **Research Project Preparation** **0 Credits** **Dr AC Tappenden/Dr M Fazeli/Mrs KM Thomas** **CORE**	
Total 120 Credits	

EG-219 Statistical Methods in Engineering

Credits: 10 Session: 2023/24 September-January

Pre-requisite Modules:

Co-requisite Modules:

Lecturer(s): Miss CM Barnes, Prof L Li, Prof P Rees, Dr Y Xuan

Format:
Lectures: 18 hours
Computer-based example classes: 16 hours
Directed private study 40 hours
Preparation for assessment 35 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

Series of lectures and computer practicals (face-to-face and online options available).

Module Aims: This module offers a balanced, streamlined one-semester introduction to Engineering Statistics that emphasizes the statistical tools most needed by practicing engineers. Using real engineering problems students see how statistics fits within the methods of engineering problem solving and learn how to apply statistical methodologies to their field of study. The module teaches students how to think like an engineer when analysing real data.

Mini projects, tailored to each engineering discipline, are intended to simulate problems that students will encounter professionally during their future careers. Emphasis is placed on the use of statistical software for tackling engineering problems that require the use of statistics.

Module Content:

Unit 1: Data Displays

• Lecture 1: Robust Data Displays. Engineering Method and Statistical Thinking (Variability); The Median; The Inter Quartile Range; Stem-and-Leaf displays; Boxplots.
• Lecture 2: Traditional Data Displays. The Mean; The Standard Deviation; Histograms; Chebyshev's Rule.

Unit 2: Modelling Random Behaviour

• Lecture 3: Probability. Rules of Probability; Independence; Total Probability; Bayes Rule; Reliability.
• Lecture 4: Discrete Random Variables. The Binomial Distribution; The Poisson Distribution; The Hyper geometric Distribution; Modelling Failure.
• Lecture 5: Continuous Random Variables. The Normal Distribution, The Exponential and Weibull Distributions; MLE; Sampling Distributions & The Central Limit Theorem.

Unit 3: Estimation and Testing

• Lecture 6: Non - Parametric Hypothesis Testing. The Null and Alternative Hypothesis; Significance Levels, The Sign Test; The Tukey Test.
• Lecture 7: Parametric Hypothesis Testing. Inference for a Single Mean; Inference for Two Independent Samples; Inference or Variances.

Unit 4: Model Building and Regression Analysis

• Lecture 8-9: Correlation & Simple Regression Analysis. The Correlation Coefficient, Simple Linear Regression, Non Linear Regression through Data transformations.
• Lecture 10-12: Multiple Regression and Diagnostics. Multiple Linear Regression, R2, Statistical Significance of Model Parameters; Residual Analysis.

Practical classes will complement each of the above lectures, where directed study will be provided to highlight how the techniques learnt in each lecture can be applied to typical engineering problems for each discipline.

Intended Learning Outcomes:

Technical Outcomes

Upon completion of this module the student should be able to:
- Appreciate the use and applicability of statistical analysis in engineering.
- Use statistical software to compute and visualise statistical functions.
- Build probabilistic models.
- Apply common statistic methodologies to their field of study.
- Apply statistical thinking and structured problem solving capabilities.
- Think about, understand and deal with variability.

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)
- Ability to apply and integrate knowledge and understanding of other engineering disciplines to support study of their own engineering discipline (SM3b/SM3p)
- Ability to apply quantitative and computational methods in order to solve engineering problems and to implement appropriate action (EA3p)
- Ability to extract and evaluate pertinent data and to apply engineering analysis techniques in the solution of unfamiliar problems (EA6m)

Assessment:	Project (50%) Examination (50%)

Assessment Description: Discipline Specific Mini Project (contributes 50% to module grade). Students will work on a mini project, related to their field of discipline, to perform statistical analysis and interpretation of a real-world data set using Matlab. The students will present their findings by submitting a written report.

Exam - (closed book and face-to-face, contributes 50% to module grade). Students will tackle a series statistical questions covering all topics.

Students need to achieve at least 40% in both components in order to pass the module.

If you do not meet the component level requirements for the module (i.e. achieving 40% in both components) 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: Moderation by sampling of the cohort

Assessment Feedback: Students will receive their grades, together with models answers, within 3 weeks of submission.

Failure Redemption: Students will be required to redeem the component that they fail during the August supplementary period. Failure of both the project and examination will result in resitting both components.

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

PENALTY: ZERO TOLERANCE FOR LATE SUBMISSION

Attendance at computer classes is compulsory.
The module is only for students within the the Faculty of Science and Engineering.
The module is unavailable to visiting/exchange students.
Notes, worked examples, assignments and mini projects can be found on Canvas.

Students need to achieve at least 40% in both components.

EG-233 Placement Preparation: Engineering Industrial Year

Credits: 0 Session: 2023/24 September-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. 11 one hour drop-in advice sessions. Review of CV and cover letter.
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 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; (d) key employability skills; getting the most from your Industrial Placement; and (e) health and safety in the workplace.

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) Engineering 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.
6) One to one meeting with careers and employability staff.
7) Health and safety in the workplace.

Intended Learning Outcomes:
Technical Outcomes
By the end of this module, students will:
- Know how to find and apply for placements, create a CV and complete a placement application.
- Understand the interview process and gain interview experience.
- Discuss and share what is expected within the workplace including behavioural and professional conduct.
- Identify personal employability skills and how these will be used in a workplace setting.

Accreditation Outcomes (AHEP)
EL5b Awareness of relevant legal requirements governing engineering activities, including personnel, health & safety, contracts, intellectual property rights, product safety and liability issues
EL6b Knowledge and understanding of risk issues, including health & safety, environmental and commercial risk,

Assessment: Placements (100%)

Assessment Description:
Students are required to attend the health and safety lecture. Students who do not attend and have no valid reason will not be permitted to continue on an Engineering Industrial Placement Year programme of study.

Moderation approach to main assessment: Not applicable

Assessment Feedback:
N/A: students will however be able to discuss and seek feedback/advice on their search for an industrial placement, during the drop-in sessions.

Failure Redemption:
Successful completion of this module depends upon attendance at, and engagement with, the health and safety lecture. Therefore there will normally be no opportunity to redeem failure. However, special provision will be made for students with extenuating or special circumstances.

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

This module is only available for students enrolled on the Engineering Year in Industry scheme.

EG-240 Electronic Circuits

Credits: 10 Session: 2023/24 January-June

Pre-requisite Modules: EG-142; EG-155

Co-requisite Modules:

Lecturer(s): Mrs M Ahmed

Format: Lectures 20 hours
Example classes 5 hours
Directed private study 75 hours

Delivery Method: This module is 100% lecture based.

Module Aims: This module introduces circuit elements such as transistors and FETs and shows how they can be used as amplifiers and switches.The amplification and bias conditions for transistor amplifiers are analysed and discussed in detail.

Circuit elements necessary for building operational amplifiers such as the long tailed pair and the current mirror are analysed, and a complete circuit for an operational amplifier is discussed.

Some applications of operational amplifiers such as the function generator and instrumentation amplifier are introduced with practical applications.

Circuits using MOSFETs for logic and analogue switches are described.

Module Content:

• Bipolar Junction Transistors; Transistor bias circuits; Small signal bipolar amplifiers; Long Tailed Pair.
• Operational amplifier design and analysis.
• Operational amplifier applications; the instrumentation amplifier.
• JFET transistors and biasing; Small signal JFET amplifiers
• MOSFET as a switch and in logic circuits

Intended Learning Outcomes:

Technical Outcomes
On successful completion of this module, students should be able, at threshold level, to:
• Describe the construction and operation of a BJT and a MOSFET.
• Design individual BJT and MOS single-stage amplifiers.
• Describe the component parts of an operational amplifier, including the long-tailed pair and current mirror.
• Describe various Op-Amp applications including the instrumentation amplifier.
• Design MOSFET Switch and logic Circuits.

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)
- Knowledge of characteristics of particular materials, equipment, processes, or products (EP2p)
- Ability to apply relevant practical and laboratory skills (EP3p)

Assessment: Examination 1 (100%)
Resit Assessment: Examination (Resit instrument) (100%)

Assessment Description: The module is conventionally assessed by a 2 hour Examination; Answer 3 out of 4 questions, Question 1 is compulsory.
The compulsory question will test understanding of the subject over a wide range of topics, and the elective questions will focus on particular topics.

Moderation approach to main assessment: Moderation of the entire cohort as Check or Audit

Assessment Feedback:
Feedback will be in a standard format on the College of Engineering Community Hub on Canvas. 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%). Level 2 re-sits (Supplementary exams) are capped at 40%.

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.

EG-241 Electrical Machines

Credits: 10 Session: 2023/24 September-January

Pre-requisite Modules: EG-155; EGA107

Co-requisite Modules:

Lecturer(s): Dr A Egwebe

Format: Lectures: 22 hours
Examples: 10 hours
Directed private study and assessment 60 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 employ lectures with assessment by examination.

Module Aims: This module introduces the operation and configuration of the most common electrical machines, with a focus on transformers, asynchronous (induction) motors and dc machines.

Module Content:
Section 1: Introduction
Review of active and reactive power, three-phase systems, electromagnetism.

Section 2: Transformers
Ideal transformer, real single-phase transformers, equivalent circuit of a transformer, three-phase transformers.

Section 3: ac Machines Fundamentals
Induced voltage and torque, rotating magnetic field and power flow diagram.

Section 4: Induction motors
Construction, equivalent circuit, definition power and torque, torque-speed characteristics.

Section 4: dc machines
Commutation in a simple four-loop dc machine, commutation with real machines, voltage-torque equations in real machines, equivalent circuit of dc motor, shunt dc motors. separately excited dc motors.

Intended Learning Outcomes: Technical Outcomes
Upon completion of the module, students should be able to:
• Explain the construction and operation of transformers, induction motors and dc machines.
• Explain, draw and use the equivalent circuits of transformers, induction motors and dc machine.
• Use short-circuit and open-circuit tests to calculate transformer parameters.
• Use equivalent circuits to study operation of transformers, induction motors and dc machines.
• Use power flow diagrams for transformers, induction motors and dc machines to calculate efficiency and power losses
• Apply the concepts of synchronous speed, slip speed, and slip.
• Explain torque-speed/slip characteristic of an induction motor and of a dc machine.

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)

Assessment:	Examination 1 (80%) Coursework 1 (10%) Coursework 2 (10%)
Resit Assessment:	Examination (Resit instrument) (100%)

Assessment Description: 80% Examination (closed-book/onsite submission)
10% Coursework 1
10% Coursework 2

This module is assessed by a combination of examination and continual assessment. In order to pass the module students must achieve a minimum of 30% in the examination component, and a minimum of 40% overall for the module. If students do not meet the exam and module requirements they will receive a QF outcome and will be required to take a supplementary assessment in this module, even if their module mark is above 40%.

Moderation approach to main assessment: Moderation of the entire cohort as Check or Audit

Assessment Feedback:
Coursework feedback will be provided through Canvas and a formal lecture. Additional feedback will be provided during office hours.

Exam feedback will be in a standard format on the 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: If a student is awarded a re-sit: failure redemption of this module will be by Examination only (100%).

Level 2 re-sits (Supplementary exams) are capped at 40%

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

EG-242 Electronic Materials and Devices

Credits: 10 Session: 2023/24 September-January

Pre-requisite Modules:

Co-requisite Modules:

Lecturer(s): Prof KS Teng

Format: Lectures 20 hours
Directed private study 80 hours

Delivery Method: Lecture and end of semester examination.

Module Aims: The module introduces the fundamental properties of semiconducting materials and the operating principles of electronic devices.

Module Content:
Basic principles: Energy band diagram, the Fermi-Dirac distribution function, Boltzmann Approximation, Electrons and Holes, Donors and Acceptors, Calculation of n and p, Intrinsic level, Intrinsic carrier concentration, Poisson's equation, Neutral and space-charge regions, Carriers Scattering and Mobility, Drift and Diffusion of holes and electrons, Modified Ohms Law, Recombination and Generation, Equilibrium and non-equilibrium, Quasi-Fermi Levels.

Diode: p-n junction, Ideal diode law, Reverse bias and avalanche breakdown, Transient effect, Small-signal equivalent circuit.

Bipolar transistors: Basic operation of npn and pnp junctions, DC characteristics, Emitter efficiency, Base transport factor, Large and small signal current gains.

MOS transistors: Basic MOS Theory (flat band, accumulation, depletion, strong inversion), MOS Transistor, Small signal parameters, Equivalent circuit of MOSFET.

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)
- Ability to identify, classify and describe the performance of systems and components through the use of analytical methods and modelling techniques (EA2p)
- Understanding of the principles of electronic materials and the ability to apply them to analyse the operation of devices, such as p-n junction, bipolar junction transistor and MOSFET (EA1p)

All are assessed in the Examination.

Assessment: Examination 1 (100%)
Resit Assessment: Examination (Resit instrument) (100%)

Assessment Description: EG-242 - Closed book in-person exam 2 hours

Moderation approach to main assessment: Moderation of the entire cohort as Check or Audit

Assessment Feedback: Feedback will be in a standard format on the Faculty of Science and Engineering Community page on Canvas. 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%). Level 2 re-sits (Supplementary exams) are capped at 40%

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

• Notes and example sheets for this module are available on Canvas.

EG-243 Control Systems

Credits: 10 Session: 2023/24 January-June

Pre-requisite Modules:

Co-requisite Modules:

Lecturer(s): Dr A Egwebe

Format: Lectures: 22 hours
Example classes: 10 hours
Directed private study: 68 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

Lectures with assessment by coursework and examination

Module Aims: The module introduces the topic of feedback control systems and presents methods of modelling that lead to transient, steady-state, and stability performances in control systems. An emphasis is placed on links between time responses and complex frequency domains. Principal topics are feedback systems, focusing on the system characteristic equation and its solution. There is an emphasis on the root-locus approach in studying stability conditions and compensation design. The overall aim is to understand and be able to apply basic techniques, using relevant software tools, for the analysis and design of feedback control systems.

Module Content: • Dynamic systems generally;
• Examples of feedback systems and practical performance criteria;
• Time and frequency response analysis;
• Differential equations and the implications of feedback;
• Open and closed loop control system configurations;
• Closed loop characteristics from open-loop transfer functions;
• Stability in the context of negative feedback;
• Complex frequency domain representations;
• Solutions of the characteristic equation, Bode, Nyquist and root-locus techniques;
• Design to meet stability and error performance criteria;
• Proportional, integral and differential (PID) compensation and their role in designs to meet a specification.

Intended Learning Outcomes:

Technical Outcomes

- Upon completion of this module the student should be able to demonstrate a knowledge and understanding of:
- The influence of feedback on dynamic systems;
- The characteristic equation and its importance in feedback systems;
- The link between open-loop and closed-loop transfer functions;
- Stability criteria;
- Steady-state accuracy;
- Time and frequency responses.

Accreditation Outcomes (AHEP)

- Ability to apply quantitative and computational methods in order to solve engineering problems and to implement appropriate action (EA3b/EA3p)
- Understanding of, and the ability to apply, an integrated or systems approach to solving engineering problems (EA4b)
- 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)
- Ability to apply and integrate knowledge and understanding of other engineering disciplines to support the study of their own engineering discipline (SM3b/SM3p)
- Work with information that may be incomplete or uncertain and quantify the effect of this on the design (D3b/D3p)

Assessment:	Examination 1 (70%) Coursework 1 (10%) Coursework 2 (10%) Coursework 3 (10%)
Resit Assessment:	Examination (Resit instrument) (100%)

Assessment Description:

Coursework:

Three electronic online tests with randomised coefficients/questions 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 10%

Coursework 2 - Weighting 10%

Coursework 3* - Weighting 10%

* Coursework 3 will include a one-hour continuous professional development course that students must complete online. It will be assessed by submitting a completion certificate and a reflective blog.

The closed-book examination is worth 70% of the module. The examination consists of 3 questions and students are expected to answer all questions. Question 1 is weighted 30%, and the 2 other questions each weigh 20%. The examination topics will be those presented in the lectures.

This module is assessed by a combination of examination and continual assessment. In order to pass the module students must achieve a minimum of 30% in the examination component, and a minimum of 40% overall for the module. If students do not meet the exam and module requirements they will receive a QF outcome and will be required to take a supplementary assessment in this module, even if their module mark is above 40%.

Moderation approach to main assessment: Partial moderation

Assessment Feedback: Standard University procedure via a generic form. Information is given on popularity of the individual questions, relative performances across the cohort and common mistakes.Other information includes the class grade for each question (1st class, 2:1 class, 2:2 class, 3rd class and fail) achieved by the cohort.

Individual students can make appointments with the lecturer to receive general feedback on the examination where this is requested.

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

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

EG-244 Software Engineering

Credits: 10 Session: 2023/24 September-January

Pre-requisite Modules:

Co-requisite Modules:

Lecturer(s): Dr JW Jones

Format: Each week consists of 2 one hour lectures and a 2 hour practical session in a computer laboratory.

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

A blended learning approach to class contact will be used in which the key concepts and readings will be introduced and understanding tested weekly via the Canvas platform.

Lab Assignments will be delivered via Canvas and can be solved using the student's own PC or the campus PC Labs. All required software is free and easily installable (a tutorial video is provided on Canvas).

Assistance with Lab Assignments will be provided via a combincation of in-person lab classes, and drop-in sessions on Zoom.

Module Aims: The module develops software engineering practice through practical applications using Python. This is achieved through a number of programming assignments throughout the semester and a series of class tests each week. Each assignment begins with the students being given one or more programs which they are expected to enhance to satisfy the brief.

Module Content:

The aspects of the Python language that will be covered include:

- Simple interaction with the user through the keyboard and screen;
- Variables and Types;
- Lists;
- Basic Operators;
- String Formatting and Basic String Operations;
- Conditions;
- Loops;
- Developing and using functions;
- Dictionaries;
- Input and Output to Disk and Serialisation;
- Modules and Packages.

Intended Learning Outcomes: Technical Outcomes

After completing this module you should be able to:

- Describe the Python language in the context of the application domain (SM1p, EP2p)
- Develop, analyse and test simple Python programs and algorithms to meet specifications (SM1p, SM2p, EA1p, EP2p)
- Implement simple dynamic data structures (SM1p, SM2p, EA1p, EP2p)

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)
- Understanding of engineering principles and the ability to apply them to analyse key engineering processes (EA1b/EA1p)
- Knowledge of characteristics of particular materials, equipment, processes, or products (P2/EP2p/EP2m)

Assessment:	Coursework 1 (10%) Coursework 2 (20%) Coursework 3 (5%) Examination (40%) Coursework 4 (25%)

Assessment Description: The coursework component comprises 3 separate programming assignments. The first two are conducted and assessed individually. The 3rd assignment is conducted and assessed in pairs. Coursework 3 assesses the documentation part of the 3rd assignment, and Coursework 4 examines the software itself.

This module is assessed by a combination of exam and continual assessment. In order to pass the module students must achieve a minimum of 30% in the Exam component, and a minimum of 40% overall for the module. If students do not meet the requirements for the exam and module requirements they will receive a QF outcome and will be required to take a supplementary assessment in this module, even if their module mark is above 40%.

Moderation approach to main assessment: Not applicable

Assessment Feedback: All students will receive their coursework marks and feedback within two weeks of the assignment deadline.

Failure Redemption: The coursework components can be redeemed by a supplementary coursework shortly before the August supplementary exam period. The examination component can be redeemed via a supplementary examination during the August supplementary exam period.
Year 2 supplementary exam marks are capped at 40%.

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

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

EG-247 Digital Signal Processing

Credits: 10 Session: 2023/24 January-June

Pre-requisite Modules: EG-116; EG-150

Co-requisite Modules:

Lecturer(s): Dr CP Jobling

Format: On-demand lecture materials to be reviewed before and after class: 10 hours
On-campus examples classes: 20 hours
On-campus laboratory and project work: 20 hours
Directed private study 50 hours

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.

Timings are based on completely on-campus delivery. EG-247 can easily be delivered on-line should circumstances prevent on-campus delivery.

Lab and project work can be done using on-campus PCs, virtual machines, or MATLAB online. A flipped blended learning approach to class contact will be used.

The key concepts and readings will be introduced, and understanding tested before each class, leaving time to practice the mathematical techniques causing the most difficulties during the on-campus examples classes.

This will be reinforced by making worked solutions available after class. The OneNote Class Notebook will be used as a classroom delivery, shared whiteboard, and portfolio.

Canvas will be used for class discussion, assignment distribution, and submission.

Assessment: on-campus invigilated examination 60%; Lab Portfolio: 30%; Project 10%.

MATLAB and Simulink will be used for the Lab Work and graded using MATLAB Grader.

The project submission will be made via the submission tool provided by Canvas.

Module Aims: To develop further methods of representing and analyzing signals and dynamic systems, to extend these concepts to sampled-data systems, to introduce concepts in digital signal processing and to use computer-aided methods for modelling and analysis.

Module Content: • Review of the Laplace transform and its applications to Circuit Analysis.
• Fourier series and the Fourier Transform.
• Ideal and Butterworth filters.
• Fundamentals of Sampled data signals, digital systems, z-transforms.
• Discrete Fourier Transform (DFT) and the Fast Fourier Transform (FFT).
• Implementations of digital Infinite Impulse Response (IIR) and Finite Impulse Response (FIR) filters.

Intended Learning Outcomes: Technical Outcomes
Upon completion of the module, students should be able to:
- Demonstrate knowledge and understanding of the mathematical methods and their application to signals and systems; including complex numbers; elementary signals; Fourier series and spectral analysis; the Laplace, Fourier, Z- and Discrete Fourier Transforms and their applications to electronic and electrical systems. Assessed by the Examination and the Lab Portfolio (SM2p).
- Identify, classify, and describe the performance of analogue and digital signals and signal processing systems by the application of analytic methods and modelling techniques. Assessed by the Examination and the Lab Portfolio. (EA3p)
- Apply computational methods in order to solve engineering problems involving for time-domain and frequency-domain analysis of continuous and discrete-time systems, modelling and mathematical analysis in MATLAB and systems simulation in Simulink. Assessed by the Lab Portfolio (EA2p).
- Understanding and applying a systems approach to digital signal processing including signal sampling systems for analogue signals such as speech and filter design. Assessed by the Design Project (EA4p).

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 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)
Understanding of, and the ability to apply, an integrated or systems approach to solving engineering problems (EA4p)

Assessment:	Examination (60%) Project (10%) Laboratory 1 (5%) Laboratory work (5%) Laboratory work (5%) Laboratory work (5%) Laboratory work (5%) Laboratory work (5%)
Resit Assessment:	Examination (Resit instrument) (100%)

Assessment Description: Student mastery of the material will be assessed using an online on-campus invigilated examination of 2 hours duration. 60%

Portfolio - A portfolio of evidence of completing a number of MATLAB Exercises graded by MATLAB Grader will be presented. These exercises will be graded weekly starting from teaching week 3.

A filter design project will be completed by each student and is worth 10%.

This module is assessed by a combination of examination and continual assessment. In order to pass the module students must achieve a minimum of 30% in the examination component, and a minimum of 40% overall for the module. If students do not meet the exam and module requirements they will receive a QF outcome and will be required to take a supplementary assessment in this module, even if their module mark is above 40%.

Moderation approach to main assessment: Moderation of the entire cohort as Check or Audit

Assessment Feedback: Test feedback will be delivered through Canvas.
Coursework and project feedback will be returned via the assignment and peer assessment facilities provided by MATLAB Grader and Canvas.

Failure Redemption: If a student is awarded a re-sit - Failure Redemption of this module will be by Examination only (100%). Level 2 re-sits (Supplementary exams) are capped at 40%

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

• The Faculty of Science and Engineering has a ZERO TOLERANCE penalty policy for late submission of all coursework and continuous assessment.
• Class notes, homework problems, worked examples and past papers for this module are distributed through a OneNote Class Notebook linked to Canvas. You are advised to install OneNote prior to the start of class.

EG-252 Group Design Exercise

Credits: 20 Session: 2023/24 September-June

Pre-requisite Modules: EG-151; EG-152

Co-requisite Modules: EG-240; EG-244

Lecturer(s): Dr T Davies, Mr AG Francis, Dr CP Jobling

Format: Lectures 10 hours
Laboratory work 80 hours
Directed private study 110 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 is mainly a practical module, assessed by Continual Assessment.
There will be a short lecture course at the start of the module, designed to give students some experience of high-level programming for the selected microcontroller.
The lecture course will be delivered as a series of ten, hour-long lectures, "live" online, and recorded using the Canvas VLE.

The taught material will be reinforced and assessed by short investigative reports.
A lab session is set aside for a formal lecture and quiz on engineering ethics.
Students will also be expected to contribute to a group presentation and produce technical, managerial and promotional documentation of their group's work in the form of a web site.

Module Aims:
The module is intended to reinforce aspects of Engineering Applications (EA1) and develop EA2.
Advanced features of microcontroller operation are introduced, including interrupts and programming of features of the selected microcontroller.
Extended experimental work is carried out as a Group Design Exercise.
Practice in using technical IT packages including microcontroller software development and the use of design aids such as PCBs and engineering drawing is inherent.
Development of project documentation through a web-site.
Concepts of engineering ethics introduced in first year are developed through a formal lecture, and examined as part of the presentation in the final assessment.

Module Content:
The group design exercise (GDE) will run across both teaching blocks. This is an open-ended exercise (the development of a micro-mouse) which will draw on concepts from the taught modules in each of the teaching blocks.

Microcontroller work:
• Embedded C in a practical application.
• Interrupts and interrupt handling
• Timer-counter applications
• Further applications, including use of the analogue to digital converter, Inter-Integrated Circuit (IIC) bus and Serial Peripheral Interface (SPI) bus.
• Experimental work in the programming of microprocessors will provide support for the GDE.

Work in small groups on the project, involving:
• Embedded microcontroller software design for motor control and sensors
• Sensor design and interface
• Derivation of calibration and test experiments
• Business considerations
• Configuration of a hosted web site with database support
• Web-based collaboration and reporting
• A group presentation on the project, including a discussion of engineering ethics

Intended Learning Outcomes: Technical Outcomes
After completing this module you should be able to:
• Use the C programming language to create an embedded application.
• Describe and use advanced features of the microcontroller, including timing functions, analogue to digital conversion, and interrupts.
• Work in a small group on a technical project.
• Design simple electronics and software routines.
• Assess appropriate experimental strategies.
• Apply formal project planning and descriptive methods.
• Prepare technical documentation using Information Technology.
• Record and communicate design decisions
• Use design notations as appropriate to the stage in a system design lifecycle.
• Refer to the guidelines for engineering ethics as described in the IET website
• Consider the ethical implications of complex systems such as autonomous machines and vehicles.
• Make a group presentation about their experience, including their findings about ethical aspects.

Accreditation Outcomes (AHEP)
- Understanding of, and the ability to apply, an integrated or systems approach to solving engineering problems. (EA4p)
- Understanding of the need for a high level of professional and ethical conduct in engineering and a knowledge of professional codes of conduct (ET1p)
- Knowledge and understanding of management techniques, including project management, that may be used to achieve engineering learning outcomes (ET3p)
- Understanding of the requirement for engineering activities to promote sustainable development and ability to apply quantitative techniques where appropriate (ET4p)
- Understanding of contexts in which engineering knowledge can be applied (eg operations and management, application and development of technology, etc) (EP1p)
- Ability to apply relevant practical and laboratory skills (EP3p)
- Understanding of the use of technical literature and other information sources (EP4p)
- Understanding of appropriate codes of practice and industry standards (EP6p)
- Understanding of, and the ability to work in, different roles within an engineering team (EP9p)
- Understand and evaluate business, customer and user needs, including considerations such as the wider engineering context, public perception and aesthetics (D1p)
- Communicate their work to technical and non-technical audiences (D6p)

Assessment:	Coursework 1 (20%) Coursework 2 (10%) Coursework 3 (60%) Participation Exercise (0%) Coursework 4 (10%)

Assessment Description: Coursework C1: 20% of total. Based on the assessment of the microprocessor lab and the online quiz.

Coursework C2: 10% of total. The result of an inspection of the Micromouse hardware and the online documentation (web site).

Coursework C3: 60% of total. This is the "grand finale" of Micromouse, including testing of individual machines, technical inspection, a presentation, and the final mark for the web site.

Coursework C4: 10% of total. This is a new assessment, titled "The Engineer in Society". It will contain four short assessments, submitted by individual students. The topics are as follows:

Sustainability - The cost of the Micromouse, and how much can be recovered for future projects.

Ethical Dilemma: The student's response to an ethical dilemma, such as the legal problems inherent in autonomous vehicles.

Diversity: A brief statement by the student on the impact of diversity on the team members.

IET Code of Practice: The student's understanding of the IET Code of Practice for Engineers.

The above four topics will take the form of short essays submitted using the Canvas VLE.

Participation exercise. This is a 0% pass/fail component which will assess the student’s contribution to the project in terms of attendance, being a team member, contributions to web site and so on. It will be assessed using a mixture of attendance and contributions to the monthly blog posts. Students cannot pass the module unless they achieve a pass in the Participation Exercise.

Moderation approach to main assessment: Not applicable

Assessment Feedback: Feedback will be provided in a standard format on the FSE Canvas HUB. Information provided will be the average mark, maximum and minimum marks, for the module as a whole. In addition, the same information will be provided for the microcontroller course (4 credits), the December inspection (2 credits) and the group design exercise (14 credits).

Failure Redemption: There is no opportunity to redeem a failure in this module due to the nature of the work (practical and group work).

The only component that can be redeemed is the 10% Individual Assessment - An individual reflection on the role of an Engineer in Society, to include professional ethics, EDI and sustainability.

Failure of this module will mean that the student must repeat the module or repeat the year. Failure to attend classes and activities related to this module will mean that the student will fail the module; hence the student will repeat the module/year.

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

EG-277 Research Project Preparation

Credits: 0 Session: 2023/24 September-June

Pre-requisite Modules:

Co-requisite Modules:

Lecturer(s): Dr AC Tappenden, Dr M Fazeli, Mrs KM Thomas

Format: Formal Lectures - 2-3 hours

Delivery Method: 2-3 formal lectures throughout the academic year concerning project design and selection.

Module Aims:

This module has been designed to provide you with information needed ahead of undertaking a research project in Year 3 of studies.

The research project in Year 3 is worth 30 credits, and will involve the application of scientific and engineering principles to the solution of a practical problem associated with engineering systems and processes.

In the research project you will gain experience in working independently on a substantial, individually assigned task, using accepted planning procedures. It will require and develop self-organisation and the critical evaluation of options and results, as well as developing technical knowledge in the chosen topic.

The preparation for the research project commences in Year 2 where you are required to engage in project selection. In this preparation module we will confirm the options available to you to either define your own project or to select from a list of project titles and descriptors put forward by academic staff. Communications concerned project selection will be done via the Canvas course page. Additional supplementary resources will also be provided.

Module Content: In conjunction the formal lectures and supplementary resources will cover:

- Key staff members - contact details
- Key dates for Year 2 regarding project selection - defining your own project or selecting from staff titles
- How to design a project concept and what to consider before approaching a possible supervisor
- Where to start in finding a possible supervisor
- What to do if you're hoping to undertake a placement year
- Selecting from staff titles
- Further information around the allocation process
- First steps in EG-353 when you commence Year 3

Intended Learning Outcomes: NA

Assessment: Participation Exercise (100%)

Assessment Description: This module is not assessed but we would strongly suggest participation to ensure that you understand how the project selection system will work.

Moderation approach to main assessment: Not applicable

Assessment Feedback: NA

Failure Redemption: NA

Additional Notes: Only available to students following an Engineering Degree Programme.

EGA207 Applied Electromagnetics

Credits: 10 Session: 2023/24 September-January

Pre-requisite Modules: EG-114; EG-116; EGA107

Co-requisite Modules:

Lecturer(s): Dr TGG Maffeis

Format: On demand content 20 hours
F2F/synchronous 10 hours
coursework prep 30 hours
exam revision 40 hours

Delivery Method: Blended delivery comprising of on demand lecture notes, short videos of derivations and worked examples backed by online assessed quizzes, and synchronous/F2F example classes

Module Aims: Transmission lines, telegraph equations, characteristic impedance, reflection coefficients, VSWR, wave impedance, stubs, and basic matching circuits (quarter wave transformer and series/shunt stub matching)
Application of Maxwell's equations to electro-magnetic plane wave propagation. Wave parameters, attenuation, Wave impedance, reflection, and transmission in loss-free and lossy medium. Skin depth.

Module Content:
• Derive the Telegraph equations for transmission line.
• Derive solutions and the associated characteristics of transmission line propagation.
• Derive the parameters of reflection coefficient, voltage standing wave ratio (VSWR) and input impedance for a loaded transmission line.
• Develop techniques to match a load to a transmission line.
• Review of Ampere's Law, Faraday's Law and Gauss's Laws.
• Develop Maxwell's equations in 1-dimension and the associated plane wave solutions.
• Determine the attenuation, wavelength and velocity of propagation given the electrical properties of the media.
• Derive expressions for the transmission and reflection coefficients of plane waves at an interface between different media.

Intended Learning Outcomes:
Technical outcomes:
• Determine the important parameters associated with transmitting electromagnetic energy through transmission lines.
• Solve mismatched transmission line problems.
• Explain the links between currents and voltages on one hand and electromagnetic fields on the other.
• Explain how the electromagnetic plane waves can be deduced from Maxwell's equations.
• Explain how a medium constitutive parameters affect the propagation of electromagnetic waves.
• Describe the terms linear polarisation and circular polarisation.
• Derive expressions for the transmission and reflection coefficients of plane waves at an interface between different media.

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)
Understanding of engineering principles and the ability to apply them to analyse key engineering processes. (EA1p)
Ability to identify, classify and describe the performance of systems and components through the use of analytical methods and modelling techniques (EA2p)

Assessment: Examination 1 (75%)
Coursework 1 (25%)

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

Assessment Description: 25% Continual Assessment
75% Exam

This module is assessed by a combination of examination and continual assessment. In order to pass the module students must achieve a minimum of 40% in the examination component, and a minimum of 40% overall for the module. If students do not meet the exam and module requirements they will receive a QF outcome and will be required to take a supplementary assessment in this module, even if their module mark is above 40%.

Moderation approach to main assessment: Moderation of the entire cohort as Check or Audit

Assessment Feedback: Feedback will be in a standard format on the Canvas Community HUB. Information provided includes average mark, maximum and minimum marks for the examination 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%). Year 2 re-sits (Supplementary exams) are capped at 40%

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

EGA211 Semiconductor Technology

Credits: 10 Session: 2023/24 January-June

Pre-requisite Modules:

Co-requisite Modules:

Lecturer(s): Prof K Kalna

Format: Lectures 22 hours + Labs 12 hours 34 hours
Directed private study 54 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: The module is delivered by standard lectures (2 lectures per week), and lab sessions which run about 5 weeks in the middle of the module.

Examination: 60% Exam + 40% Lab work

Module Aims: The module introduces semiconductor fundamentals, semiconductor processing, device fabrication technology and device characterization.

Module Content: Semiconductor growth, material defects, doping of semiconductors: diffusion and ion implantation, metal deposition, Oxide growth and alternative gate materials. Interface states. Lithography, annealing. Cleanroom technology. Process flow. Process issues affecting scaling of devices.

Device design: interfaces, and strain (lattice and thermal mismatch).

Intended Learning Outcomes: Technical Outcomes
After completing this module you should be able to demonstrate a knowledge and understanding of:
• The issues surrounding the fabrication of semiconductor device technology including the nanoscale semiconductor fabrication in mass production.
• Determine a process flow and understand the device technology for the fabrication of electronic devices.
• Simulate fabrication processes using SILVACO Athena TCAD commercial tool.
• Basic design process and flow.
• Numerically analyze physical principles.

Accreditation Outcomes (AHEP)
- Understanding of engineering principles and the ability to apply them to analyse key engineering processes (EA1p)
- 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)
- Work with information that may be incomplete or uncertain and quantify the effect of this on the design (D3p)
- Plan and manage the design process, including cost drivers, and evaluate outcomes (D5)
- Knowledge of characteristics of particular materials, equipment, processes, or products (EP2p)
- Understanding of the use of technical literature and other information sources (EP4p)
- Knowledge of relevant legal and contractual issues (EP5p)
- Ability to work with technical uncertainty (EP8p)

Assessment: Examination 1 (60%)
Coursework 1 (40%)

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

Assessment Description: Examination 1 (Written examination) 60% and 40% Assessment Project Report (Coursework).
• Written Examination on the taught part of the course - worth 60% of the total module mark.
• Assessment Project Report on the laboratory part of the course - worth 40% of the total module mark.

Specific rules for passing this module:
Students must also achieve at least 40% in both components to pass this module.
If you do not meet the component level requirements for the module you will receive a QF outcome. This means that you will be required to undertake a resit, even if your module mark is above 40%

7 laboratory classes of 2 hours are compulsory. Students must attend at least 5 two-hours classes of the initial 5 classes or 6 two-hours classes of all classes.
The laboratory classes can be missed only against a valid Extenuating Circumstances request. Fail to attend one of the 5 two-hours initial classes or 6 two-hours all classes will result in the zero mark for the 40% project assessment. The zero mark from assessment will mean the zero mark from the module.

Moderation approach to main assessment: Moderation of the entire cohort as Check or Audit

Assessment Feedback: Feedback will be available on Canvas for the assessment project, during a special session via a video-conferencing platform, and in a standard format on the FSE intranet. Information provided includes extensive comments on your assessment report, then average, maximum and minimum marks for the examination as a whole and for individual questions. The exam script will also contain comments on the particular mark which can be read after asking to see the exam answer sheet. There is also very important additional feedback given during the exercise classes.

Failure Redemption: If a student is awarded a re-sit - Failure Redemption of this module will be by 100% Examination.
Level 2 re-sits (Supplementary exams) are capped at 40%.
For other issues, following university policy (see below):
http://www.swan.ac.uk/registry/academicguide/assessmentissues/redeemingfailures/.

Specific rules for passing this module:
Students must also achieve at least 40% in both components to pass this module.
If you do not meet the component level requirements for the module, you will receive a QF outcome. This means that you will be required to undertake a resit, even if your module mark is above 40%.

7 laboratory classes of 2 hours are compulsory. Students must attend at least 5 two-hours classes of all classes.
The laboratory classes can be missed only against a valid Extenuating Circumstances request. Fail to attend one of the 5 two-hours compulsory classes will result in the zero mark for the 40% project assessment. The zero mark from assessment will mean the zero mark from the module which means that the student failed the module.

Additional Notes: • AVAILABLE TO Visiting and Exchange Students
• The Faculty of Science and Engineering has a ZERO TOLERANCE policy for late submission of all coursework and continuous assessment.
• Notes worked examples and past papers for this module can be found on Canvas.
• The module is a lecture and a laboratory-based. Assessment methods include coursework (laboratory report) and written examination. The laboratory work will be on Campus.
• Assessment: Individual report from a fabrication process carried out using Silvaco Athena TCAD commercial tool. A small group of 2 students will work together to develop a step/steps of fabrication process for a semiconductor device. Each group member will have to identify in the individual report his/her contribution to the common work.
• Exam - Closed Book in May/June
This module is assessed by a combination of examination and assessment project report. The following special provisions apply:
1) In order for the exam mark to count, you must achieve at least 40% mark from the assessment project report. If you achieve less than 40% mark from the assessment project report, then you will fail the entire module with a mark zero.
2) In order for the mark from the assessment project report to count, you must achieve at least 40% in the exam component. If you achieve less than 40% in the exam, then the module mark will be just the exam mark.
• All the assessment submissions will be made via the submission tool provided by Canvas.

EGA222 Electrical Machines Laboratory

Credits: 5 Session: 2023/24 September-January

Pre-requisite Modules: EG-151; EG-152; EG-168; EGA107

Co-requisite Modules: EG-241; EG-243

Lecturer(s): Dr A Egwebe

Format: On-campus Laboratory work 15 hours; On-demand lab work 15 hours; On-demand online support 5 hours;
Directed private study 15 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 laboratory work: Each student will have a minimum of 12-hours, timetabled, lab access to complete an assortment of electrical machine experiments.

The lab work has been carefully designed for students to complete on-campus and on-demand.

In term time, the progress of each student will be captured via a Biweekly Blog on the VLE platform.

Assessment Components: Biweekly reflective blog (30%) + Laboratory Diary (20%) + Technical Report (50%)

Module Aims: Module Aims:

The laboratory modules EGA222 and EGA223 provide a practical experience of some of the material presented in taught modules, including EG-241 Electrical Machines, EG-243 Control Systems, EG-240 Electronic Circuits, EG-247 Signals and Systems. Experiments on Amplitude Modulation, Frequency Modulation and Digital Modulation are also included (in EGA223) to support the two Communications modules later in the degree programme.

Module Content:

Selected Electrical Machines Experiments:

- DC motor in PM, shunt, series and compound mode.
- Design, operation, and characteristics of Single-and-Three Phase Transformers.
- Modelling, characterisation and control of a Brushless DC motor.
- Investigation and characterisation of a three-phase induction machine.
- Characterisation and control of a Stepper motor.
- The operation and positioning of a Linear motor.
- Closed-loop speed control of an electrical drive.

Intended Learning Outcomes: Technical Outcomes
After completing this module you should be able to:
• Perform electrical machine simulation and experiments according to an open-ended script (EA1-4 assessed by a lab diary).
• Select and apply instrumentation required for electrical measurements (EP1-3 assessed by a lab diary and progress report).
• To design, build and analyse electrical circuits to a specification (SM2 assessed by blogs, lab dairy and technical report).
• Prepare informative technical reports using Information Technology (D6 assessed by progress report).

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)
- Understanding of, and the ability to apply, an integrated or systems approach to solving engineering problems (EA4p)
- 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 (D2)
- Work with information that may be incomplete or uncertain and quantify the effect of this on the design (D3b)
- Understanding of contexts in which engineering knowledge can be applied (eg operations and management, application and development of technology, etc) (EP1p)
- Knowledge of characteristics of particular materials, equipment, processes, or products (EP2p)
- Ability to apply relevant practical and laboratory skills (EP3p)

Assessment:	Coursework 1 (50%) Coursework 2 (20%) Coursework 3 (30%)
Resit Assessment:	Coursework reassessment instrument (100%)

Assessment Description:
Set of experiments to support taught modules, assessed as follows:

• Coursework 1: Formal technical report, worth 50% of the module
• Coursework 2: Laboratory diary inspection, worth 20% of the module
• Coursework 3: Biweekly blog, worth 30% of the module

Specific rules for passing this module:

This module is assessed by three assignments. In order to pass the module students must achieve a minimum of 30% in Coursework 1, and a minimum of 40% overall for the module. If students do not meet the Coursework 1 and module requirements they will receive a QF outcome and will be required to take a supplementary assessment in this module, even if their module mark is above 40%.

Moderation approach to main assessment: Moderation of the entire cohort as Check or Audit

Assessment Feedback:
Feedback will be provided informally by means of class emails, when laboratory reports are submitted and marked, and in a standard format on the The Faculty of Science and Engineering intranet. Information provided includes average marks, maximum and minimum marks for the assessment components as a whole and for individual coursework.

Failure Redemption: If the examining board awards a student a re-sit, at least one piece of coursework will be set, for example one or more laboratory reports. The failure redemption is only available to students who had at least 80% attendance at laboratory classes or online equivalents 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.

• AVAILABLE TO Visiting and Exchange Students

• 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.

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

EGA223 Electronic Circuits Laboratory

Credits: 5 Session: 2023/24 January-June

Pre-requisite Modules: EG-150; EG-152; EG-155; EG-168

Co-requisite Modules: EG-240; EG-247

Lecturer(s): Dr KM Ennser, Mr AG Francis

Format: Laboratory work 20 hours
Directed private study 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

Laboratory work to support taught modules
Assessment: Continuous Assessment

Module Aims:
The laboratory modules EGA223 provides a practical experience of some of the material presented in taught modules, including:

EG-240 Electronic Circuits: the bipolar transistor, the long tailed pair and the instrumentation amplifier.

EG-247 Signals and Systems: digital encoding and digital filters.

Experiments on Amplitude Modulation, Frequency Modulation and Digital Modulation are also included to support the two Communications modules later in the degree programme.

Module Content:
• Formal experimental work associated with Level 2 lecture courses.
• An open-ended design exercise will be undertaken.
• Further practice in the use of commercial software packages and Technical Report preparation.

Circuits experiments:

• The bipolar transistor (BJT) characteristics and as an amplifier.
• The long-tailed pair as a difference amplifier.
• Design of an instrumentation amplifier and its use as an ECG.

Signals and Systems experiments:

• Data Conversion and sampling.
• Simple digital filters; Rolling Average and Comb filters.
• Finite Impulse response low-pass digital filter.

Radio Communication experiments:

• Simulation of Amplitude Modulation.
• Construction and testing of an Amplitude Modulator.
• Analysis of Frequency Modulation signal.
• Construction and testing of a phase-locked loop.

Intended Learning Outcomes: Technical Outcomes
After completing this module you should be able to:
• Perform electronic experiments according to an open-ended script
• Select and apply instrumentation required for electrical measurements
• Work in small teams to design, build and analyse circuits to a specification
• Prepare technical reports using Information Technology

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)
- Communicate their work to technical and non-technical audiences (D6p)
- Knowledge of characteristics of particular materials, equipment, processes, or products (EP2p)
- Ability to apply relevant practical and laboratory skills (EP3p)

Assessment:	Coursework 1 (80%)
	Coursework 2 (20%)
Resit Assessment:	Coursework reassessment instrument (100%)

Assessment Description:
Set of experiments to support taught modules, assessed as follows:

• Coursework 1: Formal laboratory report, worth 80% of module
• Coursework 2: Laboratory diary inspection, worth 80% of module

Specific rules for passing this module:
This module is assessed by two assignments. In order to pass the module students must achieve a minimum of 30% in Coursework 1, and a minimum of 40% overall for the module. If students do not meet the Coursework 1 and module requirements they will receive a QF outcome and will be required to take a supplementary assessment in this module, even if their module mark is above 40%.

Moderation approach to main assessment: Moderation of the entire cohort as Check or Audit

Assessment Feedback: Feedback will be provided informally by means of class emails, when laboratory reports are submitted and marked and in a standard format on the The Faculty of Science and Engineering Community page. Information provided includes average marks, maximum and minimum marks for the assessment components as a whole and for individual coursework.

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

If the Examining Board awards a student a re-sit (supplementary) then at least one piece of coursework will be set. For example one or more laboratory reports.

Students who fail the module and have attended less than 80% of laboratory sessions may be required to repeat the module again in the next academic. NOTE: Failed modules cannot be carried over as extra modules to the next academic year.

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.