

Postgraduate Research Scholarships 2025/26

Applications are now open for a range of postgraduate research scholarships.

- **MIC Doctoral Award**
fee waiver + €12,600 annual stipend; application deadline: 25 April 2025
- **MIC Doctoral Studentship Award**
fee waiver + €6,900 annual stipend; Application deadline: 25 April 2025
- **MIC Postgraduate Studentship Award**
fee waiver + €6,900 annual stipend; Application deadline: 25 April 2025
- **Departmental Assistantship Award**
fee waiver + €6,900 annual stipend; Application deadline: 16 May 2025

To be considered for any of these Awards, applicants should identify a research topic and supervisor (see below), and complete a [research postgraduate application](#).

Further information on the PGR scholarship schemes is available on the [College website](#).

Prospective applicants are encouraged to contact the Head of Department, Dr Bernd Kreuzsler, at the earliest opportunity: Bernd.Kreussler@mic.ul.ie

Department Overview

The department of Mathematics and Computer Studies belongs to the Faculty of Arts in Mary Immaculate College. The department has staff members based in Thurles and in Limerick who publish their research findings in leading international journals. Research activity and postgraduate research supervision expertise is available in Mathematics and Mathematics Education. More detailed research profiles and sample research projects are laid out below.

Postgraduate research students will be supported in their research through regular and professional contact with friendly, supportive, knowledgeable and experienced department staff.

Further information about the department is available on [the department website](#).

Staff Research Interests and Sample Research Projects

In addition to the sample projects listed below, PhD projects are available on an individual basis, taking into account background, experience and research interests of the applicant. MA projects different from these sample projects are available on an individual basis as well.

Mathematics

Dr Stephen Coughlan

Research Interests: Algebraic Geometry, classification and moduli of projective algebraic varieties.

Sample MA Project: Moduli spaces of algebraic varieties. The background to this project is in the classification of algebraic surfaces from the early 20th century and/or the classification of algebraic 3-folds from the 1980s. The main aim will be to study examples of surfaces or 3-folds in the explicit algebraic geometry style. This will involve commutative algebra, possibly using a computer, and will lead to the study of families and moduli spaces.

Dr Norbert Hoffmann

Research Interests: Algebraic Geometry, moduli spaces of vector bundles and principal bundles over algebraic varieties.

Sample MA Project: Examples of Algebraic Vector Bundles. After introductory work on Algebraic Geometry that prepares for the study of some algebraic vector bundles, the main aim of this project would be to investigate a specific class of examples.

Dr Derek Kitson

Research Interests: Operator theory, discrete geometry, combinatorics.

Sample MA Project: Rigidity and flexibility of frameworks. Frameworks are ubiquitous in engineering, the natural sciences and technology. They model everything from bridges and mechanical linkages to the molecular bonds of proteins and communication channels in autonomous multi-vehicle systems. The flexibility of a framework (or lack thereof) is often central to its functionality. The goal of the project is to develop new techniques for determining when a given framework is flexible by applying elements of linear algebra, graph theory, functional analysis and operator theory.

Dr Bernd Kreussler

Research Interests: Algebraic Geometry, the structure of twistor spaces, and stability conditions on triangulated categories.

Sample MA Project: A Study of Deformations of Coherent Sheaves. This involves acquiring basic knowledge in commutative algebra and algebraic geometry before background material on deformations of coherent sheaves on particular algebraic varieties will be studied. The main aim of the project is the construction of concrete examples in a certain interesting set-up.

Dr Arundhathi Krishnan

Research Interests: Operator algebras with a focus on non-commutative probability.

Sample MA Project: Algebraic Central Limit Theorems. This involves acquiring a basic understanding of noncommutative probability spaces and studying some preliminaries on the combinatorics of pair partitions. The main aim of the project is to (attempt to) formulate an algebraic central limit theorem in the context of the infinite braid group using different sets of generators.

Dr Cian O'Brien

Research Interests: Combinatorial and algebraic structures arising from alternating sign matrices.

Sample MA Project: Alternating Sign Hypermatrices and Characterisations of Latin-like Squares. Alternating sign matrices are a class of matrices with deep connections to a wide variety of areas in mathematics and beyond. A Latin square is an $n \times n$ grid containing numbers from $\{1, 2, \dots, n\}$ with each number occurring exactly once in each row and column. A Sudoku puzzle is a well known example. A connection has recently been made between Latin squares and a 3-dimensional version of alternating sign matrices called an alternating sign hypermatrix (ASHM). At present, these Latin-like squares can only be recognised by finding the corresponding ASHM, and there is no known set of necessary and sufficient rules for what its entries can be. After some introductory study of these objects, the aim of this project would be to find further necessary conditions on the entries of a Latin-like square.

Mathematics Education

Dr Páraic Treacy

Research Interests: Mathematics curriculum change at secondary level; teaching and assessment methods in tertiary level mathematics; STEM Education.

Sample MA Project: Integrating mathematics and science in the classroom. This project would involve examining the means by which pupil learning in both mathematics and science can be achieved simultaneously. Furthermore, a suitable approach will be applied in the classroom, the impact of which will be analysed through case study research.