Swansea University
Prifysgol Abertawe

FACULTY OF SCIENCE AND ENGINEERING

UNDERGRADUATE STUDENT HANDBOOK

YEAR 2 (FHEQ LEVEL 5)

MATHEMATICS AND SPORTS SCIENCE

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/essential-

info-taught-students/your-programme-explained/

Year 2 (FHEQ Level 5) 2023/24
Mathematics and Sports Science
BSc Mathematics and Sports Science with a year in industry[GC18]

Coordinator: Prof C Yuan

Compulsory Modules

Semester 1 Modules	Semester 2 Modules
MA-201 **Multi-variable analysis** **15 Credits** **Prof V Moroz** **CORE**	**MA-202** **Metric spaces and measure theory** **15 Credits** **Prof V Moroz** **CORE**
MA-203 **Professional Development and Career Planning** **0 Credits** **Miss VV Wislocka/Miss VV Wislocka** **CORE**	**SR-254** **Technology and Innovation in Injury Mechanics** **15 Credits** **Dr EMP Williams**
SR-253 **Exercise Physiology** **15 Credits** **Prof MA Mcnarry/Dr M Waldron**	**SR-259** **Human Nutrition** **15 Credits** **Dr TD Love**
SR-258 **Biomechanical Technology, Measurement & Analysis** **15 Credits** **Prof NE Bezodis/Dr C Starbuck**	
Total 120 Credits	

Optional Modules
Choose exactly 30 credits
Subject to Pre-Requisite Requirements

MA-241	Differential Equations	Dr JB Macmillan	TB1	15
MA-243	Mathematical Modelling: Theory and Practice	Prof GG Powathil	TB2	15
MA-252	Probability Theory	Prof C Yuan/Prof E Lytvynov	TB1	15
MA-292	Statistical Data Analysis	Dr K Evans	TB2	15

Year 2 (FHEQ Level 5) 2023/24
Mathematics and Sports Science
BSc Mathematics and Sports Science[GC16]
BSc Mathematics and Sports Science with a Year Abroad[GC17]

Coordinator: Prof C Yuan

Compulsory Modules

Semester 1 Modules	Semester 2 Modules
MA-201 **Multi-variable analysis** **15 Credits** **Prof V Moroz** **CORE**	**MA-202** **Metric spaces and measure theory** **15 Credits** **Prof V Moroz** **CORE**
SR-253 **Exercise Physiology** **15 Credits** **Prof MA Mcnarry/Dr M Waldron**	**SR-254** **Technology and Innovation in Injury Mechanics** **15 Credits** **Dr EMP Williams**
SR-258 **Biomechanical Technology, Measurement & Analysis** **15 Credits** **Prof NE Bezodis/Dr C Starbuck**	**SR-259** **Human Nutrition** **15 Credits** **Dr TD Love**
Total 120 Credits	

Optional Modules

Choose exactly 30 credits
Subject to Pre-Requisite Requirements

MA-203	Professional Development and Career Planning	Miss VV Wislocka/Miss VV Wislocka	TB1	0
MA-241	Differential Equations	Dr JB Macmillan	TB1	15
MA-243	Mathematical Modelling: Theory and Practice	Prof GG Powathil	TB2	15
MA-252	Probability Theory	Prof C Yuan/Prof E Lytvynov	TB1	15
MA-292	Statistical Data Analysis	Dr K Evans	TB2	15

MA-201 Multi-variable analysis

Credits: 15 Session: 2023/24 September-January

Pre-requisite Modules: MA-101; MA-102; MA-111; MA-112

Co-requisite Modules:

Lecturer(s): Prof V Moroz

Format: 44

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

On campus

Module Aims: The module introduces fundamental concepts of the analysis in n-dimensional spaces such convergence, continuity, differentiability, integrability and elements of vector calculus.

Module Content: • The space R^n: inner product, norm, Schwarz inequality
• Topology of R^n: interior and boundary points, open and closed sets
• Sequences in R^n: convergence, sub-sequences, Cauchy sequences
• Sequential compactness, Heine-Borel theorem
• Functions: limits, continuity, preservation of compactness, maxima and minima
• Partial derivatives, directional derivative, Jacobi matrix
• Differentiation on R^n: definition, properties, chain rule
• Mean value theorem, implicit and inverse function theorems
• Optimization: gradient, Hessian, maxima and minima of functions on R^n
• Curves in R^n
• Iterated integrals, Fubini theorem
• Volume integrals, integrable sets, integrable functions
• Oriented line integral of a vector field
• Green’s theorem on the plane
• Conservative vector fields, area formula on the plane

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

1) understand basic concepts of topology, distinguish open and close sets in R^n
2) analyse convergence of sequences in R^n and continuity of multidimensional mappings
3) handle partial derivatives and Jacobians
4) discuss basic properties of differentiable functions of several variables
5) compute iterated and volume integrals
6) apply Green's theorem on the plane

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 abstract thinking, advanced problem solving, and developing complex 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-202 Metric spaces and measure theory

Credits: 15 Session: 2023/24 January-June

Pre-requisite Modules: MA-101; MA-102; MA-111; MA-112

Co-requisite Modules: MA-201

Lecturer(s): Prof V Moroz

Format: 44

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

On campus

Module Aims: The module extends ideas such as continuity and convergence to metric spaces and introduces key concepts in the general theory of measure and Lebesgue integration.

Module Content: • Metric spaces, topological notions (boundary, interior, open and closed set, closure)
• Convergence in metric spaces
• Cauchy sequences, complete metric spaces
• Compact metric spaces
• Connected metric spaces
• Continuous mappings on metric spaces
• Contraction mapping theorem
• Pointwise and uniform convergence
• The metric of uniform convergence
• Uniform convergence and continuity
• Series of functions, Weierstrass M-test, Taylor series
• Basic measure theory, measurable sets, relation to probability theory
• Measurable functions
• Lebesgue integral, basic properties
• Fatou theorem, monotone and dominated convergence
• L^p-spaces

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

1) demonstrate understanding of the basic concepts of metric spaces such as convergence, completeness, compactness and connectedness
2) identify contraction mappings
3) distinguish between pointwise and uniform convergence
4) investigate convergence of series of functions using the Weirstrass M-test
5) demonstrate understanding of the basic concepts of measure theory and its interaction with probability theory
6) compare the Lebesgue integral to the standard Riemann integral
7) recognise situations in which to use the monotone and dominated convergence theorem

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-203 Professional Development and Career Planning

Credits: 0 Session: 2023/24 September-January

Pre-requisite Modules:

Co-requisite Modules:

Lecturer(s): Miss VV Wislocka, Miss VV Wislocka

Format: 6 hours consisting of live lectures which will include guest lectures with employers, previous students. Face to face delivery.

Delivery Method: Delivery of teaching will be live, whilst assessments will be self-directed activities online.

Module Aims: This module is a mandatory module for all students who have enrolled (or transferred) onto the Science Industrial Placement Year but is also available to all other maths students. The module focuses on the underpinning and fundamental requisites required to gain, enter and progress through a successful career. Learners will be introduced to (a) sourcing placements, CV writing, and application techniques; (b) Interview techniques, how to pitch yourself and be successful; (c) workplace fundamentals and IP awareness, behaviors and expectations; and, (d) Key employability skills; getting the most from your job or Industrial Placement.

Module Content: How to find placements and the main sites to use,
Cv writing, CV do's and dont's
Writing a cover letter
Assessments centres, interview techniques and mock interviews
How to utilise LinkedIn for your placement search

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

1) Be aware of and possess the essential skills needed to secure placement opportunities; alongside having the skills to apply for relevant jobs and placements.

2) Have a general understanding of an interview process and what tools and attributes make a good interview.

3) Discuss and share what is expected within the workplace including behavioral and professional conduct.

4) Identify personal employability skills and how these will be used in a workplace setting.

5) Understand the need to reflect and maximise the placement experience in future career decisions.

Assessment: Participation Exercise (100%)

Assessment Description: These modules are delivered through online resources, scheduled Zoom sessions and 1-2-1 meetings. There is self-directed learning required using online resources provided. Students who do not attend and have no valid reason will not be permitted to continue on a Science Industrial Placement Year programme of study.

Moderation approach to main assessment: Not applicable

Assessment Feedback: N/A

However feedback on progress and the progression through the module will be provided in the one to one mandatory meeting, and via the quiz.

Failure Redemption: Successful completion of this module depends upon satisfactory attendance at, and engagement with, all sessions. Therefore there will normally be no opportunity to redeem failure. However, special provision will be made for students with extenuating or special circumstances.

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

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MA-241 Differential Equations

Credits: 15 Session: 2023/24 September-January

Pre-requisite Modules:

Co-requisite Modules:

Lecturer(s): Dr JB Macmillan

Format: Lectures and support classes

Delivery Method: Lectures, reinforced by support classes and regular formative/summative coursework assignments

Module Aims: This module is an elementary course on the theory and methods for ordinary differential equations (ODEs). It combines a rigorous approach to the existence and uniqueness of solutions with methods for finding explicit solutions to ODEs. Applications are discussed to concrete problems in Physics and Biology.

Module Content: This module focuses on ordinary differential equations (ODEs). It combines questions about existence, uniqueness and properties of solutions to ODEs with finding explicit solutions to linear and nonlinear ODEs.

1. Ordinary Differential Equations and real world problems
2. Lipschitz condition versus Differentiability
3. Existence and Uniqueness of solutions
4. The Cauchy Problem for higher order ODEs
5. Linear equations with constant coefficients
6. Linear equations with variable coefficients
7. Some elementary nonlinear ODEs
8. Boundary value problems
9. Solutions by infinite series
10. Qualitative properties of solutions - Sturm theorems

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

1) recognise standard forms of ODEs and find solutions
2) identify existence and uniqueness issues for ODEs
3) connect the theory of ODEs with related topics in Linear Algebra and Mathematical Analysis

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 develop skills in problem solving and constructing logically structured written 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, individualized 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-243 Mathematical Modelling: Theory and Practice

Credits: 15 Session: 2023/24 January-June

Pre-requisite Modules:

Co-requisite Modules: MA-241

Lecturer(s): Prof GG Powathil

Format: 22 Lectures, 11 PC labs, 11 modelling workshops

Delivery Method: Lectures, interactive modelling workshops and PC labs where there will be a focus on model formation and analysis.

Module Aims: This module focusses on developing mathematical models of real world problems. It considers how to create a model, how to simulate and analyse the model and how to use the model to answer questions about the world around us. It will consider a diverse selection of examples from a range of areas including biology, mechanics, medicine and physics. There will be weekly modelling workshops and PC labs in which students will actively create and analyse their own models. The module will culminate in a group project in which students will create, analyse and simulate a model of their own.

Module Content: The module will have a clear practical modelling focus and will be predominantly taught through examples taken from biology, mechanics, medicine and physics as well as other areas of science. Specific techniques and approaches covered will depend on the examples covered.

Revision of modelling: Modelling cycle, simple model examples, use of differential equations, use of MATLAB.
Differential Equations: Classification of differential equations - ordinary vs partial, linear vs non-linear, order, homogeneous vs non-homogeneous, boundary value problems, initial value problems; Identifying if an analytical or numerical approach is appropriate; Importance of the existence and uniqueness of solutions; Systems of equations; Phase portraits. (Other techniques as appropriate to the models studied).
Numerical methods: Use of MATLAB to simulate differential equations, revision of numerical methods, the Euler-Method for ODEs. (Other example methods as appropriate to the models studied.)

Intended Learning Outcomes: By the end of this module students should be able to:
1) Analyse a real world problem to extract essential information for model formation.
2) Select appropriate modelling approaches based on the scenario to be modelled and the information required from the model.
3) Evaluate the strengths and weaknesses of a particular model for a given scenario.
4) Formulate a suitable differential equation to describe a scenario.
5) Simulate a differential equation based model using appropriate computational techniques.
6) Analyse a differential equation based model using suitable analytical approaches.

Assessment:	Examination (40%)
	Group Work - Project (40%)
	Coursework 1 (6%)
	Coursework 2 (7%)
	Coursework 3 (7%)
Resit Assessment:	Examination (Resit instrument) (100%)

Assessment Description: Exam: A closed book examination to take place at the end of the module.
Group work - project: A group project to construct, analyse and simulate a real world problem and investigate some aspect using MATLAB. The work will be presented as a written report.
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 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 examination.

Additional Notes: Available to visiting and exchange students.

MA-252 Probability Theory

Credits: 15 Session: 2023/24 September-January

Pre-requisite Modules:

Co-requisite Modules:

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

Format: 44

Delivery Method: On campus

Module Aims: An introduction to fundamental probabilistic concepts and methods such as probability spaces, expectation and variance of random variables, independence, law of large numbers.

Module Content: - Independent random variables, expectation, including additive and multiplicative properties of expectation;
- Moments, variance, covariance;
- sigma-algebras, minimal sigma-algebra containing a given collection of sets, Borel sigma-algebra;
- Measures, Lebesgue measure, probability measures;
- Random variables (measurable functions), sufficient conditions of measurability, operations with random variables preserving measurability, image measure, joint distribution of a collection of random variables;
- Expectation of a random variable, integration of a random variable in terms of integration with respect to its distribution;
- Continuous random variables, examples: uniform distribution, Gaussian (normal) distribution, gamma distributions, in particular, exponential distribution, Laplace distribution, Cauchy distribution;
- Moments of a random variable, variance, Chebyshev and Markov inequalities, characteristic function (Fourier transform);
- Independence of random variables, expectation of a product of independent random variables, Bienaymé's identity;
- Weak law of large numbers.
- Central Limit Theorem.

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

1) explain the fundamentals of probability theory;
2) know that probability theory is based on measure theory;
3) understand the concept of a random variable;
4) formulate given problems in terms of probabilities;
5) discuss expectation and integral;
6) understand independence.

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 develop skills in problem solving and constructing complex logical written 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-292 Statistical Data Analysis

Credits: 15 Session: 2023/24 January-June

Pre-requisite Modules: MA-192

Co-requisite Modules:

Lecturer(s): Dr K Evans

Format: Primarily lectures, additional support classes and lab classes.

Delivery Method: Lectures and lab classes on campus: 3 lectures and 1 lab class weekly.

Module Aims: This module concentrates on non-parametric statistics and techniques used to treat categorical data. In particular, the module covers a variety of statistical tests, criteria for choosing appropriate tests and the use of statistical software in order to deal with large data sets.

Module Content: The module will cover the following topics:

Non-parametric techniques including bootstrapping, the Wilcoxon Signed-Rank test, the Mann-Whitney U test, the Kruskal Wallis test and the Friedman test;

Chi-square tests for goodness-of-fit and association, Fisher's exact test;

Generalised linear models;

Factor analysis and principal component analysis;

Statistical computing.

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

1) Use non-parametric methods to construct confidence intervals;
2) Test hypotheses in the non-parametric setting using the Wilcoxon Signed-Rank test, the Mann-Whitney U test, the Kruskal Wallis test and the Friedman test;
3) Perform chi-square tests for goodness-of-fit and association;
4) Use Fisher's exact test where appropriate;
5) Perform generalised linear models;
6) Reduce appropriate large data sets using factor analysis and principal component analysis.
7) Choose the appropriate statistical test;
8) Use statistical software to deal with large data sets.

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

Assessment Description: Exam: 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.
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 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 examination.

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

Available to visiting and exchange students

SR-253 Exercise Physiology

Credits: 15 Session: 2023/24 September-January

Pre-requisite Modules:

Co-requisite Modules:

Lecturer(s): Prof MA Mcnarry, Dr M Waldron

Format: 11 * 2 hour lectures
5 * 2 hour labs
1 * 3 hour Poster Conference

Delivery Method: The module will be delivered in person only. Videos will be available online afterwards of the lectures but not the labs. Attendance at all live sessions in therefore compulsory.

Module Aims: The module develops the understanding gained from Human Anatomy (SR-141) and Human Physiology (SR-145). This lecture and practical based module will provide information on: homeostatic mechanisms; energy supply during exercise; the short term and chronic effect of exercise on the cardiovascular and respiratory systems; the sites of fatigue during exercise and the physiological challenges presented by extreme environments. Throughout this module, we will discuss how ageing and disease influence the response to exercise, as well as the techniques available to assess physiological responses.

Module Content: Physiological Control: Neural and hormonal control of positive and negative feedback mechanisms.
Energy Supply and Fuel Utilisation during Exercise: Control and regulation of anaerobic and aerobic metabolism during exercise. Factors that influence fuel utilisation during exercise.
Cardiovascular Response to Exercise: Acute cardiac and vascular response to exercise. Chronic cardiovascular adaptations to exercise and training.
Neuromuscular Response to Exercise: Neural control of muscular activity. Neuromuscular adaptation to exercise. Sites and causes of muscular fatigue.
Respiratory Response to Exercise: Respiratory changes during exercise. Maximal and submaximal oxygen consumption. Anaerobic threshold. Oxygen deficit and excess post exercise oxygen consumption. Control of respiration during exercise.
Fatigue: Central and peripheral fatigue. Metabolic challenge of exercise. Possible sites of fatigue during high-intensity exercise and prolonged exercise.
Environmental Challenge: Human thermoregulation. Exercise in a hot and cold environment; Physiological adaptation to exercise in a hot and cold environment. Exercise at altitude. Physiological adaptation to altitude training.

Practical Investigations: Laboratory practicals to include the investigation of:
Blood lactate response to high intensity exercise; Wingates; Indirect estimation of maximal oxygen consumption; Thermoregulation.

Intended Learning Outcomes: At the end of the module the student will be expected to be able to:
1. Discuss the acute response to exercise with regards to energy supply, cardiorespiratory and neuromuscular systems.
2. Discuss the chronic response to exercise with regards to energy supply, cardiorespiratory and neuromuscular systems.
3. Analyse data using standard equations for calculating physiological parameters and interpret the results of exercise
testing.
4. Explain the influence of external and internal factors on the physiological response to exercise.

Assessment: Examination (65%)
Online Class Test (35%)
Resit Assessment: Examination (Resit instrument) (100%)

Assessment Description: At the end of each lab, students will be required to complete an in-class test to assess the knowledge and understanding of the content covered. This will be administered through Canvas and only made available to those who have attended the lab.

The remaining 65% will be from a written, closed-book examination at the end of the module.

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

Assessment Feedback: Students will receive their marks and, if they didn't get it right, what the right answer was.
Failure Redemption: A supplementary examination will form 100% of the module mark.
Additional Notes: Delivery of both teaching and assessment will be blended including live and self-directed activities online and on-campus. The Faculty of Science and Engineering has a ZERO TOLERANCE policy for late submission of coursework, meaning that a mark of zero will be recorded in such cases.

SR-254 Technology and Innovation in Injury Mechanics

Credits: 15 Session: 2023/24 January-June

Pre-requisite Modules:

Co-requisite Modules:

Lecturer(s): Dr EMP Williams

Format: Lecture based theoretical learning with some discussion-based learning (22), practical laboratory learning (9), interactive tutorial time (4), optional tutorial time (5) online learning and supporting resources (10)
Contact Hours will be delivered through a blend of live activities online and on-campus, and may include, for example, lectures, seminars, practical sessions and Academic Mentoring sessions.

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

This module will be delivered over 11 weeks in semester 2 (OR over 22 weeks across TB1 & TB2 depending on COVID status)

It will consist of:
-11 * 2-hour lectures (delivered as face to face standard lectures AND/OR online lectures with both synchronous and asynchronous delivery components)
-Three * 3-hour, interactive practical laboratory classes (supplemented by online demonstration videos and both synchronous and asynchronous activities)
-Two compulsory interactive 2-hour tutorial sessions and one optional interactive 2-hour tutorial session: These may be delivered online, and/or in person with options to join the class online

Module Aims: Students will gain a conceptual understanding of tissue adaptation to external load, the mechanics of injury for various human movements and how to measure relevant biomechanical parameters, with a focus on human gait. Students will gain practical skills in the operation of lab-based and wearable technology motion analysis systems. Students will develop critical evaluation skills to assess the validity of wearable technology systems used in motion analysis.

Module Content: • Biomechanics Recap, Mechanics of Injury, Tissue Loading and Adaptation
• Sports Injury Epidemiology – Acute vs Chronic Definitions
• Movement Control Systems and Adaptations of the Neuromuscular System
• Mechanical Properties of Tissues and Loading: Bone, Muscle, Ligament and Tendons
• Physical Training and Structural Adaptation of the Musculoskeletal System
• Mechanics of Gait: Normal and Pathological & Gait Measurement Systems
• Measurement and Characterisation of Gait
• Wearable Technology Systems in Biomechanics
• Brain Injury Biomechanics and Head Impact Telemetry in Sports
• Workplace Injury Biomechanics: Prevention Systems, Load Quantification & Role of Biomechanist in Workplace Health and Safety

Intended Learning Outcomes:
By the end of this module the student should be able to:
• Describe the difference between acute and chronic injuries by differentiating the relevant injury mechanics and contributing factors (included in lab class 1 in-class test and exam)
• Explain and characterize the human gait cycle and normal loading in human gait mechanics and non-normal loading in clinical gait (lab class 1 test and exam)
• Describe the relationship between injury mechanisms and mechanical properties of tissues (integrated into innovation assignment, lab 1 test and exam)
• Identify and describe the roles of the four sensorimotor systems involved in movement control and injury prevention (assessed in laboratory class 2 and exam)
• Describe basic principles of injury susceptibility, risk factors, bio-positive and bio-negative loading (innovation assignment and exam)
• Demonstrate an operational proficiency of lab and field-based motion analysis systems (demonstrated in practical laboratory session and necessary in order to answer laboratory test questions and complete laboratory exercises)
• Demonstrate independent learning ability and original innovative research ideas (innovation assignment)
• Describe why it is essential to have both male and female participants equally represented in sport science and medical studies

o *Where these LO's are assessed is notated in brackets.

Assessment:	Assignment 1 (40%) Examination 1 (30%) In class test (Invigilated on campus) (10%) Class Test 2 - Held under exam conditions (10%) Class Test 3 - Held under exam conditions (10%)
Resit Assessment:	Examination (Resit instrument) (100%)

Assessment Description: Students are expected to attend one 2-hour lecture per week from weeks 2 to 12. Each student must also attend THREE compulsory 3-hour practical laboratory sessions which include an in-class test weighting 10% of the module grade (9% in class and 1% pre lab online quiz). There will be four streams for each laboratory and students MUST attend the session for the group that they are assigned to. Lab 1 will be held in weeks 3&4, Lab 2 in weeks 6&7 and Lab 3 in weeks 9&10.
The laboratory sessions focus on demonstrating the practical implementation of theoretical concepts covered in the course. Course content relies on mathematics to develop quantitative explanations for biomechanical phenomena. Students are assumed to have a basic knowledge of algebraic manipulation, vectors, and trigonometry. Students without this background are strongly advised to seek out additional support in these areas before and during the course. This support may include accessing the Student Learning Centre, taking a course in basic mathematics or physics, forming a study group with your classmates, or arranging for personal tutoring. Optional tutorial workshops will be held in the biomechanics lab in weeks 5 and 8 in allocated lab session times. A compulsory workshop about the written biomechanics innovation assignment will be held in the biomechanics lab in the allocated session times in weeks where this is no practical session.
Online demonstration videos have been made for students to view prior to coming to the practical laboratory sessions. These are 10-12 minutes long and provide detailed explanations of what to expect in these sessions. These will be posted on Canvas several weeks before the respective laboratory sessions. All students must watch these videos at least once before coming to the laboratory so on arrival, everyone will know what to do. The videos feature last year's students and every effort has been made to ensure the explanations are clear, memorable, entertaining and informative. Short trailers for each video will be screened at the end of the corresponding lectures with clear instructions regarding where to find these videos on Canvas. Following the viewing of the videos, students will undertake a 1% online quiz, to encourage preparation for the practical classes. The written test at the conclusion of practical sessions will be worth 9% of the module grade.
Two compulsory tutorials for the innovation assignment will be conducted in laboratory time in weeks two and five. Students will be given a design thinking workshop, introduced to concepts of innovative thinking in preparation for the innovation assignment.

Moderation approach to main assessment: Moderation by sampling of the cohort

Assessment Feedback: Written feedback followed by oral clarification of issues at student's request. Comments on assignments and rubric.

Failure Redemption: Resit examination

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

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

SR-254 and SR-258 are pre-requisites for SR-305

SR-258 Biomechanical Technology, Measurement & Analysis

Credits: 15 Session: 2023/24 September-January

Pre-requisite Modules:

Co-requisite Modules:

Lecturer(s): Prof NE Bezodis, Dr C Starbuck

Format: 22 hours lectures and group discussions
11 hours practicals
Contact Hours will be delivered through a blend of live activities online and on-campus, and may include, for example, lectures, seminars, practical sessions and Academic Mentoring sessions.

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

Lectures and group discussions, practical laboratory classes, and directed independent study.

Module Aims: The module aims to introduce students to the application of biomechanical theory and technology (hardware and software) to the measurement, analysis and understanding of human motion. The module will provide students with an advanced understanding of linear and angular kinematics and kinetics, and will provide the opportunity to experience laboratory work using biomechanics equipment and software to collect and analyse data. The module will lay the foundations for study of biomechanics and technology at Level 3.

Module Content: Qualitative motion analysis
Angular kinematics
Quantitative motion capture and analysis
Centre of gravity
Moment of inertia
Angular momentum
Quantitative kinetic capture and analysis
Angular kinetics
Automatic motion capture
Electromyographical capture and analysis
Theoretical biomechanical analysis

Intended Learning Outcomes: By the end of this module the student will be expected to be able to:
1. Understand the analysis of human movement through the application of qualitative and quantitative approaches
2. Determine variables from 'real-life' biomechanical data
3. Apply biomechanical principles to the quantification of human movement
4. Analyse biomechanical data using information technology

Assessment: Examination 1 (80%)
Class Test 1 - Coursework (20%)

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

Assessment Description: A 1 hour online test (taken remotely during class time) comprising data analysis and a short (~200 word) written section
A 2-hour written (short answer) examination.

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

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

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

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

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

SR-258 is a pre-requisite for SR-305

SR-259 Human Nutrition

Credits: 15 Session: 2023/24 January-June

Pre-requisite Modules:

Co-requisite Modules:

Lecturer(s): Dr TD Love

Format: Lectures - 22h
Workshops/Practicals - 18h

Delivery Method: Lecture, Practical and workshop based.

Module Aims: The module will introduce and discuss the basic concepts underlying the study of human nutrition.

Module Content: Dietary Assessment Methods
Energy Expenditure
Lipid metabolism & dietary sources
Protein metabolism & dietary sources
Carbohydrate metabolism & dietary sources
Micronutrient intake and role in anemia, metabolism, bone health and oxidative stress

Intended Learning Outcomes: By the end of the module students will be expected to be able to:

1. Discuss the mechanisms which determine nutrient balance
2. Critically appraise methods of assessing nutritional status
3. Analyse the nutrient content of a diet
4. Interpret the nutritional adequacy of a diet
5. Evaluate the effect of nutrient intake on health

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

Resit Assessment: Coursework reassessment instrument (100%)

Assessment Description:
Assignments 1-10
10 x online tests that relate to lecture and workshop material.

Coursework 1
The coursework involves a nutritional assessment of an individual. A detailed guideline is provided to students at the start of the module upon which a written report is based. This is an individual piece of work.

Moderation approach to main assessment: Moderation by sampling of the cohort

Assessment Feedback: Individual written and verbal feedback will be provided alongside the marking scheme used to assess the coursework

Failure Redemption: Supplementary coursework will form 100% of the module mark, provision will be made for supporting data to be gathered.

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

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