2025

Postgraduate courses

Mathematics, Statistics & Data Science

School of Mathematics and Statistics

Te Kura Mātai Tatauranga

Location:	Room CO358, Cotton Building, Kelburn Campus
Phone:	04-463 5341
Email:	sms-office@vuw.ac.nz

www.wgtn.ac.nz/sms

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VICTORIA UNIVERSITY OF WELLINGTON
TE HERENGA WAKA

CONTENTS

ENROLLING FOR POSTGRADUATE STUDY

The School offers postgraduate programmes in Mathematics, Statistics and Data Science. There are a variety of degree options.

Domestic students should enroll online for Honours, Master of Applied Statistics, Master of Data Science, MSc Part 1 or Diplomas/Certificates. It is advisable to discuss your intended programme first with the Postgraduate Coordinator.

Students can also enroll for Master's by thesis online. To apply for PhD study, please contact the Postgraduate Coordinator and read the application information on the Faculty of Graduate Research website **www.wgtn.ac.nz/fgr**

Staff email: **firstname.lastname@vuw.ac.nz**

Students must discuss their intended programme with the relevant Postgraduate Coordinator.

POSTGRADUATE COORDINATORS		ROOM	PHONE	EMAIL
MATHEMATICS				
Dr Dan Turetsky	(Convener, Thesis)	436	04-463 5660	dan.turetsky@vuw.ac.nz
Dr Hung Le Pham	(Course Work)	440	04-463 6732	hung.pham@vuw.ac.nz
STATISTICS				
Prof Peter Smith	(Convener, Thesis)	539	04-463 6738	peter.smith@vuw.ac.nz
A/Prof Ivy Liu	(Course Work)	424	04-463 5648	Ivy.liu@vuw.ac.nz
DATA SCIENCE				
Prof Peter Smith	(Convener, Thesis)	539	04-463 6738	peter.smith@vuw.ac.nz
Dr Ryan Admiraal	(Course Work)	536	04-463 5275	ryan.admiraal@vuw.ac.nz

POSTGRADUATE ADMINISTRATOR	ROOM	PHONE	EMAIL
Morgan Holschier	358	04-887 3988	morgan.holschier@vuw.ac.nz

For Postgraduate enquiries please email: pg-ecs-sms@vuw.ac.nz

QUALIFICATIONS AVAILABLE

HONOURS AND MSC PART 1

The programme for the **Bachelor of Arts with Honours (BA(Hons)), Bachelor of Science with Honours (BSc(Hons)),** or **Master of Science (MSc) Part 1,** consists of 120 points, typically made up of eight 15-point courses or the equivalent in an approved combination, to be chosen from the courses described below and subject to availability. All Honours students must enrol in 30 points of project-based work.

The Honours degree is intended to be a single offering based on a coherent programme of study. When courses are substituted from other subjects, they must be relevant and complementary to the rest of the programme. At most 60 points may be substituted, that is at least 60 points must be from those listed for the major subject. With permission of the Honours and Postgraduate Coordinator, a part-time student may extend their Honours/Master's Part 1 over more than one year. The maximum time for BSc(Hons) is two years, for BA(Hons) four years.

Those who do MSc Part 1 can do MSc Part 2 the following year and obtain the MSc degree with a class of Honours. However, the School prefers that students do the same two years' work by obtaining a BSc(Hons) degree in the first year, and then enrolling in MSc Part 2 to complete an MSc degree.

There is no MA Part 1. The MA has the same status as MSc Part 2 and, like the BA(Hons), can be taken in Mathematics but not in Data Science or Statistics.

PREREQUISITE FOR HONOURS IN MATHEMATICS

The prerequisite for BA(Hons) or BSc(Hons) in MATH is an undergraduate major in Mathematics, including at least 60 points in 300-level Mathematics courses. An average grade of at least B+ in the relevant 300-level courses is normally required, and students should have completed any specific prerequisites for their proposed courses of study. An equivalent background will be required for a student whose undergraduate study has been undertaken elsewhere.

PREREQUISITES FOR HONOURS IN STATISTICS

You will need a BA or BSc with at least 45 points from DATA 303, MATH 377, STAT 300-399 (with an average grade of B+ or better). Other entry combinations are also possible.

Students with interests in the theoretical aspects of Statistics:
Such students, particularly if they are considering the possibility of a research degree, may wish to strengthen their general mathematical background before specialising. The MATH courses in Differential Equations, Algebra, Analysis and Measure Theory all provide valuable background for different aspects of work in Statistics.

PREREQUISITES FOR HONOURS IN DATA SCIENCE

You will need a BSc in Data Science with at least 60 points from COMP 309, DATA 301-399 (with an average grade of B+ or better). Other entry combinations are also possible.

POSTGRADUATE CERTIFICATE IN SCIENCE

The Postgraduate Certificate in Science (PGCertSc) is offered in all subjects offered for the MSc. Entry requirements are the same as for the MSc, but the grade requirement may be relaxed slightly. The qualification consists of only 60 points of postgraduate courses in the relevant subject, so provides a shorter coursework postgraduate qualification. It may be suitable for a student in full-time work or managing other commitments and may also be used for those who wish to exit early from another postgraduate qualification. Conversely, a PGCertSc may later be abandoned in favour of a PGDipSc if the requirements for that qualification are subsequently met.

A candidate in PGCertSc should be enrolled for at least one trimester and should complete the requirements within two years.

- The **PGCertSc in Mathematics** requires 60 points in approved courses from MATH 401-489.
- The **PGCertSc in Statistics** requires 60 approved points from STAT 401-489.
- The **PGCertSc in Data Science** requires one of (AIML 425, 426, 427, 429), one of (STAT 432, 438); 30 further points from AIML 400-479, COMP 400-479, DATA 400-499, 501, MATH 400-483, STAT 400-483.
- Postgraduate Diploma in Science.

The Postgraduate Diploma in Science (PGDipSc) is a postgraduate science qualification offered in all subjects offered for the MSc. Entry requirements are the same as for the MSc, but the grade requirement may be relaxed slightly. The PGDipSc requires 120 points of postgraduate study and can be completed in two trimesters (full time) or over four years (part time), and provides an alternative to the Honours and Master's degrees for students.

- The **PGDipSc in Mathematics** requires 120 points in approved courses from MATH 401-489.
- The **PGDipSc in Statistics** requires 120 points from STAT 401-489 or approved alternatives; at least 60 points shall be from 400-level STAT courses.
- The **PGDipSc in Data Science** requires AIML 427, STAT 432, 438; one of (AIML 425, 426, 429); 60 further points from AIML 400-479, COMP 400-479, DATA 400-499, 501, MATH 400-483, STAT 400-483.

With permission some optional courses in a PGDipSc may be replaced by substitute courses from other subjects offered for postgraduate degrees.

MASTER'S DEGREES

The programmes available at Master's level are:

- Master of Science (MSc) or Master of Arts (MA) in Mathematics
- MSc in Statistics
- MSc in Data Science
- Master of Applied Statistics (MAppStat)
- Master of Data Science (MDataSc)

The Master of Science is a two-year programme. Part 1 consists of 120 points of courses. This is followed by Part 2 which consists either of a full year research project (120-point thesis), or (for some subjects only) a combination of a smaller research project (90-point thesis) together with 30 points of taught courses. Students have 12 months in which to complete their research thesis in Part 2. Students who have completed an Honours degree of class II(2) or better, or a postgraduate diploma in Science at equivalent standard, can proceed directly to Part 2.

The Master of Arts is a one-year programme and is equivalent to Part 2 of the Master of Science.

Candidates for Master's degrees must enrol each year for the individual courses, projects, theses, etc. they will be doing that year. For each student, the requirements for any such course(s) are worked out in consultation with the Postgraduate Coordinator.

Entry to all Master's programmes requires approval by the relevant Postgraduate Coordinator and depends on an initial agreement on a programme of study. Enrolment in a Master's thesis requires agreement on a supervisor and a provisional thesis topic. Potential areas of research are outlined in the section on the PhD programme.

With the permission of the Associate Dean (Students), study can be undertaken on a part time basis.

MSC OR MA IN MATHEMATICS

PROGRAMME STRUCTURE

MSc Part 1: 120 points of courses in an approved combination from MATH 401-489.

MA or MSc Part 2: The programme consists of preparation of a research thesis (MATH 591, 120 points) under the individual supervision of a staff member.

A Master's thesis is normally an exposition of a piece of mathematical work and may contain new results or may represent a study of known material from a fresh point of view, together with some review of the literature. The thesis must be submitted for examination within 12 months of enrolment for the Master's degree.

ENTRY REQUIREMENTS

MSc Part 1: 60 points in approved courses from MATH 300-399, or approved alternatives

MA or MSc Part 2: Students entering these programmes will normally have completed BA(Hons) or BSc(Hons) with a class of Honours of II(2) or better, or MSc Part 1.

MSC IN STATISTICS

PROGRAMME STRUCTURE

MSc Part 1: An approved combination from MATH 477, MATH 401-489, STAT 401-489; at least 60 points shall be from MATH 477 or 400-level STAT courses.

MA or MSc Part 2: The programme consists of preparation of a research thesis (STAT 591, 120 points) under the individual supervision of a staff member. Alternatively, students may prepare a smaller research thesis (STAT 592, 90 points) and study 30 points from approved courses.

Areas of interest encouraged by the group are Bayesian inference, biostatistics, categorical data analysis, clustering, epidemiology, financial mathematics, health informatics, multivariate analysis, reliability theory, social network analysis, spatial statistics, statistical computing, statistics in geophysics, stochastic processes and their applications, time series analysis, signal and image processing, and wireless research.

ENTRY REQUIREMENTS

MSc Part 1: at least 45 points from DATA 303, MATH 377, STAT 300-399 (normally with an average grade of B+ or better), or approved alternatives

MSc Part 2: Students entering these programmes will normally have completed a BSc(Hons) with a class of Honours of II(2) or better, or MSc Part 1. Students may also enter the programme following completion of a Postgraduate Diploma in Science or the Master of Applied Statistics.

MSC IN DATA SCIENCE

PROGRAMME STRUCTURE

MSc Part 1: AIML 427, STAT 432, 438, one of (AIML 425, 426, 429), 60 further points from AIML 400-479, COMP 400-479, DATA 400-499, 501, MATH 400-483, STAT 400-483.

MSc Part 2: The programme consists of preparation of a research thesis (DATA 591, 120 points) under the individual supervision of a staff member.

Areas of interest are artificial intelligence, machine learning, clustering, reliability theory, simulation, network analysis. Students can work on projects in the theory and practice of Data Science and may work with researchers from other disciplines who are seeking insight from their data. Staff from both the Schools of Mathematics & Statistics and Engineering & Computer Science are available as supervisors.

ENTRY REQUIREMENTS

MSc Part 1: 60 points in approved courses from COMP 309, DATA 301-399, or equivalent.

MSc Part 2: Students entering this programme will normally have completed a BSc(Hons) with a class of Honours of II(2) or better, or MSc Part 1. Students may also enter the programme following completion of a Postgraduate Diploma in Science or the Master of Data Science.

MASTER OF APPLIED STATISTICS

The Master of Applied Statistics (MAppStat) is a one-year 180-point Master's degree in Applied Statistics. The programme consists of two components: course work and practical training that has a professional focus through the inclusion of practicum and statistical consultancy. These give the programme unique characteristics among applied statistics programmes internationally.

This taught Master's programme may be completed in one year full time (three trimesters: March-June, July-October and November-February) or up to three years part time. Students can start the programme either in March or July.

PROGRAMME STRUCTURE

The MAppStat requires:

- **Part 1:** STAT 487; 105 points from an approved combination of MATH 477, STAT 431-489
- **Part 2:** STAT 480, 501, 581

The Head of School of Mathematics and Statistics may approve substitution of up to 30 points in Part 1 by other relevant 400- or 500-level courses.

A candidate who has completed Part 1 of the degree but not Part 2 may be awarded a Postgraduate Diploma in Science in Statistics.

ENTRY REQUIREMENTS

Students who enter the MAppStat will have completed a Bachelor's degree in a tertiary institution in a relevant subject; and been accepted by the Head of School of Mathematics and Statistics as capable of proceeding with the proposed course of study (normally with an average grade of B+ or better). Students should discuss their course of study with Associate Professor Ivy Liu (Ivy.Liu@vuw.ac.nz).

MASTER OF DATA SCIENCE

The Master of Data Science (MDataSc) is a two year 240-point Master's degree for students who have suitable preparation in Statistics or Computer Science. Students with an undergraduate degree in Data Science, a double major in Statistics & Computer Science or a double major in Statistics & Artificial Intelligence are granted a 60-point exemption and can complete the degree in 12 months, requiring only 180 points. The programme combines taught courses, a research project and a workplace practicum.

The 240-point programme can be completed in two years full time or up to four years part time. The 180-point programme can be completed in 12 months full time or up to three years part time. Students can start the programme either in March or July, although it is recommended that they start in March, as course prerequisites complicate the sequencing of courses for students starting in July.

PROGRAMME STRUCTURE

The MDataSc requires:

- **Part 1**: 60 points from AIML 420, 421, DATA 471-475 or approved alternatives.
- **Part 2**: (i) AIML 427, one of (AIML 425, 426, 429), STAT 432, 438, DATA 480, 501, 581;
  (ii) DATA 487 or 489;
  (iii) 30 or 45 further points from AIML 400-479; COMP 400-479; DATA 400-469; DATA 490-499; MATH 400-483; STAT 400-483 or approved alternatives.

Students who have a Bachelor's degree in Data Science, or a double major in Statistics with either Computer Science or Artificial Intelligence are exempted from Part 1, and only need to complete Part 2. For other students the Head of School of Mathematics and Statistics can approve exemptions of up to 60 points from Part 1 according to the student's level of preparation. Some students may need to take courses in undergraduate Statistics or Computer Science concurrently in order to meet the admission requirements.

Students should contact the Postgraduate Coordinator for Data Science to determine their eligibility, and their possible course of study.

ENTRY REQUIREMENTS

Students who enter the MDataSc will have completed a Bachelor's degree in a tertiary institution in a relevant subject; and been accepted by the Head of School of Mathematics and Statistics as capable of proceeding with the proposed course of study (normally with an average grade of B+ or better). Where appropriate, recognition will be given to relevant work experience when determining each student's course of study. Students should discuss their course of study with Dr Ryan Admiraal.

PHD

The PhD degree is the usual entry to a research or academic career and is awarded for a research thesis. Its essential feature is an original contribution to new developments in the field, by way of new theory or new methodology. A candidate for the degree pursues a course of advanced study and research at the University under the immediate direction of a supervisor, or supervisors.

Study is usually full time and is for a period of at least two calendar years (the maximum time if studying full time is 48 months (4 years) and if part time it is 72 months (6 years)) from the date of registration. Local students will usually have completed a Master's degree before entering the PhD programme, but entry direct from an Honours degree is possible.

Full information about the PhD degree, including how to apply, qualifications required, fees and scholarships etc. can be obtained from the website of the Faculty of Graduate Research at **www.wgtn.ac.nz/fgr**

Any student wishing to enroll for a PhD must discuss possible fields of study with staff members.

RESEARCH AREAS IN MATHEMATICS

Discrete mathematics, algebra and number theory

Current staff interests encompass combinatorics, matroid theory, graph theory, general algebra, category theory, number theory and arithmetic geometry. Staff involved include Dr Byoung Du Kim and Dr Nick Brettell.

Logic and the theory of computation

We are interested in aspects of mathematical and philosophical logic and theoretical computer science, including model theory, set theory, computability theory, complexity of computation, algorithmic randomness, algebraic logic, and the mathematics of modal logic. Staff involved include Prof Noam Greenberg, A/Prof Sasha Melnikov, and Dr Dan Turetsky.

Analysis, topology and geometry

We have staff performing research in various aspects of functional analysis, which is a sub-branch of analysis dealing with infinite-dimensional phenomena, and also in differential geometry, both finite and infinite-dimensional. Staff involved include Prof Astrid an Huef, Prof Lisa Clark, Prof Stephen Marsland, Dr Hung Pham, and Prof Matt Visser.

Applied mathematics and theoretical physics

In applied maths we develop novel mathematical approaches to problems of real-world interest. At the moment the group has expertise in fluid mechanics, microfluidics, mathematical physics, and mathematical ecology and bioacoustics. Staff involved include Dr Petro Feketa, Dr Brendan Harding, A/Prof Dimitrios Mitsotakis, Prof Stephen Marsland, and Prof Matt Visser.

RESEARCH AREAS IN STATISTICS AND DATA SCIENCE

Bayesian statistics

This covers theoretical developments, computational aspects and applications of Bayesian methods. Staff involved include Prof Richard Arnold, Dr David Huijser, and A/Prof Nokuthaba Sibanda.

Categorical data

Interests include analysis and method development for categorical data (A/Prof Ivy Liu).

Probability theory and stochastic processes

Dr John Haywood has research interests in stochastic process applications in time series analyses. Dr Budhi Surya has research interests in Levy processes, optimal stopping, applied probability and financial stochastics.

Statistical modelling, estimation and testing

There are interests in modeling of directional and geophysics data (Prof Richard Arnold) and categorical data (A/Prof Ivy Liu). There are also research interests in goodness-of-fit testing (Dr John Haywood) and screening interaction effects for high-dimensional data (Dr Yuan Yao).

Applications of Statistics and Data Science

A number of staff are involved in statistical and data science applications in various fields. These include: geophysics and epidemiology (Prof Richard Arnold, Dr Ryan Admiraal), biomedical statistics (Prof Richard Arnold, Dr David Huijser, A/Prof Ivy Liu, A/Prof Nokuthaba Sibanda, Dr Yuan Yao), fisheries science (Prof Richard Arnold, A/Prof Nokuthaba Sibanda), ecology (Dr John Haywood, A/Prof Nokuthaba Sibanda) and population genetics for ecology (Dr Louise McMillan).

Clustering

A/Prof Ivy Liu, Prof Richard Arnold, Dr Louise McMillan have interests in model-based clustering of mixed data types, particularly categorical data (nominal and ordinal). They have applied their models and methods in areas such as ecology, fisheries, linguistics and psychology. They are working on applications in population genetics.

Statistics and engineering

Prof Peter Smith has research interests in telecommunications and Statistics in Engineering.

Time series and forecasting

Dr John Haywood has interests in time series, forecasting and seasonal adjustments.

Artificial Intelligence and Machine Learning

Dr Binh Nguyen has interests in applications of machine learning, especially deep learning, in different domains, particularly, in health informatics, bioinformatics, and drug discovery. Prof. Alejandro Frery is interested in applications of Statistical Information Theory in signal and image processing. Prof Stephen Marsland works on information geometry -- the mathematical underpinnings of machine learning -- together with applications in representations of shape, and ecology, particularly bioacoustics.

COURSE INFORMATION INDEX

Course code ↓	Course reference number ↓	Title ↓	Points ↓	Trimester ↓
MATH 432	**CRN 7673**	**MATROID THEORY**	**15 PTS**	T2

Prerequisites: Courses you must have passed before taking this course.
Restrictions: You can't enrol in this course if you have passed any of the restricted courses.

PLANNING A PROGRAMME IN MATHEMATICS

The Mathematics Honours (BSc(Hons) or BA(Hons)) programme requires 120 points:

- 30 points from MATH 487-489
- 90 points from MATH 401-483

MATH 432	**CRN 7673**	**DISCRETE MATHEMATICS**	**15 PTS**	**T2**
Prerequisites:	(MATH 311, 324 or 361) and 15 further 300 level MATH pts			
Coordinator:	Dr Nick Brettell			
Discrete mathematics deals with mathematical structures that can be counted. These structures can describe, for example, the pairwise relationships between a set of objects (forming graphs) or discrete symmetries of crystals (forming groups). Another example is a matroid, which describes a notion of dependence of a set of objects. This course combines ideas from graph theory, linear algebra, coding theory, and problems in combinatorial optimisation. It investigates properties of these various mathematical structures, and the underlying notions of duality.				

MATH 433	**CRN 7674**	**MODEL THEORY**	**15 PTS**	**T1**
Prerequisites:	MATH 309 and 15 further 300 level MATH pts			
Coordinator:	Dr Dan Turetsky			
Model theory describes mathematical structures by investigating logical statements that are true of those structures. This course introduces the fundamental ideas and techniques of model theory, such as structures and formulas, the ultraproduct construction, the compactness theorem, and quantifier elimination. The course gives examples of applications to entities in algebra and discrete mathematics, such as fields, groups, and graphs.				

MATH 434	**CRN 7675**	**SET THEORY**	**15 PTS**	**T1**
Prerequisites:	MATH 309 and 15 further 300 level MATH pts			
Coordinator:	Dr Dan Turetsky			
Set theory lies at the foundations of mathematics - all objects of mathematical interest can be construed as sets. Contemporary set theory explores some of the rich structure of the class of all sets, and the limitations of the theory. The course constructs the universe of set theory from the axioms of Zermelo-Fraenkel set theory with the Axiom of Choice. Other topics include ordinals, cardinals and transfinite constructions.				
NOT OFFERED IN 2025				

MATH 435	CRN 7676	COMPUTABILITY AND COMPLEXITY	15 PTS	T1
Prerequisites:	MATH 309 and 15 further 300 level MATH pts			
Coordinator:	Prof Noam Greenberg			
The questions of the minimal computational effort required to find answers to certain problems, and whether there are limits to what can be computed, are at the heart of this course. Topics covered include the basics of computability theory, partial computable functions, a universal machine, the recursion theorem, relativised Turing computability, the arithmetical hierarchy, priority arguments and the computably enumerable degrees. Further topics following students' interests, such as computable structures, Ramsey theory, and algorithmic randomness.				

MATH 436	CRN 7677	GALOIS THEORY AND NUMBER THEORY	15 PTS	T2
Prerequisites:	MATH 311 and 15 further 300 level MATH pts			
Coordinator:	Dr Byoung Du Kim			
Galois theory brings together several branches of mathematics and is a natural bridge between algebra and number theory. The course starts with the historical question of whether polynomial equations can be solved by radicals and rediscovers Galois' method. It explores the connection between different areas of algebra such as finding roots of polynomials, field extensions, algebraic and transcendental numbers, and Galois groups. The second half of the course covers algebraic number theory.				

MATH 441	CRN 7680	MEASURE THEORY	15 PTS	T1
Prerequisites:	MATH212 and 15 300 level MATH pts			
Coordinator:	Dr Hung Le Pham			
Measure theory generalises mathematical notions such as length and volume, and has important applications in probability, physics, and mathematical analysis. Topics that are covered in this introductory course include measurable spaces and measures, integration theory on measure spaces, convergence theorems, and decomposition theorems.				

MATH 452	CRN 591	TOPOLOGY	15 PTS	T2
Prerequisites:	30 300 level MATH pts			
Coordinator:	Prof Lisa Orloff Clark			
Topology is a fundamental subject that interacts with most other areas of mathematics. This course covers basic point set topology, providing a foundation used throughout mathematics. Abstractions of analytic notions such as continuity, compactness, and connectedness are introduced.				

MATH 462	CRN 7685	DYNAMICAL SYSTEMS AND CONTROL	15 PTS	T2
Prerequisites:	MATH244 and 15 300 level MATH pts			
Coordinator:	Dr Petro Feketa			
Dynamical systems, which are time-varying, underlie much of mathematical physics. This course covers the fundamental concepts of qualitative theory of dynamical systems, including limit sets and periodic orbits, stable manifolds and crises, and bifurcations. The addition of inputs and outputs to a system provides the possibility for methods for analysis and control of it, known as Control Theory. This course introduces control-theoretic notions, including reachability, controllability, observability analysis and feedback stabilization techniques.				

MATH 468	CRN	MECHANICS AND FLUID DYNAMICS	15 PTS	T1
Prerequisites:	MATH244 and 15 300 level MATH pts			
Coordinator:	A/Prof Dimitrios Mitsotakis			
The analysis of physical systems has motivated much of the study of differential equations. This course investigates the differential equations that arise from Hamiltonian and Lagrangian mechanics. Noether's theorem is motivated via a basic introduction to differential geometry. The course also introduces the theory of fluid mechanics, deriving various equations describing fluid motion from first principles. The treatment justifies fluid equations as deterministic mathematical models and highlights their connections with Hamiltonian mechanics.				

MATH 469	CRN	SOBOLEV SPACES AND APPLICATIONS	15 PTS	T1
Prerequisites:	MATH212 and 15 300 level MATH pts			
Coordinator:	A/Prof Dimitrios Mitsotakis			
This course develops the foundations of the modern theory of differential equations and numerical analysis. The theory of Sobolev spaces is developed and used to study well-posedness of some ordinary and partial differential equations. A benefit of these theoretical developments is that they enable the analysis of numerical methods for solving partial differential equations; the course focuses on finite element methods				

MATH 477	CRN 29142	PROBABILITY	15 PTS	T1
Prerequisites:	MATH 377	Restrictions:	STAT 437	
Coordinator:	TBD			
The course starts with weak and almost sure convergence, then covers limit theorems and semi-groups of distributions, infinitely divisible and stable distributions and Lévy processes, with emphasis on compound Poisson processes, random walks and Brownian motion. The material is illustrated by real-life examples from finance, insurance and other fields.				
NOT OFFERED IN 2025				

MATH 440 MATH 440 MATH 440 MATH 460	CRN 15207 CRN 33083 CRN 33084 CRN 15208	DIRECTED INDIVIDUAL STUDY	15 PTS	T1 T2 T3 T2
Prerequisites:	Permission of Course Coordinator			
Coordinator:	Dr Hung Le Pham			
A DIS label can sometimes be used to enable study in a field taught in a 300-level MATH course not previously passed. As well as attending the 300-level course at its regular time and fulfilling its requirements, the student will be required to prepare additional material for assessment, demonstrating an understanding of a suitable topic at a level appropriate to an Honours degree; it will typically count for 20% of the course grade. At most **one** 15-point course of this nature may be included in an Honours degree, and only at the discretion of the coordinator of the associated 300-level course. It may not count towards the minimum of 60 MATH points required for Honours in Mathematics. It also requires a specific justification, such as the need to provide prerequisite material for some other course in the student's individual Honours programme.				

MATH 480 **MATH 481** **MATH 482** **MATH 483**	**CRN 6891** **CRN 6892** **CRN 9758** **CRN 6894**	**SPECIAL TOPIC**	**30 PTS** **30 PTS** **15 PTS** **15 PTS**	**T1 + T2** **T1 + T2** **T1** **T1**
The special topic label can be used to create 30-point, or 15-point courses tailored to particular interests, or to introduce new topics that may be offered in a particular year. One Special Topic label may be used for different subject matter for different students. There are four labels that can be used, two for 30-point full-year courses, and two for 15-point one-trimester courses that are each available in both 1/3 and 2/3:				
NOT OFFERED IN 2024				

MATH 487	**CRN 33112** **CRN 33113** **CRN 33114**	**RESEARCH PROJECT 1**	**15 PTS** **15 PTS** **15 PTS**	**T1** **T2** **T3**
MATH 488	**CRN 27014** **CRN 7693**	**RESEARCH PROJECT 2**	**15 PTS** **15 PTS**	**T1** **T2**
MATH 489	**CRN 7694**	**RESEARCH PROJECT 1**	**30 PTS**	**T1 + T2**

Prerequisites:	Permission of the Honours Coordinator	Restrictions:	MATH 489
Coordinator:	Dr Hung Le Pham		

These courses offer the experience of exploring the literature on a certain topic and writing a report that gives a coherent survey of findings and demonstrates mastery of the material. Supervision takes the form of regular meetings between the student and supervisor. It is expected that MATH Honours students take 30 points of project-based courses.

A list of possible project topics and supervisors is available on the project homepage. The Coordinator will allocate a supervisor and topic to each student, taking into account the overall preferences of students and staff.

SUBSTITUTION FROM OTHER SUBJECTS

Up to half of a Mathematics Honours degree can consist of courses from other subjects. The overall selection of courses must still form a coherent programme and requires approval from the Mathematics Postgraduate Coordinator.

PLANNING A PROGRAMME IN STATISTICS

TAUGHT COURSES AND PROJECTS: HONOURS, PGDIPSC, MAPPST AND MSC

The Statistics Honours programme requires 120 points:
- 30 points from STAT 480, 487-489
- 90 points from STAT 401-479, 481-483.

The PGDipSc and the MSc Part 1 in Statistics also require 120 points:
- At least 60 points from STAT 401-489
- Further approved courses to total 120 points from MATH 401-489, STAT 401-489.

The MAppStat requires:
- 120 approved 400- or 500-level points including STAT 487 or 489 for Part 1
- STAT 480, STAT 501 and STAT 581 are required in Part 2.

COURSE	TITLE	PREREQUISITES
TRIMESTER 1		
STAT 439	Sample Surveys	STAT 193 or equivalent; 30 approved 200/300 level pts
STAT 440	Directed Individual Study	
STAT 452	Bayesian Inference	One of (STAT 332, 393, 394) or (one of (STAT 391, DATA 491) and one of (DATA 303, 473))
STAT 487	Research Project 1 (15 pts)	
STAT 489	Research Project (30 pts)	
TRIMESTER 2		
STAT 432	Computational Statistics	One of (STAT 332, 393, 394) or (one of (STAT 391, DATA 491) and one of (DATA 303, 473))
STAT 433	Stochastic Processes	One of (MATH 377, STAT 332)
STAT 438	Generalised Linear Models	One of (STAT 332, 393, 394) or (one of (STAT 391, DATA 491) and one of (DATA 303, 473))
STAT 441	Directed Individual Study	
STAT 451	Official Statistics	STAT 193 (or equivalent); 30 approved 200/300 level pts
STAT 488	Research Project 2 (15 pts)	
STAT 489	Research Project (30 pts)	
STAT 501	Statistical Consulting	Enrolment in the MAppStat; 30 approved STAT points at 400-level or above
TRIMESTER 3		
STAT 480	Research Preparation	
STAT 487	Research Project 1 (15 pts)	
STAT 588	Applied Statistics Project (45 pts)	
STAT 581	Statistical Practicum (30 pts)	Enrolment in the MAppStat; 60 approved STAT points at 400-level or above

400-LEVEL COURSES

MATH 477	CRN 29142	PROBABILITY		15 PTS	T1
Prerequisites:	MATH 377		Restrictions:	STAT 437	
Coordinator:	TBD				
The course starts with weak and almost sure convergence, then covers limit theorems and semi-groups of distributions, infinitely divisible and stable distributions and Lévy processes, with emphasis on compound Poisson processes, random walks and Brownian motion. The material is illustrated by real-life examples from finance, insurance and other fields.					
NOT OFFERED IN 2025					

STAT 431	CRN 23080	BIOSTATISTICS	15 PTS	T1
Prerequisites:	One course from (STAT 332, 393, 394) or one of (STAT 391, DATA 491) and one of (DATA 303, 473))			
Coordinator:	Dr Budhi Surya			
A course about modelling survival time and multilevel data. Topics selected from maximum likelihood estimator review; large sample tests (Likelihood Ratio, Wald and Score tests); information criteria; Life tables; Kaplan-Meier estimator and log-rank test; Cox-proportional hazard model; multilevel linear regression and logistic regression; likelihood and Bayesian inference; multilevel models in R and WinBUGS.				
NOT OFFERED IN 2025				

STAT 432	CRN 23079	COMPUTATIONAL STATISTICS	15 PTS	T2
Prerequisites:	one course from (STAT 332, 393, 394) or (one of (STAT 391, DATA 491) and one of (DATA 303, 473))			
Coordinator:	Dr Louise McMillan			
Introduction to computationally intensive methods for statistical modelling and inference. Topics selected from jackknife and bootstrap bias correction and variance estimation; permutation tests; maximum likelihood estimation using EM algorithm; random numbers; probability distribution simulation; Bayesian Inference; Markov Chain Monte Carlo; Metropolis-Hastings algorithm; Gibbs sampling. Desirable that students have some programming experience.				

STAT 433	CRN 23078	STOCHASTIC PROCESSES		15 PTS	T2
Prerequisites:	One of (MATH 377, STAT 332)		Restrictions:	STAT 441	
Coordinator:	Dr Budhi Surya				
The first half of the course covers the concepts of probability spaces, filtration and adapted processes; in particular, Brownian motion, Geometric Brownian motion and diffusion processes. It also studies Ito integrals, martingales, stochastic differential equations, stopping times, and the strong Markov property. The second half covers the Feynman-Kac formula and its connection to boundary value problems, Girsanov change-of-measure, Esscher transform of measure, first-passage problems of (Geometric) Brownian motion and diffusion processes, plus the Laplace transform of their first-passage times. Applications of the concepts in mathematical finance and actuarial science are discussed towards the end of the course.					

MATH 434	CRN 8109	STATISTICAL INFERENCE	15 PTS	T2
Prerequisites:	STAT 332; MATH 377 recommended			
Coordinator:	Dr Yuan Yao			
In-depth cover of classical statistical inference procedures in estimation and hypothesis testing. Topics include: limit theorems; theory of parametric estimation; sufficiency and efficiency; uniformly most powerful tests and likelihood ratio tests. As time permits, a selection of notions from Bayesian, nonparametric and robust statistics, will be discussed. This course is co-taught with STAT 332.				
NOT OFFERED IN 2025				

STAT 438	CRN 8113	GENERALISED LINEAR MODELS	15 PTS	T2
Prerequisites:	one course from (STAT 332, 393, 394) or (one of (STAT 391, DATA 491) and one of (DATA 303, 473))			
Coordinator:	A/Prof Ivy Liu			
Brief outline of generalised linear model theory, contingency tables, binary response models, log-linear models (for contingency tables), repeated measures, GEE analysis, logit models for multinomial responses, and ordinal response models.				

STAT 439	CRN 10019	SAMPLE SURVEYS	15 PTS	T1
Prerequisites:	STAT 193 (or equivalent); 30 approved 200/300-level pts	Restrictions:	STAT 392	
Coordinator:	Prof Richard Arnold			
An introduction to practical and technical aspects of survey sampling, including writing a survey proposal, costing, non-sampling errors, sampling theory, sample designs, questionnaire design, fieldwork, basic analytic techniques, and report writing. This course is co-taught with STAT 392.				

STAT 451	CRN 28349	OFFICIAL STATISTICS	15 PTS	T2
Prerequisites:	STAT 193 (or equivalent), 30 points at 200-level or above (including STAT 292 or STAT 392 or STAT 439)			
Coordinator:	Prof Richard Arnold			
An overview of key areas of Official Statistics. Topics covered include data sources (sample surveys and administrative data); legal and ethical framework of official statistics; introductory demography; collection and analysis of health, social and economic data; data visualisation including presentation of spatial data; data matching and integration; the system of National Accounts.				

STAT 452	CRN 28350	BAYESIAN INFERENCE	15 PTS	T1
Prerequisites:	One of (STAT 332, 393, 394) or (one of (STAT 391, DATA 491) and one of (DATA 303, 473))			
Coordinator:	A/Prof Nokuthaba Sibanda			
The Bayesian approach is an alternative and increasingly popular way of analysing data in many applied fields of study, including biostatistics, ecology, psychology and economics. We will cover the basics of Bayesian theory and introduce computing methods necessary for practical implementation of this theory. Topics covered include Bayes' theorem and the concepts of prior and posterior distributions, Bayesian model comparison and numerical tools for Bayesian estimation such as Markov Chain and Hamiltonian Monte Carlo. Practical implementation of the Bayesian approach will be illustrated in linear regression models, generalised linear models and mixed effects models.				

STAT 480	CRN 27124	RESEARCH PREPARATION	15 PTS	T3
Prerequisites:	Enrolment in the MAppStat			
Coordinator:	Dr Ryan Admiraal			
This course provides students with an opportunity to develop their research skills in Mathematics, Statistics and Operations Research, including use of library resources, constructing literature reviews, developing research questions, writing research proposals and developing skills in oral presentation.				

STAT 487	CRN 28354 CRN 28438 CRN 28377	RESEARCH PROJECT	15 PTS 15 PTS 15 PTS	T1 T2 T3
STAT 488	CRN 28355	RESEARCH PROJECT	15 PTS	T2
STAT 489	CRN 28367 CRN 28378 CRN 28379 CRN 28380 CRN 28381 CRN 28382	RESEARCH PROJECT	30 PTS	T1 T2 T3 T1 + T2 T2 + T3 T3 + T1
STAT588	CRN 32214	APPLIED STATISTICS PROJECT	45 PTS	T3
Coordinator:	A/Prof Ivy Liu			
Students should meet with the Postgraduate Coordinator to identify their areas of interest, for assistance in identifying a suitable supervisor and then contact potential supervisors directly. Fifteen-point projects are usually completed in one trimester. Thirty-point projects can be completed within either a single trimester, or two successive trimesters, and should take 300 hours of study, supervision meetings and writing. The 45-point project STAT 588 is available to students in the Master of Applied Statistics who, with permission, are replacing the combination of the work placement STAT 581 and project STAT 487 with a larger research project.				

STAT 440	CRN 28352 CRN 33539 CRN 28376 CRN 32257 CRN 28353	DIRECTED INDIVIDUAL STUDY	15 PTS	T1 T2 T3 T1 T2
Prerequisites:	Approval of Postgraduate Coordinator			
Coordinator:	A/Prof Ivy Liu			
The Directed Individual Study label can be used to provide a reading course when there is no suitable Honours course available. The student follows an individual course of study under supervision. One DIS label may be used for different subject matter for different students.				

A DIS label can sometimes be used to enable study in a field taught in a 300-level STAT course not previously passed. As well as attending the 300-level course at its regular time and fulfilling its requirements, the student will be required to prepare additional material for assessment, as specified by the course coordinator. At most **one** 15-point course of this nature may be included in an Honours degree, and only at the discretion of the coordinator of the associated 300-level course. It may not count towards the minimum of 60 STAT points required for Honours in Statistics. It also requires a specific justification, such as the need to provide prerequisite material for some other course in the student's individual Honours programme.

STAT 501	CRN 27125	STATISTICAL CONSULTING	15 PTS	T2
Prerequisites:	Enrolment in the MAppStat			
Corequisites:	30 points from 400-level STAT courses or approval of Postgraduate Coordinator			
Coordinator:	Prof Peter Smith			

This course provides training in statistical consulting for practical research in other disciplines. Following formal development of skills to determine appropriate analysis methods for clients, students will complete projects based on supervised consultancy with students or staff members.

This course will be taught with a combination of lectures and practical training.

- Lectures: the skills required for statistical consulting, such as client engagement; statistical packages; paper reviews for various types of analysis in Biology, Psychology, etc.
- Practical training: face-to-face meetings with clients (students or staff members in other disciplines); discussion with academic mentors about the methodology used for the clients' projects; report preparation.

STAT 581	CRN 28423 CRN 28424 CRN 27154	STATISTICAL PRACTICUM	30 PTS	T1 T2 T3
Prerequisites:	Enrolment in the MAppStat; 60 approved STAT points at 400-level or above			
Coordinator:	Dr Ryan Admiraal			

This course enables students to gain professional work experience in the application of statistics. Each student is supervised by a host organisation involved in statistical consulting or statistical applications in the public or private sectors. The placement allows students to develop teamwork and communication skills in the real world.

This course consists of:

- Practicum briefing: understanding professional expectations and responsibilities; dealing with problems arising in the workplace.
- Placement: working on specific projects with significant statistical content assigned by a host employer; developing teamwork and communication skills; and writing a portfolio.
- Seminar: presenting the findings from the projects and sharing the placement experience with the class.

SUBSTITUTION FROM OTHER SUBJECTS

Up to half of a Statistics Honours degree can consist of courses from other subjects as listed below. Information about these courses is contained elsewhere in this prospectus, or in the relevant Postgraduate Prospectus or websites of the School responsible for it. The overall selection of courses must still form a coherent programme and requires approval from the Statistics Postgraduate Coordinator (Taught Course). Examples of such courses are listed below.

COURSE	TITLE	
TRIMESTER 1		
AIML 420	Artificial Intelligence	
AIML 427	Big Data	
AIML 428	Text Mining and Natural Language Processing	
AIML 429	Probabilistic Machine Learning	(NOT OFFERED IN 2025)
BIOL 420	Conservation Ecology (30 points)	
DATA 474	Simulation and Stochastic Models	(NOT OFFERED IN 2025)
DATA 475	Machine Learning Methods	
ECON 408	Econometrics: Cross-sectional data	
FINA 402	Current Topics in Corporate Finance	
FINA 403	Derivative Securities	
PSYC 434	Conducting Research across Cultures	
TRIMESTER 2		
AIML 420	Artificial Intelligence	
AIML 425	Text Mining and Natural Language Processing	
AIML 426	Evolutionary Computation and Learning	
DATA 472	Data Management and Programming	
DATA 492	Data Science Algorithms	
ECON 409	Econometrics: Panel Data and Time Series	
FINA 401	Current Topics in Asset Pricing	
GEOG 415	Introduction to Geographic Information Science and its Applications	
PHYG 414	Climate Change: Lessons from the Past	

PLANNING A PROGRAMME IN DATA SCIENCE

TAUGHT COURSES AND PROJECTS: HONOURS, PGDIPSC, MAPPST AND MSC

The Data Science Honours, PGDipSc and MSc Part 1 programmes require AIML 427, STAT 432, 438 and a further 75 points in an approved combination from AIML 420-429, DATA 400-499, STAT 400-499 or approved alternatives (up to 60 points).

The MDataSc requires AIML 427, DATA 480, 487, 501, 581 STAT 432, 438 and one of AIML 425, 426, 429. The 180-point programme (available to Data Science graduates) requires 45 further approved points from 400 level AIML, DATA, MATH and STAT, or approved alternatives. The full 240-point MDataSc requires a further 60 points from AIML 421, DATA 471-474 or approved alternatives.

COURSE	TITLE	PREREQUISITES
TRIMESTER 1		
AIML 420	Artificial Intelligence	60 300-level COMP, DATA, SWEN or NWEN pts.
AIML 427	Big Data	One of (AIML 420, 421, COMP 307, 309, STAT 393, 394); one of (ENGR 123, STAT 193, MATH 177, QUAN 102)
AIML 428	Text Mining and Natural Language Processing	60 300-level COMP, DATA, NWEN, STAT or SWEN pts
AIML 429	Probabilistic Machine Learning	AIML 420 or COMP 307; one of (MATH 177, STAT 292, 293) or approved background in Mathematics or Statistics.
DATA 473	Statistical Modelling for Data Science	30 300-level pts from (COMP, DATA, NWEN, SWEN); STAT 292 or comparable background in Statistics
DATA 474	Simulation and Stochastic Models **NOT OFFERED IN 2025**	30 300-level pts from (COMP, DATA, STAT, NWEN, SWEN); STAT 292 or comparable background in Statistics
DATA 475	Machine Learning Methods	30 300-level pts from (COMP, DATA, NWEN, SWEN); X DATA 302, 305
DATA 481	Special Topic 1 (Not offered in 2025)	
DATA 482	Special Topic 2 (Not offered in 2025)	
DATA 487	Project (15 points)	
DATA 489	Project (30 points)	
DATA 491	Mathematics for Data Science	30 300-level pts from (COMP, DATA, NWEN, SWEN); STAT 292 or comparable background in Statistics

COURSE	TITLE	PREREQUISITES
TRIMESTER 2		
AIML 420	Artificial Intelligence	60 300-level COMP, DATA, NWEN, STAT or SWEN pts
AIML 425	Neural Nets and Deep Learning	AIML 420 or COMP 307
AIML 426	Evolutionary Computation and Learning	AIML 420 or COMP 307
DATA 471	Practical Data Science	DATA 201, 202
DATA 472	Data Management and Programming	60 300-level pts from (COMP, DATA, STAT, NWEN, SWEN)
DATA 483	Special Topic 3 (Not offered in 2025)	
DATA 487	Project (15 points)	
DATA 489	Project (30 points)	
DATA 501	Advanced Techniques for Data Science	30 approved 400-level pts from (AIML, COMP, DATA, STAT)
STAT 432	Computational Statistics	DATA 303 or DATA 473; STAT 391 or DATA 491
STAT 438	Generalised Linear Models	DATA 303 or DATA 473; STAT 391 or DATA 491
TRIMESTER 3		
DATA 480	Research Methods	Enrolment in the MDataSc
DATA 487	Project (15 points)	
DATA 588	Project (45 points)	
DATA 581	Data Science Practicum (30 pts)	Enrolment in the MDataSc

400-LEVEL COURSES

AIML 420	CRN 33065	ARTIFICIAL INTELLIGENCE	15 PTS	T1
Prerequisites:	60 300-level CGRA, COMP, CYBR, DATA, SWEN or NWEN pts			
Restrictions:	COMP 307, COMP 420			
Coordinator:	Dr Heitor Gomes			
This course addresses concepts and techniques of artificial intelligence (AI). It provides a brief overview of AI history and search techniques, as well as covering important machine learning topics and algorithms with their applications, including neural networks and evolutionary algorithms. Other topics include probability and Bayesian networks, planning and scheduling. The course will also give a brief overview of a selection of other current topics in AI.				

AIML 421	CRN 33066	MACHINE LEARNING TOOLS AND TECHNIQUES	15 PTS	T2
Prerequisites:	60 300-level CGRA, COMP, CYBR, DATA, NWEN, STAT OR SWEN pts			
Restrictions:	COMP 309			
Coordinator:	Dr Qi Chen			
This course addresses the use of machine learning tools and techniques for analysing data and automatically generating applications. The course will explore a range of tools and techniques for classification, regression, image analysis, clustering, text mining, and preprocessing data. It examines the applicability and limitations of the techniques and methods for analysing and evaluating the outcome of using machine learning tools. Students will gain practical experience in applying a range of tools to a range of different problems from different domains.				
NOT OFFERED IN 2025				

AIML 425	CRN 33067	NEURAL NETWORKS AND DEEP LEARNING	15 PTS	T2
Prerequisites:	AIML 420 or COMP 307	Restrictions:	The pair (COMP 421, 422)	
Coordinator:	Prof Bastiaan Kleijn			
This course addresses the fundamentals of neural network based deep learning. It covers the commonly used deep learning architectures such as fully connected networks, resnets, variational autoencoders, and generative adversarial networks. It discusses functional blocks such as convolutional nets, recurrent neural nets such as LSTMs, and the common objective functions and regularization procedures. Examples will discuss applications such as object classification, classification of sequential text, and the generation of realistic human faces.				

AIML 426	CRN 33068	EVOLUTIONARY COMPUTATION AND LEARNING	15 PTS	T2
Prerequisites:	AIML 420 or COMP 307			
Coordinator:	Dr Yi Mei			
This course addresses evolutionary approaches in machine learning and optimization. The course will cover both evolutionary algorithms and swarm intelligence as well as some other population-based techniques for problem solving. It will include a range of real-world application domains such as classification, regression, clustering, and optimization.				

AIML 427	CRN 33069	BIG DATA	15 PTS	T1
Prerequisites:	One of (AIML 420, 421, COMP 307, 309, STAT 393, 394); one of (ENGR 123, STAT 193, MATH 177, QUAN 102) or comparable background in Statistics			
Restrictions:	COMP 424, COMP 473 (2016-2018)			
Coordinator:	Dr Qi Chen			
Big Data refers to the large and often complex datasets generated in the modern world: data sources such as commercial customer records, internet transactions, environmental monitoring. This course provides an introduction to the theory and practice of working with Big Data. Students enrolling in this course should be familiar with the basics of machine learning, data mining, statistical modelling and with programming.				

AIML 428	CRN 33070	TEXT MINING AND NATURAL LANGUAGE PROCESSING		15 PTS	T1
Prerequisites:	60 300-level pts	Co-requisite:	AIML 420 or COMP 307	Restrictions:	COMP 423
Coordinator:	Dr Xiaoying Gao				
This course focuses on text mining and natural language processing. It covers a variety of topics including text representation, document classification and clustering, opinion mining, information retrieval, recommender systems, query expansion, and information extraction.					

AIML 429	CRN 33071	PROBABILISTIC MACHINE LEARNING	15 PTS	T1
Prerequisites:	AIML 420 or COMP 307; one of (MATH 177, STAT 292, 293) or approved background in Mathematics or Statistics.	Restrictions:	COMP 421	
Coordinator:	A/Prof Marcus Frean			
This course teaches the ideas, algorithms and techniques of probabilistic machine learning. Topics include Bayesian inference, discriminative and generative classifiers, the EM algorithm, Gaussian processes, Markov Chain Monte Carlo, hidden Markov models, belief nets and other graphical models, and causal modelling.				
NOT OFFERED IN 2025				

DATA 471	CRN 33154	PRACTICAL DATA SCIENCE	15 PTS	T2
Prerequisites:	DATA 201; one of (DATA 202, SCIE 201 in 2017-2018)	Restrictions:	DATA 301	
Coordinator:	Dr Louise McMillan			
A course in practical data science. The course will introduce interactive displays, infographics and dashboards, focussing on communication, reporting and visualisation. It will bring together techniques in statistical and mathematical modelling with programming as well as social and ethical perspectives on data science. This course is co-taught with DATA 301.				

DATA 472	CRN 33155	DATA MANAGEMENT AND PROGRAMMING	15 PTS	T1
Prerequisites:	60 300-level pts from (COMP, DATA, STAT, NWEN, SWEN)			
Restrictions:	DATA 202, SCIE 201 (2017-2016), STAT 483 (2017-2020)			
Coordinator:	Dr Louise McMillan			
A course in the practical aspects of data management for those who work with data sources. Students will apply programming and data management techniques using a high-level language and SQL. Web scraping, data transformation, data cleaning, summary and visualisation. Students will create a web-based application to investigate, analyse and display a data set. This course is co-taught with DATA 202.				

DATA 473	CRN 33156	STATISTICAL MODELLING FOR DATA SCIENCE	15 PTS	T1
Prerequisites:	30 300-level pts from (COMP, DATA, NWEN, SWEN); STAT 292 or comparable background in Statistics	Restrictions:	DATA 303	
Coordinator:	A/Prof Nokuthaba Sibanda			
The course develops aspects of statistical modelling and inference underpinning data science, including binary and count data. The role of data and modelling in decision-making is examined in a variety of contexts. This course is co-taught with DATA 303.				

DATA 474	CRN 33157	SIMULATION AND STOCHASTIC MODELS	15 PTS	T1
Prerequisites:	30 300-level pts from (COMP, DATA, STAT, NWEN, SWEN); STAT 292 or comparable background in Statistics			
Restrictions:	COMP 312, DATA 304, OPRE 354			
Coordinator:	Prof Alejandro Frery			
Simulation and modelling of stochastic systems, covering examples from Operations Research and Computer Science, including queues, networks and computer systems. Design, analysis and validation of simulation experiments. This course is co-taught with DATA 304.				
NOT OFFERED IN 2025				

DATA 475	CRN tbc	MACHINE LEARNING TECHNIQUES	15 PTS	T1
Prerequisites:	30 300-level pts from (COMP, DATA, NWEN, SWEN)			
Restrictions:	DATA 302, DATA 305			
Coordinator:	Prof Stephen Marsland			
Data Science uses machine learning methods to fit data and make predictions. In this course you will learn how to explore data in order to identify the appropriate ethical and cultural considerations and select the appropriate tools to analyse the data, develop the theory that underlines those tools, and see a variety of modern machine learning algorithms (such as Large Language Models) that make modern machine learning such a fascinating topic.				

DATA 480	CRN 33158	RESEARCH PREPARATION FOR DATA SCIENCE	15 PTS	T3
Prerequisites:	Enrolment in the MDataSc			
Coordinator:	Dr Ryan Admiraal			
This course provides students with an opportunity to develop their research skills in Data Science, including use of library resources, constructing literature reviews, developing research questions, writing research proposals, and developing skills in oral presentation.				

DATA 487	CRN 33162 CRN 33163 CRN 33164	RESEARCH PROJECT	15 PTS	T1 T2 T3
DATA 489	CRN 33165 CRN 33166 CRN 33167	RESEARCH PROJECT	30 PTS	T1 T2 T3 T1 + T2 T2 + T3 T3 + T1
DATA 588	CRN 33174	RESEARCH PROJECT	45 PTS	T3
Coordinator:	Dr Ryan Admiraal			
Students should meet with the Postgraduate Coordinator to identify their areas of interest, for assistance in identifying a suitable supervisor and then contact potential supervisors directly. Fifteen-point projects are usually completed in one trimester. Thirty-point projects can be completed within either a single trimester, or two successive trimesters, and should take 300 hours of study, supervision meetings and writing. The 45-point project DATA 588 is available to students in the Master of Data Science who, with permission, are replacing the combination of the work placement DATA 581 and project DATA 487 with a larger research project.				

DATA 491	CRN 33168	MATHEMATICS FOR DATA SCIENCE	15 PTS	T1
Prerequisites:	30 300-level pts from (COMP, DATA, NWEN, SWEN); STAT 292 or comparable background in Statistics			
Restrictions:	MATH 277, STAT 391			
Coordinator:	Dr John Haywood			
This course covers key mathematical methods used in the construction and maximisation of likelihoods, analyses of experimental data and general linear models, and exploration of probability distributions. Topics will include differentiation and optimisation of functions, matrices and their properties, probability distributions and integration. The statistical software R will be used. The mathematical methods will be implemented and illustrated using R including the use of simulation, numerical methods and graphics. This course is co-taught with STAT 391.				

DATA 501	CRN 33170	ADVANCED TECHNIQUES FOR DATA SCIENCE	15 PTS	T2
Prerequisites:	30 approved 400-level pts from (AIML, COMP, DATA, STAT)			
Coordinator:	Prof Alejandro Frery			
A course in the application of Data Science techniques to a problem. Each student will develop a distributable software package to process, investigate, analyse, manipulate, summarise and visualise data from a data source. The package will be developed in a standard programming environment and will be fully documented and peer tested. Students will write an accompanying critique of relevant data limitations and any legal or ethical considerations.				

DATA 581	CRN 33171-3	DATA SCIENCE PRACTICUM	30 PTS	T1, T2, T3
Prerequisites:	Enrolment in the MDataSc			
Coordinator:	Dr Ryan Admiraal			

This course enables students to gain professional work experience in the application of Data Science. Each student is supervised by a host organisation involved in the practice of Data Science in the public or private sectors. The placement allows students to develop teamwork and communication skills in the real world.

This course consists of:

- Practicum briefing: understanding professional expectations and responsibilities; dealing with problems arising in the workplace.
- Placement: working on specific projects with significant Data Science content assigned by a host employer; developing teamwork and communication skills; and writing a portfolio.
- Seminar: presenting the findings from the projects and the placement experience.

STAT 432	CRN 23079	COMPUTATIONAL STATISTICS	15 PTS	T2
Prerequisites:	one course from (STAT 332, 393, 394) or (one of (STAT 391, DATA 491) and one of (DATA 303, 473))			
Coordinator:	Dr Louise McMillan			

Introduction to computationally intensive methods for statistical modelling and inference. Topics selected from jackknife and bootstrap bias correction and variance estimation; permutation tests; maximum likelihood estimation using EM algorithm; random numbers; probability distribution simulation; Bayesian Inference; Markov Chain Monte Carlo; Metropolis-Hastings algorithm; Gibbs sampling. Desirable that students have some programming experience.

STAT 438	CRN 8113	GENERALISED LINEAR MODELS	15 PTS	T2
Prerequisites:	one course from (STAT 332, 393, 394) or (one of (STAT 391, DATA 491) and one of (DATA 303, 473))			
Coordinator:	A/Prof Ivy Liu			

Brief outline of generalised linear model theory, contingency tables, binary response models, log-linear models (for contingency tables), repeated measures, GEE analysis, logit models for multinomial responses, and ordinal response models.

SUBSTITUTION FROM OTHER SUBJECTS

Honours, Postgraduate Diploma and Master's degrees can include approved courses from other subjects as listed below. Information about these courses is contained from elsewhere in this prospectus, or in the relevant Postgraduate Prospectus or websites of the School responsible for it. The overall selection of courses must still form a coherent programme and requires approval from the Postgraduate Coordinator for Data Science. Examples of such courses are listed below.

COURSE	TITLE
TRIMESTER 1	
ECON 408	Econometrics: Cross-sectional Data
FINA 402	Current Topics in Corporate Finance
STAT 431	Biostatistics (NOT OFFERED)
STAT 452	Bayesian Statistics
TRIMESTER 2	
AIML 430	Applications and Implications of Artificial Intelligence
AIML 431	Current Topics in Artificial Intelligence
ECON 409	Econometrics: Panel Data and Time Series (NOT OFFERED)
FINA 401	Current Topics in Asset Pricing (NOT OFFERED)
FINA 403	Derivative Securities
GEOG 415	Introduction to Geographic Information Science and its Applications
STAT 451	Official Statistics

EXAMPLE COURSES OF STUDY IN THE MDATASC

Each student's course of study must be approved by the postgraduate coordinator. Some examples of courses of study are shown in the table below.

Note that students with an undergraduate major in Data Science, or a double major in Statistics and Computer Science, can complete the MDataSc in 12 months and only complete 180 points. Other students will need to complete the full 240-point qualification.

Some courses (such as AIML 420 Artificial Intelligence and DATA 491 Mathematics for Data Science) may be required for students as preparation for courses later in the degree. Also note that some students may need to take additional prerequisite courses (such as COMP 132 Programming for the Natural and Social Sciences, or STAT 292 Applied Statistics 2A) concurrently with the MDataSc. Recognition can be given for work experience as well as prior study when assessing the need for these prerequisites.

EXAMPLE PROGRAMMES IN THE MDATASC

Year/Trimester	(a) Data Science graduates, double majors in Statistics and Computer Science, or double majors in Statistics and Artificial Intelligence (180 points)	(b) Statistics graduates (240 points)	(c) Computer Science or Artificial Intelligence graduates (240 points)
Y1/T1	AIML 420 (AI) + AIML 427 (Big Data) DATA 491 (Mathematics) + STAT 452 (Bayesian Stats) o	AIML 420 (AI) DATA473 (Statistical Modelling for Data Science) * DATA 475 (Machine Learning) *	AIML 420 (AI) o DATA 475 (Machine Learning) * AIML 427 (Big Data) *[+ optionally STAT 292]*
Y1/T2	AIML 425 (Neural Nets) STAT 432 (Comp Stat) STAT 438 (Gen Lin Models) DATA 501 (Data Science)	AIML 472 (Data Management and Programming) * DATA 471 (Data Science) * STAT 438 (Gen Lin Models)	AIML 425 (Neural Nets) DATA 471 (Data Science) * DATA 472 (Data Management and Programming) *
Y1/T3	DATA 480 (Research Prep) DATA 487 (Project) DATA 581 (Practicum)	DATA 480 (Research Prep) DATA 487 (Project) DATA 581 (Practicum)	DATA 480 (Research Prep) DATA 487 (Project) DATA 581 (Practicum)
Y2/T1		AIML 427 (Big Data) + AIML 428 (Nat Lang) o STAT 452 (Bayes Stats) o	AIML 428 (Nat Lang) o DATA 491 (Mathematics) + DATA 473 (Statistics) *
Y2/T2		AIML 425 (Neural Nets) DATA 501 (Data Sci) STAT 432 (Comp Stat)	DATA 501 (Data Sci) STAT 432 (Comp Stat) STAT 438 (Gen Lin Models)

* = Part 1 course; o = Elective course; + = Required prerequisite course

CONTACT INFORMATION

SCHOOL OF MATHEMATICS AND STATISTICS

Te Kura Mātai Tatauranga

Location: CO358, Level 3, Cotton Building, Kelburn Campus
Phone: 04-463 5341
Email: sms-office@vuw.ac.nz
Website: www.wgtn.ac.nz/sms

STAFF (All room numbers refer to Cotton Building)		**ROOM**	**PHONE**
Head of School	Prof Lisa Orloff Clark	324	04-463 6734
Deputy Head of School	Prof Richard Arnold	538	04-463 5668
School Manager	Hariaty Abu Hassan	323	04-463 5557
Office Administration			
Senior Administrator	Sonia Tenreiro	358	04-886 3633
Administrator	Amy Blair	358	04-463 5341
Postgraduate Coordinator	Morgan Holschier	358	04-887 3988

TEACHING STAFF	**ROLE / RESEARCH INTERESTS**	**ROOM**	**EMAIL**
Dr Ryan Admiraal	Social network analysis, disease modelling	536	ryan.admiraal@vuw.ac.nz
Prof Astrid an Huef	Functional analysis, operator algebras, dynamical systems	439	astrid.anhuef@vuw.ac.nz
Dr Steven Archer	Lecturer (teaching)	363	steven.archer@vuw.ac.nz
Dr Becky Armstrong	Post Doctoral Fellow in Mathematics	364	becky.armstrong@vuw.ac.nz
Prof Richard Arnold	Biostatistics, Bayesian statistics, statistics in geophysics	538	richard.arnold@vuw.ac.nz
Dr Nick Brettell	Matroid theory, graph theory, algorithms	427	nick.bretell@vuw.ac.nz
David Cox	Lecturer (teaching)	320	david.cox@vuw.ac.nz
Dr Petro Feketa	Stability theory, nonlinear control, hybrid and discontinuous dynamical systems	426	petro.feketa@vuw.ac.nz
Prof Alejandro Frery	Statistical computing; signal, image, network analysis, data analysis, synthetic aperture radar (SAR) imagery	537	alejandro.frery@vuw.ac.nz
Dr Emma Greenbank	Mathematical modelling, fluid dynamics, Surtseyan ejecta and Lithium-ion batteries	435	emma.greenbank@vuw.ac.nz
Prof Noam Greenberg	Computability theory, set theory	438	noam.greenberg@vuw.ac.nz
Dr Tanya Gvozdeva	Lecturer (teaching)	362	tanya.gvozdeva@vuw.ac.nz
Dr Brendan Harding	Fluid dynamics, iterated function systems	433	brendan.harding@vuw.ac.nz

Dr John Haywood	Time series, forecasting, seasonal adjustment, statistical modelling	541	john.haywood@vuw.ac.nz
Dr David Huijser	Bayesian statistics, data modelling	542	david.huijser@vuw.ac.nz
Dr Byoung Du Kim	Number theory	434	byoungdu.kim@vuw.ac.nz
A/Prof Ivy Liu	Categorical data analysis	424	ivy.liu@vuw.ac.nz
Prof Stephen Marsland	Shape analysis, diffeomorphism groups, machine learning, complexity	443	stephen.marsland@vuw.ac.nz
Dr Louise McMillan	Model-based clustering, statistical ecology	429	louise.mcmillan@vuw.ac.nz
A/Prof Sasha Melnikov	Mathematical logic, computability theory, computable algebraic and metric structures	442	sasha.melnikov@vuw.ac.nz
A/Prof Dimitrios Mitsotakis	Numerical analysis, differential equations, nonlinear waves	441	dimitrios.mitsotakis@vuw.ac.nz
Dr Binh Nguyen	Image analysis, visualization	535	binh.p.nguyen@vuw.ac.nz
Prof Lisa Orloff Clark	Algebra and functional analysis	324	lisa.orloffclark@vuw.ac.nz
Dr Hung Le Pham	Functional analysis	440	hung.pham@vuw.ac.nz
A/Prof Nokuthaba Sibanda	Biomedical statistics, statistical process control, applications of Bayesian statistics	534	nokuthaba.sibanda@vuw.ac.nz
Prof Peter Smith	Telecommunications, statistics in engineering	539	peter.smith@vuw.ac.nz
Dr Budhi Surya	Levy process, optimal stopping, applied probability, financial stochastics	544	budhi.surya@vuw.ac.nz
Dr Ilija Tolich	Post Doctoral Fellow in Mathematics	430	ilija.tolich@vuw.ac.nz
Dr Dan Turetsky	Computability theory, algorithmic randomness	436	dan.turetsky@vuw.ac.nz
Prof Matt Visser	Black holes, general relativity, cosmology	321	matt.visser@vuw.ac.nz
Dr Yuan Yao	Statistical learning, high-dimensional data analysis, survival analysis, empirical processes	533	yuan.yao@vuw.ac.nz

STUDENT SUPPORT

TĪTOKO—CENTRE FOR STUDENT SUCCESS

The Student Success team offers a range of services that cover all student-related matters from applications and enrolment to graduation. Our aim is to create a client-focused, friendly environment where all who visit our area not only feel welcome, but also receive support and advice of high quality.

Address	CO144, Level 1, Cotton Building
Phone	0800 04 04 04
Email	info@vuw.ac.nz
Hours	9.00am - 4.00pm Monday, Wednesday, Thursday, Friday 9.30am - 4.00pm Tuesday

Email
We encourage you to use email for enquiries. You can contact our team at info@vuw.ac.nz.
Please include your full name and ID number in the subject line of your email.

In-person appointments
If you are coming to the office, you will need to make an appointment in advance.

ĀWHINA | MĀORI STUDENT SUPPORT

Āwhina is the on-campus whānau for Māori students to work together to share knowledge, achieve academic success, and build strong communities and leaders.

At Āwhina, our kaupapa (goal) is to help students successfully transition from secondary education or work into tertiary education, and to provide academic support for Māori students enrolled at the University. Our experienced staff offer one-to-one advising and mentoring sessions, tutorials, study wānanga, and a range of workshops to help you achieve your study goals. Our culturally inclusive environment includes whānau rooms with computer facilities, study areas, kitchen facilities, and space to meet with peers or tuākana (older students).

Email: awhina@vuw.ac.nz Website: www.wgtn.ac.nz/awhina

PASIFIKA STUDENT SUCCESS

The Pasifika Student Success team is the University ‘āiga (family) who journey with all Pasifika students at the University. The team fosters learning and teaching communities in an environment that celebrates Pasifika cultures, is welcoming and safe, and is focused on academic excellence, personal growth, and wellbeing.

The Pasifika Student Success team can help you navigate your transition into tertiary study, with study spaces, support staff and mentoring programmes. The team engage with Pasifika students on campus and via various online platforms, such as Zoom, email, phone, and social media.

Email: pasifika@vuw.ac.nz Website: www.wgtn.ac.nz/pasifika

VICTORIA UNIVERSITY OF WELLINGTON
TE HERENGA WAKA