



MSc MATHEMATICAL MODELLING AND SCIENTIFIC COMPUTING

Msc Mathematical Modelling and Scientific Computing

The primary aim is to educate participants to M.Sc. level in the theoretical and practical aspects of mathematical problem solving, mathematical model development, creating software solutions and communication of results.

This programme provides training in the use and development of reliable numerical methods and corresponding software. It aims to train graduates with a mathematical background to develop and apply their skills to the solution of real problems. It covers the underlying mathematical ideas and techniques, the use and design of mathematical software, and several application areas are examined in detail. It develops skills in mathematical problem solving, scientific computing, and technical communication. Training is also provided in general computing skills, mathematical typesetting, mathematical writing, desktop and web-based mathematical software development, and the use of computer languages and packages including Mathematica, parallel computing, C#, 3D graphics and animation, and visualisation.

The programme is available on a full-time and part-time basis and can be taken wholly online. Full-time students study for a full 12 months and take 60 taught credits (see below for details) followed by a period of research leading to a minor dissertation worth 30 credits. Part-time students cover the same material as full-time students but over a 24 month period. Being mindful of work constraints there is a level of flexibility for part-time students.

Graduates have recently secured jobs in the following areas: Banking, Software Development, Logistics, Data Analysis and with companies such as AIB, McAfee, Fexco, DeCare Systems, MpStor and the Tyndall institute.

Unique aspects of this programme

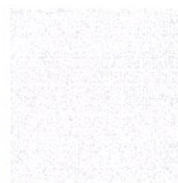
As well as providing students with a host of abilities which are in demand in industry, this MSc provides skills

which are complimentary to most scientific and engineering undergraduate programmes. Thus graduates of the MSc not only open up new avenues of possibilities they also gain a skill set which sets them apart from the crowd in their original fields of study. The final project is an excellent opportunity for students to showcase their abilities to future employers or to undertake a detailed study in a new area of interest. The course is extremely flexible in helping students realise their ambitions. This is the first online programme in the area of Mathematical Modelling and Scientific Computing in Ireland, the UK and possibly the world. It introduces a level of flexibility to students thus making it attractive to recent graduates or those in full time employment wishing to upskill.

Course Details

Students take 90 credits as follows:

- AM6001 Introduction to Mathematica (5 credits)
- AM6002 Numerical Analysis with Mathematica (5 credits)
- AM6003 Cellular Automata (5 credits)
- AM6004 Applied Nonlinear Analysis (Computational Aspects) (5 credits)
- AM6005 Modelling of systems with strong nonlinearities (5 credits)
- AM6006 Mathematical Modelling of Biological Systems with Differential Equations (5 credits)
- AM6007 Object Oriented programming with Numerical Examples (10 credits)
- AM6008 Developing Windowed Applications and Web-based Development for Scientific Applications (5 credits)
- AM6009 3D Computer Graphics and Animation for Scientific Visualisation (5 credits)
- AM6010 Topics in Applied Mathematical Modelling (5 credits)
- AM6011 Advanced Mathematical Models and Parallel Computing with Mathematica (5 credits)
- AM6012 Minor Dissertation (30 credits)



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Module descriptions are contained in the Book of Modules, 2011/2012.

The course places great emphasis on the acquisition of practical skills and to this end there is a computer laboratory allocated solely for the use of MSc students. PCs are preloaded with all the required software and tools. Contact hours comprising lectures, tutorials and practical demonstrations usually take place in the morning. The rest of the time students are expected to do exercises, homeworks and assignments and generally put in the time required to acquire key skills.

Continuous assessment is the primary method of examining. In each module typically 40% of the marks are available for take home assignments and the remaining 60% of the marks are examined by a practical computer-based examination. Minor dissertations are read and examined by at least two members of staff.

By the end of the course students should be able to: (1) use the description of a real world problem to develop a reasonable mathematical model in consultation with the scientific literature and possibly experts in the area, (2) carry out appropriate mathematical analysis, (3) select or develop an appropriate numerical method and write a computer program which gives access to a sensible solution to the problem, and (4) finally present and interpret these results for a possible client or non-technical audience.

Research project

The minor dissertation (AM6012) represents a significant research undertaking. Students are encouraged to choose a topic of interest, relating to their academic background or perhaps in a new area, which may be mathematical or computational or a combination. In particular students can ensure that the dissertation is one which showcases their skills for their next career step, be that a job in industry or further research. Each student is assigned a supervisor from the staff of the School of Mathematical Sciences who guides, advises and helps get the dissertation delivered on time.

For further information contact:
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Entry requirements

Candidates must have obtained at least a second class honours degree or equivalent in a numerate discipline (i.e. Science or Engineering). All candidates must ultimately be approved by the Course Director of the MSc in Mathematical Modelling and Scientific Computing. In the case of competition for places selection will be made on the basis of primary degree results and/or interview.

Student Testimonial:

The course in Mathematical Modelling and Scientific Computing is intellectually stimulating and challenging. If you wish to push yourself you will be satisfied and, I have found, if you run into difficulties the lecturers are very supportive and flexible. Unless this year is an anomaly, the course attracts friendly, helpful students which is beneficial as there is a lot of time spent collaborating, not to mention a great deal of time spent in each other's company. I would recommend this course to anyone who is interested in an MSc that will teach them useful mathematical and computing skills and is willing to work hard to learn them.

Roisin Stronach, graduate 2014

Details of how to apply

Students wishing to apply for this course may do so online at the following website <http://www.pac.ie/ucc>. Look under taught postgraduate programmes and course Code CKR36. Alternatively search taught postgraduate programmes using some or all of the title.

