Swansea University
Prifysgol Abertawe

FACULTY OF SCIENCE AND ENGINEERING

UNDERGRADUATE STUDENT HANDBOOK

YEAR 1 (FHEQ LEVEL 4) CIVIL 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 Civil Engineering	Professor Eduardo De Souza Neto
Civil Engineering Programme Director	Dr Clare Wood
Year Coordinators	Dr Jude Clancy

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.

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
Civil Engineering

BEng Civil Engineering[H200,H205]
BEng Civil Engineering with a Year Abroad[H206]
MEng Civil Engineering[H201]
MEng Civil Engineering with a Year Abroad[H207]

Semester 1 Modules	Semester 2 Modules
EG-112 **Introduction to Civil Engineering Materials** **10 Credits** **Prof C Li** **CORE**	**EG-115** **Engineering Mathematics 2 (Aero & Civil)** **10 Credits** **Mr A Cene** **CORE**
EG-113 **Engineering Mathematics 1 (Aero & Civil)** **10 Credits** **Dr AJ Bruce** **CORE**	**EG-120** **Strength of Materials (Aero & Civil)** **10 Credits** **Dr J Clancy** **CORE**
EG-133 **Engineering for People Hackathon** **10 Credits** **Prof JC Arnold/Dr WG Bennett/Dr JW Jones/Dr S Potts/...** **CORE**	**EG-121** **Surveying and Introductory Highways Design** **10 Credits** **Dr J Clancy/Dr WG Bennett** **CORE**
EG-139 **Critical thinking and maths-based problem solving for Engineers** **10 Credits** **Dr N Wint/Ms NM Chartier/Dr AC Tappenden** **CORE**	**EGA117** **Fluid Mechanics I** **10 Credits** **Prof DE Reeve/Prof HU Karunarathna** **CORE**
EG-166 **Engineering Mechanics (Aero & Civil)** **10 Credits** **Dr S Jiffri** **CORE**	
EG-154 **Conceptual Design and Analysis Practice** **30 Credits** **Prof O Hassan/Dr WG Bennett/Dr J Li** **CORE**	
Total 120 Credits	

Year 1 (FHEQ Level 4) 2022/23
Civil Engineering
BEng Civil Engineering with a Year in Industry[H202]

Semester 1 Modules	Semester 2 Modules
EG-112 **Introduction to Civil Engineering Materials** **10 Credits** **Prof C Li** **CORE**	**EG-115** **Engineering Mathematics 2 (Aero & Civil)** **10 Credits** **Mr A Cene** **CORE**
EG-113 **Engineering Mathematics 1 (Aero & Civil)** **10 Credits** **Dr AJ Bruce** **CORE**	**EG-120** **Strength of Materials (Aero & Civil)** **10 Credits** **Dr J Clancy** **CORE**
EG-133 **Engineering for People Hackathon** **10 Credits** **Prof JC Arnold/Dr WG Bennett/Dr JW Jones/Dr S Potts/...** **CORE**	**EG-121** **Surveying and Introductory Highways Design** **10 Credits** **Dr J Clancy/Dr WG Bennett** **CORE**
EG-139 **Critical thinking and maths-based problem solving for Engineers** **10 Credits** **Dr N Wint/Ms NM Chartier/Dr AC Tappenden** **CORE**	**EG-135** **Placement Preparation: Science and Engineering Year in Industry** **0 Credits** **Prof GTM Bunting/Dr SA Rolland/Dr V Samaras** **CORE**
EG-166 **Engineering Mechanics (Aero & Civil)** **10 Credits** **Dr S Jiffri** **CORE**	**EGA117** **Fluid Mechanics I** **10 Credits** **Prof DE Reeve/Prof HU Karunarathna** **CORE**
EG-154 **Conceptual Design and Analysis Practice** **30 Credits** **Prof O Hassan/Dr WG Bennett/Dr J Li** **CORE**	
Total 120 Credits	

Year 1 (FHEQ Level 4) 2022/23
Civil Engineering
MEng Civil Engineering with a Year in Industry[H204]

Semester 1 Modules	Semester 2 Modules
EG-112 **Introduction to Civil Engineering Materials** **10 Credits** **Prof C Li** **CORE**	**EG-115** **Engineering Mathematics 2 (Aero & Civil)** **10 Credits** **Mr A Cene** **CORE**
EG-113 **Engineering Mathematics 1 (Aero & Civil)** **10 Credits** **Dr AJ Bruce** **CORE**	**EG-120** **Strength of Materials (Aero & Civil)** **10 Credits** **Dr J Clancy** **CORE**
EG-133 **Engineering for People Hackathon** **10 Credits** **Prof JC Arnold/Dr WG Bennett/Dr JW Jones/Dr S Potts/...** **CORE**	**EG-121** **Surveying and Introductory Highways Design** **10 Credits** **Dr J Clancy/Dr WG Bennett** **CORE**
EG-139 **Critical thinking and maths-based problem solving for Engineers** **10 Credits** **Dr N Wint/Ms NM Chartier/Dr AC Tappenden** **CORE**	**EG-135** **Placement Preparation: Science and Engineering Year in Industry** **0 Credits** **Prof GTM Bunting/Dr SA Rolland/Dr V Samaras**
EG-166 **Engineering Mechanics (Aero & Civil)** **10 Credits** **Dr S Jiffri** **CORE**	**EGA117** **Fluid Mechanics I** **10 Credits** **Prof DE Reeve/Prof HU Karunarathna** **CORE**
EG-154 **Conceptual Design and Analysis Practice** **30 Credits** **Prof O Hassan/Dr WG Bennett/Dr J Li** **CORE**	
Total 120 Credits	

EG-112 Introduction to Civil Engineering Materials

Credits: 10 Session: 2022/23 September-January

Pre-requisite Modules:

Co-requisite Modules:

Lecturer(s): Prof C Li

Format: Contact hours (lecture and lab sessions): 25

Reading/Private Study: 50

Lab Reports and Online Assignments: 25

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 includes roughly 20 hours lecture classes and up to 6 hours lab sessions in the concrete and structure labs.

The module is assessed via 2 lab reports, worth 10% each, and 2 online assignments, worth 40% each.

Module Aims: This module is designed for Year 1 Civil Engineering students. It provides a conceptual introduction to a broad range of civil engineering materials, including material properties, fabrication and construction methods etc.The materials covered by this module include: metals and alloys, concrete, polymers, fibre composites, glass, timber, masonry, and bituminous materials.

Module Content: The main content of the module includes:

1. Fundamentals: atoms, bonding, energy and equilibrium; mechanical properties of solids; structure of solids; fracture and toughness; liquids, viscoelasticity and gels; surfaces; electrical and thermal properties.

2. Metals and alloys: deformation and strengthening of metals; forming of metals; oxidation and corrosion; iron and steel; aluminium.

3. Concrete: Portland cements; admixtures; additions; other types of cement; aggregates for concrete; early-stage properties of concrete; deformation of concrete; strength and failure of concrete; concrete mix design; non-destructive testing of hardened concrete; durability of concrete; special concrete; recycling of concrete.

4. Polymers: types, properties and applications of polymers.

5. Fibre composites: reinforcing fibre materials; reinforcing fibre architecture; matrices; interfaces and bonding; mechanical behaviour and properties of composites; manufacture of fibre composites; applications of fibre composites in construction; durability; recycling.

6. Glass: manufacture and processing; properties and performance; design and applications; service and end of life.

7. Timber: structure of timber and the presence of moisture; deformation in timber; strength and failure in timber; durability of timber; processing and recycling of timber.

8. Masonry: materials and components for masonry; masonry construction and forms; structural behaviour and movement of masonry; non-structural physical properties of masonry; deterioration, conservation and strengthening of masonry.

9. Bituminous materials: components of bituminous materials; viscosity, stiffness and deformation of bituminous materials; strength and failure of bituminous materials; durability of bituminous mixtures; design and production of bituminous materials; recycling of bituminous materials.

Intended Learning Outcomes: After completing the student should be able to:

• Demonstrate a good understanding of various construction materials in terms of their properties and applications.
• Build a systemic set of knowledge in various construction materials, with the ability of applying the right materials in the right condition for various civil engineering structures.
• Develop the basic lab skills related to concrete and structural experiments, and the skills of writing technical reports.
• Analyse the advantages and disadvantages for the application of different construction materials in specific conditions.

Accreditation Outcomes (AHEP3)
SM1b 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
SM2b 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
SM3b Ability to apply and integrate knowledge and understanding of other engineering disciplines to support study of their own engineering discipline
EL4 Understanding of the requirement for engineering activities to promote sustainable development and ability to apply quantitative techniques where appropriate
EL6b Knowledge and understanding of risk issues, including health & safety, environmental and commercial risk, and of risk assessment and risk management techniques
P1 Understanding of contexts in which engineering knowledge can be applied (for example operations and management, application and development of technology, etc.)
P2b Knowledge of characteristics of particular materials, equipment, processes or products
P3 Ability to apply relevant practical and laboratory skills
P4 Understanding of the use of technical literature and other information sources
G1 Apply their skills in problem solving, communication, information retrieval, working with others and the effective use of general IT facilities

Assessment:	Assignment 1 (10%)
	Assignment 2 (10%)
	Assignment 3 (40%)
	Assignment 4 (40%)
Resit Assessment:	Assignment 3 (50%)
	Assignment 4 (50%)

Assessment Description: Assignment 1 is a lab report.
Assignment 2 is a lab report.
Assignment 3 is an online test.
Assignment 4 is an online test.

Moderation approach to main assessment: Universal non-blind double marking

Assessment Feedback: The lab reports are marked manually, and component marks and specific feedback are returned to students via online platform.

The online tests are automated, and component marks and specific feedback are returned immediately upon the completion of the tests.

Failure Redemption: Failure can be redeemed in Aug by resubmitting the lab reports and retaking the online tests (with different questions).

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-113 Engineering Mathematics 1 (Aero & Civil)

Credits: 10 Session: 2022/23 September-January

Pre-requisite Modules:

Co-requisite Modules:

Lecturer(s): Dr AJ Bruce

Format: Lectures 30 hours
Directed private study 70 hours

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

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

This module will consist of pre-recorded (asynchronous) short videos covering the mathematical theory and examples. Students will have access to e-learning and e-assessment system MyMathLab, through Canvas, which will enable them to practice questions and get instant feedback on their solutions to formative questions. MyMathlab will also be used for summative assessments. Synchronous (live) activities will in the form of remote example classes via Zoom and remote office hours via Zoom.

Module Aims: This module (in combination with Engineering Analysis 2A) 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.

• Graphing/Plotting of 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-115 Engineering Mathematics 2 (Aero & Civil)

Credits: 10 Session: 2022/23 January-June

Pre-requisite Modules: EG-113

Co-requisite Modules:

Lecturer(s): Mr A Cene

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

Depending on the COVID-19 situation in TB2 the delivery method will be

1) This module will consist of face to face lectures, which concentrate on the mathematical theory, and face to face example classes, which concentrate on applying the theory to solve examples. Students will have access to e-learning and e-assessment system MyMathLab, through Canvas, which will enable them to practice questions and get instant feedback on their solutions to formative questions. MyMathLab will be used for continuous assessments and there will be closed book exam.

or

2) This module will consist of pre-recorded (asynchronous) short videos covering the mathematical theory and examples. Students will have access to e-learning and e-assessment system MyMathLab, through Canvas, which will enable them to practice questions and get instant feedback on their solutions to formative questions. MyMathlab will also be used for summative assessments. Synchronous (live) activities will in the form of remote example classes via Zoom and remote office hours via Zoom.

or a combination of 1) and 2).

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

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:
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 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 (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.

This module is assessed by 4 coursework tests on MyLab Maths, where each test is worth 25%. All tests must be passed in order to pass the module. The pass mark is 40%

EG-120 Strength of Materials (Aero & Civil)

Credits: 10 Session: 2022/23 January-June

Pre-requisite Modules:

Co-requisite Modules:

Lecturer(s): Dr J Clancy

Format: Lectures 1 hour per week
Example classes 2 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 - 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.
3 - Stress and Strain analysis: principal directions, maximum shear stress, Mohr's circle, stress-strain relationships in linear elasticity. Stresses in pressurised vessels.
4 - Advanced beam theory: combined loading, torsion theory, shear stresses, shear warping of sections.
5 - Revision

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)

- 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)
- Ability to apply and integrate knowledge and understanding of other engineering disciplines to support study of their own engineering (SM3b)
- Understanding of engineering principles and the ability to apply them to analyse key engineering processes (EA1b)
- Knowledge of characteristics of particular materials, equipment, processes or products (P2)

Assessment: Assignment 1 (7%)
Assignment 2 (7%)
Assignment 3 (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.

Each assignment consists of a Canvas test.

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 via 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 complete the coursework.

EG-121 Surveying and Introductory Highways Design

Credits: 10 Session: 2022/23 January-June

Pre-requisite Modules:

Co-requisite Modules:

Lecturer(s): Dr J Clancy, Dr WG Bennett

Format: Lecture: 26 hours
Field work: 12 hours
Field trip: 30 hours
Contact Hours will be delivered through a blend of live activities online and on-campus, and may include, for example, lectures, seminars and practical 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

A mix of online and in-person lectures using mixture of power point presentations, visualiser and whiteboard.
Prerecorded video content to enhance learning.
Additional video resources provided on Canvas, introducing the learner to new technologies and methods.
Practical sessions using surveying equipment
Demonstrations of state of the art surveying equipment, provided with industrial partners.

Module Aims: This module introduces construction and geometric design of highways, such as the hierarchy of roads, design speed selection and the horizontal and vertical alignment of such roads. The module also covers most aspects of land surveying, from basic methods to those involving modern technologies, with a particular focus on how that relates to road design and construction. Aspects of sustainability in highway design and health and safety consideration in surveying activities will be covered. This module includes a field trip to be held in May/June 2023.

Module Content: 1. Introduction to highway design and land surveying
Types and applications of surveying; basic highway layouts and components

2.Levelling
Practical techniques and equipment; Calculation of elevations; Adjustments of errors and arithmetic checks

3. Basic Highway Design
Hierarchy of the road network; Design speed philosophy and sight distance requirements
Road scheme assessments and cost-benefit analysis. Environmental appraisal and constraints.

4. Geodesy and Coordinate Calculation
Elementary geodesy; Sexagesimal system; Coordinate calculation and conversion in polar and rectangular form; bearings.
Intersection and Resections.
Area, volume and earthwork quantities calculations.

5. Angle Measurement and Control Surveys
Angle measurement and booking
Components of theodolite and total station; procedure for set-up and usage
Distance measurement; techniques and equipment; steel tape and electronic methods.
Control surveys; Traverse; Angular and linear misclosure; Adjustment; Control Networks.

6. Detail Surveys
Methods for producing detail surveys
Feature coding and numbering; use of surveying software for mapping
Longitudinal and cross sections

7. Horizontal Alignment and Setting Out
Camber, crossfall and super-elevation; forms of horizontal curves
DMRB and the properties of horizontal curve properties; components of horizontal curves
Setting out principles; horizontal and vertical control
Generation of setting out data for horizontal curves

8. Vertical Alignment
Forms of sag and crest curves; K-values
Generation of setting out data for vertical curve
Mass-haul diagrams

9. GNSS Surveying and advanced technologies
Components of GNSS system; global systems
Static and real-time kinematic methods; sources of errors
3D scanning; point clouds; drones; LiDAR.

Intended Learning Outcomes: Highway Design:
After completing this part of the module the student should be able to:
-Interpret the Design Manual for Roads and Bridges to follow a basic design process for highways
-Apply user and road hierachies to design road types
-Determine design speeds for single and dual carriageways
-Design and evaluate horizontal and vertical alignment of roads
-Develop an appreciation of environmental and economic constraints to road construction and route selection.

Surveying:
After completing this part of the module the student should be able to:
-Utilize an automatic level and apply the height of collimation method to determine vertical heights, adjusting for misclosure
-Utilize a total station to carry out a control survey, adjusting for misclosure
-Utilize a total station and GNSS systems to perform a mapping exercise and import data into AutoCAD
-Utilize a total station to set out construction points
-Calculate area and volume using mapped points
-Develop an appreciation of newer surveying techniques and hardware, such as 3D scanning and machine control and a basic understanding of point clouds and their use to represent spatial features.

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)
- Investigate and define the problem, identifying any constraints including environmental and sustainability limitations; ethical, health, safety, security and risk issues; intellectual property; codes of practice and standards (D2)
- Understanding of the requirement for engineering activities to promote sustainable development and ability to apply quantitative techniques where appropriate (EL4)
- Ability to apply relevant practical and laboratory skills (P3)
- Understanding of, and the ability to work in, different roles within an engineering team (P11)
- Exercise initiative and personal responsibility, which may be as a team member or leader (G4)

Assessment:
Coursework 1 (10%)
Coursework 2 (5%)
Coursework 3 (10%)
Coursework 4 (5%)
In class test (Invigilated on campus) (20%)
Project (50%)

Assessment Description: 10% Practical Coursework 1 (Levelling)
5% Practical Coursework 2 (Areas and Volumes)
10% Practical Coursework 3 (Traverse Surveys)
5% Practical Coursework 4 (Setting Out)
20% Class test
50% Fieldtrip with a mix of group and individual exercises

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

Assessment Feedback: Practical Assignments will be marked within 3 weeks and returned to students.
Class test will be discussed in a subsequent lecture.
Weekly office hour for students to get one-to-one feedback
Practical sessions are an opportunity for direct feedback from observation

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

Failure of this module will mean that the student must repeat the module or repeat the year during the next academic session. Failure to attend classes and activities related to this module will mean that the student will fail the module; hence the student will repeat the module/year, subject to University regulations.

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

Not available to visiting and exchange students.

EG-133 Engineering for People Hackathon

Credits: 10 Session: 2022/23 September-January

Pre-requisite Modules:

Co-requisite Modules:

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

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

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

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

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

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

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

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

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

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

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

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

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

Supported learning outcomes are:

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

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

Assessment:	Coursework 1 (10%) Coursework 2 (10%) Coursework 3 (70%) Coursework 4 (10%)
Resit Assessment:	Coursework reassessment instrument (100%)

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

Coursework 2: (10%)
Professional development assignments

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

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

Coursework 4: A group reflection task (10%)

Moderation approach to main assessment: Partial second marking

Assessment Feedback: Formal feedback from online test

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

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

Failure Redemption: Supplementary Assessment to be submitted in August.

Reassessment: Design Reflection & Report (100%)

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

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

Credits: 0 Session: 2022/23 January-June

Pre-requisite Modules:

Co-requisite Modules:

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

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

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

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

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

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

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

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

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

Assessment: Participation Exercise (100%)

Assessment Description: Not assessed

Moderation approach to main assessment: Not applicable

Assessment Feedback: Not assessed

Failure Redemption: Not assessed

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

EG-139 Critical thinking and maths-based problem solving for Engineers

Credits: 10 Session: 2022/23 September-January

Pre-requisite Modules:

Co-requisite Modules:

Lecturer(s): Dr N Wint, Ms NM Chartier, Dr AC Tappenden

Format: Part 0: Academic Integrity 2 hour lecture discussion session (teaching week 1 or 2)
Part 1: Critical Thinking: 1 hours lecture +
2 hours team-based learning per week (weeks 1-5)
Part 2: Maths based problem solving: 3 hours per week PC lab based lectures/examples classes/assessments (weeks 6-12)

Delivery Method: Part 0: Academic Integrity - A 2 hour lecture & discussion session to be delivered by the Civil Engineering Programme Director
Part 1: Critical thinking: Discussion-based class sessions and use of scenarios.
Part 2: Maths-based problem solving for Engineers: PC lab based in-person lectures, example classes and assessments.

Module Aims: Part 0: Academic Integrity - A 2 hour lecture & discussion session to be delivered by the Civil Engineering Programme Director. Students will consider a set of common academic scenarios in which the Academic Integrity must be explored. Assessment via online test.

Part 1: Critical Thinking
Engineers have always solved problems. Rarely though are problems simple with obvious, clear and perfect solutions. In addition to this, there is a growing need for engineers to work toward solving increasingly complex, open ended and 'wicked' problems, something which is further complicated by the increasinging availability of information and data within society. As such itis important that students are equipped with the skills and awareness to critically analyse complex situations in order to come to the best possible conclusions. This course aims to turn students away from black and white thinking and to prepare them for difficult decision making by applying critical thinking skills to real life scenarios.

This will be done through exploring case studies that concern the social, economic and environmental impact of engineering systems. Students will explore how to critically analyse a situation from multiple viewpoints, dissecting and evaluating arguments.

Part 2: Maths based problem solving
This part of the module will examine how maths based problem solving approaches and tools can be used to solve real world engineering problems. The module will introduce planning, program conceptual development and structured programming skills utilising the popular software Matlab.

Module Content: Part 0: Academic Integrity - A 2 hour lecture & discussion session to be delivered by the Civil Engineering Programme Director

Part 1: Critical Thinking
Most lessons are structured to introduce an aspect of critical thinking with some presentations given by the teacher as well as group activities and class discussion. Simulation of engineering scenarios.
Teaching Week 1: This class aims to introduce some of the main concepts in critical thinking and barriers to critical thinking, as well as highlighting how it is relevant to university.
Teaching Week 2: Define different types of argument and put them in standard form.
Teaching Week 3: Understand what makes good and bad arguments, with a focus on logical fallacies that we often encounter.
Teaching Week 4: Learn how to and practice evaluating arguments.
Teaching Week 5: How these skills can be applied to engineering scenarios and how students can build good arguments from different perspectives

Part 2: Maths based problem solving for Engineers
Teaching Weeks 6-7: MATLAB as an engineering tool
Teaching Weeks 7-9: Basics of programming, introduction to MATLAB, input and output of data, operations, functions, plotting, simple programming, conditional statements and debugging.
Teaching Weeks 9-11: MATLAB programming for engineering problem solving

Intended Learning Outcomes: Technical Outcomes
Upon completion of this module students should be able to:
- Understand key aspects of critical thinking and challenges to it in order to be able to define the concept and understand its purpose.
- Give a basic evaluation of arguments from different types of texts and know what steps to take to take the evaluation further.
- Build good arguments and understand how critical thinking skills can be applied to real-world scenarios.

Accreditation Outcomes (AHEP)
- Understanding of the need for a high level of professional and ethical conduct in engineering and a knowledge of professional codes of conduct (EL1)
- Understanding of, and the ability to apply, an integrated or systems approach to solving engineering problems (EA4B)
- Apply their skills in problem solving, communication, working with others, information retrieval, and the effective use of general IT facilities (G1)

Assessment:	Coursework 1 (5%)
	Coursework 2 (0%)
	Coursework 3 (45%)
	Coursework 4 (5%)
	Coursework 5 (10%)
	Coursework 6 (15%)
	Coursework 7 (20%)
Resit Assessment:	Coursework reassessment instrument (50%)
	Coursework reassessment instrument (50%)

Assessment Description: Assessment:
Note, that this module cannot be passed if any of the compulsory PASS/FAIL elements have not not been passed, even if your overall mark for each part of the course is above a pass grade.

Part 0: Academic Integrity - This element must be passed with 90% to pass this module
CW 1 - Online individual Canvas quiz on academic integrity - worth 5% of module - compulsory. A mark of 90% must be achieved in this component in order to pass the module.

Part 1: Critical thinking (worth 50% of the 10 credit module) - a pass grade must be achieved in Part 1 (in addition to passing all compulsory pass/fail elements) in order to pass the module EG-139 overall.
CW 2 - attend at least 3/5 2 hour interactive workshop sessions - compulsory PASS/FAIL - no associated %
CW 3 - Group written analysis of ethical scenario - worth 45% of module
CW 4 - Online individual Canvas quiz about principles of reflection - worth 5% of module

Part 2: Maths based problem solving for Engineers (worth 45% of the 10 credit module) - a pass grade must be achieved in Part 2 in order to pass the module EG-139 overall.
CW 5 - Matlab Onramp beginner assessment - worth 10% of module
CW 6 - Matlab classroom assessment under exam conditions in PC labs. Students prepare code from scratch, submit results and m-code within 1.5 hours. Run within timetabled PC lab session - worth 15% of module
CW 7 - Matlab classroom assessment under exam conditions in PC labs. Students prepare code from scratch, submit results and m-code within 1.5 hours. Run within timetabled PC lab session - worth 20% of module

Moderation approach to main assessment: Partial second marking

Assessment Feedback: Voluntary feedback on reflection assignment
Feedback during active learning sessions, scenario

Failure Redemption: In the case that students have failed the coursework they will be provided with the opportunity to complete and submit an alternative task within term time.

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

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EG-154 Conceptual Design and Analysis Practice

Credits: 30 Session: 2022/23 September-June

Pre-requisite Modules:

Co-requisite Modules:

Lecturer(s): Prof O Hassan, Dr WG Bennett, Dr J Li

Format: Lectures 2 hours per week, plus computer based in-person learning 2 hours per week. Optional office hours: 1.0 hour per week, directed private study: 6.0 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

All course lecture slides will be distributed electronically in advance of lectures via Canvas, but occasional accurate notes of worked examples should be taken by the student during the lecture/example classes. Lectures may be supported by visits from practising civil engineers / site visits / ICE and IStructE evening lectures.

All online assessments and coursework must be completed and submitted in the format as specified by the lecturer. Late submissions will be marked (for feedback purposes) but will normally not contribute to the total mark for the module.

Module Aims: This 30 credit module spans TB1 and TB2 and addresses the topic of Conceptual Design and Analysis in the context of Civil Engineering. Teaching will combine conventional lecture sessions, computer lab work, example classes and practical design, build and test, groupwork and presentation. The module brings together the principals and practice of graphical communication (hand sketching, engineering drawing and computer modelling), civil engineering concept development, structural analysis, an understanding of the use of key civil engineering materials (eg Steel, Concrete, Timber, Masonry) and the preliminary sizing of structural elements in accordance with Eurocodes as part of the Conceptual Design development process.

We link to learning from modules Engineering Mechanics and Strength of Materials, reinforcing understanding of structural analysis and building skills in sketching internal force diagrams without going through step-by-step calculations. The axial force in truss structures, as well as the shear force and bending moment diagrams in continuous beams and frames, are the principal structural analysis skills developed here. We also develop further engineering knowledge of key skills, such as the analysis of statically determinate structures in Civil Engineering.

Module Content: Graphical Communication:
Drawing principles: Orthogonal projections; Perspective and isometric views.
Drawing techniques: Freehand sketching, both observational and conceptual/creative; Drawing conventions, use of linetype shading and tone to infer properties.
AutoCAD drawing: Introduction to AutoCAD; Technical drawing layout; Detailing; Reinforced concrete conventions; Steel sections and joints.
3D modelling with Revit
Design communication. Introduction to Building Information Modelling (BIM)

Conceptual Design:
1. Engineering design philosophies: Introduction to processes and people within a civil engineering design project. Concepts of Serviceability and Ultimate limit states. Characteristic and design actions and material strengths, partial safety factors. Engineering disaster case studies.
2. Actions on structures: Introduction to the use of Structural Eurocodes for determination of actions on structures, including permanent, imposed and snow loading and appropriate application of actions to structural elements. Consideration of load combinations for critical loading at limit states, calculation of characteristic and design values of loading to structural elements. Introduction to methodologies for appraisal of build options in the context of the sustainability (eg BREEAM, carbon calculation tools).
3. Introduction to structural forms: Introduction to the engineering aesthetics, beams, columns, trusses, frames and bracing. Reading structures i.e. understanding how a structure works.
4. Reinforced Concrete conceptual design and preliminary sizing to Eurocodes
5. Steel conceptual design and preliminary sizing to Eurocodes
6. Masonry conceptual design and preliminary sizing to Eurocodes
7. Timber conceptual design and preliminary sizing to Eurocodes

Structural analysis practice:
1. Load carrying actions of a structure;
2. Types, characteristics and symbols of supports;
3. Determinate and Indeterminate Structures; External and internal indeterminacy;
4. Equations of equilibrium; Calculation of reactions of determinant truss and frame;
5. Calculation of internal forces of a truss using method of joint and method of section;
6. Calculation of shear force and bending moment at a particular position of a frame or continuous beam; Sketch shear force & bending moment diagrams for frames and continuous beams; Principle of superposition.

Intended Learning Outcomes: Accreditation Outcomes (AHEP)

- Apply the concept of Limit State Design which underlies the Eurocodes methodology and undertake the preliminary design of steel beams and columns, concrete beams and slabs, timber beams and loadbearing masonry walls.
- Evaluate actions on structures including understanding of load paths through multistorey structures, with some simple structural analysis (shear force and bending moment diagrams (EA1b)
- Appreciate sustainability issues especially with respect to advantages and disadvantages of different structural materials (steel, reinforced concrete, timber, masonry) and structural forms (beams, columns, frames, trusses, bracing), including critiquing of possible design options
- Have an understanding of, and ability to work in, different roles within an engineering team
- Have an understanding of what BIM is and how it impacts on design and construction

- Make basic planning and initial design decisions by utilising knowledge of materials, safety, environment, construction and risk (EL4, EL6)
- Communicate planning and design decisions by production of engineering calculations, sketches and formal drawings, creation of 2D and 3D geometry computer models (D6)
- Understand and evaluate business, customer and user needs, including considerations such as the wider engineering context, public perception and aesthetics (D1)
- Communicate their work to technical and non-technical audiences (D6)
- 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)
- Understanding of, and the ability to apply, an integrated or systems approach to solving engineering problems (EA4)
- Understanding of the requirement for engineering activities to promote sustainable development and ability to apply quantitative techniques where appropriate (EL4)
- Apply their skills in problem solving, communication, information retrieval, working with others and the effective use of general IT facilities - (G1)
- Plan self-learning and improve performance, as the foundation for lifelong learning/CPD (G2)
- Plan and carry out a personal programme of work, adjusting where appropriate (G3b)
- Understanding of the use of technical literature and other information sources (P4)
- Understanding of appropriate codes of practice and industry standards (P6)

Assessment: Assignment 1 (30%)
Assignment 2 (35%)
Assignment 3 (35%)

Assessment Description: Assignment 1 Graphical Communication - 30% of the 30 credit module:

1. Class test 1 (Individual, online multiple choice): Orthogonal projections, perspective and isometric views. (5%)
2. Class test 2: (Individual, in-person class test) Freehand sketching; Basic technical drawing principles. (5%)
3. Assignment 1: (Individual coursework assignment) AutoCAD technical civil engineering drawings. (10%)
4. Assignment 2: (Group coursework assignment) 3D Revit modelling exercise. (10%) - note this component will be directly related to and submitted alongside a group conceptual design & analysis coursework in TB2 - 10% Graphical Communication (Revit) component

Assignment 2 Structural Analysis Practice - 35% of the 30 credit module:
Individual online test 1 (exam conditions): Reactions (no associated %) but PASS/FAIL criterion i.e. must be passed to pass the course
Individual online test 2 (exam conditions): Trusses 7%
Individual online test 3 (exam conditions): Bending moments 8%
Group coursework assignment: 20% Structural Analysis Practice component

Assignment 3 Conceptual Design - 35% of the 30 credit module:
Individual online test 1 (exam conditions): Concrete 7%
Individual online test 2 (exam conditions): Steel 8%
Individual online test 3 (exam conditions): Timber & Masonry (no associated %) but PASS/FAIL criterion i.e. must be passed to pass the course
Group coursework assignment: 20% Conceptual Design component

Specific rules for passing this module:
Each module topic (Graphical communication, Structural Analysis Practice, Conceptual Design) must be passed individually in order to pass this module. The assessment components associated with each topic are detailed above. This module does not have a final examination.

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

Assessment Feedback: Individual feedback will be given on all submitted coursework either via direct oral feedback or written feedback information. Examination feedback will be provided using the Faculty of Science and Engineering feedback form available on the College Community page on Canvas, with general information provided on examination performance in each question, statistics on overall class performance.

Failure Redemption: Failure redemption of failed module components (Graphical Communication, Structural Analysis Practice, Conceptual Design) is by 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.

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. Students will be continuously assessed over TB1 and TB2.

EG-166 Engineering Mechanics (Aero & Civil)

Credits: 10 Session: 2022/23 September-January

Pre-requisite Modules:

Co-requisite Modules:

Lecturer(s): Dr S Jiffri

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 (synchronous) online sessions and pre-recorded (asynchronous) online material.

Delivery Method: This module will employ a blended approach to delivery using the Canvas Digital Learning Platform for live and self-directed online activity.

Module is Lecture and Examples class based.
A blend of live (synchronous) and pre-recorded (asynchronous) online delivery is envisaged.
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: Examination 1 (80%)
Class Test 1 - Coursework (10%)
Class Test 2 - Coursework (10%)
Resit Assessment: Examination (Resit instrument) (100%)

Assessment Description: 20% from two online tests (10% each) administered via Canvas at the middle and towards the end of semester 1, and 80% from an in-person January examination.

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: Generic feedback on the online tests will be provided, following the tests. The feedback for the final examination will be through the College 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: 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.

EGA117 Fluid Mechanics I

Credits: 10 Session: 2022/23 January-June

Pre-requisite Modules:

Co-requisite Modules:

Lecturer(s): Prof DE Reeve, Prof HU Karunarathna

Format: Lectures and examples 33h
Laboratory classes 4h
Directed private study 38hr
Preparation for assessment 23hr

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

Theoretical part (worth 60% of total marks): Campus based lectures.

Practical part (worth 40% of total marks): Laboratory sessions.

Module Aims: The module provides an introduction to the methods that can be employed by engineers for the analysis of basic problems involving stationary and flowing fluids. The module contains a theoretical part (delivered in lectures) and a practical component (comprising a set of laboratory experiments). The practical part aims to consolidate the understanding of fluid mechanics in civil engineering.

Module Content: THEORETICAL PART:

Introduction to Fluid Mechanics. Basic characteristics of fluids. Hydrostatic pressure and its measurement [3h]

Forces exerted by a fluid at rest on both planar and curved submerged surfaces [9h]

Conservation of mass, energy and momentum in a moving fluid and applications [9h]

Laminar and turbulent flow in pipes. Moody chart and the Colebrook correlation. Pipeline systems [9h]

Revision [3h]

LABORATORY WORK:

Impact of jets;

Venturi tube;

Discharge over weirs;

Hydrostatic pressure observation;

Intended Learning Outcomes: Technical Outcomes
By the end of the module, the student should be able to:
• Determine how to calculate hydrostatic forces on both planar and curved surfaces (assessed by assignment and written examination).
• Identify the nature of viscosity and its role in the creation of shear forces (assessed by assignment and examination).
• Identify the application of and distinguish between the fundamental conservation principles of mass, energy and momentum to fluid mechanics (assessed by assignment and written examination).
• Distinguish between different classes of pipe flow and produce solutions to problems involving simple pipe systems with major and minor losses due to friction (assessed by written examination).
• Conduct practical fluid laboratory exercises (assessed by written report).
• Use relevant laboratory equipment and interpret the results of laboratory experiments (assessed by laboratory reports).

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)
- Understanding of engineering principles and the ability to apply them to analyse key engineering processes (EA1b)
- Understanding of contexts in which engineering knowledge can be applied (for example operations and management, application and development of technology, etc.) (P1)
- Apply their skills in problem solving, communication, information retrieval, working with others and the effective use of general IT facilities (G1)

Assessment: Laboratory work (20%)
Laboratory work (20%)
Examination (60%)
Resit Assessment: Examination (Resit instrument) (100%)

Assessment Description: Examination. This CLOSED BOOK examination will test understanding of all the material presented in the course. Adhering to the University Examination Guidelines, an appropriate calculator may be used. It is a requirement to pass the examination component to pass this module.

This module is assessed by a combination of examination and laboratory work. In order for the laboratory work 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 laboratory work, you may still fail the module, depending on the marks achieved, so it is important to do the laboratory work.

Laboratory work: These are individual laboratory reports based on the practical work carried out in practical classes.

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

Assessment Feedback:
Electronic feedback for Assignments within 3 weeks of the deadline for Assignment completion.
Electronic feedback on the class examination performance following the relevant Examination Board meetings in June.

Failure Redemption: A supplementary written examination will be set which will form 100% of the 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.

This module is assessed by a combination of examination and laboratory report. In order for the laboratory report 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

Notes:
1. Supplementary assessment for the practical component of the module is not available in August.
2. Attendance to practical classes is compulsory and will be strictly monitored. Failure to attend a practical class according to the published schedule will result in a zero mark being recorded for assessment components relating to that class.
3. Penalty for late submission of continual assessment assignments and reports: normally assigned zero mark.
4. All laboratory work must be completed and handed in as specified by the lecturer.