Swansea University
Prifysgol Abertawe

FACULTY OF SCIENCE AND ENGINEERING

UNDERGRADUATE STUDENT HANDBOOK

YEAR 0 (FHEQ LEVEL 3)

FOUNDATION 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

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 **Head of School: Professor Antonio Gil**	
School Education Lead	Professor Cris Arnold
Head of General Engineering	Dr Patricia Xavier
Foundation Engineering Programme Director	Dr Natalie Wint

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 and also 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 also 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 contains useful information and links to other resources:

https://myuni.swansea.ac.uk/college-of-engineering/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 21-22 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. For Engineering courses, we do not expect you to purchase textbooks, unless it is a specified key text for the course.

FACULTY OF SCIENCE AND ENGINEERING

Progression Requirements from Year 0 Foundation Year to Year 1 Undergraduate Programmes (2022-23)

The following progression requirements ensure that the Foundation Year meets the requirements of the Professional Institutions which accredit our degrees.

The normal University Progression rules require you to pass all modules with at least 40% in each module. You can have up to 20 credits with marks between 30% and 40% and still progress. These are known as "tolerated failures". However, certain modules are classed as 'Core' and **a minimum mark of 40%** must be attained in each of these modules. The table below shows which modules are 'Core' for progression to which Year 1 programmes.

DEGREE SCHEMES		EG-060	EG-065	EG-066	EG-085
Aerospace Engineering		CORE	CORE	CORE	
H405	**FEGAS**				
Chemical Engineering		CORE	CORE	CORE	
H835	**FEGBS**				
Chemistry					CORE
F10F	**FCHEMS**				
Civil Engineering		CORE	CORE	CORE	
H205	**FCIVS**				
Electronic & Electrical Engineering			CORE	CORE	
H605	**FEEES**				
Engineering		CORE	CORE	CORE	
H101	**FEGGS**				
Materials Engineering			CORE		
J505	**FMTSS**				
Mechanical Engineering		CORE	CORE	CORE	
H307	**FMECS**				

Biomedical Engineering		**CORE**	**CORE**	**CORE**	
HBC9	**FEGLS**				

Year 0 (FHEQ Level 3) 2022/23
Foundation Year

BEng Aerospace Engineering[H405]
BEng Chemical Engineering[H835]
BEng Civil Engineering[H205]
BEng Engineering with Deferred Choice of Specialism with a Foundation Year[H101]
BEng Mechanical Engineering[H307]
BEng Medical Engineering[HBC9]

Semester 1 Modules	Semester 2 Modules
EG-065 **Basic Engineering Analysis 1** **20 Credits** **Dr SP Jeffs/Ms S Walsh** **CORE**	**EG-060** **Mechanics** **20 Credits** **Dr AM Higgins/Dr C Wang** **CORE**
EG-091 **Chemistry of Materials** **15 Credits** **Prof G Williams/Dr N Wint**	**EG-066** **Basic Engineering Analysis 2** **20 Credits** **Dr AJ Williams/Dr M Khalifa** **CORE**
EG-092 **Fundamentals of Engineering Science 1** **15 Credits** **Dr WC Tsoi/Dr S Azizishirvanshahi/Dr MR Brown/Dr N Wint**	**EG-093** **Fundamentals of Engineering Science 2** **15 Credits** **Dr C Wang/Prof JC Arnold/Dr S Yusha'U**
EG-094 **Fundamentals of Engineering Design** **15 Credits** **Dr N Wint/Mr JK Mcfadzean/Dr AJ Williams/Dr PA Xavier**	
Total 120 Credits	

Year 0 (FHEQ Level 3) 2022/23
Foundation Year
BEng Electronic and Electrical Engineering[H605]

Semester 1 Modules	Semester 2 Modules
EG-065 **Basic Engineering Analysis 1** **20 Credits** **Dr SP Jeffs/Ms S Walsh** **CORE**	**EG-060** **Mechanics** **20 Credits** **Dr AM Higgins/Dr C Wang**
EG-091 **Chemistry of Materials** **15 Credits** **Prof G Williams/Dr N Wint**	**EG-066** **Basic Engineering Analysis 2** **20 Credits** **Dr AJ Williams/Dr M Khalifa** **CORE**
EG-092 **Fundamentals of Engineering Science 1** **15 Credits** **Dr WC Tsoi/Dr S Azizishirvanshahi/Dr MR Brown/Dr N Wint**	**EG-093** **Fundamentals of Engineering Science 2** **15 Credits** **Dr C Wang/Prof JC Arnold/Dr S Yusha'U**
EG-094 **Fundamentals of Engineering Design** **15 Credits** **Dr N Wint/Mr JK Mcfadzean/Dr AJ Williams/Dr PA Xavier**	
Total 120 Credits	

Year 0 (FHEQ Level 3) 2022/23
Foundation Year
BEng Materials Science and Engineering[J505]

Semester 1 Modules	Semester 2 Modules
EG-065 **Basic Engineering Analysis 1** **20 Credits** **Dr SP Jeffs/Ms S Walsh** **CORE**	**EG-060** **Mechanics** **20 Credits** **Dr AM Higgins/Dr C Wang**
EG-091 **Chemistry of Materials** **15 Credits** **Prof G Williams/Dr N Wint**	**EG-066** **Basic Engineering Analysis 2** **20 Credits** **Dr AJ Williams/Dr M Khalifa**
EG-092 **Fundamentals of Engineering Science 1** **15 Credits** **Dr WC Tsoi/Dr S Azizishirvanshahi/Dr MR Brown/Dr N Wint**	**EG-093** **Fundamentals of Engineering Science 2** **15 Credits** **Dr C Wang/Prof JC Arnold/Dr S Yusha'U**
EG-094 **Fundamentals of Engineering Design** **15 Credits** **Dr N Wint/Mr JK Mcfadzean/Dr AJ Williams/Dr PA Xavier**	
Total 120 Credits	

EG-060 Mechanics

Credits: 20 Session: 2022/23 January-June

Pre-requisite Modules:

Co-requisite Modules:

Lecturer(s): Dr AM Higgins, Dr C Wang

Format: Lectures: 30 hours
Example classes: 10 hours
Directed private study: 160 hours

Delivery Method: Lecture-based.

Module Aims: Introductory Newtonian mechanics at Foundation level.

Module Content: • Introduction: Basic concepts, units and dimensions. Vectors, addition, subtraction and resolution. [2]

• Force Systems: Turning effect, couples and moments, force systems, equilibrium and friction. [3]

• Velocity and Acceleration: Linear motion with constant acceleration. Displacement/time and velocity/time graphs, gravity. [3]

• Newton's Laws: Effect of a constant force acting in a body, motion of connected particles. [3]

• Projectiles: General equations for path and motion of a projectile. [3]

• Work, Power and Energy: Work done, resistance to motion, motion up and down slopes, kinetic and potential energy, Hooke's law, elastic energy, conservation of energy. [5]

• Momentum: direct impact, conservation of momentum, laws of restitution, elastic and non-elastic impact. [3]

• Turning Effect: Non-concurrent forces, moments, equilibrium of non-concurrent forces. [3]

• Rotational Dynamics: Rotational motion, equations of motion for constant angular acceleration, torque, moment of inertia, energy and power. [3]

• Centres of Gravity: Particles in a plane, uniform laminas, composite bodies. [2]

• Motion in a Circle: Circular motion with constant speed, centripetal, force, conical pendulum, banked tracks, practical applications. [3]

Intended Learning Outcomes: Technical Outcomes
After completing the student should be able to:
• demonstrate knowledge and understanding of the behaviour of mechanical systems at an introductory level appropriate for practising engineers in all branches of the profession.
• identify the relevant parameters in physical systems and make analyses to estimate forces, displacements, acceleration etc, in both linear and rotational motion (thinking skills).
• tackle practical engineering problems by applying fundamental principles, to both formulate problems and find solutions (practical skills).
• demonstrate the motivation and discipline necessary to work independently in directed private study and to contribute to class discussion (key skills).

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 1 (70%) Assignment 1 (15%) Assignment 2 (15%)
Resit Assessment:	Examination (Resit instrument) (100%)

Assessment Description: Assignment 1; Online test (Canvas)
Assignment 2; Online test (Canvas)
End of semester exam.

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

Assessment Feedback: Correct answers will be provided following online (Canvas) tests

Feedback sheets will be provided following the examination.

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

EG-065 Basic Engineering Analysis 1

Credits: 20 Session: 2022/23 September-January

Pre-requisite Modules:

Co-requisite Modules:

Lecturer(s): Dr SP Jeffs, Ms S Walsh

Format: Lectures: 30 hours;
Example Class: 20 hours;
Direct private study: 150 hours;
Office hours in a weekly basis
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: Lecture-based (lectures and example classes)
All lecture recordings will be made available online via the Canvas Digital Learning Platform

Module Aims: To provide grounding in engineering analysis methods for students without the background of A-level mathematics. The module will provide foundation math and prepare students for EG-066. The module will introduce some of the key mathematical techniques used in engineering. These will be related to common engineering problems.

Module Content:
a) Basic algebra: indices, algebraic expressions, equation manipulation, use of brackets;
b) Functions and their graphs, lines, quadratics and polynomials;
c) Trigonometry: angles, trigonometrical functions, polar coordinates;
d) Exponentials and logarithms;
e) Inverse trigonometrical functions;
f) Simultaneous equations;
g) Introduction to matrices;
h) Introduction to complex numbers;
i) Introduction of vectors;

Intended Learning Outcomes: Technical Outcomes
After completing this module, the student should be able to demonstrate:
A knowledge and understanding of:
•the basics of numbers and algebra (assessed by C1, C2, C5, and examination)
•the methods of solution of certain types of equations (assessed by C2, C3, C5, and examination)
•the basics of trigonometry (assessed by C4, C5, C6, and examination)
•the graphical interpretation of common analytical functions (assessed by C4, C5, and examination)
•the basic property of complex numbers (assessed by C6 and examination)
•the basic property of vectors and scalars (assessed by C6 and examination)
•the language of matrices (assessed by C2, C5, and examination)
An ability to:
•understand and manipulate numbers in various forms (assessed by C1, C5, and examination)
•understand and manipulate basic algebraic items (assessed by C2, C5, and examination)
•manipulate trigonometrical functions (assessed by C4, C5, C6, and examination)
•manipulate exponential and logarithmic functions (assessed by C4, C5, and examination)
•manipulate complex numbers (assessed by C6 and examination)
•understand and manipulate vectors and scalars (assessed by C6 and examination)
•solve basic matrices based problems (assessed by C2, C5, and examination)
•solve certain types of equations (assessed by C2, C3, C5, and examination).
(thinking skills)
•represent functions using graphs (assessed by C4, C5, and examination)
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,

Assessment: Coursework 1 (8%)
Coursework 2 (8%)
Coursework 3 (8%)
Coursework 4 (8%)
Coursework 5 (10%)
Coursework 6 (8%)
Examination (50%)

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

Assessment Description: Coursework 1-4 and 6: MyLab Math online MCQ Electronic online tests with randomised coefficients will be set during the semester. These tests make up 8% of the course. Each test is an individual piece of coursework.
Coursework 5: In-lecture written test (10%)
January examination: 2-hours (50%)

This module is assessed by a combination of examination and coursework. In order for the coursework marks to count, you have to pass the exam component (with at least 40%). If you have less than 40% in the exam, then the module mark will be just the exam mark. Any resits are done by a supplementary exam. 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.

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

Assessment Feedback: Coursework feedback will be provided within 3 weeks of the deadline according to University policy. Where assessment is a computer based assignment, the feedback will be completed online and if required during lectures.
Feedback will also be provided verbally through example classes.
Students can also attend office hours for this module for individual feedback.
Exam: an examination feedback summary is available online to students.

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

Additional Notes: Available to visiting and exchange students.

This module will be supported with Canvas.

Penalty for late submission of continuous assessment: zero tolerance.

This module is assessed by a combination of examination (50%) and coursework (50%). In order for the coursework marks to count, you have to pass the exam component (with at least 40%). If you have less than 40% in the exam, then the module mark will be just the exam mark. Any resits are done by a supplementary exam. 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.

Any resits are done by a supplementary exam.

EG-066 Basic Engineering Analysis 2

Credits: 20 Session: 2022/23 January-June

Pre-requisite Modules: EG-065

Co-requisite Modules:

Lecturer(s): Dr AJ Williams, Dr M Khalifa

Format: Synchronous lectures and example classes: 55 hours;
Direct private study: 145 hours;
Office hours in a weekly basis

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

The delivery method will be a combination of pre-recorded lectures, online exercises, and example classes.

Module Aims: To provide grounding in engineering analysis methods for students without the background of A level mathematics. The module will extend the concepts covered in EG-065 to introduce some of the key mathematical techniques used in engineering. These will be related to common engineering systems.

Module Content: a) Inverse functions and graphical interpretation.

b) Binomial expansions.

c) Sequences and series: arithmetic, geometric, periodic and oscillating sequences, summation of series, Taylor series.

d) Differentiation: geometrical basis, definition and examples. Tangents and normal to curves. Differentiation of elementary functions, sums, products and quotients. Maxima and minima. Numerical differentiation techniques.

e) Integration: geometrical basis and basics of integral calculus. Areas, volumes of revolution, simple techniques of integration. Numerical integration techniques.

f) Newton Raphson method.

Intended Learning Outcomes: Technical outcomes:
After completing this module, the student should be able to demonstrate the following:
• The ability to determine inverse function algebraically and graphically (assessed by coursework 1 and examination)
• An ability to recognise, characterise and manipulate sequences and series (assessed by Coursework 1 and examination)
• The ability to expand binomial expressions (assessed by Coursework 2 and examination)
• The ability to differentiate common analytical functions (assessed by Courseworks 2-3, and examination)
• The ability to calculate maximum and minimum points (assessed by Courseworks 2-3 and examination)
• The ability to use implicit differentiation techniques (assessed by examination)
• The ability to use partial differentiation techniques (assessed by Coursework 4 and examination)
• The ability to integrate common analytical functions (assessed by Courseworks 4-5 and examination)
• The ability to calculate area and volume using integration (assessed by Coursework 4 and examination)
• An understanding of the graphical significance of integration and differentiation (assessed by Courseworks 2-4, and examination)
• The ability to apply numerical differentiation using Taylor series expansions (assessed by Coursework 3)
• The ability to apply numerical integration techniques (assessed by Coursework 5 and examination)
• An awareness of the differences between numerical and analytical methods (assessed by Courseworks 4-5, and examination)
• The ability to solve problems using multiple integrals (assessed by Coursework 5 and examination)
• The ability to use the Newton-Raphson method to solve equations (assessed by Coursework 3)
• The ability to use mathematical techniques to solve problems (thinking and problem interpretation skills) (assessed by Courseworks 1-5 and examination)

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) Assessed by Coursework's 1-5 and examination

Assessment:	Coursework 1 (10%) Coursework 2 (10%) Coursework 3 (10%) Coursework 4 (10%) Coursework 5 (10%) Examination 1 (50%)
Resit Assessment:	Examination (Resit instrument) (100%)

Assessment Description: Examination: A 2 hour closed book exam will take place in May/June (worth 50 % of the final mark).

Coursework: Electronic online tests with randomised coefficients will be set during the semester. These tests make up the coursework element of the course (worth 50% of the final mark). Each test is an individual piece of coursework.

This module is assessed by a combination of examination and coursework. In order for the coursework marks to count, you have to pass the exam component (with at least 40%). If you have less than 40% in the exam, then the module mark will be just the exam mark. Any resits are done by a supplementary exam. 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.

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

Assessment Feedback: Coursework feedback will be provided within 3-week after deadline according to University policy. When computer-based assignment the feedback will be done online and if required during lectures.

Exam: an examination feedback summary is available online to students.

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.

This module will be supported with Canvas.

Penalty for late submission of continuous assessment: zero tolerance.

This module is assessed by a combination of examination (50%) and coursework (50%). In order for the coursework marks to count, you have to pass the exam component (with at least 40%). If you have less than 40% in the exam, then the module mark will be just the exam mark. Any resits are done by a supplementary exam. 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.

Any resits are done by a supplementary exam.

EG-091 Chemistry of Materials

Credits: 15 Session: 2022/23 September-January

Pre-requisite Modules:

Co-requisite Modules:

Lecturer(s): Prof G Williams, Dr N Wint

Format: Taught theory - Lectures (26 hours).
Examples classes (4 hours).
Practicals to complement taught theory (8 hours).
A seminar style/groupwork approach will be used to introduce materials selection case studies and explore the use of chemical reactions within engineering processes (6 hours).

Delivery Method: This module 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.

Module Aims: This course provides an introduction to the chemical properties of materials used throughout engineering. A practical component will be used to complement taught theory and will allow students to develop the skills to carry out a number of basic laboratory manipulations in an accurate and safe manner. Fundamental knowledge regarding atomic structure and chemical bonding will be used to select the most appropriate material (or group of materials) for use within given applications, and to understand the ways in which chemical reactions are utilized within a range of engineering processes.

Module Content:

• Atoms: the proton, neutron and electron. Atomic number. Mass number. Elements and isotopes.
• Atomic trends: Relative atomic mass. Energy levels. Electronic configurations. The Periodic Table.
• Chemical Reactions: Writing Formulae. Chemical equations and their balancing. Scaling up from atoms and molecules to moles.
• Bonding and forces: Principles of ionic and metallic bonding. Covalent bonds. Intermolecular forces.
• Types of reaction: Redox, acid-base, precipitation and complexation. Organic Compounds: Functional groups and reactions. Hybridisation and aromaticity. Isomerism
• Energetics: Bond energy. Enthalpy changes. Heat capacities.
• Equilibria: Le Chatelier principle.
• Electrochemical cells: Electricity from chemical reactions. Electrode potentials.
• Rates of reaction: Rate equations. Orders of reaction. Effect of temperature on reaction rates. Activation energies. Effect of catalysts
• Materials selection
• Sustainable materials issues, for example: manufacturing steel and alumimium with reduced environmental impact; biodegradable polymers; low environmental impact cement; alternative fuels / energy sources for aviation

Intended Learning Outcomes: • Describe the fundamental structure of an atom and the way in which atomic structure influences the properties and uses of common engineering materials.
• State the formula of common chemical species and construct balanced chemical equations. Carry out simple mole calculations.
• Describe and identify the presence of bonding types within compounds. Distinguish between types of intermolecular forces and use them to predict the physical properties of engineering materials.
• Identify reaction types and write relevant balanced equations. Construct rate equations and identify the order of a reaction.
• Recognise basic organic functional groups and identify/predict their reactions.
• Describe the different energy changes associated with matter. Use energy data to solve simple thermodynamic equations.
• Define Le Chatelier's principle and apply it to predict the effect of induced changes to a reaction.
• Select the most appropriate material (or group of materials) for given applications.
• Discuss the ways in which chemical reactions are utilized within a range of engineering processes (e.g. electrochemical cell).

AHEP 4
F1. Apply knowledge of mathematics, statistics, natural science and engineering principles to broadly-defined problems.
F4. Select and use technical literature and other sources of information to address broadly defined problems.
F12. Use practical laboratory and workshop skills to investigate broadly defined problems

Assessment:	Examination 1 (50%) Laboratory work (15%) Assignment 1 (10%) Case Study (25%)
Resit Assessment:	Examination (Resit instrument) (100%)

Assessment Description: Exam January 50%
Laboratory work 15%
Assignment 1 (Canvas quiz) 10%
Materials Case Study 25%, with a Pass/Fail component: Students will be required to attend a minimum number of seminar/workshop style classes and contribute towards peer feedback

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

Assessment Feedback: Students will receive verbal feedback during laboratory sessions and written feedback on laboratory reports. They will be provided with the correct answers to the quiz. They will receive both formative feedback (including peer feedback) on the case study, as well as written summative feedback.

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

Additional Notes: Compulsory for all Foundation Year Engineering students and assumes no previous Chemistry background.

PENALTY: ZERO TOLERANCE FOR LATE SUBMISSION.

EG-092 Fundamentals of Engineering Science 1

Credits: 15 Session: 2022/23 September-January

Pre-requisite Modules:

Co-requisite Modules:

Lecturer(s): Dr WC Tsoi, Dr S Azizishirvanshahi, Dr MR Brown, Dr N Wint

Format: Taught theory - Lectures (22 hours).
Examples classes (11 hours).
Practicals to complement taught theory (6 hours).
Computer Labs (5 hours).

Delivery Method: This module 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.

Module Aims: This course provides an introduction to the physical sciences (including thermal, electrical and optical properties of matter) and their application in engineering. A practical component will be used to complement taught theory.

Module Content: • Quantities, units, dimensions,
• Measurement accuracy, uncertainties, introduction to errors
• Use of large data sets and statistical treatment
• States of matter, phase changes
• Temperature and Heat; specific heats, latent heats
• Heat transfer; conduction, radiation, convection
• Electrical charges, current, voltages
• Introduction to sources of EMF, basic units
• Ohm's law, resistivity
• Resistors in series and parallel, solving resistor networks
• Intro to capacitance and capacitors, static electricity
• EM spectrum
• Reflection and mirrors
• Refraction and lenses, refractive index, Snell's law

Intended Learning Outcomes:
• Apply statistical methods to data sets to draw meaning from them
• Conduct dimensional analysis
• Identify sources of uncertainty and error and determine how they impact engineering calculations
• Define the three states of matter and explain the processes which occur during phase changes
• Explain the difference between temperature and heat (specific heats, latent heats) and be able to perform calculations on these concepts
• Understand and explain the differences between the three methods of heat transfer: conduction, radiation, convection
• Understand basic electrical concepts of voltage, current, charge and identify sources of EMF
• Analyse resistive dc networks
• Understand and explain the differences between series and parallel circuits
• Define capacitance and explain the role of capacitors within a circuit and engineering applications
• Differentiate between the different parts of the electromagnetic spectrum
• Define reflection and the use of mirrors within engineering applications
• Define refraction and the use of lenses within engineering applications

AHEP 4
F1. Apply knowledge of mathematics, statistics, natural science and engineering principles to broadly-defined problems.
F12. Use practical laboratory and workshop skills to investigate broadly defined problems.

Assessment: Practical (15%)
Assignment 1 (15%)
Assignment 2 (20%)
Examination 1 (50%)

Resit Assessment: Examination (Resit instrument) (50%)
Coursework reassessment instrument (50%)

Assessment Description: Exam January 50%
Practical 15%
Assignment 1 (Canvas quiz) 15%
Data Interpretation Assignment 20%

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

Assessment Feedback: Correct answers to quizzes will be provided.
Feedback during Q&As in lecture and example classes.
Lecturer available for ad-hoc feedback during office hours.
A general exam feedback pro-forma will be distributed after the exam marks are released

Failure Redemption: If students have failed either the exam or the coursework, they will be eligible to do a supplementary in that aspect failed (or both). Exam or coursework marks passed will be retained.
If students have less than 40% average on the coursework components, they will be able to submit a supplementary coursework assignment, worth 50% of the module.
In the case that the exam is failed they will be given the opportunity to resit during the supplementary period, worth 50% of the module.

Additional Notes: The Faculty of Science and Engineering has a ZERO TOLERANCE penalty policy for late submission of all coursework and continuous assessment.
Available to visiting and exchange students.

EG-093 Fundamentals of Engineering Science 2

Credits: 15 Session: 2022/23 January-June

Pre-requisite Modules:

Co-requisite Modules:

Lecturer(s): Dr C Wang, Prof JC Arnold, Dr S Yusha'U

Format: Taught theory - Lectures (28 hours).
Examples classes (10 hours).
Practicals to complement taught theory (6 hours)

Delivery Method: This module 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.

Module Aims: This course provides an introduction to the physical sciences (including the fundamentals of elementary fluid mechanics and electricity and magnetism) and their application in engineering. A practical component will be used to complement taught theory.

Module Content: • Quantities, units, dimensions,
• Measurement accuracy, uncertainties, introduction to errors
• Use of large data sets and statistical treatment
• Matter and material behaviour, phases and phase change
• Basic Principles of Fluid Statics - Concepts of pressure, hydrostatic pressure, buoyancy and Archimedes Principle.
• Pressure Measurement Devices - Piezometer, inclined piezometers, manometers, differential manometers.
• Centroids
• Methods of calculating position of centre of pressure.
• Continuity - Basic concepts, definitions of steady flow, mass and volumetric flow rates.
• Energy and Bernoulli's Equation
• The relationships between Temperature, Heat, Pressure and Volume in fluids.
• Thermodynamic cycles
• AC, RMS values, Phase angle
• Introduction to Magnetism: Magnetic Induction and magnetic circuits.
• Basic motors and transformers.

Intended Learning Outcomes: • Apply statistical methods to data sets to draw meaning from them
• Conduct dimensional analysis
• Identify sources of uncertainty and error and determine how they impact engineering calculations
• Demonstrate knowledge and understanding of the basic principles of fluid statics
• Demonstrate knowledge and understanding of the basic principles of fluid dynamics
• Apply fundamental equations and concepts to solve problems involving fluid flow, heat transfer and pressure in fluid flow or static fluid
• Determine the rms current and power dissipated in a resistive ac circuit.
• Determine the phase relationship between voltage and current in the RC components of an ac circuit.
• Understand the relationship between magnetic field, flux and flux density.
• Derive the magnetic field distributions around a straight wire, a circular loop and a solenoid.
• Understand the main features and operation of a transformer and a basic electric motor.
• Understand the analogy between electric and magnetic circuits.
• Determine the force on a current-carrying wire in a magnetic field.

AHEP 4
F1. Apply knowledge of mathematics, statistics, natural science and engineering principles to broadly-defined problems.
F12. Use practical laboratory and workshop skills to investigate broadly defined problems.

Assessment: Examination 1 (50%)
Practical (15%)
Assignment 1 (15%)
Case Study (20%)

Resit Assessment: Examination (Resit instrument) (50%)
Coursework reassessment instrument (50%)

Assessment Description: Exam January 50%
Practical 15%
Assignment 1 (Canvas quiz) 15%
Case study 20%

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

Assessment Feedback: Correct answers to quizzes will be provided.
Feedback during Q&As in lecture and example classes.
Lecturer available for ad-hoc feedback during office hours.
A general exam feedback pro-forma will be distributed after the exam marks are released

Failure Redemption: If students have failed either the exam or the coursework, they will be eligible to do a supplementary in the aspect failed (or both). The mark in the passed component will be retained.
If students have less than 40% average on the coursework components, they will be able to submit a supplementary coursework assignment, worth 50% of the module.
In the case that the exam is failed they will be given the opportunity to resit during the supplementary period, worth 50% of the module.

Additional Notes: Available to visiting and exchange students.
PENALTY: ZERO TOLERANCE FOR LATE SUBMISSION

EG-094 Fundamentals of Engineering Design

Credits: 15 Session: 2022/23 September-June

Pre-requisite Modules:

Co-requisite Modules:

Lecturer(s): Dr N Wint, Mr JK Mcfadzean, Dr AJ Williams, Dr PA Xavier

Format: Taught theory (16 hours).
Practicals/group sessions and computer labs (18 hours).
Design group work tutorials (10 hours).

Delivery Method: This module 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.

Module Aims: This module provides the essential skills required for future design modules and project tasks by providing a firm grounding for teamwork and emphasizing the need for professional standards and strong communication skills within engineering.

Module Content: • The role of a professional engineer within society and skills necessary to become an effective engineer
• Personal and professional development: self-awareness; reflection; setting targets; receiving and acting upon feedback
• Project Work: structure of the project, planning and organisation, managing competing demands and prioritizing tasks; brainstorming, review of progress.
• Teamwork: active listening: delegation; providing effective feedback
• Research skills - Making effective use of resources to search for and gather relevant information to develop knowledge and understanding and present accurate research information
• Critical Thinking: assess, interrogate and create arguments
• Oral, written and graphical communication
• The design process

Intended Learning Outcomes: After completing this module the student should be able to demonstrate:
• An increased understanding of the engineering profession and the variety of roles available to engineering graduates
• Knowledge and understanding in the fundamental skills that engineers require during academic study and professional careers.
Students should develop an ability to:
• Present and communicate ideas, plans and designs effectively to variety of audiences, provide written descriptions and explanation
• Understand the need for 3D representation of structures and create engineering drawings / sketches to represent these, with appropriate detail.
• Plan and carry out project work as a member of a group and individually
• Use basic computational methods to solve engineering problems
• Demonstrate feedback literacy and provide meaningful, clear and constructive peer feedback
• Recognise anomalies within data, manipulate data to task and purpose

AHEP 4
F4. Select and use technical literature and other sources of information to address broadlydefined problems.
F5. Design solutions for broadly defined problems that meet a combination of user, business and customer needs as appropriate. This will involve consideration of applicable health and safety, diversity, inclusion, cultural, societal and environmental matters, codes of practice and industry standards
F16. Function effectively as an individual, and as a member or leader of a team
F17. Communicate effectively with technical and non-technical audiences
F18. Plan and record self-learning and development as the foundation for lifelong learning/CPD.

Assessment:	Assignment 1 (10%) Assignment 2 (10%) Assignment 3 (25%) Assignment 4 (15%) Group Work - Project (40%) Attendance (0%)
Resit Assessment:	Coursework reassessment instrument (100%)

Assessment Description: Assignment 1: Personal reflection / learning plan 10%
Assignment 2: Laboratory report 10%
Assignment 3: Matlab assignment 25%
Assignment 4: Audio visual presentation 15%
Assignment 5: Group Design Project, with a Pass/Fail Component:

40%. Students will be required to attend a minimum number of group/feedback sessions Note, that this module cannot be passed if this pass/fail element is not passed. 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%.

Students will be provided with the opportunity to resubmit failed components. The mark for the second submission will be capped at 40%

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

Assessment Feedback: Formative and peer feedback will be given in group/workshop sessions
Feedback during Q&As in lecture and example classes.
Lecturer available for ad-hoc feedback during office hours.
Written feedback on all coursework submitted

Failure Redemption: Students will be provided with the opportunity to resubmit failed components.
If engagement in group project activities is below required level, no supplementary will be possible and module will have to be resat in the following year.

Additional Notes: Available to visiting and exchange students.

PENALTY: ZERO TOLERANCE FOR LATE SUBMISSIONS