



**ROINN NA MATAMAITICE AGUS NA STAITISTICE
DEPARTMENT OF MATHEMATICS & STATISTICS**

POSTGRADUATE HANDBOOK

2019/2020

Ollscoil na hÉireann, Má Nuad, Co. Chill Dara, Éire.

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ABOUT THE DEPARTMENT OF MATHEMATICS & STATISTICS

Welcome to the Department of Mathematics & Statistics. We are located on the Top Floor of Logic House at the southern end of the old Campus. We hope you find this handbook of some help to you. If you have any further enquiries, these can be made at the Department Office. This office is located in Room 207 on the Top Floor of Logic House.

OFFICE HOURS:

10.00 a.m. - 11.00 a.m.

12.00 p.m. - 1.00 p.m.

2.00 p.m. - 4.00 p.m.

Telephone: + 353-1-7083914

E-mail: mathsstats@mu.ie

Website: <https://www.maynoothuniversity.ie/mathematics-and-statistics>

The information in this handbook is as accurate as we can make it at the time of going to press, but it may be in error. In the event of difference, the official University rules and procedures take precedence over anything in this handbook, and nothing in this handbook should be understood as official.

TERM DATES: 2019-2020

<https://www.maynoothuniversity.ie/registrar/key-term-dates>

FIRST SEMESTER

First-Year Registration/Orientation	12 th September 2019	20 th September 2019
First Semester	23 rd September 2019	20 th December 2019
Study Week	28 th October 2019	1 st November 2019
Christmas Break	23 rd December 2019	3 rd January 2020
Study Period	6 th January 2020	9 th January 2020

SECOND SEMESTER

Second Semester	3 rd February 2020	8 th May 2020
Study Week	16 th March 2020	20 th March 2020
Easter Vacation	13 th April 2020	17 th April 2020
Study Period	11 th May 2020	14 th May 2020

DEPARTMENT STAFF

Professor Stephen Buckley, Head of Department

<https://www.maynoothuniversity.ie/mathematics-and-statistics/our-people/stephen-buckley>

Dr Stefan Bechtluft-Sachs, Lecturer

<https://www.maynoothuniversity.ie/mathematics-and-statistics/our-people/stefan-bechtluft-sachs>

Dr Caroline Brophy, Lecturer

<https://www.maynoothuniversity.ie/mathematics-and-statistics/our-people/caroline-brophy>

Dr Niamh Cahill, Lecturer

<https://www.maynoothuniversity.ie/mathematics-and-statistics/our-people/niamh-cahill>

Dr Rafael de Andrade Moral, Lecturer

<https://www.maynoothuniversity.ie/mathematics-and-statistics/our-people/rafael-de-andrade-moral>

Dr Detta Dickinson, Senior Lecturer

<https://www.maynoothuniversity.ie/mathematics-and-statistics/our-people/detta-dickinson>

Dr Katarina Domijan, Lecturer (on-leave Sept 2019...)

<https://www.maynoothuniversity.ie/mathematics-and-statistics/our-people/katarina-domijan>

Dr Lida Fallah, Lecturer

September 2019

Dr Catherine Hurley, Senior Lecturer

<https://www.maynoothuniversity.ie/mathematics-and-statistics/our-people/catherine-hurley>

Professor George Huxley

Adjunct Professor

Department of Mathematics & Department of Ancient Classics

Dr Ciarán Mac an Bhaird, Lecturer

Director, Mathematics Support Centre

<https://www.maynoothuniversity.ie/mathematics-and-statistics/our-people/ciar-n-mac-bhaird>

Dr David Malone, Senior Lecturer

<https://www.maynoothuniversity.ie/mathematics-and-statistics/our-people/david-malone>

Dr Oliver Mason, Senior Lecturer

<https://www.maynoothuniversity.ie/mathematics-and-statistics/our-people/oliver-mason>

Dr Pat McCarthy, Lecturer

<https://www.maynoothuniversity.ie/mathematics-and-statistics/our-people/pat-mccarthy>

Dr John Murray, Senior Lecturer

<https://www.maynoothuniversity.ie/mathematics-and-statistics/our-people/john-murray>

Dr Fiacre Ó Cairbre, Senior Lecturer

<https://www.maynoothuniversity.ie/mathematics-and-statistics/our-people/fiacre-cairbre>

Dr Ann O'Shea, Senior Lecturer

<https://www.maynoothuniversity.ie/mathematics-and-statistics/our-people/ann-oshea>

Professor Andrew Parnell

<https://www.maynoothuniversity.ie/mathematics-and-statistics/our-people/andrew-parnell>

Dr Anthony Small, Senior Lecturer

<https://www.maynoothuniversity.ie/mathematics-and-statistics/our-people/anthony-small>

Dr Mark Walsh, Lecturer

<https://www.maynoothuniversity.ie/mathematics-and-statistics/our-people/mark-walsh>

Professor David Wraith

<https://www.maynoothuniversity.ie/mathematics-and-statistics/our-people/david-wraith>

SUPPORT STAFF

Ms. Janice Love, Senior Technical Officer

<https://www.maynoothuniversity.ie/mathematics-and-statistics/our-people/janice-love>

Ms. Gráinne O'Rourke, Administrator

(Tel: 01 – 7083914/3651)

<https://www.maynoothuniversity.ie/mathematics-and-statistics/our-people/gr-inne-orourke>

Mr. Anthony Waldron, Technical Officer

<https://www.maynoothuniversity.ie/mathematics-and-statistics/our-people/anthony-waldron>

POSTGRADUATE COORDINATORS

MATHEMATICS 2019/-

Dr Mark Walsh, Lecturer

<https://www.maynoothuniversity.ie/mathematics-and-statistics/our-people/mark-walsh>

MASTERS IN DATA SCIENCE AND ANALYTICS 2019/-

PhD in STATISTICS 2019/-

Dr Catherine Hurley, Senior Lecturer

<https://www.maynoothuniversity.ie/mathematics-and-statistics/our-people/catherine-hurley>

HIGHER DIPLOMA IN DATA ANALYTICS 2019/-

Dr Rafael de Andrade Moral, Lecturer

<https://www.maynoothuniversity.ie/mathematics-and-statistics/our-people/rafael-de-andrade-moral>

RESEARCH INTERESTS OF STAFF

Dr. Stefan Bechtluft-Sachs

Stefan Bechtluft-Sachs' research deals with the relation of (algebraic) topology on one side and differential geometry and (global) analysis on the other. Specifically Stefan works on the role variational calculus, in particular natural functionals, plays in homotopy theory. Moreover he is interested in topological obstructions to certain curvature properties of manifolds.

Dr. Caroline Brophy

Caroline Brophy's research interests are in the development and application of statistical modelling techniques to non-standard situations in Ecology and Environmental Science. The Statistical topics she is particularly interested in are mixture models, functional relationship models, multinomial models, mixed models, methods for modelling data with large numbers of missing or zero values, methods for predicting the mean response without bias from non-linear models and bootstrapping methods for assessing predictions from non-linear models. The Ecological and Environmental topics she is currently working on are climate change, biodiversity in grassland systems, competition in a range of ecological systems, and genotypic variability in allergenic plant species.

Professor Stephen Buckley

Stephen Buckley's research interests span algebra, geometry, and analysis. In algebra, he is interested in ring theory (particularly combinatorial ring theory and commutativity conditions) and group theory.

He is interested in geometric analysis in the settings of Euclidean space, metric spaces, or metric measure spaces, especially various weak notions of negative or nonpositive curvature such as Gromov hyperbolicity, CAT(0), Busemann convexity, and the Ptolemaic inequality.

He is also interested in quasiconformal mappings, potential theory, metric measure spaces, Gromov hyperbolicity, geometric function theory, and other fields in geometric and harmonic analysis. In particular, he has studied various types of Poincaré and Trudinger inequalities, over Euclidean and non-Euclidean spaces, especially the connection between such analytic inequalities and geometry.

Dr. Niamh Cahill

Broadly, Niamh Cahill's research focuses on the development of statistical models for the analysis of time dependent, compositional and/or spatial data. I use a Bayesian approach to statistical modeling, which is suitable for developing complex hierarchical models, accounting for uncertainties related to model parameters, incorporating prior knowledge and sharing information across data populations. Specifically, my research interests lie in the analysis of reproductive health indicators and climate change.

Dr Rafael de Andrade Moral

Rafael's research interests include the development and application of statistical modelling techniques to Biology and Agriculture, more specifically Ecology and Entomology. He is also

interested in the computational implementation of statistical models, especially as packages for the open-source statistical software R. He is currently working on the development of computational and statistical tools to jointly model multivariate responses in ecological studies, in particular those involving the collection of abundance measurements.

Dr. Detta Dickinson

Detta Dickinson's research interests lie in the areas of measure theory and metric Diophantine approximation. In particular, Diophantine approximation on manifolds.

Classically, Diophantine approximation is the study of how well real numbers can be approximated by rationals. This can be extended to higher dimensions by asking how well real points in n -dimensional Euclidean space can be approximated by rational points or by rational hyperplanes. Results in this area are very delicate as shown in Khintchine's theorem, where the set of well approximable points has either zero or full measure depending on the convergence or divergence of a certain volume sum. This leads to further questions: those of Hausdorff dimension in the case of measure zero and those of asymptotic number of solutions in the case of full measure.

Both of the above questions become more difficult when the set under investigation is restricted to a manifold embedded in Euclidean space and this is Detta's current area of interest.

Dr. Katarina Domijan

Katarina Domijan's research interests lie in applying Bayesian methods of statistical inference to analyze data of complex structure that arise in a variety of applications. In particular, I am interested in classification problems in data with large feature spaces. One of the most important aspects of modelling high-dimensional data is feature selection and I am interested in developing novel methods for this challenging problem.

Dr. Catherine Hurley

Catherine Hurley's research interests are in statistical computing, graphics and data analysis. At present the focus of these interests is the design of software for interactive statistical graphics. This work has resulted in new software for statistical graphics, which is part of the QUAIL (for Quantitative Analysis In Lisp) system, available from the University of Waterloo Statistical Computing Laboratory.

Dr. Ciarán Mac an Bhaird

Ciarán Mac an Bhaird's current areas of research focus on Mathematics Education and Algebraic Number Theory. In Maths Education he is working on the benefits of introducing new methods of teaching Maths to students. He is particularly interested in using podcasts, screencasts and touchscreen technology. He is also developing resources to help introduce the history and background of mathematical topics to students at all levels. He is also working on investigations into the levels of student engagement with extra Mathematics Support initiatives. In Algebraic Number Theory he is interested in Gauss Sums and Cyclotomic Numbers. He is currently working with the computer package Singular in order to investigate these topics further.

Dr. Pat McCarthy

Pat McCarthy is interested in Classical Function Spaces and the inequalities which arise in their study. Examples include H^p , L^p and Lipschitz spaces.

He has worked on convergence problems for Fourier series and extremal properties of certain orthogonal polynomials. Currently he is examining generalisations of Carleson Interpolation Sequences.

Another interest is Number Theory, cryptography, and the implementation of cryptographic routines and cipher attacks on microprocessors.

Dr. John Murray

John Murray works on the modular representation theory of groups. Representation theory is the study of concrete realisations of the axiomatic systems of abstract algebra. It originated in the study of permutation groups and algebras of matrices. The representation theory of finite groups was developed by G. Frobenius in the last decade of the nineteenth century. Major applications were quickly found by W. Burnside and I. Schur. R. Brauer began his investigations into the modular representations of finite groups in 1939. His work was the genesis of the programme to classify the finite simple groups, which reached fruition in the early 1980's. Other landmarks in the subject include the 1956 paper of J. Green on the general linear group, the work of P. Deligne and G. Lusztig in the 1970's on algebraic groups, and the (still open) conjectures of J. Alperin, G. Robinson and E. Dade from the late 1980's on the p -defects of characters.

Dr. Murray is fascinated by all aspects of this rapidly changing subject. He is particularly interested in the structure of the centres of modular group algebras, the block theory of finite groups, properties of involutions, and generally in the connections between ring theoretic and group theoretic invariants of algebras. He has written a number of papers on these topics. John has developed and implemented algorithms for the computer package GAP to facilitate his investigation into the structure of finite algebras. At the moment he is working on the proof of a result that concerns the involution classes of symmetric groups, using the ring of symmetric functions and the class algebra of I. MacDonald.

Dr. Fiacre Ó Cairbre

Fiacre Ó Cairbre's research interests are currently in the two areas of stability theory and mathematics education. He is working on the stability of certain types of switching systems in control theory. He is also working on resource materials for second level mathematics teachers.

Dr. Ann O'Shea

Ann O'Shea is interested in Mathematics Education. Current research projects include: investigating concept formation; investigating the effects of beliefs and attitudes on learning; measuring the effectiveness of mathematics support. She has also worked in the area of Value Distribution Theory in Several Complex Variables.

Professor Andrew Parnell

TO BE ADDED

Dr. Anthony Small

Anthony Small is working on problems in algebraic/differential geometry, in particular the construction and study of differential geometric objects of variational origin, via 'transforms' that convert the data into more tractable algebro-geometric objects, e.g. minimal surfaces (soap films), constant mean curvature surfaces (soap bubbles), monopoles.

Dr. Mark Walsh

Mark Walsh's interests are in Geometry, in particular concerning the relationship between Curvature and Topology. His work so far has focused on Positive Scalar Curvature and especially understanding the topology of the space of Riemannian metrics of positive scalar curvature on a smooth manifold, as well as the corresponding moduli spaces. More recently he has shifted attention to analogous questions for positive Ricci curvature.

Professor David Wraith

David Wraith's research interests encompass Differential Geometry and Algebraic Topology, and focus primarily on the topological implications of positive curvature. Most of his work to date explores the effects of surgery on Ricci positive manifolds.

INTRODUCTION TO POSTGRADUATE COURSES

The Mathematics & Statistics Department offers postgraduate students the opportunity to study Mathematics or Statistics for the degrees of PhD, MSc, MA, or for a Higher Diploma in Mathematical Studies, Mathematics and Statistics.

Please note that all postgraduate Mathematics and Statistics courses can be taken on a part-time basis over two or more years. Students who study on a part-time basis attend the regular daytime classes. The Department does not offer any classes during the evening or at weekends.

Information on Fees can be found on the University website at:

<https://www.maynoothuniversity.ie/student-fees-grants>

HIGHER DIPLOMA IN MATHEMATICAL STUDIES

<https://www.maynoothuniversity.ie/study-maynooth/postgraduate-studies/courses/higher-diploma-mathematical-studies>

HIGHER DIPLOMA IN MATHEMATICS

<https://www.maynoothuniversity.ie/study-maynooth/postgraduate-studies/courses/higher-diploma-mathematics>

HIGHER DIPLOMA IN STATISTICS

<https://www.maynoothuniversity.ie/study-maynooth/postgraduate-studies/courses/higher-diploma-statistics>

HIGHER DIPLOMA IN DATA ANALYTICS

<https://www.maynoothuniversity.ie/mathematics-and-statistics/springboard>

MSc in MATHEMATICS OR STATISTICS BY RESEARCH

<https://www.maynoothuniversity.ie/study-maynooth/postgraduate-studies/courses/msc-mathematics>

MSc in MATHEMATICS BY EXAMINATION

<https://www.maynoothuniversity.ie/study-maynooth/postgraduate-studies/courses/msc-mathematics-science>

MA IN MATHEMATICS BY EXAMINATION

<https://www.maynoothuniversity.ie/study-maynooth/postgraduate-studies/courses/ma-mathematics>

MASTER IN DATA SCIENCE AND ANALYTICS

<https://www.maynoothuniversity.ie/mathematics-and-statistics/postgraduates/MSc-data-science>

PHD IN MATHEMATICS

<https://www.maynoothuniversity.ie/study-maynooth/postgraduate-studies/courses/phd-mathematics>

PHD IN STATISTICS

<https://www.maynoothuniversity.ie/study-maynooth/postgraduate-studies/courses/phd-statistics>

ERASMUS PROGRAMME

The Department has exchange agreements under the ERASMUS programme with a number of European universities. Students may spend up to half of one year at another university under this program, provided that a suitable programme of studies is arranged. For the Masters degree by examination, certain courses offered at the Universities of Kiel, Tübingen, Ulm (Germany), and the University of La Laguna (Tenerife) have been approved by the NUI as suitable to form part of the Maynooth course. You can find some useful links at

<https://www.maynoothuniversity.ie/international>

SCHOLASTIC FUNDING

There are opportunities for talented postgraduate students to get funding at Maynooth University, in either taught or research-based courses. Depending on the nature of the award, this can range from funding to cover fees, up to a full scholarship with not only fees, but a living allowance and provision for expenses also.

Competition for both Maynooth University funding and funding from other agencies is very high.

Further information can be found on the Maynooth University website at:

<https://www.maynoothuniversity.ie/study-maynooth/postgraduate-studies/fees-funding-scholarships>

RESEARCH STUDENT SUPERVISORY POLICIES

For information about the University's research student policies, contact Marie Murphy of the Graduate Studies Office (phone 01-7086016, or e-mail marie.murphy@nuim.ie).

Students doing research degrees should also read the Mathematics & Statistics Department Research Student Policy Document:

https://www.maynoothuniversity.ie/sites/default/files/assets/document/policy_res_student_1920_0.pdf

Structured Research students must take a certain number of taught modules, as explained in the above policy document. Other research students can also avail of these modules. The most relevant modules are the 800 level modules on the following webpage, although 500-level and other modules can also be taken with the permission of the Head of Department:

<https://www.maynoothuniversity.ie/mathematics-and-statistics/undergraduates/module-descriptors-201920>

HOW TO APPLY FOR A POSTGRADUATE COURSE AT MAYNOOTH UNIVERSITY

TAUGHT POSTGRADUATE COURSES:

Before you submit an application, please discuss your choice of course with the relevant Department Postgraduate Coordinator.

RESEARCH DEGREE:

Before submitting any application for a Research degree, please ensure you have the prior agreement of a research supervisor.

If you have satisfied the above criteria, you may proceed and submit your application to the:

POSTGRADUATE APPLICATIONS CENTRE

www.pac.ie/