Module Descriptor

Title	Statistical Estimation and Inference		
Session	2025/26	**Status**	Published
Code	MATH09012	**SCQF Level**	9
Credit Points	20	**ECTS (European Credit Transfer Scheme)**	10
School	**Computing, Engineering and Physical Sciences**		
Module Co-ordinator	Dr Raymond Carragher		

Summary of Module

This module extends the ideas in Statistics and probability from the level 8 module Probability and Statistics. The emphasis of the module is on survey sampling, point estimates, interval estimates, and parametric and non-parametric hypothesis testing, specifically to prepare participants for research.

Simple random sampling from a population will be introduced, then extended to different sampling methods, followed by sample parameter estimation topics such as distribution of the mean and estimation of ratio.

Confidence intervals are reviewed and expanded from the level 8 module Probability and Statistics to include mean in normal populations, point estimates and maximum likelihood estimation methods including generalised likelihood ratio tests.

Bayesian inference is introduced including Bayesian estimates and credible intervals for model parameters.

Hypothesis testing is introduced from first principles for parametric and non-parametric methods. The error types and p-values are discussed with respect to decision making.

Suitable statistical package(s) will be used for visual understanding of the concept, calculations and predictions.

The Graduate Attributes relevant to this module are given below:

- Academic: Critical thinker; Analytical; Inquiring; Knowledgeable; Problem-solver; Digitally literate; Autonomous.
- Personal: Effective communicator; Motivated; Resilient.
- Professional: Collaborative; Research-minded; Ambitious; Driven.

Module Delivery Method	On-Campus[1] ☒	Hybrid[2] ☐	Online[3] ☐	Work -Based Learning[4] ☐
Campuses for Module Delivery	☐ Ayr ☐ Dumfries	☐ Lanarkshire ☐ London ☒ Paisley	☐ Online / Distance Learning ☐ Other (specify)	

Terms for Module Delivery	Term 1 ☐		Term 2 ☒	Term 3 ☐	
Long-thin Delivery over more than one Term	Term 1 – Term 2 ☐		Term 2 – Term 3 ☐	Term 3 – Term 1 ☐	

Learning Outcomes	
L1	Apply a range of sampling methods, distributions and perform parameter estimation.
L2	Implement confidence interval and credible interval estimation and perform relevant interpretation.Perform appropriate hypothesis tests for parametric and non-parametric methods.
L3	Perform appropriate hypothesis tests for parametric and non-parametric methods.
L4	Use suitable computer software to perform and display appropriate analysis.
L5	

Employability Skills and Personal Development Planning (PDP) Skills	
SCQF Headings	**During completion of this module, there will be an opportunity to achieve core skills in:**
Knowledge and Understanding (K and U)	**SCQF 9** Demonstrating a knowledge and understanding of concept of Sampling and basic methods of point estimates. Demonstrating basic awareness of the application of statistical hypothesis, as appropriate, to the solution of problems.
Practice: Applied Knowledge and Understanding	**SCQF 9** Using a range of standard techniques of decision making and the application of the hypothesis in research to solve standard statistical problems, as appropriate, and making valid interpretations of these.

[1] Where contact hours are synchronous/ live and take place fully on campus. Campus-based learning is focused on providing an interactive learning experience supported by a range of digitally-enabled asynchronous learning opportunities including learning materials, resources, and opportunities provided via the virtual learning environment. On-campus contact hours will be clearly articulated to students.

[2] The module includes a combination of synchronous/ live on-campus and online learning events. These will be supported by a range of digitally-enabled asynchronous learning opportunities including learning materials, resources, and opportunities provided via the virtual learning environment. On-campus and online contact hours will be clearly articulated to students.

[3] Where all learning is solely delivered by web-based or internet-based technologies and the participants can engage in all learning activities through these means. All required contact hours will be clearly articulated to students.

[4] Learning activities where the main location for the learning experience is in the workplace. All required contact hours, whether online or on campus, will be clearly articulated to students

Generic Cognitive skills	**SCQF 9** Using a range of methods to analyse well-defined problems in relevant statistical contexts.
Communication, ICT and Numeracy Skills	**SCQF 9** Conceptualising and analysing problems informed by professional and research issues. Using suitable software to obtain, present and make valid interpretation of statistical problems and results, as appropriate.
Autonomy, Accountability and Working with Others	**SCQF 9** Working autonomously to produce short reports on statistical problems. Collaborating with others in a small team to solve statistical problems.

Prerequisites	**Module Code** MATH08010	**Module Title** Probability and Statistics
	Other Or equivalent	
Co-requisites	**Module Code**	**Module Title**

Learning and Teaching	
In line with current learning and teaching principles, a 20-credit module includes 200 learning hours, normally including a minimum of 36 contact hours and maximum of 48 contact hours.	
Learning Activities During completion of this module, the learning activities undertaken to achieve the module learning outcomes are stated below:	**Student Learning Hours** (Note: Learning hours include both contact hours and hours spent on other learning activities)
Lecture / Core Content Delivery	24
Tutorial / Synchronous Support Activity	12
Laboratory / Practical Demonstration / Workshop	12
Independent Study	152
Please select	
Please select	
TOTAL	200

Indicative Resources
The following materials form essential underpinning for the module content and ultimately for the learning outcomes: The following materials form essential underpinning for the module content and ultimately for the learning outcomes: “Statistical Estimation and Inference” class notes on the University VLE.

"Introduction to Robust Estimation and Hypothesis Testing", RR Wilcox. "In Akk Likelihood" Yudi Pawitan. Suitable software, e.g. Excel, SPSS, R and Word.
(N.B. Although reading lists should include current publications, students are advised (particularly for material marked with an asterisk*) to wait until the start of session for confirmation of the most up-to-date material)

Attendance and Engagement Requirements
In line with the Student Attendance and Engagement Procedure, Students are academically engaged if they are regularly attending and participating in timetabled on-campus and online teaching sessions, asynchronous online learning activities, course-related learning resources, and complete assessments and submit these on time. **For the purposes of this module, academic engagement equates to the following:** The School of Computing, Engineering and Physical Sciences considers attendance and engagement to mean a commitment to attending, and engaging in, timetabled sessions. You will scan your attendance via the scanners each time you are on-campus and you will login to the VLE several times per week. Where you are unable to attend a timetabled learning session due to illness or other circumstance, you should notify the Programme Leader that you cannot attend. Across the School an 80% attendance threshold is set. If you fall below this, you will be referred to the Student Success Team to see how we can best support your studies.

Equality and Diversity
The University's Equality, Diversity and Human Rights Procedure can be accessed at the following link: UWS Equality, Diversity and Human Rights Code. Aligned with the University's commitment to equality and diversity, this module supports equality of opportunity for students from all backgrounds and learning needs. Using the VLE, material will be presented electronically in formats that allow flexible access and manipulation of content. This module complies with University regulations and guidance on inclusive learning and teaching practice. This module has lab-based teaching and as such you are advised to speak to the Module Co-ordinator to ensure that specialist assistive equipment, support provision and adjustment to assessment practice can be put in place, in accordance with the University's policies and regulations.
(N.B. Every effort will be made by the University to accommodate any equality and diversity issues brought to the attention of the School)

Supplemental Information

Divisional Programme Board	**Engineering Physical Sciences**
Overall Assessment Results	☐ **Pass / Fail** ☒ **Graded**
Module Eligible for Compensation	☒ **Yes** ☐ **No** **If this module is eligible for compensation, there may be cases where compensation is not permitted due to programme accreditation requirements. Please check the associated programme specification for details.**
School Assessment Board	Computing, Engineering and Physical Sciences
Moderator	Dr Alan Walker
External Examiner	P Wilson

Accreditation Details	
Module Appears in CPD catalogue	☐ **Yes** ☒ **No**
Changes / Version Number	

Assessment (also refer to Assessment Outcomes Grids below)
Assessment 1
Coursework worth 30% of the final mark. This will involve appropriate statistical analyses and use suitable software, as required.
Assessment 2
Class Test (Unseen, closed book) (70%)
Assessment 3
(N.B. (i) Assessment Outcomes Grids for the module (one for each component) can be found below which clearly demonstrate how the learning outcomes of the module will be assessed. (ii) An indicative schedule listing approximate times within the academic calendar when assessment is likely to feature will be provided within the Student Module Handbook.)

Component 1							
Assessment Type	**LO1**	**LO2**	**LO3**	**LO4**	**LO5**	**Weighting of Assessment Element (%)**	**Timetabled Contact Hours**
Class Test (unseen, closed book)	☒	☒	☒	☐	☐	70	2

Component 2							
Assessment Type	**LO1**	**LO2**	**LO3**	**LO4**	**LO5**	**Weighting of Assessment Element (%)**	**Timetabled Contact Hours**
Coursework	☐	☐	☐	☒	☐	30	

Component 3							
Assessment Type	**LO1**	**LO2**	**LO3**	**LO4**	**LO5**	**Weighting of Assessment Element (%)**	**Timetabled Contact Hours**
	☐	☐	☐	☐	☐		
Combined total for all components						100%	2 hours

Change Control

What	**When**	**Who**
Summary, Learning outcome L2, Indicvative resources - minor updates	March 2025	Raymond Carragher
