Swansea University
Prifysgol Abertawe

FACULTY OF SCIENCE AND ENGINEERING

UNDERGRADUATE STUDENT HANDBOOK

YEAR 1 (FHEQ LEVEL 4)

BIOMEDICAL 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 Engineering and Applied Sciences **Head of School: Professor Serena Margadonna**	
School Education Lead	Professor Simon Bott
Head of Biomedical Engineering	Professor Huw Summers
Biomedical Engineering Programme Director	Dr Chris Wright C.Wright@swansea.ac.uk
Year 1 Coordinator	Dr Claire Barnes c.m.barnes@swansea.ac.uk

STUDENT SUPPORT

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

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

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

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

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

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

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

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

READING LISTS

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

THE DIFFERENCE BETWEEN COMPULSORY AND CORE MODULES

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

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

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

Year 1 (FHEQ Level 4) 2022/23
Biomedical Engineering
BEng Biomedical Engineering[HB18,HBC9]
BEng Biomedical Engineering with a Year Abroad[HB01]

Compulsory Modules

Semester 1 Modules	Semester 2 Modules
EG-118 **Engineering Mathematics 1 (Chem & Med)** **10 Credits** **Dr DR Daniels** **CORE**	**EG-117** **Engineering Mathematics 2 (Chem & Med)** **10 Credits** **Dr AJ Bruce** **CORE**
EG-155 **Circuit Analysis** **10 Credits** **Prof PM Holland** **CORE**	**EG-131** **Strength of Materials (Mech & Med & Engineering)** **10 Credits** **Dr S Azizishirvanshahi** **CORE**
EG-180 **Introduction to Materials Engineering** **10 Credits** **Dr MP Coleman** **CORE**	**EG-142** **Instrumentation and Control** **10 Credits** **Mrs M Ahmed/Dr RJ Cobley** **CORE**
EGA101 **Introduction to Biomedical Engineering** **10 Credits** **Dr CJ Wright** **CORE**	**EG-182** **Manufacturing Technology I** **10 Credits** **Prof HM Davies** **CORE**
SR-113 **Human Neuromusculoskeletal System** **10 Credits** **Dr L Mason/Dr R Van Loon** **CORE**	**EGA100** **Numerical Methods for Biomedical Engineers** **10 Credits** **Dr AS Ademiloye** **CORE**
	SR-112 **Human Physiology** **10 Credits** **Dr RS Metcalfe** **CORE**
Total 120 Credits	

Optional Modules

Choose exactly 10 credits

The optional modules EGA103 and EG-134 are chosen depending on the qualifications and academic background of each student. Students who have not done chemistry in their A-levels (or equivalent) will have to choose Foundation Chemistry (EGA103). Students that have taken chemistry, but have not taken physics/mechanics in their A-levels will have to choose Engineering Mechanics (EG-134). All remaining students should choose Engineering Mechanics.

EG-134	Engineering Mechanics (Mech & Med & Engineering)	Dr Y Xia	TB1	10 (CORE)
EGA103	Foundation Chemistry	Prof G Williams	TB1	10 (CORE)

Year 1 (FHEQ Level 4) 2022/23
Biomedical Engineering
BEng Biomedical Engineering with a Year in Industry[HB19]

Compulsory Modules

Semester 1 Modules	Semester 2 Modules
EG-118 **Engineering Mathematics 1 (Chem & Med)** **10 Credits** **Dr DR Daniels** **CORE**	**EG-117** **Engineering Mathematics 2 (Chem & Med)** **10 Credits** **Dr AJ Bruce** **CORE**
EG-155 **Circuit Analysis** **10 Credits** **Prof PM Holland** **CORE**	**EG-131** **Strength of Materials (Mech & Med & Engineering)** **10 Credits** **Dr S Azizishirvanshahi** **CORE**
EG-180 **Introduction to Materials Engineering** **10 Credits** **Dr MP Coleman** **CORE**	**EG-135** **Placement Preparation: Science and Engineering Year in Industry** **0 Credits** **Prof GTM Bunting/Dr SA Rolland/Dr V Samaras**
EGA101 **Introduction to Biomedical Engineering** **10 Credits** **Dr CJ Wright** **CORE**	**EG-142** **Instrumentation and Control** **10 Credits** **Mrs M Ahmed/Dr RJ Cobley** **CORE**
SR-113 **Human Neuromusculoskeletal System** **10 Credits** **Dr L Mason/Dr R Van Loon** **CORE**	**EG-182** **Manufacturing Technology I** **10 Credits** **Prof HM Davies** **CORE**
	EGA100 **Numerical Methods for Biomedical Engineers** **10 Credits** **Dr AS Ademiloye** **CORE**
	SR-112 **Human Physiology** **10 Credits** **Dr RS Metcalfe** **CORE**
Total 120 Credits	

Optional Modules

Choose exactly 10 credits

The optional modules EGA103 and EG-134 are chosen depending on the qualifications and academic background of each student. Students who have not done chemistry in their A-levels (or equivalent) will have to choose Foundation Chemistry (EGA103). Students that have taken chemistry, but have not taken physics/mechanics in their A-levels will have to choose Engineering Mechanics (EG-134). All remaining students should choose Engineering Mechanics.

EG-134	Engineering Mechanics (Mech & Med & Engineering)	Dr Y Xia	TB1	10 (CORE)
EGA103	Foundation Chemistry	Prof G Williams	TB1	10 (CORE)

EG-117 Engineering Mathematics 2 (Chem & Med)

Credits: 10 Session: 2022/23 January-June

Pre-requisite Modules:

Co-requisite Modules:

Lecturer(s): Dr AJ Bruce

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

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

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

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

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

Module Content:

• Vectors: physical meaning, Cartesian, cylindrical and spherical coordinates scalar and cross products. Equations of lines and planes. Scalar and vector fields.

• Complex numbers: manipulation with complex numbers, Cartesian, polar and exponential forms. Functions of complex variable, Euler's formula, relationship between trigonometric and hyperbolic functions. Solving ODEs with the help of complex numbers.

• Ordinary differential equations: classification of differential equations, solutions to first order ODE's including separable, linear and more specialised types. Solution to second order ODE's with constant coefficients, homogeneous and inhomogeneous. Laplace transform methods.

• Functions of more than one variable: visualisation, partial differentiation, vector calculus differential operators (in Cartesian coordinates). Contour, surface and volume integrals.

• Sequences and series, infinite series, tests of convergence. Taylor series of common functions.

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

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

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

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

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

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

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

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

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

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

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

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

AVAILABLE TO visiting and exchange students.

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

EG-118 Engineering Mathematics 1 (Chem & Med)

Credits: 10 Session: 2022/23 September-January

Pre-requisite Modules:

Co-requisite Modules:

Lecturer(s): Dr DR Daniels

Format: Lectures 30 hours
Directed private study 70 hours

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

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

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

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

Module Content:

* Linear Algebra: simultaneous equations, Gauss elimination, matrices, rules of matrix algebra, rank and linear dependence, calculation of determinates and eigenvalue problems.
* Number systems: numbers, algebra and geometry.
* Functions: inverse and composite functions, polynomial functions, rational functions, circular functions, exponential, logarithmic and hyperbolic functions, continuous and discontinuous functions, plotting functions.
* Differentiation: basic ideas and definition, elementary functions, rules of differentiation, parametric and implicit differentiation, higher derivatives, optimum values.
* Integration: basic ideas and definition, definite and indefinite integrals, techniques of integration, integrals of partial fractions, integration by parts, integration by substitution.

Intended Learning Outcomes: On successful completion of this module students will be expected, at threshold level, to be able to:

Technical Outcomes
- Demonstrate knowledge of the fundamentals of mathematics, which underpin their engineering degree.
- Demonstrate a comprehension of the fundamentals of mathematics, which underpin their engineering degree, through the use of the following specific techniques: manipulate algebraic expressions, differentiation (including optmisation of functionals), integration, matrices and Gauss elimination.

Accreditation Outcomes (AHEP3)
- Knowledge and understanding of scientific principles and methodology necessary to underpin their education in their engineering discipline, to enable appreciation of its scientific and engineering context, and to support their understanding of relevant historical, current and future developments and technologies (SM1b)
- Knowledge and understanding of mathematical and statistical methods necessary to underpin their education in their engineering discipline and to enable them to apply mathematical and statistical methods, tools and notations proficiently in the analysis and solution of engineering problems (SM2b)

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

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

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

Coursework 1 (Complex numbers, vectors) Weighting 25%
Coursework 2 (Ordinary differential equations) Weighting 25%
Coursework 3 (Functions or more than 1 variable) Weighting 25%
Coursework 4 (Series and sequences) Weighting 25%

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

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

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

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

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

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

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

AVAILABLE TO visiting and exchange students.

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

EG-131 Strength of Materials (Mech & Med & Engineering)

Credits: 10 Session: 2022/23 January-June

Pre-requisite Modules:

Co-requisite Modules:

Lecturer(s): Dr S Azizishirvanshahi

Format: Lectures 2 hours per week
Example classes 1 hour per week
Directed private study 3 hours per week

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 module is delivered through lectures and example classes. The Canvas site contains course notes, screencasts, example sheets, practice tests, past exam papers and model answers. Lecture recording may be applied. Assessment is conducted though Canvas tests and final examination.

Module Aims: The aim of the module is to gain understanding into how engineering structures and components transmit loads and other external actions by means of internal stresses and how these stresses lead to strains and displacements. The course aims to explain the simple models of beam behaviour, concepts such as Mohr circle of stress and the relationships between stress and strain. Relevant case studies will be used to illustrate the importance of these subject areas.

Module Content:

1 - Introduction to basic concepts: rupture, deformation, stress, strain, brittle and ductile behaviour, elasticity, creep, fatigue, static determinacy. [2]
2 - Basic Beam theory: axial, shear force and bending moments, Euler beam theory, centroid (mass centre) and moment of inertia of sections, deflection of beams, indeterminate beams. [8]
3 - Stress and Strain analysis: principal directions, maximum shear stress, Mohr's circle, stress-strain relationships in linear elasticity. Stresses in pressurised vessels. [6]
4 - Advanced beam theory: combined loading, , Euler torsion theory, shear stresses, shear warping of sections, shear distribution in rectangular and thin sections. [4]
5 - Revision [2]

Intended Learning Outcomes:
Technical Outcomes
Upon completion of this module students should be able to:
- Determine the compatibility conditions for elementary structures.
- Construct partial and full free body diagrams required to obtain reactions, axial forces, bending moments and shear forces in simple rods and beams.
- Apply the equations of static equilibrium to calculate reactions, axial forces, bending moments, shear forces.
- Develop shear force and bending moment diagrams for beams of varying support conditions.
- Determine beam displacements from bending moments that are compatible with the support conditions.
- Propose designs of beam structures to operate within specified loading and material limitations.
- Apply the principle of superposition for structures with complex loading.
- Evaluate section properties of beams and similar structures, such as the second moment of area and centroid location.
- Obtain stress distribution on simple sections from bending moments and shear or axial forces.
- Apply the Mohr Circle principle to obtain principal stresses and maximum shear stress in 2-dimensions. Obtain strains from stresses and vice versa for 2-D elastic materials.
- Demonstrate the understanding of origin of formulae that appear in pressure vessel design codes.
- Make basic design and performance calculations on pressure vessels.
- Evaluate the effect of torsional moments on simple beams and the resultant stresses and deformations.

Accreditation Outcomes (AHEP)
- Ability to apply and integrate knowledge and understanding of other engineering disciplines to support study of their own engineering (SM3b)
- Knowledge of characteristics of particular materials, equipment, processes or products (P2)
- Understanding of the use of technical literature and other information sources (P4)

Assessment: Assignment 1 (7%)
Assignment 2 (7%)
Laboratory report (6%)
Examination 1 (80%)

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

Assessment Description: Final examination in May/June will consist of a mix of multiple choice and written solution questions. All questions are compulsory. The examination is closed-book.

Two assignments consists of a Canvas test.

One will be a laboratory experiment.

Specific rules for passing this module:
This module is assessed by a combination of examination and coursework. In order for the coursework marks to count, you have to 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: Students receive feedback from each of the three Canvas tests by being given their scores in each question together with the correct answer. Once the Canvas test has been scored and the exercises done by the lecturer in an example class, students can re-try the tests as many times as desired. Each time the numeric values of the questions change and they can compare their answers against the correct ones until they are satisfied with their understanding of the topic. Feedback from the final examination is via the University feedback form.

Failure Redemption: Through 100% supplementary examination in August.

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.

Failure to complete the Canvas tests in time will lead to zero marks being awarded in the relevant exercise.

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.

This version of Strength of Materials is for the Mechanical and Medical cohorts.

EG-134 Engineering Mechanics (Mech & Med & Engineering)

Credits: 10 Session: 2022/23 September-January

Pre-requisite Modules:

Co-requisite Modules:

Lecturer(s): Dr Y Xia

Format: Lectures: 2 hours per week,
Example classes : 1 hour per week,
Directed private study: 3 hours per week,

Contact Hours will be delivered through on-campus lectures and example classes.

Delivery Method: The module will employ a blended approach using the Canvas Digital Learning Platform, with on-campus lectures and example classes. The Canvas site contains learning materials such as lecture notes, lecture recordings, example sheets and solutions, online tests, past exam papers and answers.

Lectures: 2 hours per week,
Example classes : 1 hour per week,
Directed private study: 3 hours per week

Module Aims: This module aims to provide the students with the basic knowledge of the fundamental concepts of statics, including force, moment/couple, resultant force and resultant moment of a general force-couple system, equilibrium conditions/equations of a force system, common types of constraints/supports, and free body diagram, and by applying these concepts, the students will be able to solve statically determined truss structures using the methods of joints and sections.

Module Content:

Introduction: Basic concepts; Newton's laws of motion; Units; Idealisations of a real body and forces. [1]
2D Force Systems: Force definition; The principle of transmissibility; Concurrent & non-concurrent forces; Resultant forces; Resolution of forces; Projection; Moments and couples; Varignon's theorem; Simplification of co-planar force-couple systems; [6]
Equilibrium: Equations of equilibrium for a rigid body and assemblage of rigid bodies; Types of supports and connections; Free body diagrams; Externally static determinacy; Practical Examples. [5]
Friction: Characteristics of dry friction; Coulomb friction model; The angle of Friction; Wedge; Practical Examples. [5]
Application - Truss analysis: Definitions; Two-force member; Internally static determinacy; The method of joints; The method of sections; Advanced issues. [6]
3D force systems: Forces with vector representation; Moments; Equilibrium of concurrent and general 3D force systems. [5]
Revision [1] and Assessment [1]

Intended Learning Outcomes:

Technical Outcomes

Upon completion of this module the student should be able to:

- Calculate the resultant force of several forces using vector analysis; compute the moment of a force generated about a point; and determine both the resultant force and the resultant moment of a general force-couple system;
- Correctly identify types of constraints/supports and corresponding reaction forces;
- Correctly draw free body diagrams;
- Establish and solve the equilibrium equations of a rigid body or a group of rigid bodies subject to various loadings and supports.
- Solve simple problems involving dry friction;
- Determine if a give truss structure is statically determinant or not;
- Apply the method of joints and the method of sections to analyse simple/statically determinant truss structures to obtain the axial forces of all the truss members;
- Determine the resultant force of several 3D forces, and calculate the moment vector of a force produced about a point.

Accreditation Outcomes (AHEP)

- Ability to identify, classify and describe the performance of systems and components through the use of analytical methods and modelling techniques (EA2)
- Understanding of engineering principles and the ability to apply them to analyse key engineering processes (EA1b)
- 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)

Assessment: Exam - open book (80%)
Class Test 1 - Coursework (10%)
Class Test 2 - Coursework (10%)

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

Assessment Description: This module is assessed by a combination of examination (80%) and courseworks (20%). Courseworks are in the format of two online tests (10% each) administered via Canvas at the middle and towards the end of semester 1, and 80% from open book examination.

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

Assessment Feedback: Generic feedback on the online tests will be provided, following the tests. The feedback for the final examination will be through the Faculty module feedback procedure.

Failure Redemption: If a student is awarded a re-sit, failure redemption of this module will be by examination worth 100% of the module mark.

Additional Notes: NA

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

Credits: 0 Session: 2022/23 January-June

Pre-requisite Modules:

Co-requisite Modules:

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

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

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

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

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

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

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

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

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

Assessment: Participation Exercise (100%)

Assessment Description: Not assessed

Moderation approach to main assessment: Not applicable

Assessment Feedback: Not assessed

Failure Redemption: Not assessed

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

EG-142 Instrumentation and Control

Credits: 10 Session: 2022/23 January-June

Pre-requisite Modules:

Co-requisite Modules:

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

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

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

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

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

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

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

Accreditation Outcomes (AHEP)
-Knowledge and understanding of scientific principles and methodology necessary to underpin their education in their engineering discipline, to enable appreciation of its scientific and engineering context, and to support their understanding of relevant historical, current and future developments and technologies (SM1b/SM1p) - Assessed by Examination.
- Knowledge and understanding of mathematical and statistical methods necessary to underpin their education in their engineering discipline and to enable them to apply mathematical and statistical methods, tools and notations proficiently in the analysis and solution of engineering problems (SM2b/SM2p) - Assessed by both Assignment and Examination
- Ability to identify, classify and describe the performance of systems and components through the use of analytical methods and modelling techniques (EA2/EA2p) - Assessed by Examination.
-Knowledge and understanding of management techniques, including project management, that may be used to achieve engineering learning outcomes (ET3p)

Assessment: Examination 1 (50%)
Coursework 1 (20%)
Online Class Test (10%)
Online Class Test (20%)

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

Assessment Description:
• Examination: Written final exam.
• Coursework: An individual assignment containing a mix of exam style calculation questions and the design of a solution to a given instrumentation problem.
• Online Class Test: Two online tests delivered through Canvas.

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

This descriptor is provisional for the year 2020-21, with updates expected due to Covid-19.

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

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

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

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

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

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

EG-155 Circuit Analysis

Credits: 10 Session: 2022/23 September-January

Pre-requisite Modules:

Co-requisite Modules:

Lecturer(s): Prof PM Holland

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

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

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

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

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

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

Assessment: 70% Examination and 30% Continual Assessment.

The 30% continual assessment will consist of 10 mini weekly Canvas Tests worth 3% each.
.

Module Aims: Provides an introduction to analog electrical circuits analysis.

Module Content:

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

Intended Learning Outcomes:

Technical Outcomes

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

Accreditation Outcomes (AHEP)

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

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

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

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

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

In 2021/2022 the exam will be conducted online.

Specific rules for passing this module:

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

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

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

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

Failure Redemption:

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

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

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

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

EG-180 Introduction to Materials Engineering

Credits: 10 Session: 2022/23 September-January

Pre-requisite Modules:

Co-requisite Modules:

Lecturer(s): Dr MP Coleman

Format: Lectures: 24 hours
Tutorials / Example classes: 12 hours
Directed private study: 36 hours
Preparation for assessment: 28 hours

Delivery Method: Assessment: The module will be assessed via an online course work assessment during the first semester, worth 20% followed by a standard 2 hour multiple choice examination at the end of the teaching block, worth 80%

Module Aims: The module aims to introduce year 1 Engineering students to the understanding of key concepts relating to materials selection and applications. Following completion of this module the student should be able to demonstrate an appreciation of materials selection in relation to the structure/mechanical and physical properties/applications of metallic, ceramic, polymeric and composite materials.

Module Content: Principles of Materials Selection: Classes and typical properties of materials, the role of materials selection in mechanical design [1].
Elastic and Plastic Behaviour of Solids: Stress and strain in solids, elastic behaviour. Plastic behaviour, tensile testing, stress-stain curves [3].
Toughness and Hardness Testing: Impact testing, hardness testing [1].
Atomic Structure: Atomic structure, atomic numbers and weights, electronic structure of atoms, types of atomic bonding including ionic, covalent, metallic, intermediate, Van de Waals, and hydrogen bonding [1].
Crystal Structure of Solids: Types of solid state structure (e.g. crystalline and amorphous), atomic packing in crystals, atomic arrangements (eg FCC, HCP, BCC), crystallography: Plane (Miller) indices, direction indices, crystal structure of ceramics [4].
Solidification: Volume change, nucleation and growth of crystals, grain boundaries, glasses: temperature dependence, silica glass structures, forms of silica glass, soda glass [2].
Cement and Concrete: Portland cement and its manufacture, hydration and its development, strength of concrete [1].
Vacancies and Diffusion: Diffusion and Fick's Law, crystal lattice defects, atomic vibration, probability of diffusion, mechanisms of diffusion [2].
Microstructure of Solids: Examples of microstructures, microstructural features, phases, diagrams (maps), unary diagrams and Gibbs Phase rule, solid solubility, solubility in a binary system, composition in a two-phase region, microstructural development, Lever rule [3].
Polymers and Composites: Polymerisation, skeletal structures, structure of polymers, homopolymers, copolymers, classification of polymers, classification of composites, manufacture routes, fibre-reinforced composites, fibre matrix interface [2].
Steels: Iron-Iron carbide system, eutectoid steel, effect of carbon content, effect of cooling rate, non-equilibrium steels, heat treatment of steels, diffusion, classification of steels: plain carbon steels (e.g. low-carbon, mild, medium-carbon, high-carbon steels) and alloy steels (e.g. high strength low-alloy steels (HSLA), tool/die steels, corrosion/heat-resistant steels) [4].

Intended Learning Outcomes:
Technical Outcomes
Upon completion of the module the student should be able to demonstrate a knowledge and understanding of:
- The fundamental concepts across a broad spectrum of material families and mechanical/material properties.
- The basic principles of materials selection in mechanical design, including characterisation of mechanical properties, atomic structure of materials, crystal structures, vacancies and diffusion, microstructure evolution (solidification), phase diagrams, the treatment of plain carbon steels, creep, corrosion and oxidation.

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)
- Ability to apply and integrate knowledge and understanding of other engineering disciplines to support study of their own engineering discipline (SM3b)
- Understanding of engineering principles and the ability to apply them to analyse key engineering processes (EA1b)

Assessment:	Coursework 1 (20%) Exam - Multiple choice questions (80%)
Resit Assessment:	Examination (Resit instrument) (100%)

Assessment Description: Online course work assessment - 20%
Formal MCQ in Jan exam period - 80%

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

Assessment Feedback: Feedback on CW1 will be provided during lecture time.

Failure Redemption: A 2 hour multiple choice examination in the supplementary exam period in August 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.

PENALTY: THE FACULTY OF SCIENCE AND ENGINEERING HAS A ZERO TOLERANCE FOR LATE SUBMISSION OF ALL COURSEWORK AND CONTINUOUS ASSESSMENT
Available to visiting and exchange students.
Full course notes provided. Additional Reading list provided.

EG-182 Manufacturing Technology I

Credits: 10 Session: 2022/23 January-June

Pre-requisite Modules:

Co-requisite Modules:

Lecturer(s): Prof HM Davies

Format: Lectures: 30 hours
Directed private study: 40 hours
Preparation for assessment: 30 hours

Delivery Method: Quizzes will be incorporated into the lectures.

Module Aims: Manufacturing makes a major contribution to the world economy and, engineering processes help solve some of the most serious challenges facing society today. The role of engineers in the manufacturing sector is crucial to generate sustainable high economic value products and jobs. To meet this ever-changing role, new graduates require an understanding of established and advanced processes. The module provides students with a holistic view of current, emerging and integrated manufacturing processes, providing a wide range of techniques required for producing product specifications based on process/technology selection. The taught material builds together with knowledge gained from materials and design modules. The topics are delivered by means of traditional lectures in each of the areas shown in the syllabus below.

Module Content: • Overview of Manufacturing and Materials
• Polymers and PMCs
• Ceramics and Cermets
• Glass Working
• Metal Casting
• Powder Metallurgy
• Metal Forming
• Sheet Metalworking
• Metal Machining
• Cutting Tools
• Grinding and other Abrasive Processes
• Heat Treatment of Metals
• Manufacturing Economics
• 21st Century Manufacturing

Intended Learning Outcomes:
Technical Outcomes
Upon completion of this module the student should be able to:
- Describe important manufacturing techniques.
- Understand the control of these techniques including metrology.
- Discuss how the forming techniques affect the material's structure.
- Understand that both materials selection and manufacturing processes are important in producing products with optimum performance at minimum cost.
- Undertake selection of production process for successful product manufacture.
- Perform quality metrology measurements.

Accreditation Outcomes (AHEP)
- Knowledge of characteristics of particular materials, equipment, processes or products (P2)
- Understanding of the use of technical literature and other information sources (P4)
- Understanding of contexts in which engineering knowledge can be applied (eg operations and management, application and development of technology, etc) (P1)

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

Assessment Description: Assessment: 2 hour examination at the end of the Semester (100%). Resits in August will have 100% weighting.

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

Assessment Feedback: Via generic feedback form from written examinations.

Failure Redemption: Closed book exam in the supplementary exam period in August 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.

Failure to sit an examination or submit work by the specified date will result in a mark of 0% being recorded.
Assessment: examination.
Resource pack from lecturer. Available to visiting and exchange students.

EGA100 Numerical Methods for Biomedical Engineers

Credits: 10 Session: 2022/23 January-June

Pre-requisite Modules: EG-118

Co-requisite Modules: EG-117

Lecturer(s): Dr AS Ademiloye

Format: 2 hours computer lab per week, 1 hour lecture per week. Directed private study: 4 hours per week
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

Computer lab: 2 hours per week
Lecture: 1 hour per week

Module contents and learning materials will be made available to the students through Canvas.

Module Aims: The course provides a practical foundation for the use of numerical methods to solve biomedical engineering problems. It will review MATLAB programming techniques and apply these techniques to a range of biomedical engineering problems. By the end of the course, students should (1) feel comfortable in a programming environment, (2) be able to translate numerical formulations into a program, and (3) solve biomedical engineering problems computationally.

Module Content: Basics of Programming [6 weeks]
• Basic vector and matrix manipulations
• Cell arrays, structures
• Reading, writing, plotting and graphics with MATLAB
• Writing scripts and functions
• Loops and conditionals

Advanced techniques and numerical methods [5 weeks]
• Writing advanced functions
• Numerical methods with MATLAB
• Modeling biomedical systems with differential equations

Intended Learning Outcomes: Technical Outcomes
An introduction to structured programming and experience in the use of computer software relevant to the discipline.

1. Gain programming skills and confidence (Evaluated in: Assignment 1, EA1, SM2)
• Basic programming (vector manipulations, conditionals, loops)
• Reporting (generating plots, tables)
• Overcome threshold of MATLAB's learning curve

2. Develop a foundational understanding and experience in numerical analysis (Evaluated in: Assignment 1 and Assignment 2, SM2, EA1).

3. Develop the ability to convert a numerical formulation into a computer program and designing programs to solve biomedical engineering problems, (Evaluated in: Assignment 3, SM2, EA2, EA3).

4. Develop an appreciation of how/where numerical methods can be used in biomedical engineering (Evaluated in: Assignment 3, SM2, EA2, EA3).

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)
- Understanding of engineering principles and the ability to apply them to analyse key engineering processes (EA1b)
- Ability to identify, classify and describe the performance of systems and components through the use of analytical methods and modelling techniques (EA2)
- Ability to apply quantitative and computational methods in order to solve engineering problems and to implement appropriate action (EA3b)

Assessment: Coursework 1 (30%)
Coursework 2 (30%)
Coursework 3 (40%)
Resit Assessment: Coursework reassessment instrument (100%)

Assessment Description:
The course assessment will be 100% based on continuous assessments. These will be split into 3 sections:
CA1: Fundamental principles - basic understanding of programming techniques and algorithm development in Matlab (30%)
CA2: Further programming techniques - development of specific areas such as graphing and numerical analysis (30%)
CA3: Computational project - modeling of biomedical systems (40%)

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

Assessment Feedback: Assignments: Assignments will be marked against a rubric and students will be given their overall scores as well as written feedback on their submissions.

Weekly Coursework: Multiple problems in each weekly coursework set will be marked and the overall marks returned to the students via Canvas. During the weekly lecture, the instructor will review the correct answers.

In-class Quizzes: Quiz scores will be returned to the students by the instructor via Canvas. During the weekly lab/lecture, the instructor will review the correct answers.

Failure Redemption: The supplementary assignment will be of the same form as the computational project (100%).

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

Available to visiting students.

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

EGA101 Introduction to Biomedical Engineering

Credits: 10 Session: 2022/23 September-January

Pre-requisite Modules:

Co-requisite Modules:

Lecturer(s): Dr CJ Wright

Format: Lectures 30 hours. Directed private study 70 hours Contact Hours will be delivered through a blend of lectures, seminars, practical sessions and academic mentoring sessions.

Delivery Method: A blended approach will be used across the semester ensuring engagement between the students and the staff of Biomedical Engineering Department. There will be a combination of lectures, tutorials and laboratory practicals. The Canvas Digital Learning Platform will be used for self-directed online activity.

Module Aims: This module will introduce the concepts of biomedical engineering and will establish a grounding of knowledge within the area that can be used within subsequent modules.

Module Content: History of Biomedical Engineering
Modern Biomedical Engineering
Units and dimensions: Convert between different unit systems i.e. SI, imperial, US units; Dimensional Analysis (check validity of equations for dimensional consistency)
Thermodynamics: Ideal Gas behaviour; Revision of Boyle's law, Charles' law, Avogadro's law, Dalton's law, Ideal Gas Law; Properties of pure substances and solutions; Equations of state; Energy and the first and second law of thermodynamics
Mass transfer: Molecular diffusion in fluids (diffusion coefficients, Fick's law); Eddy or turbulent diffusion; Mass-transfer coefficients
Biomedical Engineering Design
Biomedical Engineering in society: ethics, safety and regulation.
Laboratory Skills

Intended Learning Outcomes: On successful completion of this module students will be expected to demonstrate

Technical Outcomes

(Knowledge and understanding) Key scientific principles important within biomedical engineering. Overview of design processes and their context. Regulatory framework of medical devices.

(Thinking Skills) Appraisal of the ethics of key Biomedical Engineering applications

(Practical Skills) Use of simple laboratory procedures. Pipetting and serial dilution, pH and ionic strength determination, spectrophotometry and microbial cell growth. Microscopy

Assessment:
Coursework 1 (35%)
Coursework 2 (15%)
Coursework 3 (35%)
Coursework 4 (15%)

Assessment Description: Coursework 1 Essay
Coursework 2 Lab report 1
Coursework 3 Problem Sheet
Coursework 4 Lab report 2

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

Assessment Feedback: The students will receive a mark and written narrative on error and improvement within the standard feedback time.

Failure Redemption: If you are eligible for a resit examination this will take the form of a written report.

Additional Notes: Module code reserved by c.wright on 07/06/2022 14:38:11

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.

EGA103 Foundation Chemistry

Credits: 10 Session: 2022/23 September-January

Pre-requisite Modules:

Co-requisite Modules:

Lecturer(s): Prof G Williams

Format: 20 lectures/ 4 examples classes/ 8 hours of practicals.
68 hours directed private study.
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

Module Aims: This course is designed as an introduction to the chemical properties of materials used throughout engineering. To complement the taught theory, this course has a strong practical component during which students will develop the skills to carry out a number of basic laboratory manipulations in an accurate and safe manner.

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. Isomersim
• 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.

Intended Learning Outcomes: Knowledge Based
After completing this module you should be able to:

• Describe the fundamental structure of an atom and predict the properties associated with a given species.
• 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 compounds.
• Identify reaction types and write relevant balanced equations.
• 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.
• Describe a typical electrochemical cell. Use relevant data to calculate cell potentials.
• Construct rate equations and identify the order of a reaction. Discuss those factors that affect the rates of a reaction.

The following AHEP 3 Programme Learning outcomes at Partial CEng (p) are partially demonstrated at a threshold level by this module:

* Knowledge and understanding of scientific principles and methodology (SM1)
* Knowledge and understanding of mathematical and statistical methods (SM2)
* Knowledge of characteristics of particular materials, equipment, processes, or products (EP2)
* Ability to apply relevant practical and laboratory skills (EP3)

Assessment: Examination 1 (60%)
Laboratory work (20%)
Assignment 1 (10%)
Assignment 2 (10%)

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

Assessment Description: The examination paper consists of a series of multiple choice questions covering the entire syllabus.

Laboratory work consists of 3 practical classes totalling 10 hours, where experiments dealing with inorganic, organic and physical chemistry based experiments are carried out. Lab reports are completed within the allotted time and are handed in for marking at the end of each class.

The assignment consists of a two Canvas tests, to be completed before a specified deadline within the teaching block.

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

Assessment Feedback: As set out by Faculty of Science and Engineering guidelines.

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.

This module assumes no previous chemistry background.
PENALTY: ZERO TOLERANCE FOR LATE SUBMISSION

SR-112 Human Physiology

Credits: 10 Session: 2022/23 January-June

Pre-requisite Modules:

Co-requisite Modules:

Lecturer(s): Dr RS Metcalfe

Format: Lectures (22-h)
Seminars (5-h)
Contact Hours will be delivered through a blend of live online lectures and seminars.

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

The module consists of lectures and practical classes. All lecturers will be recorded and made available via Canvas. Face to face delivery will be supplemented with online (blended) learning materials.

Module Aims: The purpose of the module is to provide a basic introduction to the physiological systems and metabolic processes responsible for the transfer and utilisation of energy both at rest and during physical activity. This module is lecture and seminar based and is intended to develop introductory knowledge and understanding on the structure and function of the human body from cellular to gross body systems fundamental to the later study of sports and exercise. The module practically investigates how to assess the physiological and biochemical state at rest and during exercise.

Module Content: The module will include:

1. Basic Biochemistry - understanding of units and relevant definitions
2. The Cell - functional components with reference to differences between cell types.
3. Nutrients - the digestive system, the basis of the chemical structures of carbohydrates, amino acids and lipids.
4. Acid-Base Balance - the concept of pH, alkalosis and acidosis. Sources of H+ ions & pH regulation by organs. Changes in pH with exercise.
5. PCr hydrolysis and glycolysis: its role in maximal exercise metabolism.
6. Aerobic metabolism, glucose, lipids, oxidative phosphorylation, the electron transport chain and their roles in sub-maximal exercise.
7. The cardiovascular system structure and its function in response to exercise.
8. The respiratory system structure and its function in response to exercise.

Intended Learning Outcomes: Technical Outcomes
At the end of the module the learner is expected to be able to:
1. Describe the gross anatomical structure of the major components of the: cardiovascular system, respiratory system, digestive system, endocrine system and urinary/renal system.
2. Describe cardiac and peripheral circulation and the physiological control of the cardiovascular system.
3. Describe the processes of inspiration, expiration, gaseous exchange and explain the control of respiration.
4. Describe the functional relationships between endocrine glands and their regulation of physiological function.
5. Describe the digestion and absorption of carbohydrates, fats and proteins.
6. Describe renal control of water, electrolytes and acid/base balance.
7. Observe and describe the effect of progressive exercise on the cardiovascular and respiratory systems.

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)
- Ability to apply and integrate knowledge and understanding of other engineering disciplines to support study of their own engineering discipline (SM3b)
- Knowledge and understanding of risk issues, including health & safety, environmental and commercial risk, and of risk assessment and risk management techniques (EL6)
- Knowledge of characteristics of particular materials, equipment, processes, or products (P2)
- Ability to apply relevant practical and laboratory skills (P3)

Assessment:	Examination 1 (80%) Coursework 1 (2%) Coursework 2 (2%) Coursework 3 (2%) Coursework 4 (2%) Coursework 5 (2%) Coursework 6 (2%) Coursework 7 (2%) Coursework 8 (2%) Coursework 9 (2%) Coursework 10 (2%)
Resit Assessment:	Examination 1 (100%)

Assessment Description: A series of weekly online Canvas tests will contribute 20% of the module mark. A written examination will take place at the end of the module, worth 80% of the module mark.

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

Assessment Feedback: Students will receive feedback on their weekly online Canvas tests, including guidance on incorrect answers. Written feedback based on cohort performance will be made available for exam questions.

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.

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

Not available to visiting and exchange students.

SR-113 Human Neuromusculoskeletal System

Credits: 10 Session: 2022/23 September-January

Pre-requisite Modules:

Co-requisite Modules:

Lecturer(s): Dr L Mason, Dr R Van Loon

Format: Lectures 27 hours
e content 11 hours
Labs 2 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.

17 x 1 hour lectures on Anatomy
11 x 1 hour Anatomy e content
2 x 1 hour Anatomy lab
10 x 1 hour lectures on Introduction to Medical Engineering

Module Aims: The purpose of the module is to develop knowledge and understanding of the structure and function of the following systems of the human body: skeletal system, muscular system, articular system, nervous system, endocrine system, digestive system, urinary system.

In addition an introduction to medical engineering will be given, highlighting the variety of topics studied within the field of medical engineering.

Module Content: PART A

1. Tissues and cellular organisation in multicellular organisms
Tissues: epithelia, muscle, nerve, connective
Cellular organisation: tissues, organs, systems

2. The musculoskeletal system
Skeletal system: skeleton and joint support structures, functions of the skeleton, axial skeleton and appendicular skeleton
Muscular system: structure of muscle, pennate and non-pennate fibre arrangements.
Muscle function: muscle contraction, anatagonistic pairs of muscles, force transmission, control of joint movements.
Categories of movement: upright posture, transport, manipulation of objects
Loading on the musculoskeletal system: effects of open chain arrangement of the bones.

3. Connective tissues
Ordinary connective tissues: areolar tissue, regular collagenous connective tissue
Special connective tissues: cartilage, bone.

4. The articular system
Structural classification of joints.
Fibrous joints: syndesmoses
Cartilaginous joints: synchondroses, symphyses
Synovial joints

5. The nervous system
Structural division of the nervous system.
Neurones: structure, types.
Spinal cord: gray matter, white matter, dorsal root, ventral root
Spinal nerves: epineurium, perineurium, endoneurium

6. The neuromuscular system
Muscle fibre structure and function: sliding filament theory; motor units.
Kinaesthetic sense and proprioception: types of proprioceptors
Mechanical characteristics of musculotendinous units: length-tension relationship; force-velocity relationship.
Muscle architecture and function: roles of muscles; muscle fibre arrangement and force and excursion; biarticular muscles.
Stretch-shorten cycle; storage and use of elastic strain energy.

7. The endocrine system
Hormonal and neural control of body functions.
Endocrine glands, neuroendocrine glands, autocrines and paracrines.
Hormones: amino acid-based and steroids; effects of hormones; regulation of hormones.

8. The digestive system
The alimentary canal and accessory digestive organs.
Digestive processes: ingestion, swallowing, peristalsis, digestion, absorption, defecation.

9. The urinary system
Components of the urinary system: kidneys, ureter, bladder.
Kidneys: cortex, medulla, pelvis, blood supply, nephrons.
Urine: formation, regulation of concentration and volume.

PART B

An introduction to medical Engineering (weekly lectures) highlighting the different aspects in medical engineering including examples in image/signal processing, biomechanics, biofluids, tissue engineering, bioinstrumentation.

Intended Learning Outcomes: Technical Outcomes
By the end of this module the student will be expected to be able to:
1. Identify and distinguish between the four basic types of tissues and cellular organisation in multicellular organisms
2. Identify and label the composition of the musculoskeletal system
3. Classify and explain the structure of ordinary connective tissues, cartilage, and bone
4. Recognise and describe the structure of the following organ/tissue systems: articular, nervous, neuromuscular, endocrine, digestive, urinary.
5. Describe a variety of topics within the field of medical engineering such as image/signal processing, biomechanics, biofluids, tissue engineering and bioinstrumentation.

Accreditation Outcomes (AHEP)
- Communicate their work to technical and non-technical audiences (D6)
- Knowledge of characteristics of particular materials, equipment, processes, or products (P2)

Assessment: Examination 1 (50%)
Group Work - Presentation (20%)
Class Test 1 - Practical Assessment Not Exam Cond (10%)
Class Test 1 - Coursework (5%)
Class Test 2 - Coursework (5%)
Class Test 3 - Coursework (5%)
Class Test 4 - Coursework (5%)
Resit Assessment: Examination (Resit instrument) (100%)

Assessment Description: A written examination on the "Anatomy" part of the module.

A individual laboratory assessment using virtual reality for anatomy.

Online tests as continuous assessment instruments over the module.

A presentation will be given in groups on the "Introduction to medical engineering" part of the module.

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

Assessment Feedback: Written feedback based on cohort performance will be made available for exam questions.

Virtual reality assessment will give immediate feedback.

Individual written feedback will be provided alongside the marking scheme used to assess the coursework.

There will be numerous possibilities for students to gain informal feedback across the module as a whole these include, but are not limited to:
¿ Formative e-content assessments which provide regular weekly feedback.
¿ Office drop in sessions
¿ Asking questions during lectures
¿ Informal discussion and seeking advice during lectures or using Canvas discussion groups.

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.

The Faculty of Science and Engineering has a ZERO TOLERANCE policy for late submission of coursework, meaning that a mark of zero will be recorded in such cases.