Swansea University
Prifysgol Abertawe

FACULTY OF SCIENCE AND ENGINEERING

UNDERGRADUATE STUDENT HANDBOOK

YEAR 1 (FHEQ LEVEL 4)

MATHEMATICS AND COMPUTER SCIENCE

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 26 September 2022

Full term dates can be found here

DATES OF 22-23 TERMS

26 September 2022 – 16 December 2022

9 January 2023 – 31 March 2023

24 April 2023 – 09 June 2023

SEMESTER 1

26 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 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 Noemi Picco Year 2 – Professor Jiang-Lun Wu Year 3 – Dr Grigory Garkusha Year 4/MSc – Professor Chenggui Yuan

STUDENT SUPPORT

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

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

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

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

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

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

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

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

READING LISTS

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

THE DIFFERENCE BETWEEN COMPULSORY AND CORE MODULES

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

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

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

Year 1 (FHEQ Level 4) 2022/23
Mathematics and Computer Science

BSc Mathematics and Computer Science[GS08,GS10]
BSc Mathematics and Computer Science with a Year Abroad[GS14]
BSc Mathematics and Computer Science with a Year in Industry[GS12]

Coordinator: Dr N Picco

Compulsory Modules

Semester 1 Modules	Semester 2 Modules
CS-110 **Programming 1** **15 Credits** **Dr NA Harman**	**CS-115** **Programming 2** **15 Credits** **Dr TK Astarte/Dr DW Archambault**
CS-150 **Concepts of Computer Science** **15 Credits** **Dr JE Blanck/Dr M Edwards**	**MA-102** **Introduction to Analysis 2** **15 Credits** **Prof ECM Crooks** **CORE**
MA-101 **Introduction to Analysis 1** **15 Credits** **Prof ECM Crooks** **CORE**	**MA-112** **Introductory Linear Algebra** **15 Credits** **Dr G Garkusha** **CORE**
MA-111 **Foundations of Algebra** **15 Credits** **Dr EJ Beggs** **CORE**	
Total 120 Credits	

Optional Modules

Choose exactly 15 credits

CS-135	Professional Issues 2: Software Development	Prof M Roggenbach/Dr H Nguyen	TB2	15
MA-182	Introduction to Biomathematics	Dr N Picco	TB2	15
MA-192	Probability and Statistics	Prof C Yuan	TB2	15

CS-110 Programming 1

Credits: 15 Session: 2022/23 September-January

Pre-requisite Modules:

Co-requisite Modules:

Lecturer(s): Dr NA Harman

Format: 30 (10 lectures, 20 laboratory)

Delivery Method: On-campus/virtual lectures and lab sessions.

Module Aims: This module teaches students the fundamentals of programming in Java. Students will learn to develop and debug simple programs using basic programming concepts (assignments, if statements, loops, methods); data types (scalars, arrays, arraylists); and basic object-oriented programming concepts (objects and classes). They will also learn to write programs to a professional standard - programs that both work and are accessible and maintainable by other professional programmers. The module will place less emphasis on traditional lectures - there be one per week - and instead (a) more time will be spent in laboratories gaining hand-on experience; and (b) material will be available both in the form of extensive written notes and short screen capture videos, explaining and demonstrating tools, concepts and their applications.

Module Content: What is a program? Examples of programming languages.
Introduction to Programming in Java.
The Java programming environment and tools for writing Java programs.
Declaring and Using Variables and Assignments.
Primitive data types, arithmetical operations, precedence and expressions.
Input/Output: Input from Keyboard; Output to Screen; Checking input for correctness and security.
Decisions: principles of decision-making and conditional statements in programming, if statements, if-else statement, switches, comparing numbers and strings.
Iteration: principles of loop structures and termination/continuation conditions in programming, for loops, while loops and do loops, nested loops.
Collection Data Types: Arrays and Arraylists.
Common algorithms on arrays.
Program design techniques, modularisation and methods, parameters and parameter passing.
Object Oriented Programming: basic principles and design, classes and objects.
Principles and good practice for program engineering: structure, documentation, security, readability, coding conventions and standards, maintenance, testing (this theme will run through the module).

Intended Learning Outcomes: - Students will be able to design programs to solve specific problems based on procedural programming concepts, and the object oriented programming concepts of classes, objects, methods and encapsulation.
- Students will be able to write and debug programs to solve specific problems based on procedural programming concepts, and the object oriented programming concepts of classes, objects, methods and encapsulation.
- Students will be able to write programs that meet professional standards in terms of readability and the programming conventions of Java.
- Students will be able to read and describe the function of straightforward programs based on procedural programming concepts, and the object oriented programming concepts of classes, objects, methods and encapsulation written by others.

Assessment: Examination 1 (40%)
Coursework 1 (15%)
Coursework 2 (15%)
Laboratory work (20%)
Class Test 2 - Held under exam conditions (10%)

Resit Assessment: Coursework reassessment instrument (100%)

Assessment Description: Examination - Multiple Choice
Coursework 1 - Practical programming assignment (basic programming) - end of Week 7.
Coursework 2 - Practical programming assignment (classes and objects) - middle of Week 12
Guided and Supported Laboratory Sessions - submit nine assessed tasks (one each in Weeks 3 to 11)
Online in-class programming test to be taken in University computer laboratory.

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

Assessment Feedback: Outline solutions provided along with analytical individual feedback for coursework's. Examination feedback summarising strengths and weaknesses of the class. Individual feedback on submissions from lecturer and/or demonstrators in laboratory sessions.
Failure Redemption: Resit examination and/or resubmit coursework(s) as appropriate.
Additional Notes: Updated July 2022. Available to visiting and exchange students.

CS-115 Programming 2

Credits: 15 Session: 2022/23 January-June

Pre-requisite Modules:

Co-requisite Modules: CS-110

Lecturer(s): Dr TK Astarte, Dr DW Archambault

Format: 40 (20 lectures, 20 laboratories)

Delivery Method: On-campus/virtual lectures and lab sessions.

Module Aims: This module is a continuation of the module CS-110 Programming 1. In it, students will continue to enhance their skills in programming, as well as gain a basic understanding of algorithms and data structures.

Module Content: Objects and Classes.
Instance Methods and Fields.
Static Methods and Fields.
Object oriented programming and design techniques.
Encapsulation: Public and Private Methods, Public and Private Fields.
Basic inheritance: Sub-classes and Overriding.
Introduction to algorithms - searching and sorting.
Simple complexity analysis, introduction to data structures.

Intended Learning Outcomes: Students will be able to develop substantial programs to solve specific problems based on algorithms using standard data structures.
Students will have an awareness of efficiency considerations for different algorithms.
Students will be able to read and debug substantial programs written by others.

Assessment: Examination 1 (70%)
Coursework 1 (10%)
Coursework 2 (10%)
Laboratory work (10%)

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

Assessment Description: Standard Computer Science format unseen examination, duration 2hrs.
Coursework 1 - Practical programming assignment.
Coursework 2 - Practical programming assignment.
Laboratory Exercises.

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

Assessment Feedback: Outline solutions provided along with group and individual analytical feedback for courseworks.
Examination feedback summarising strengths and weaknesses of the class.
Individual feedback on submissions from lecturer and/or demonstrators in laboratory sessions.

Failure Redemption: Resit examination and/or resubmit coursework(s) as appropriate.

Additional Notes:

Updated July 2019. Available to visiting and exchange students

CS-135 Professional Issues 2: Software Development

Credits: 15 Session: 2022/23 January-June

Pre-requisite Modules:

Co-requisite Modules:

Lecturer(s): Prof M Roggenbach, Dr H Nguyen

Format: 40 hours (20 hours lectures, 20 hours laboratory sessions)

Delivery Method: On-campus/virtual lectures and lab sessions.

Module Aims: The aim of this module is to give an understanding of fundamental software engineering tools, testing and design methods that are used to create reliable software. A number of state-of-the-art development environments will be shown, with hands-on experimentation and use of test systems. Students will also be given a sound grasp of the use of these systems in the different professional software engineering processes used in the software industry. Innovative software engineering methods such as Extreme Programming will be introduced and learnt in hands-on laboratory work.

Module Content: Introduction to Integrated Development Environments (IDEs).
The Software Engineering Process.
Software Engineering Strategies.
Agile Programming/Extreme Programming.
Program debugging tools and debugging strategies.
Basic unit testing and tools for unit testing.

Intended Learning Outcomes: An understanding of the methods for developing reliable software. A sound knowledge of current tools and methods for developing and testing software to ensure its reliability and to pinpoint known errors. Students will be able to explain the operation and testing of a simple computer program.

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

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

Assessment Description: Standard Computer Science format unseen examination, duration 2hrs.
Assessed practical coursework x 2.
Supervised and assessed laboratory sessions.

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

Assessment Feedback: Outline solutions provided along with group and individual analytical feedback for courseworks.
Examination feedback summarising strengths and weaknesses of the class.
Individual feedback on submissions from lecturer and/or demonstrators in laboratory sessions.

Failure Redemption: Resit examination and/or resubmit coursework(s) as appropriate.

Additional Notes:

Updated July 2014. Available to visiting and exchange students

CS-150 Concepts of Computer Science

Credits: 15 Session: 2022/23 September-January

Pre-requisite Modules:

Co-requisite Modules:

Lecturer(s): Dr JE Blanck, Dr M Edwards

Format: 2 lectures, 1 tutorial/lecture, 1 lab per week.

Delivery Method: Delivery
On-campus/virtual lectures and lab sessions.
Contact Hours
30 hours lectures and tutorials; 10 hours lab classes

Module Aims: This module gives an overview of some of the main principles underlying computers and computing from both a theoretical and an applied point of view.

Following a brief history of computers and software an introduction to the representation of data and the basic components of a computer will be given. Students will be introduced to the principles of programming at assembly language level. Further topics include simple algorithm analysis, operating systems, file systems, computer networks, and the world wide web. A brief discussion on the limitations of computing is also given.

The module is accessible and relevant to students of all disciplines who wish to learn about, or reinforce their understanding of, computers and computer science

Module Content: Brief history of computers and software
Binary values and number systems
Data representation
Logic, gates and circuits
Computing components
Low level programming
Operating system concepts
Operating system shells and command line interfaces
Programming paradigms
Limitations of computing
Searching, Sorting, and algorithm efficiency
Computer networks and the world wide web

Intended Learning Outcomes: Students will:
- gain an appreciation of the scope and limitations of computer science and its applications;
- have a clear understanding of how software and hardware interact in a computer system;
- be fully aware of the principles behind modern computer architecture;
- be able to express simple programming constructs in assembly language;
- be fully aware of the principles behind modern operating systems, file systems and networks;
- understand the relationship between networks and the world wide web;
- be aware of the limitations of computing.

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

Assessment Description: Standard Computer Science format unseen examination, duration 2hrs
Assessed coursework - two problem sheets/online quizzes

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

Assessment Feedback: Outline solutions provided along with group and individual analytical feedback for courseworks.
Examination feedback summarising strengths and weaknesses of the class.
Individual feedback on submissions from lecturer and/or demonstrators in laboratory sessions.

Failure Redemption: Resit examination

Additional Notes: Updated July 2022. Available to visiting and exchange students.

MA-101 Introduction to Analysis 1

Credits: 15 Session: 2022/23 September-January

Pre-requisite Modules:

Co-requisite Modules: MA-111

Lecturer(s): Prof ECM Crooks

Format: 33 hours: This will be a mixture of sessions which may include for example lectures, quizzes, exercises.

11 hours: In Person Interactive Small Group Sessions. This will be an examples class. If it is not possible to deliver these sessions in person then they will take place as Live Online Teaching.

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

Module Aims: The module introduces basic concepts such as sets, functions, completeness, sequences and series.

Module Content: • sets, basic properties and set operations
• examples of sets of numbers: natural numbers, integers, rational numbers, real numbers
• arithmetic and ordering properties of real numbers
• the absolute value, inequalities, intervals
• mathematical induction
• functions (domain, co-domain, range), examples including polynomials, rational functions
• injective, surjective, bijective functions, composition of functions, inverse functions
• upper and lower bounds of subsets of real numbers, infimum and supremum
• completeness of the real numbers, Archimedean property
• sequences of real numbers, limits of sequences
• algebra and ordering of limits of sequences
• monotone sequences, recursively-defined sequences
• Cauchy sequences, subsequences, Bolzano-Weierstrass
• series, convergence of series, examples of convergent and divergent series
• absolute convergence of series
• comparison, ratio, root, alternating and integral tests for series convergence

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

1) explain basic set theory
2) give a formally correct proof
3) use the concept of mathematical induction
4) determine properties of functions such as injectivity, surjectivity, bijectivity
5) discuss the completeness of the real numbers
6) identify well-known sequences and series
7) apply various techniques to determine whether or not sequences and series converge

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

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

Assessment Description: Examination: A closed book examination to take place at the end of the module.
Assignment 1: formed of a number of coursework assignments along with participation in the module during the semester. The assignments will develop student's skills in problem solving, and developing and writing logical arguments.

Moderation approach to main assessment: Universal second marking 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-102 Introduction to Analysis 2

Credits: 15 Session: 2022/23 January-June

Pre-requisite Modules:

Co-requisite Modules: MA-101; MA-111

Lecturer(s): Prof ECM Crooks

Format: 33 hours: This will be a mixture of sessions which may include for example lectures, quizzes, exercises.

11 hours: In Person Interactive Small Group Sessions. This will be an examples class. If it is not possible to deliver these sessions in person then they will take place as Live Online Teaching.

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

Module Aims: The module introduces fundamental concepts such as limits, continuity, differentiability and integrability.

Module Content: • open and closed subsets of real numbers
• limits for real-valued functions, properties of limits
• continuous functions, examples and properties of continuous functions
• Intermediate Value Theorem
• continuous functions on closed bounded intervals
• uniform continuity
• derivatives, basic properties of derivatives
• Rolle's Theorem, Mean Value Theorem
• local extreme values of functions
• L'Hopital's rules
• exponential, trigonometric and hyperbolic functions
• partition of an interval, lower and upper Riemann sums
• Riemann integral
• inequalities and Mean Value Theorem for integrals
• fundamental theorem of calculus
• improper integrals

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

1) use the definition of limit to prove results about the limits of real-valued functions
2) outline properties of continuous and differentiable functions
3) use properties of the derivative to investigate the behaviour of functions
4) sketch the graphs of the exponential, trigonometric and hyperbolic functions
5) determine whether or not functions are Riemann integrable

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

Assessment Description: Examination: A closed book examination to take place at the end of the module.
Assignment 1: formed of a number of coursework assignments along with participation in the module during the semester. The assignments will develop student's skills in problem solving, and developing and writing logical arguments.

Moderation approach to main assessment: Universal second marking 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-111 Foundations of Algebra

Credits: 15 Session: 2022/23 September-January

Pre-requisite Modules:

Co-requisite Modules: MA-101

Lecturer(s): Dr EJ Beggs

Format: 44

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

Module Aims: An introduction to logic and algebraic structures. The course covers the basics of logic, proof and algebraic manipulation before introducing the abstract algebra of groups, rings and fields.

Module Content: Logic: statements, connectives, truth tables, quantifiers, what does it mean 'to prove'.
Binary operations on sets: commutative, associative operations, manipulations with brackets.
Introduction to groups and group homomorphisms, symmetric group, integers modulo n
Introduction to rings and ring homomorphisms, integers, rationals.
Introduction to fields, rationals and reals.
Polynomials, polynomial division, roots, irreducibility.
Complex numbers, roots, algebraically closed fields.
Matrices, 2 by 2 determinants.

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

1) explain and apply the basic principles of logic, proof and algebraic manipulation,
2) define groups, rings and fields and describe their basic properties,
3) solve basic algebraic problems in concrete and abstract situations,
4) apply appropriate techniques of algebraic manipulation to a given situation,
5) recognise patterns underlying a variety of algebraic situations,
6) work with and explain the need for complex numbers,
7) state the fundamental theorem of algebra.

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

Assessment Description: Examination: A closed book examination to take place at the end of the module.
Assignment 1: formed of a number of coursework assignments along with participation in the module during the semester. The assignments will develop student's skills in problem solving, and developing and writing logical arguments.

Moderation approach to main assessment: Universal second marking 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-112 Introductory Linear Algebra

Credits: 15 Session: 2022/23 January-June

Pre-requisite Modules:

Co-requisite Modules: MA-101; MA-111

Lecturer(s): Dr G Garkusha

Format: 44

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

Module Aims: An introduction to combinatorics, vectors, matrices and abstract vector spaces.

Module Content: Divisibility, Euclid algorithm for numbers and polynomials.
Relations and orders.
Combinatorics and the binomial theorem.
Countability, Russell's paradox.
Matrices and linear equations, Gauss elimination.
Determinants, PLU decomposition.
Introduction to vector spaces and linear transformations, subspaces, bases, matrix representation of linear transformations.

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

1) explain set orderings and the concept of countability,
2) apply basic combinatorial techniques,
3) calculate the greatest common divisor and otherwise manipulate the Euclidean algorithm,
4) define the concept of a vector space and subspace and give standard examples of vector spaces,
5) explain the relationships between vectors, matrices, vector spaces and linear transformations,
6) solve systems of linear equations using Gaussian elimination,
7) define the concepts of bases and coordinates in vector spaces and subspaces,

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

Assessment Description: Examination: A closed book examination to take place at the end of the module.
Assignment 1: formed of a number of coursework assignments along with participation in the module during the semester. The assignments will develop student's skills in problem solving, and developing and writing logical arguments.

Moderation approach to main assessment: Universal second marking 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-182 Introduction to Biomathematics

Credits: 15 Session: 2022/23 January-June

Pre-requisite Modules:

Co-requisite Modules: MA-181

Lecturer(s): Dr N Picco

Format: 44 hours of lectures, examples classes and PC labs

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

Mixture of lectures, examples classes and PC labs.

Module Aims: The module illustrates how mathematical modelling and simulation can be applied to problems from biology and medicine. It introduces students to models of population growth, interacting species and spread of infectious diseases, and develops appropriate techniques for model construction, analysis, solution and simulation.

Module Content: 1) Introduction to mathematical modelling in biology
2) Discrete and Continuous-time models for single species
3) Discrete-time models for interacting species using systems of difference equations (DEs).
4) Analytical and computational techniques for DEs: implementation in Matlab.
5) Continuous-time models for interacting species using systems of Ordinary Differential Equations (ODEs).
6) Computational methods to solve coupled systems of linear and non linear ODEs
7) Advanced applications in infectious disease modelling and cancer modelling

Intended Learning Outcomes: At the end of this module, students should be able to
1) Understand the role of mathematical modelling in biosciences
2) Translate biological problems into mathematical models
3) Know different types of modelling techniques
4) Interpret mathematical models describing non-linear dynamics of interacting species
5) Apply analytical approaches to mathematical models to learn how the system evolves in time. Translate an observed interaction into the appropriate term in an ODE model
6) Explain various applications of modelling and model building in different areas of biology
7) Select and implement an appropriate computational method to study a model

Assessment: Examination (70%)
Assignment 1 (20%)
Assignment 2 (10%)

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

Assessment Description: Examination: is a written, closed-book examination at the end of the module.
Assignment 1: is formed of a number of coursework assignments during the semester along with participation in the module during the semester. The assignments will develop skills in problem solving, mathematical modelling of the real world and the use of computers to simulate real world problems.
Assignment 2: is a computing test to be taken in controlled conditions at the end of the module to assess skills in the use of computers to investigate models of real world problems.

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

Assessment Feedback: For the coursework assignments and computing 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 exam in August.

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

Available to visiting and exchange students.

MA-192 Probability and Statistics

Credits: 15 Session: 2022/23 January-June

Pre-requisite Modules:

Co-requisite Modules:

Lecturer(s): Prof C Yuan

Format: 44 hours: Primarily lectures, additional support classes and lab classes

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

Lectures on campus

Module Aims: The module is an introductory course on applied statistics. It will cover a variety of statistical tests, criteria for choosing appropriate tests, and the use of statistical software in dealing with large data sets.

Module Content: This module will treat the following topics:

Basic probability;
Confidence intervals;
Hypothesis testing;
Regression;
Parametric techniques;
Statistical computing.

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

1) Use basic results in probability;
2) Construct confidence intervals;
3) Test hypotheses including the use of t-tests and ANOVA;
4) Choose correct statistical tests;
5) Use parametric techniques to treat data sets;
6) Use regression techniques;
6) Use statistical software to deal with large data sets.

Assessment: Examination (70%)
Assignment 1 (20%)
Assignment 2 (10%)

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

Assessment Description: Component 1 is a written closed book examination to take place at the end of the module. Component 2 is formed of a number of coursework assignments along with participation in classes during the semester. The assignments will develop skills in problem solving and applying techniques to real world problems. Component 3 is formed of a computing based controlled test to assess skills in the use of computers to investigate and analyse real world problems."

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

Assessment Feedback: For the coursework 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 exam

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

Available to visiting and exchange students