Swansea University
Prifysgol Abertawe

FACULTY OF SCIENCE AND ENGINEERING

UNDERGRADUATE STUDENT HANDBOOK

YEAR 3 (FHEQ LEVEL 6)

APPLIED MATHEMATICS

DEGREE PROGRAMMES

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

DISCLAIMER

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

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

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

The 23-24 academic year begins on 25 September 2023

Full term dates can be found here

DATES OF 23-24 TERMS
25 September 2023 – 15 December 2023
8 January 2024 – 22 March 2024
15 April 2024 – 07 June 2024

SEMESTER 1
25 September 2023 – 29 January 2024
SEMESTER 2
29 January 2024 – 07 June 2024
SUMMER
10 June 2024 – 20 September 2024

IMPORTANT

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

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

Please ensure that you read the University webpages covering the topic – procedural guidance here and further information here. You should also read the Faculty Part One handbook fully, in particular the pages that concern Academic Misconduct/Academic Integrity.

Welcome to the Faculty of Science and Engineering!

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

At Swansea University and in the Faculty of Science and Engineering, we believe in working in partnership with students. We work hard to break down barriers and value the contribution of everyone.

Our goal is an inclusive community where everyone is respected, and everyone's contributions are valued. Always feel free to talk to academic, technical and administrative staff, administrators - I'm sure you will find many friendly helping hands ready to assist you. And make the most of living and working alongside your fellow students.

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

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

Faculty of Science and Engineering	
Pro-Vice-Chancellor and Executive Dean	Professor David Smith
Director of Faculty Operations	Mrs Ruth Bunting
Associate Dean – Student Learning and Experience (SLE)	Professor Laura Roberts
School of Mathematics and Computer Science	
Head of School	Professor Elaine Crooks
School Education Lead	Dr Neal Harman
Head of Mathematics	Professor Vitaly Moroz
Mathematics Programme Director	Dr Kristian Evans
Year Coordinators	Year 0 – Dr Zeev Sobol Year 1 – Dr Nelly Villamizar Year 2 – Professor Chenggui Yuan Year 3 – Professor Grigory Garkusha Year 4 – Professor Grigory Garkusha MSc – Dr Guo Liu

STUDENT SUPPORT

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

Standard Reception opening hours are Monday-Friday 8.30am-4pm.

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

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

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

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

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

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

READING LISTS

Reading lists for each module are available on the course Canvas page and are also accessible via http://ifindreading.swan.ac.uk/. We've removed reading lists from the 23-24 handbooks to ensure that you have access to the most up-to-date versions. We do not expect you to purchase textbooks, unless it is a specified key text for the course.

THE DIFFERENCE BETWEEN COMPULSORY AND CORE MODULES

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

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

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

Year 3 (FHEQ Level 6) 2023/24
Applied Mathematics
BSc Applied Mathematics[G120]
BSc Applied Mathematics with a Year Abroad[G121]
BSc Applied Mathematics with a Year in Industry[G122]

Coordinator: Prof G Garkusha

Compulsory Modules

Semester 1 Modules	Semester 2 Modules
	MA-312 **Higher Algebra** **15 Credits** **Dr NY Villamizar**
	MA-331 **Numerical Analysis** **15 Credits** **Dr V Giunta**
Total 120 Credits	

Optional Modules

Choose exactly 15 credits
MAWXXX modules are for students who wish to study part of their course through the medium of Welsh.

MA-301	Complex Analysis	Dr K Evans	TB1	15
MAW301	Dadansoddi Cymhlyg	Dr K Evans	TB1	15

And
Choose exactly 30 credits
MAWXXX modules are for students who wish to study part of their course through the medium of Welsh.

MA-300	Project	Prof G Garkusha	TB1+2	30
MAW300	Prosiect	Prof G Garkusha	TB1+2	30

And
Choose a maximum of 30 credits
Subject to pre-requisite requirements.

MA-324	Differential Geometry	Dr I Rodionova	TB2	15
MA-325	Applied Algebra: Coding Theory	Prof T Brzezinski	TB1	15
MA-358	Financial Mathematics in Discrete Time	Dr I Rodionova	TB1	15
MA-395	Teaching Mathematics via a School Placement	Dr S Lyakhova	TB2	15

And
Choose a minimum of 15 credits
Students must take at least 15 credits from the following Applied Mathematics modules. Subject to pre-requisite requirements.

MA-308	Machine Learning	Prof B Lucini	TB2	15
MA-311	Partial Differential Equations	Prof E Lytvynov/Prof E Lytvynov	TB1	15
MA-345	Cashflows and Interest Rates	Dr G Liu	TB1	15
MA-346	Assurance and annuity	Dr G Liu	TB2	15
MA-359	Financial Mathematics in Continuous Time	Prof E Lytvynov	TB2	15
MA-364	Markov Processes and Applications	Prof C Yuan	TB1	15
MA-365	Risk and Survival Models	Dr DL Finkelshtein	TB2	15
MA-371	Biomathematics	Prof GG Powathil	TB1	15

MA-300 Project

Credits: 30 Session: 2023/24 September-June

Pre-requisite Modules: MA-201; MA-202; MA-211; MA-212

Co-requisite Modules:

Lecturer(s): Prof G Garkusha

Format: 10 lecture, 4 supervision

Delivery Method: Primarily on Campus

Module Aims: This module provides the opportunity to explore a mathematical topic and learn new subjects without instruction, but under the supervision of a member of staff.

Module Content: Researching a mathematical topic, planning a large project, presentation skills, enhancing employability, mathematical writing, structuring a long report, use of IT in oral and written presentation

Intended Learning Outcomes: At the end of this module students should be able to:
1) Search the literature effectively, and synthesize different sources,
2) Plan a project, and exercise time-management skills,
3) Prepare and delivery written reports and oral presentations,
4) Make effective use of IT in all of the above.

Assessment:
Project (10%)
Presentation (10%)
Report (70%)
Presentation 2 (10%)

Assessment Description: Project plan: A project preparation document.
Presentation 1: A digital-slide or whiteboard based presentation.
Report: A written report, submitted at the stated deadline near the end of Teaching Block 2.
Presentation 2: A digital-slide based presentation near the end of Teaching Block 2.

Moderation approach to main assessment: Universal Non-Blind Double Marking of the whole cohort

Assessment Feedback: Lecturer feedback

Failure Redemption: Redemption of failure is not possible for this module (for finalists).

Additional Notes:
Each student is to write a report on a specific mathematical topic, under the supervision of a member of staff. A list of areas within mathematics will be circulated at the start of the year. Students must select two areas that they are interested in. These selections will then be used to allocate each student a supervisor with the aim of ensuring that everyone can complete a project in one of the areas that they have selected. Once a supervisor has been allocated, students will have a first meeting at which there will be a discussion about the project in the chosen area. A title and outline for the project is agreed, and supervisors will provide some initial reading that must be completed.

There will be a number of mandatory lectures throughout the year; a schedule for these will be distributed in the first teaching week. These classes will provide full details about what students are expected to do, how to research and write the project, and how the supervision will function.

There are four assessment components. The exact deadlines for each component will be announced in the first teaching week of the year, and also published on Canvas; the time-frame given here is merely indicative, and should not be taken as definitive.

1) Project Preparation Form. The Project Preparation form is to be completed during the first part of Teaching Block 1, and submitted electronically. This component counts for 10% of the final mark.

2) Presentation. Near the start of Teaching Block 2, the student will give a presentation to their supervisor and a small group of students, based on the work done so far. The presentation should be of 10 minutes in length. This component counts for 10% of the final mark. Questions may be asked following the presentation, but these will not affect the mark.

3) Project Report. The main written project must be word-processed, preferably in TeX or LaTeX. Submission of this written report takes place over two deadlines. The first deadline will be early in the second semester. At this point you are required to submit at least 4 pages of your project, although you can choose to submit more. This first submission is to be made electronically, and we will provide feedback on your work submitted at this stage, including your referencing. You can then use this feedback in revising and extending your work, before submitting the final version by the second deadline, which will take place before the Easter vacation. This final version should be a comprehensive, self-contained report on the chosen topic, of 7,000-8,000 words in length. This should be submitted electronically. The project report counts for 70% of the final mark. It is important to note that a final submission can only be made if at least 4 pages have been submitted for the first deadline. If you fail to meet this first deadline then you will be awarded a mark of 0% for the report component no matter what you submit for the second deadline.

4) Presentation. At the end of Teaching Block 2, the student will give a presentation to a group of students and staff on their completed project. The presentation should be of 15 minutes in length. The component counts for 10% of the final mark. Questions may be asked following the presentation, but these will not affect the mark.

Failure to give either presentation will result in an overall mark of zero for the module.

MA-301 Complex Analysis

Credits: 15 Session: 2023/24 September-January

Pre-requisite Modules: MA-201; MA-202; MA-211; MA-212

Co-requisite Modules:

Lecturer(s): Dr K Evans

Format: 44

Delivery Method: Primarily on campus

Module Aims: The module approaches the theory of complex analytic functions; including concepts of Cauchy-Riemann equations, power series, Laurent series and residue calculus.

Module Content: Complex differentiability, the Cauchy-Riemann equations, holomorphic functions.
Power series. Functions defined by power series. The exponential and trigonometric functions; their definition and fundamental properties.
Paths in the complex plane, the length of a path. Contour integration. Fundamental theorem of contour integration. Cauchy's Theorem. Cauchy's integral formulas.
Taylor theorem. Cauchy estimates. Liouville's Theorem, the Fundamental Theorem of Algebra.
Laurent's Theorem and Laurent series. Isolated singularities. Removable singularities, poles, essential singularities. The Residue Theorem. Residue calculus, evaluation of definite integrals.

Intended Learning Outcomes: At the end of this module students should be able to:
1) understand the concept of a holomorphic function and apply the Cauchy-Riemann equations;
2) define the complex exponential and trigonometric functions and prove their basic properties;
3) manipulate power series, express a holomorphic function as a power series;
4) understand the residue calculus and calculate residues;
5) evaluate contour integrals using the Residue Theorem;
6) understand Laurent's Theorem and its applications.

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

Assessment Description: Component 1 is a written, closed-book examination at the end of the module. Component 2 is formed of a number of coursework assignments during the semester.

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

Assessment Feedback: For the homework assignments, students will receive feedback in the form of marks, model solutions, overall feedback on the cohort performance, and some individual comments on their work.
For the exam, students will receive feedback in the form of marks and overall feedback on the cohort performance. Further, individualised feedback, can be provided upon request.

Failure Redemption: Supplementary examination.

Additional Notes: Delivery of the teaching will be on-campus. Continuous assessment submission will be online.

Available to visiting and exchange students

MA-308 Machine Learning

Credits: 15 Session: 2023/24 January-June

Pre-requisite Modules:

Co-requisite Modules:

Lecturer(s): Prof B Lucini

Format: 44 hours consisting of a mixture of lectures and computer lab classes

Delivery Method: Lectures supported by regular computer lab sessions.

Module Aims: The module introduces basic concepts of machine learning and some of its popular methods in a practical manner from a mathematical perspective.

Module Content: 1. Introduction to Machine Learning – Machine learning: methods and terminology; classification and regression problems; binary classification; categorical and continuous variables; the general process of a machine learning analysis: data collection, feature design, choice of model, model training, model validation; types of learning: supervised, unsupervised, reinforcement.
2. Optimisation for Machine Learning – Cost function and its optimisation; zeroth-order optimisation methods: grid search, random and coordinate search; the curse of dimensionality; first-order methods: gradient descent, batch gradient descent, stochastic gradient descent; ADAM acceleration; hyperparameters in Machine Learning.
3. Linear regression – Linear regression as a machine learning problem; the mean square cost function; the absolute deviation cost function.
4. Classification – Two-class classification; classification methods in machine learning: logistic regression, perceptron, and support vector machine; introduction to multi-class classification and the k-Nearest-Neighbour (kNN) classifier.
5. Robustness metrics – Model error on new data; training error and generalisation gap; bias, variance and their trade-off; k-fold cross-validation; the VC dimension; additional tools for evaluating the performance of binary classifiers: classification errors, confusion matrix, precision, recall, F1-score, ROC curve and Area Under the Curve (AUC).
6. Unsupervised linear learning – Linear autoencoders; Principal Component Analysis; k-Means Clustering.
7. Principles of non-linear learning – Non-linear regression; non-linear classification.
8. Regularisation – Ridge regression (L2 regularisation); lasso regression (L1 regularisation).
9. Tree-based learners – Introductions to trees; from stumps to regression trees; classification trees; random forests.
10. Introduction to deep learning – From the perceptron to fully connected neural networks (FCNN); FCNN architectures; activation functions; the computation graph; automatic differentiation; backward propagation.

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

1) Explain conceptually why machine learning is feasible.
2) Explain the fundamental mathematical ideas behind the standard approaches to machine learning.
3) Apply methods of machine learning to data sets using appropriate programming languages.
4) Analyse the strengths and weaknesses of different approaches to machine learning.
5) Determine appropriate methods to apply to given data sets.

Assessment:	Examination (60%)
	Coursework 1 (10%)
	Coursework 2 (10%)
	Coursework 3 (20%)
Resit Assessment:	Examination (Resit instrument) (100%)

Assessment Description: Examination: A closed book examination to take place at the end of the module.
Courseworks 1-3: This coursework will develop skills in problem solving, applying techniques to real world problems and understanding the use of computers to investigate problems.

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

Assessment Feedback: For the homework assignments, students will receive feedback in the form of marks, model solutions, overall feedback on the cohort performance, and some individual comments on their work.
For the exam, students will receive feedback in the form of marks and overall feedback on the cohort performance. Further, individualised feedback, can be provided upon request.

Failure Redemption: Supplementary examination.

Additional Notes: Delivery of teaching will be on-campus. Continuous assessment will be submitted online.

Available to visiting and exchange students.

MA-311 Partial Differential Equations

Credits: 15 Session: 2023/24 September-January

Pre-requisite Modules:

Co-requisite Modules:

Lecturer(s): Prof E Lytvynov, Prof E Lytvynov

Format: 44

Delivery Method: Primarily on campus

Module Aims: This course provides an introduction to the theory of partial differential equations form an analytical perspective.

Module Content: Basic results on linear and quasilinear first order equations.
Method of characteristics. Formation of singularities.
Characterisation of second order equations in two independent variables.
The wave equation. Solvability of the Cauchy problem with boundary conditions.
Fourier series expansions and separation of variables.
The heat equation. Basic properties the Gauss kernel.
The Laplace equation and Newton potentials.
Harmonic functions. Maximum principle. Green function of the ball.

Intended Learning Outcomes: At the end of the module the student should be able to:
1) discuss basic properties of first order equations and hyperbolic conservation laws.
2) Apply the method of characteristics to simple first order equations;
3) understand the behaviour of solutions of the one-dimensional wave equation and the Cauchy problem;
4) explain the fundamental properties of harmonic functions and Newtonian potentials;
5) identify the types of second order linear differential operators.

Assessment: Examination (80%)
Assignment 1 (20%)

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

Assessment Description: Component 1 is a written, closed-book examination at the end of the module.
Component 2 is formed of a number of coursework assignments during the semester.

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

Assessment Feedback: Lecturer Comments

Failure Redemption: Resit Examination.

Additional Notes: Available to visiting and exchange students

MA-312 Higher Algebra

Credits: 15 Session: 2023/24 January-June

Pre-requisite Modules:

Co-requisite Modules:

Lecturer(s): Dr NY Villamizar

Format: 44

Delivery Method: Primarily on campus

Module Aims: This course approaches the theory of groups, rings and modules as abstract algebraic objects.
The course also introduces categories as a language and unifying force in modern mathematics.

Module Content: Review of group theory. Definition of rings and maps of rings. Ideals, quotient rings. Domains, fields. Examples: integers, polynomials, matrices. Definition of modules and module homomorphisms. Generators, submodules and quotient modules. Irreducible modules. Direct sums and free modules. Bases of free modules, matrices. Short exact sequences. Projective modules. Modern uses of projective modules in (non-commutative) geometry and theoretical physics. Modules with additional properties and modules over special rings.
Finite abelian groups and their decompositions. Elementary divisors and invariant factors. Torsion free abelian groups. Free generators and unimodular matrices. Classification of finitely generated abelian groups.
Categories. Definition and motivation: categories as a language and unifying force in modern mathematics. Categories of modules.

Intended Learning Outcomes: At the end of this module students should be able to:
recognise the differences between groups;
construct proofs of abstract results;
characterise all finite abelian groups;
determine the structure of all groups of small order;

Assessment: Examination (80%)
Coursework 1 (6%)
Coursework 2 (7%)
Coursework 3 (7%)
Resit Assessment: Examination (Resit instrument) (100%)

Assessment Description: Examination: A closed book examination to take place at the end of the module.
Courseworks 1-3: This coursework will develop students' skills in problem solving, and developing and writing logical arguments.

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

Assessment Feedback: For the homework assignments, students will receive feedback in the form of marks, model solutions, overall feedback on the cohort performance, and some individual comments on their work.
For the exam, students will receive feedback in the form of marks and overall feedback on the cohort performance. Further, individualised feedback, can be provided upon request.

Failure Redemption: Supplementary examination.

Additional Notes: Delivery of teaching will be on-campus. Continuous assessment will be submitted online.

Available to visiting and exchange students

MA-324 Differential Geometry

Credits: 15 Session: 2023/24 January-June

Pre-requisite Modules:

Co-requisite Modules:

Lecturer(s): Dr I Rodionova

Format: 44

Delivery Method: Primarily on campus

Module Aims: An introduction to differential geometry

Module Content:
- Parametric curves in the plane and in space;
- The Frenet formulae;
- The fundamental theorem of the local theory of curves;
- Some global considerations for plane curves: rotation index, regular surfaces in space;
- Tangent bundle and normal line bundle of a smooth surface;
- First and second fundamental form and applications;
- Curvature
- Special surfaces (for example surfaces of rotation)
- The idea of a differential manifold

Intended Learning Outcomes: 1) Utilize the Frenet formulae
2) Comprehend the concepts of plane curves and tangent bundles
3) Understand the idea of a differentiable manifold

Assessment:	Examination (80%)
	Coursework 1 (6%)
	Coursework 2 (7%)
	Coursework 3 (7%)
Resit Assessment:	Examination (Resit instrument) (100%)

Assessment Description: Examination: A closed book examination to take place at the end of the module.
Courseworks 1-3: This coursework will develop students' skills in problem solving, and developing and writing logical arguments.

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

Assessment Feedback: Lecturer feedback

Failure Redemption: Resit examination

Additional Notes: Available to visiting and exchange students

MA-325 Applied Algebra: Coding Theory

Credits: 15 Session: 2023/24 September-January

Pre-requisite Modules:

Co-requisite Modules:

Lecturer(s): Prof T Brzezinski

Format: 44

Delivery Method: Primarily on campus.

Module Aims: This module is an introduction to modern algebraic coding theory.

Module Content: Error detection and correction.
Reed-Solomon codes.
Finite fields: construction and uniqueness.
The Hamming metric, Sphere-Packing Bounds.
Linear Codes, Reed-Muller code.
Syndrome decoding and Hamming codes.
Classification of cyclic codes.
Golay and BCH codes.
Public key cryptography.

Intended Learning Outcomes: At the end of the module the student should be able to:
1) understand key concepts of error detection and correction;
2) state and prove the basic properties of linear codes;
3) state and prove a variety of bounds on the size and capacity of codes;
4) understand the construction and properties of various families of codes;
5) understand the construction and properties of cyclic codes;
6) understand the construction and classification of finite fields, and their applications in coding theory;
7) understand the basic concepts of, and mathematics underlying, cryptography

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

Assessment Description: Component 1 is a written, closed-book examination at the end of the module.
Component 2 is formed of a number of coursework assignments during the semester.

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

Assessment Feedback: For the homework assignments, students will receive feedback in the form of marks, model solutions, overall feedback on the cohort performance, and some individual comments on their work.
For the exam, students will receive feedback in the form of marks and overall feedback on the cohort performance. Further, individualised feedback, can be provided upon request.

Failure Redemption: Supplementary examination.

Additional Notes: Available to visiting and exchange students

MA-331 Numerical Analysis

Credits: 15 Session: 2023/24 January-June

Pre-requisite Modules:

Co-requisite Modules:

Lecturer(s): Dr V Giunta

Format: 44

Delivery Method: Primarily on Campus

Module Aims: This module develops material on numerical methods from a somewhat more sophisticated standpoint. The techniques developed take the cost of computation into account, an important consideration even with immense computational capability available on modern laptop computers.

Module Content: - systems of linear equations; Gaussian elimination, pivoting strategies, PLU decompositions, residuals and error correction, iterative methods.

- eigenvalues and eigenvectors; Gerschgorin theorems, power methods (PM/IPM/SIPM), Rayleigh quotient method, Householder transformation, Hessenberg form, QR decomposition, QR iteration.

- numerical integration; Adams-Bashforth methods, Monte-Carlo methods

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

1) solve large linear systems in an efficient manner
2) compute to specified accuracy and guarantee error bounds
3) calculate eigenvalues and eigenvectors quickly for large matrices
4) approximate integrals by choosing appropriate quadrature methods

Assessment:	Examination (80%)
	Coursework 1 (6%)
	Coursework 2 (7%)
	Coursework 3 (7%)
Resit Assessment:	Examination (Resit instrument) (100%)

Assessment Description: Examination: A closed book examination to take place at the end of the module.
Courseworks 1-3: This coursework will develop students' skills in problem solving, and developing and writing logical arguments.

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

Assessment Feedback: Lecturer Feedback

Failure Redemption: Resit Examination

Additional Notes: Available to visiting and exchange students

MA-345 Cashflows and Interest Rates

Credits: 15 Session: 2023/24 September-January

Pre-requisite Modules:

Co-requisite Modules:

Lecturer(s): Dr G Liu

Format: There will be weekly delivery, each week having 3 lectures and 1 examples class.

Delivery Method: The module will be delivered on bay Campus, with a traditional mix of lectures and example classes underpinned with weekly assessments of a formative/summative mix.

Module Aims: This module will introduce students to sections 1, 2 and 3 of the Institute and Faculty of Actuaries CM1 syllabus. This module covers a detailed analysis of cashflows and interest rates with actuarial applications.

Module Content: i) Data Analysis

ii) Actuarial Modelling

iii) Generalised Cashflows

iv) Interest Rates

v) Present and Accumulated values

vi) Interest Functions

vii) Term Structures

viii) Equation of Value and applications

ix) Project Appraisal

Intended Learning Outcomes: After completion of the module, the student should be able to;

choose an appropriate actuarial model and apply it in a real world situation,

demonstrate a deep understanding of generalised cashflow models and their use,

apply their knowledge of interest rates and the interest functions in a range of settings,

employ the equation of value as a means to solve problems.

Assessment: Examination (80%)
Coursework 1 (20%)

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

Assessment Description: Component 1 is a written, closed-book examination at the end of the module.

Component 2 is formed of a number of coursework assignments during the semester.

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

Assessment Feedback: For the homework assignments, students will receive feedback in the form of marks, model solutions, overall
feedback on the cohort performance, and some individual comments on their work.

For the exam, students will receive feedback in the form of marks and overall feedback on the cohort performance.

Further, individualised feedback, can be provided upon request.

Failure Redemption: Supplementary examination.

Additional Notes: Available to visiting and exchange students.

MA-346 Assurance and annuity

Credits: 15 Session: 2023/24 January-June

Pre-requisite Modules:

Co-requisite Modules: MA-345

Lecturer(s): Dr G Liu

Format: There be weekly delivery, with each week have 3 lectures and 1 examples class.

Delivery Method: The module will be delivered on Bay Campus, with a traditional mix of lectures and example classes underpinned
with weekly assessments of a formative/summative mix.

Module Aims: This module will introduce students to sections 4, 5 and 6 of the Institute and Faculty of Actuaries CM1 syllabus.
This module covers the actuarial pricing structure of life assurance and annuity contracts, including a variety of payment and premium structures as well as two-life policies.

Module Content: i) Assurance and annuity contracts

ii) Payments – means and variances

iii) Two life policies

iv) Multiple transitions

v) Multiple decrements

vi) Future loss

vii) Gross premiums and reserves

viii) Death strains

ix) Future cashflows

Intended Learning Outcomes: After completion of the module, the student should be able to;

define assurance and annuity contracts,

demonstrate a detailed understanding of the operation of with-profits contracts,

elucidate upon the differences between assurance and annuity contracts,

value cashflows contingent upon the nature of transitions,

calculate gross premiums and reserves for assurance and annuity contracts,

project future cashflows for a variety of typical contracts.

Assessment:	Examination (80%)
	Coursework 1 (6%)
	Coursework 2 (7%)
	Coursework 3 (7%)
Resit Assessment:	Examination (Resit instrument) (100%)

Assessment Description: Examination: A closed book examination to take place at the end of the module.
Courseworks 1-3: This coursework will develop skills in problem solving, applying techniques to real world problems and understanding the use of computers to investigate problems.

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

Assessment Feedback: For the homework assignments, students will receive feedback in the form of marks, model solutions, overall feedback on the cohort performance, and some individual comments on their work. For the exam, students will receive feedback in the form of marks and overall feedback on the cohort performance. Further, individualised feedback, can be provided upon request.
Failure Redemption: Supplementary Examination.
Additional Notes: Available to visiting and exchange students.

MA-358 Financial Mathematics in Discrete Time

Credits: 15 Session: 2023/24 September-January

Pre-requisite Modules: MA-252

Co-requisite Modules:

Lecturer(s): Dr I Rodionova

Format: There be weekly delivery, with each week have 3 lectures and 1 examples class.

Delivery Method: The module will be delivered on Bay Campus, with a traditional mix of lectures and example classes underpinned
with weekly assessments of a formative/summative mix.

Module Aims: This module will introduce students to section 6 of the Institute and Faculty of Actuaries (IFoA) CM2 syllabus.

This module serves as an introduction to the theory of martingales and their applications to a discrete-time dynamics of a financial market containing a bank account and several kinds of stocks. Special attention is paid to the applications of the theory of martingales to the absence of arbitrage in a discrete-time financial market and pricing and hedging of the options.

Module Content: - A first encounter with stochastic processes, filtration, the natural filtration of a stochastic process;
- Conditional expectation;
- Martingales, including submartingales and supermartingales;
- Stopping times and hitting times, optional sampling, optional stopping;
- Discrete time financial market, self-financing trading strategies;
- Discounted price processes, equivalent martingale measures and arbitrage opportunities;
- Contingent claim, European, American and Asian options, valuation and hedging, complete and incomplete markets;
- The binomial (Cox-Ross-Rubinstein) model;
- The Black-Scholes discrete-time pricing formula.

Intended Learning Outcomes: At the end of this module students should be able to:
1) Demonstrate a comprehensive knowledge of the theory of martingales;
2) Be able to apply the optional stopping theorem to practical examples;
3) Demonstrate an understanding the main concepts of discrete-time models of financial markets;
4) Be able to apply the theory of martingales to study of financial markets;
5) Demonstrate a comprehensive knowledge of the binomial model.

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

Assessment Description: Component 1 is a written, closed-book examination at the end of the module.
Component 2 is formed of a number of coursework assignments during the semester.

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

Assessment Feedback: For the homework assignments, students will receive feedback in the form of marks, model solutions, overall feedback on the cohort performance, and some individual comments on their work.
For the exam, students will receive feedback in the form of marks and overall feedback on the cohort performance.
Further, individualised feedback, can be provided upon request.

Failure Redemption: Supplementary Examination.

Additional Notes: Available to visiting and exchange students

MA-359 Financial Mathematics in Continuous Time

Credits: 15 Session: 2023/24 January-June

Pre-requisite Modules:

Co-requisite Modules: MA-358; MA-364

Lecturer(s): Prof E Lytvynov

Format: There be weekly delivery, with each week have 3 lectures and 1 examples class.

Delivery Method: The module will be delivered on Bay Campus, with a traditional mix of lectures and example classes underpinned
with weekly assessments of a formative/summative mix.

Module Aims: This module will introduce students to sections 3, 4 and 6 of the Institute and Faculty of Actuaries CM2 syllabus.

This module serves as an introduction to the Black-Scholes model for the continuous-time dynamics of a financial market containing a bank account and several kinds of stocks. This theory is based on stochastic (Itô) calculus for Brownian motion. Special attention is paid to the applications of stochastic calculus to the absence of arbitrage in a financial market and pricing and hedging of the options.

Module Content: - Introduction to Brownian motion;
- Stochastic integral with respect to Brownian motion;
- Itô process and Itô formula;
- Product rule for Itô processes (integration by parts formula);
- Stochastic differential equations;
- Models of a financial market in continuous time;
- European call and put options, American call and put options;
- Put-call parity and other model-independent results;
- Self-financing trading strategies;
- Equivalent martingale measures and arbitrage opportunities;
- Attainability and completeness;
- Pricing and hedging of an option;
- The Black-Scholes pricing formulas for European call and put options;
- The Black-Scholes partial deferential equation;
- Dividend-paying stocks;
- The Garman-Kohlhagen pricing formulas;

Intended Learning Outcomes: At the end of this module students should be able to:
1) Systematically work with the Itô stochastic integral with respect to Brownian motion;
2) Demonstrate an understanding of Itô's formula and be able to apply it for the purposes in financial mathematics;
3) Demonstrate an understanding of the main notions related to financial markets in continuous time;
4) Demonstrate understanding of the completeness of a financial market, hedging and pricing of attainable options with the help of the equivalent martingale measures;
5) Be able to derive the Black-Scholes partial differential equation by using stochastic calculus.

Assessment:	Examination (80%)
	Coursework 1 (6%)
	Coursework 2 (7%)
	Coursework 3 (7%)
Resit Assessment:	Examination (Resit instrument) (100%)

Assessment Description: Examination: A closed book examination to take place at the end of the module.
Courseworks 1-3: This coursework will develop students' skills in problem solving, and developing and writing logical arguments.

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

Assessment Feedback: For the homework assignments, students will receive feedback in the form of marks, model solutions, overall feedback on the cohort performance, and some individual comments on their work.
For the exam, students will receive feedback in the form of marks and overall feedback on the cohort performance.
Further, individualised feedback, can be provided upon request.

Failure Redemption: Supplementary Examination.

Additional Notes: Available to visiting and exchange students

MA-364 Markov Processes and Applications

Credits: 15 Session: 2023/24 September-January

Pre-requisite Modules: MA-252

Co-requisite Modules:

Lecturer(s): Prof C Yuan

Format: There be weekly delivery, with each week have 3 lectures and 1 examples class.

Delivery Method: The module will be delivered on Bay Campus, with a traditional mix of lectures and example classes underpinned with weekly assessments of a formative/summative mix.

Module Aims: The module will introduce students to section 3 of the Institute and Faculty of Actuaries CS2 syllabus.
This module serves as an introduction to the theory of Markov processes, in both discrete and continuous times. A special attention is drawn to the theory of Markov chains and Markov jump processes (including the Poisson process) and their applications.

Module Content: - Stochastic processes, filtration, conditional expectation, independence.
- Stochastic process with prescribed finite-dimensional distributions.
- Kolmogorov's existence theorem.
- Markov semigroups of kernels.
- Markov processes.
- Markov chains.
- Poisson process.
- Markov jump process.
- Brownian motion, continuity of paths.

Intended Learning Outcomes: At the end of this module students should be able to:
1) demonstrate a comprehensive knowledge of the theory of stochastic processes, in particular, Markov processes;
2) demonstrate understanding of Kolmogorov's construction of stochastic processes;
3) design and employ Markov chain models;
4) derive and use Kolmogorov’s differential equations for Markov processes;
5) demonstrate knowledge of the construction and basic properties of Brownian motion and Poisson processes.

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

Assessment Description: Component 1 is a written, closed-book examination at the end of the module.
Component 2 is formed of a number of coursework assignments during the semester.

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

Assessment Feedback: For the homework assignments, students will receive feedback in the form of marks, model solutions, overall feedback on the cohort performance, and some individual comments on their work.
For the exam, students will receive feedback in the form of marks and overall feedback on the cohort performance.
Further, individualised feedback, can be provided upon request.

Failure Redemption: Supplementary Examination.

Additional Notes: Available to visiting and exchange students

MA-365 Risk and Survival Models

Credits: 15 Session: 2023/24 January-June

Pre-requisite Modules:

Co-requisite Modules: MA-364

Lecturer(s): Dr DL Finkelshtein

Format: There be weekly delivery, with each week have 3 lectures and 1 lab/examples class.

Delivery Method: The module will be delivered on Bay Campus, with a traditional mix of lectures and lab/example classes underpinned with weekly assessments of a formative/summative mix.

Module Aims: This module will introduce students to sections 1, 2 and 4 of the Institute and Faculty of Actuaries CS2 syllabus.

The module covers insurance risk modelling based on loss and compound distributions, time series and their applications, survival models and the estimations of their distributions and transition intensities, and future mortality projection.

Module Content: - Loss distributions
- Compound distributions
- Risk modelling
- Copulas
- Extreme value
- Concepts of time series
- Applications of time series
- Survival models
- Estimation of lifetime distributions
- Maximum likelihood estimation
- Estimation of transition intensities
- Graduation
- Mortality projection

Intended Learning Outcomes: Learning Outcomes:
At the end of this module students should be able to:
- fit statistical distributions to datasets and calculate the goodness of fit,
- demonstrate a comprehensive understanding of copulas (both Gaussian and Archimedean),
- explain the central concepts and properties of time series (AR, MA, ARMA, ARIMA),
- develop appropriate deterministic forecasts from time series data,
- describe and apply a two-state model, in the case of a single decrement,
- describe and apply the Cox model for proportional hazards,
- derive maximum (partial) likelihood estimates for various quantities,
- calculate graduation estimates of transition intensities (or probabilities) and specify their properties.

Assessment:	Examination (70%)
	Coursework 1 (6%)
	Coursework 2 (7%)
	Coursework 3 (7%)
	Laboratory work (10%)
Resit Assessment:	Examination (Resit instrument) (100%)

Assessment Description: Examination: A closed book examination to take place at the end of the module.
Coursework 1-3: This coursework will develop skills in problem solving, applying techniques to real world problems and understanding the use of computers to investigate problems.
Lab Assessment: Computing based controlled assessment to assess skills in the use of computers to investigate and analyse real world problems.

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

Assessment Feedback: For the homework assignments, students will receive feedback in the form of marks, model solutions, overall feedback on the cohort performance, and some individual comments on their work. For the lab test, students will receive feedback in the form of marks, model solutions, overall feedback on the cohort performance, and some individual comments on their work. For the exam, students will receive feedback in the form of marks and overall feedback on the cohort performance. Further, individualised feedback, can be provided upon request.
Failure Redemption: Supplementary Examination.
Additional Notes: Available to visiting and exchange students

MA-371 Biomathematics

Credits: 15 Session: 2023/24 September-January

Pre-requisite Modules:

Co-requisite Modules:

Lecturer(s): Prof GG Powathil

Format: 44

Delivery Method: Primarily on campus

Module Aims: Mathematical biology has become a vast research area, spanning many sub-fields from mathematical ecology to systems biology and medicine. Building on introductory biomathematical and modelling modules, this module gives further insights into mathematical modelling applied to the biomedical problems, with no previous knowledge of biology assumed. The focus is on modelling biological phenomena (incorporating temporal or/and spatial effects) and applying mathematical and numerical techniques to solve the model problems, which largely comprise systems of ordinary and partial differential equations.

Module Content: Revision with biochemical reaction modelling mass action kinetics, equilibrium, Michaelis-Menten kinetics and quasi-steady-state analysis.
Modelling metabolic networks and pathways (Metabolic networks, Stoichiometric network analysis, modelling signalling pathways etc)
Modelling biological oscillators (FitzHugh–Nagumo model)
Modelling biological problems using partial differential equation (introduction, derivation of reaction-diffusion equation, role of diffusion, convection, and attraction, travelling waves)
Pattern formation in biological systems (Turing instability, activator-inhibitor systems, examples)
Modelling tumour growth (basic model, treatments)

Intended Learning Outcomes: At the end of the module, the student should be able to:

• Systematically translate a biological problem into a mathematical model.
• Critically analyse the role of parameters and their effects on model behaviour.
• Systematically select and apply an appropriate solution technique for a given mathematical model.
• Demonstrate the knowledge of numerical methods to investigate model behaviour.
• Critically analyse models in terms of their steady-states and pseudo-steady-states.
• Demonstrate an understanding of models for population growth, biochemical reactions, pattern formation and tumour growth.
• Understand the role of partial differential equation in modelling biological systems.

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

Assessment Description: Examination: is a written, closed-book examination at the end of the module.
Coursework 1: is formed of a number of coursework assignments during the semester along with participation in the module during the semester. The assignments will help the students to develop skills in developing mathematical models for biological problems. It will also test the student's ability to analyse and solve the models using various analytical and numerical methods and to interpret the solutions biologically.

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

Assessment Feedback: For the homework assignments, students will receive feedback in the form of marks, model solutions, overall feedback on the cohort performance, and some individual comments on their work.
For the exam, students will receive feedback in the form of marks and overall feedback on the cohort performance. Further, individualised feedback, can be provided upon request.

Failure Redemption: Supplementary examination.

Additional Notes: Available to visiting and exchange students

MA-395 Teaching Mathematics via a School Placement

Credits: 15 Session: 2023/24 January-June

Pre-requisite Modules:

Co-requisite Modules:

Lecturer(s): Dr S Lyakhova

Format: 1 day preparatory training on campus.

8 half days on placement

Delivery Method: 1 day preparatory training on campus

8 half days on placement in a local school under supervision of an approved teacher-mentor (see attached proposal for further details)

Module Aims: This module is for students with an interest in entering teaching, and involves a weekly placement in a local school under the mentorship of a mathematics teacher. The student will engage both in observation and in various teaching activities. The module will be assessed on the basis of the mentor's report, on written project work and a final presentation.

Module Content: No formal syllabus - students will have an introductory training day to provide basic information
and practical advice. Students will then spend 8 half-days in schools under the supervison of a teacher-mentor, first mainly observing, and then progressing to small-scale teaching activities.

Intended Learning Outcomes: After completing this module, students will have:
First-hand experience of teaching in a secondary-school environment.
Demonstrated the interpersonal and improvisational skills necessary to work in a secondary-school environment.
Demonstrated ability to confidently present to an audience.
Demonstrated ability to interact with and educate secondary-school age children in a pedagogical environment.

Assessment: Placements (100%)

Assessment Description: (a) written assessment by teacher mentor (20%)
(b) continuous assessment based on student log of activities within schools (20%)
(c) assignment (preparation of learning materials) (40%)
(d) 15 minute presentation (20%)

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

Assessment Feedback: Cover sheets for continuous assessment.

Failure Redemption: resubmission of project work

Additional Notes: Not available to visiting and exchange students.

Requires an enhanced Criminal Records Bureau check.

Students cannot go on a placement at their former school.

MAW300 Prosiect
Credits: 30 Session: 2023/24 September-June
Pre-requisite Modules:
Co-requisite Modules:
Lecturer(s): Prof G Garkusha
Format: 10 lectures 4 supervision
Delivery Method: Primarily on Campus
Module Aims: This module provides the opportunity to explore a mathematical topic and learn new subjects without instruction, but under the supervision of a member of staff
Module Content: Researching a mathematical topic, planning a large project, presentation skills, enhancing employability, mathematical writing, structuring a long report, use of IT in oral and written presentation
Intended Learning Outcomes: At the end of this module students should be able to: 1) Search the literature effectively, and synthesize different sources, 2) Plan a project, and exercise time-management skills, 3) Prepare and delivery written reports and oral presentations, 4) Make effective use of IT in all of the above.
Assessment: Project Planning Statement (10%) Presentation (10%) Report (70%) Presentation 2 (10%)
Assessment Description: Project planning statement: A project preparation document. Presentation 1: A digital-slide or whiteboard based presentation. Report: A written report, submitted at the stated deadline near the end of Teaching Block 2. Presentation 2: A digital-slide based presentation near the end of Teaching Block 2.
Moderation approach to main assessment: Universal Double Blind Marking of the whole cohort
Assessment Feedback: Lecturer feedback
Failure Redemption: Redemption of failure is not possible for this module (for finalists).

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

Each student is to write a report on a specific mathematical topic, under the supervision of a member of staff. A list of areas within mathematics will be circulated at the start of the year. Students must select two areas that they are interested in. These selections will then be used to allocate each student a supervisor with the aim of ensuring that everyone can complete a project in one of the areas that they have selected. Once a supervisor has been allocated, students will have a first meeting at which there will be a discussion about the project in the chosen area. A title and outline for the project is agreed, and supervisors will provide some initial reading that must be completed.

There will be a number of mandatory lectures throughout the year; a schedule for these will be distributed in the first teaching week. These classes will provide full details about what students are expected to do, how to research and write the project, and how the supervision will function.

There are four assessment components. The exact deadlines for each component will be announced in the first teaching week of the year, and also published on Canvas; the time-frame given here is merely indicative, and should not be taken as definitive.

1) Project Preparation Form. The Project Preparation form is to be completed during the first part of Teaching Block 1, and submitted electronically. This component counts for 10% of the final mark.

2) Presentation. Near the start of Teaching Block 2, the student will give a presentation to their supervisor and a small group of students, based on the work done so far. The presentation should be of 10 minutes in length. This component counts for 10% of the final mark. Questions may be asked following the presentation, but these will not affect the mark.

3) Project Report. The main written project must be word-processed, preferably in TeX or LaTeX. Submission of this written report takes place over two deadlines. The first deadline will be early in the second semester. At this point you are required to submit at least 4 pages of your project, although you can choose to submit more. This first submission is to be made electronically, and we will provide feedback on your work submitted at this stage, including your referencing. You can then use this feedback in revising and extending your work, before submitting the final version by the second deadline, which will take place before the Easter vacation. This final version should be a comprehensive, self-contained report on the chosen topic, of 7,000-8,000 words in length. This should be submitted electronically. The project report counts for 70% of the final mark. It is important to note that a final submission can only be made if at least 4 pages have been submitted for the first deadline. If you fail to meet this first deadline then you will be awarded a mark of 0% for the report component no matter what you submit for the second deadline.

4) Presentation. At the end of Teaching Block 2, the student will give a presentation to a group of students and staff on their completed project. The presentation should be of 15 minutes in length. The component counts for 10% of the final mark. Questions may be asked following the presentation, but these will not affect the mark.

Failure to give either presentation will result in an overall mark of zero for the module.

MAW301 Dadansoddi Cymhlyg

Credits: 15 Session: 2023/24 September-January

Pre-requisite Modules:

Co-requisite Modules:

Lecturer(s): Dr K Evans

Format: 44

Delivery Method: All programmes will employ a blended approach to delivery using the Canvas digital learning platform.

Module Aims: Mae'r modiwl hwn yn ystyried y theori o ffwythiannau analytig cymhlyg; gan gynnwys cysyniadau o hafaliadau Cauchy-Riemann, cyfresi pwer, cyfresi Laurent a chalcwlws gweddill.

Module Content: Differu cymhlyg, yr hafaliadau Cauchy-Riemann, ffwythiannau holomorffig.

Cyfresi pwer. Ffwythiannau wedi'u diffinio gan gyfresi pwer. Y ffwythiannau esbonyddol a thrigonometrig; eu diffiniadau a phriodweddau sylfaenol.

Llwybrau yn y pl^an cymhlyg, hyd llwybr.

Integru amlin. Theorem sylfaenol integru amlin. Fformiwlarau integrol Cauchy.

Theorem Taylor. Amcangyfrifon Cauchy. Theorem Liouville, theroem syfaenol algebra.

Theorem Laurent a chyfresi Laurent. Hynodion unig. Hynodion symudadwy, pegynau, hynodion hanfodol. Theorem gweddill. Calcwlws gweddill, enrhifo integrynnau pendant.

Seroau o ffwythiannau holomorffig. Egwyddor yr arg a theorem Rouch.

Priodweddau cydffurf o ffwythiannau holomorffig. Ffwythiannau cyfnod dwbl, integrynnau elliptig.

Intended Learning Outcomes: Ar ddiwedd y modiwl hwn dylai myfyrwyr fod ar gallu i:

1) ddeall y cysyniad o ffwythiant holomorffig a defnyddio'r hafaliadau Cauchy-Riemann;
2) ddiffinio ffwythiannau trigonometrig ac esbonyddol cymhlyg a phrofi eu priodweddau sylfaenol;
3) drin cyfresi pwer, mynegi ffwythiant holomorffig fel cyfres pwer;
4) ddeall calcwlws gweddill a chyfrif gweddillion;
5) gyfrif integrynnau amlin gan ddefnyddio'r theorem gweddill;
6) ddeall theorem Laurent a'i chymwysiadau.

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

Assessment Description: Examination: An open book online examination at the end of the module.
Assignment 1: formed of a number of coursework assignments during the semester.

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

Assessment Feedback: Ar gyfer yr aseiniadau gwaith cartref, bydd myfyrwyr yn derbyn adborth ar ffurf marciau, atebion model, adborth cyffredinol ar y perfformiad garfan, ac mae rhai sylwadau unigol ar eu gwaith.
Ar gyfer yr arholiad, bydd myfyrwyr yn derbyn adborth ar ffurf marciau ac adborth cyffredinol ar y perfformiad garfan. Ymhellach, adborth unigol, gellir ei ddarparu ar gais.

Failure Redemption: Arholiad atodol.

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

Ar gael i fyfyrwyr ar ymweliad