ROINN NA MATAMAITICE AGUS NA STAITISTICE

DEPARTMENT OF MATHEMATICS & STATISTICS

STUDENT HANDBOOK

2011/2012

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

CONTENTS

INTRODUCTION

Welcome to the Department of Mathematics and 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 noon - 1.00 p.m.

2.00 p.m. - 4.00 p.m.

Telephone: + 353-1-7083914
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Website: http://www.maths.nuim.ie

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: 2011-2012

FIRST SEMESTER

First-Year Registration/Orientation	**12th September 2011**	**16th September 2011**
First Semester	**19th September 2011**	**16th December 2011**
Study Week	**31st October 2011**	**4th November 2011**
Christmas Break	**19th December 2011**	**30th December 2011**
Study Period	**2nd January 2012**	**5th January 2012**

SECOND SEMESTER

Second Semester	**30th January 2012**	**4th May 2012**
Study Week	**19th March 2012**	**23rd March 2012**
Easter Vacation	**9th April 2012**	**13th April 2012**
Study Period	**7th May 2012**	**10th May 2012**

MATHEMATICS & STATISTICS DEPARTMENT STAFF

Professor Stephen Buckley, Head of Department
http://www.maths.nuim.ie/sbuckleydept
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Dr Stefan Bechtluft-Sachs, Lecturer
http://www.maths.nuim.ie/sbechtluftsachs/

Dr Caroline Brophy, Lecturer
http://www.maths.nuim.ie/cbrophy/

Dr Detta Dickinson, Lecturer
http://www.maths.nuim.ie/ddickinson/

Dr Katarina Domijan, Lecturer
http://www.maths.nuim.ie/kdomijan/

Dr Catherine Hurley , Senior Lecturer
http://www.maths.nuim.ie/churley/

Professor George Huxley
Adjunct Professor
Department of Mathematics & Department of Ancient Classics

Dr Séamus Kelly, Lecturer
http://www.maths.nuim.ie/skelly/

Dr Ciarán Mac an Bhaird, Lecturer
Mathematics Support Centre Manager
http://www.maths.nuim.ie/canbard/

Dr Pat McCarthy, Lecturer
http://www.maths.nuim.ie/pmccarthy/

Dr John Murray, Senior Lecturer
http://www.maths.nuim.ie/jmurray/

Dr Fiacre Ó Cairbre, Senior Lecturer
http://www.maths.nuim.ie/focairbre/
Professor Anthony G. O'Farrell
http://www.maths.nuim.ie/aofarrell/

Dr Ann O'Shea, Lecturer
http://www.maths.nuim.ie/aoshea/

Dr Lars Pforte, Lecturer
http://www.maths.nuim.ie/lpforte

Dr David Redmond, Senior Lecturer
University Registrar, Humanity House
(Tel: 01 – 708 3579)
http://registrar.nuim.ie/

Dr Anthony Small, Senior Lecturer
http://www.maths.nuim.ie/asmall/

Dr David Wraith
http://www.maths.nuim.ie/dwraith/

POSTDOCTORAL RESEARCHERS

Dr Natalia Budarina
http://www.maths.nuim.ie/nbudarina/

SUPPORT STAFF

Ms. Janice Love, Senior Technical Officer
http://www.maths.nuim.ie/staff/

Ms. Gráinne O'Rourke, Administrator
(Tel: 01 – 7083914/3651)
http://www.maths.nuim.ie/staff/

Mr. Anthony Waldron, Technical Officer
http://www.maths.nuim.ie/staff/

COURSE CO-ORDINATORS

2011/2012

1st Year Science and CSSE	Dr Ann O'Shea
1st Year Mathematical Studies	Dr Caroline Brophy
1st Year Double Mathematics	Dr John Murray
2nd and 3rd Year Mathematical Studies	Dr John Murray
2nd Year Science and CSSE	Dr Katarina Domijan
3rd and 4th Year Applied Mathematics	Dr Fiacre Ó Cairbre
Penultimate Year (Pure) Mathematics	Dr Pat McCarthy
Final Year (Pure) Mathematics	Dr David Wraith
Statistics	Dr Catherine Hurley
Finance	Dr Anthony Small
International Students	Dr Detta Dickinson

Your Course Co-ordinator is available to advise on aspects of your academic programme, and may be consulted in the event that you encounter any difficulties with your course, be it time-tabling, library or computer resources, or anything else.

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.

Professor Stephen Buckley

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

He is also interested in metric spaces and metric measure spaces, where the measure is often (but not always) doubling. Related to this, he is attempting to achieve a better understanding of Gromov hyperbolicity for the quasihyperbolic and related metrics**.** He is also interested in CAT(0) and related notions of nonpositive curvature.

Finally, he has also recently been looking at various spaces of analytic functions. In particular, he has classified the nonlinear superposition operators between various spaces of Besov and Dirichlet type. This involves the use of both potential theory (non-standard Trudinger-type inequalities) and geometric function theory (univalent Besov functions), and so links up with his other interests.

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.

Dr Natalia Budarina

Natalia Budarina is interested in the metric theory of Diophantine approximation, Khintchine-Type Theorems and simultaneous Diophantine approximation.

Recently, she became interested in Diophantine approximation. Natalia considers the classical problem of arithmetic theory of the quadratic forms on integer representations by another form

of lower dimension. The increase of the dimension of the problem allows us to apply the deformation method of the quadratic systems. Using local methods (Venkov, Mordell, Witt, Hasse, Kneser, Kitaoka, Watson, Niemeier, Conway, Sloane, Zhuravlev) Natalia considers special kinds of specialization of quadratic systems, when their global and local arithmetic properties are transformed by rational methods. The deformation method of quadratic systems through non--homogeneous specialization allows us to connect the space of quadratic forms with the important theoretic--numerical problem: the number of solutions for equations of the highest degrees and prime twins.

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 analyse data of complex structure that arise in a variety of applications. In particular, she is interested in Bayesian modelling of classification problems in data with large feature spaces. In her PhD thesis she developed classification models based on the theory of reproducing kernel Hilbert spaces and applied them to micro-array, image-processing and near-infrared spectroscopy data sets. One of the most interesting aspects of modelling high-dimensional data is feature selection. This is a challenging problem and she is interested in developing novel approaches to solve it.

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 system. Quail is a programming environment for quantitative analysis written in Common Lisp. For more information on its current state and how to access the software, check out the Quail homepage.

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. 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's research area is Group theory, particularly the modular representation theory of finite groups.

Topics of current interest:
- Real subpairs and real subsections in blocks.
- Frobenius-Schur indicators of Blocks.
- Blocks of centralizer algebras of Young subgroups of Symmetric Groups.
- Jantzen and Specht Filtrations of restrictions of irreducible S_n-modules to S_{n-1}.

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.

Professor Anthony G. O'Farrell

Analysis. Singularities, Extensions, and Approximations. Dynamical Systems, Algebras in Analysis. Mathematics is densely interconnected. Temperamentally, the centre of his interest is in analysis. He particularly like the amazing things that happen in Complex Analysis, which still seems magic to him, after all these years. He also likes qualitative approximation problems. Most of the things he has studied grow out of these two areas, in some way. The interplay between algebraic structure and concepts from analysis is a theme that has proven enormously fruitful, and has a lot of energy left. The structures he has found most useful are algebras over

the field of complex numbers. In the past few years, he has been exploring groups of maps. Geometric insight can also be brought to bear on problems in analysis (and algebra). He has seen that probability can provide the key to solving problems that don't seem to have any uncertainty about them. Intuition derived from the physics of Hamiltonian dynamical systems or of the Brownian motion have been valuable to him, even in situations which are very un-physical (e.g. involving two-dimensional time).

Dr Ann O'Shea

Ann O'Shea is interested in Value Distribution Theory in Several Complex Variables. Her work has mostly dealt with finding defect relations for moving targets. She is also interested in the relationship between Diophantine approximations in Number Theory and Value Distribution Theory. Recently, she has also become interested in Mathematics Education.

Dr David Redmond

David Redmond's area of specialization is Group Theory and Permutation Groups. He has been working with Professor Quinn (Maynooth) and Dr. P.W. Fowler (Exeter) on the application of group theory in Chemistry and in particular on the recent developments in the chemistry and geometry of Fullerenes.

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 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.

HOW TO STUDY MATHEMATICS

Mathematics is different from other subjects and as a result it cannot be learned the way other subjects are learned.

The body of mathematical knowledge has been building up steadily for thousands of years. This contrasts with some other disciplines, some of which are brand-new by comparison and others of which periodically throw out all the received wisdom and start again. In mathematics we keep everything, but we also develop ways to compress and organise the facts that have been discovered. So the present state of mathematics is that it is a huge and superbly organised collection of great ideas.

Mathematics is very complicated, but, by comparison with other disciplines, there is not a lot to remember because the subject is very well organised. There are a relatively small number of organising principles.

In mathematics there is not a lot to remember; there is a lot to understand. Understanding needs **work** and **time**.

At the University, we use a tried and tested method for helping you to learn mathematics. This involves:

- Lectures
- Tutorials
- Homework
- Reading
- One to one discussion
- Computer Laboratories.

All of these are essential ingredients. Let's take them one at a time.

1. Lectures

One of the biggest differences between mathematics and other subjects is that mathematics lectures are not necessarily intelligible. That is, it is not part of the contract that you will understand the lecture at the time it is presented to you. The lecture may be amusing and it may be illuminating, but you need not expect either of these things to happen, at least until you become a postgraduate student. Students sometimes make the mistake of thinking that because they don't understand the lectures, that the lectures have no point. This is completely wrong. The lecture is typically the first point at which you hear about some new piece of mathematics. The Lecturer states the facts and writes on the blackboard or on the overhead, possibly in conjunction with pre-written notes or a text, and you write at the same time. This physical act, of writing notes while the lecture is in progress, has an effect on your brain and begins the process of your understanding of the subject. The process may not be completed for hours, days, weeks or months, but it begins here in the lecture. This first step is essential, even though you may be absolutely bewildered or misunderstand completely what is being said.

Students sometimes say: “There has to be an easier way than this. These lectures are not helping me. I’ll get a grind, I’ll get someone to help me and I’ll skip the lectures.” This kind of thinking has been going on for a long time. When Euclid was teaching mathematics in 300 BC, it is reported that a royal person objected to the difficulty of the course of instruction and asked whether he had to endure the same kind of instruction as common people. To this Euclid replied: “There is no royal road to mathematics.” (The same aphorism is also attributed to Menaechmus, teacher of Alexander the Great.) This is the way it has to be. This is the way it works.

After the lecture you take the notes and you re-write them, cleaning up any mistakes and filling any gaps. Your ultimate target is to understand the material by making use of reading, tutorials, discussion with your friends and with staff, and working examples.

2. Tutorials

Usually you have one or two weekly tutorials on your courses. These are opportunities to get help in clearing up difficulties. The system assumes that you are thinking about the subject between the lecture and the tutorial and that you put in some preliminary effort on the problems yourself before coming. At the tutorial, it is again important that you **write**.

3. Homework

In most courses, regular homework is assigned. The Lecturer may also throw out problems on the blackboard as he/she goes along. **The problems are not the course**. The problems are designed to enable you to work with the ideas of the course and to digest them. If you understand the ideas, you can do the problems. Try to keep this in the centre of your mind. The theory matters. The theory, properly understood, often makes the problems trivial. If you try to approach a maths course by learning how to do the problems and ignoring the theory, then you convert a forest into trees. A course that should be a matter of a few simple ideas becomes a huge confusing menagerie of assorted problems. At the same time, the problems matter. If you cannot do problems on the course, then you do not understand the material. If you understand the material perfectly, then you can take another step and make your own problems i.e. find new applications for the ideas of the course.

4. Reading

You have to learn to read mathematics. This is a difficult art, but we expect that by the time you graduate you will be able to learn new mathematics for yourself. We do not expect this at the beginning of your studies. Few students at that stage are capable of reading a piece of mathematics without assistance.

The most important thing about reading mathematics is that you must do it with paper and pencil to hand. You have to write as you read. Also, you do not expect to cover much material at a session. Reading mathematics is a slow business. You read a little and then you think about it. You work on a problem and you go back and read some more.

Mathematics books are not usually read straight through from cover to cover in one go. The normal ways to read a mathematics book is to scan it repeatedly at different levels of detail. First you get an overall idea of what's in there, then you pick some place to read. When you come back next you may pick some other place, before or after the place that you read before. You need to allow time for digestion between reading sessions. Important steps in your understanding of mathematics occur as you sleep and as you travel about engaged in other tasks. You have to allow time for that.

5. Computer Laboratories

At some stage you will have access to a computer laboratory for mathematical work. This provides an opportunity to bring another mode of learning into play. Some of the abstractions can be applied to produce concrete images and numbers. This can help you to understand the abstractions. It also provides a way to test your understanding: can you predict what kind of thing the computer will produce? Apart from scheduled and supervised practicals, you can visit the labs during opening hours to work by yourself or in small groups, and you can talk to the help-desk assistants about any problems.

6. One-to-one discussion

Mathematics is a social activity. Mathematicians work by talking to other people. Mathematics students learn mathematics by talking to other people. Talk to your fellow students about mathematics. Talk about points of difficulty in courses or problems. If you have managed to understand something important, share that knowledge, share that understanding. Talk to the Academic Staff. Each staff member in the Mathematics Department keeps regular office hours. During term, each staff member is in their office for 3 specific hours each week to talk to students. Any of them would welcome the opportunity to talk to you about mathematics. Apart from Final year and Postgraduate course material, any member of staff would probably be able to help you with questions about your course. They will also be happy to talk to you about the big picture: where the subjects you're currently studying lead to, mathematical matters not related to your current courses, possible directions for future study in mathematics and so on. We find that, regrettably, students do not make sufficient use of the lecturers' office hours. Between us, we are providing 45 hours per week of potential consultation time and a good deal of that is going unused while at the same time students sometimes have recourse to "help" from people providing grinds who may not be particularly expert in the subjects concerned.

REGULATIONS, RULES AND PROCEDURES

1. Attendance

Students are required to attend all classes, lectures, tutorials and practicals in their course. Medical certificates must be supplied to the Department Office (Room 207) in the event of absence due to illness. Homework is compulsory. Students should note that homework is usually counted towards your grade, and is important in placing students whose examination is hampered by illness and other circumstances.

2. Deadlines

Homework deadlines and project deadlines are absolute. Work submitted after the deadline will not be graded and will not count.
Every assignment needs:

Your **name,**
Your **Tutor's name**,
Course Number, e.g. MT101S, MT102S (Calculus) or MT141P (Finite Mathematics)
Your **Assignment Number,** e.g. Homework No. 1, 2.....
Your **Tutorial Time** and **Venue**

Assignments missing any of the above will be a wasted effort on your part.
Please remember the tutorials are for your benefit and make good use of them.

3. Calculators

Students should note that the memories on calculators will be erased on entering examinations.

4. Extreme weakness in Practical or Theory

Students should be aware that University regulations stipulate that they will fail their examination if they demonstrate extreme weakness in any area of the course. Thus, care should be taken to ensure that each section of the course is given its due measure of study time and attention.

5. Foundation Tutorials

On entry, First Year students take a diagnostic test. If this shows inadequate preparation for First Year courses, then students may be required to complete the online proficiency course.
A weekly workshop is also available to provide further assistance.

6. Students' Course Choices

Undergraduate students who have module choices and need advice will be referred to a staff member (see course co-ordinator list).

Postgraduate students must discuss their course choices with Dr Stefan Bechtluft-Sachs, Postgraduate Co-ordinator before the latest registration dates for changing modules in each semester.

7. Projects in Final Undergraduate Year

a) The option of doing a Reading Course will be *offered* to selected students in their final undergraduate year. Marks will be assigned in a compulsory fashion, that is, not necessarily to the student's advantage.

The project or reading course will be about some Mathematical or Statistical topic, or will involve significant use of Mathematics/Statistics. The two main factors, which determine how many marks are awarded for the project, are the difficulty of the material covered and the quality of the coverage.

b) Students will work singly when carrying out their project.

c) Students who are offered the option of doing a project or reading course do not have to take it up. Careful consideration should be given to whether the student's best interest would be served by taking a full complement of lecture courses instead. The projects on offer may vary from year to year. Students should discuss their options with the relevant course coordinator.

d) Students should select their topics (discuss with the relevant staff member) as soon as possible and in any case no later than the end of September. Students should begin work on their chosen topic in early October.

e) Each student should make arrangements with the supervisor concerning consultations. The main conditions concerning consultations are that student work must be essentially independent, and that consultations should not normally involve more than six contact hours.

f) Each student will present a written report of approximately 25 pages, to be submitted to the departmental office before the Easter vacation in each academic year. Each student may also be required to take part in a discussion, about thirty minutes long, on the topic.

g) Students are encouraged to make use of computers in preparing and presenting their reports. No matter whether the report is hand-written, typed

or laser printed, it is important to avoid mistakes in grammar and spelling by reading carefully the final drafts of the document.

8. Combination of Subjects and Elective Courses

Students who combine Mathematics or Mathematical Studies or Statistics with other subjects should be careful to observe the distinction between **core** and **non-core elective** courses. When a degree programme offers you a choice of courses, it may be that some of these choices are timetabled outside the core hours allocated to the Department for the conduct of lectures in that programme. In that case, the elective courses may clash with courses given in the core hours of another Department's programme. Obviously, the rule is that core courses take precedence over non-core electives. Frequently, courses offered at core times are **obligatory** elements of a degree programme. In that case, you may not sign up for a clashing elective in another subject.
It is very important to observe this rule. If you do not attend some obligatory component of a degree programme, you risk exclusion from the examination, under the regulations.

FINAL YEAR APPLIED MATHEMATICS, PURE MATHEMATICS AND STATISTICS OPTIONS:

<u>4th Applied DH (Science)</u>

Intro to programming	MT471S I
Mathematical Biology	MT481S I
Groups	MT316A II

Plus one of the following:
(students who have taken 3rd Stats must take MT412C; all other students must take MT351A)

Geometry	MT351A I
Graph Theory	MT412C I

Plus one of the following (scheduled simultaneously):
(students who have taken MT236S must take MT444P; all other students must take MT432C)

Analysis I (C)	MT432C II
Number Theory	MT444P II

Plus one of the following:

Partial Differential Equations	MT401S II
Numerical Analysis	MT472S II
Codaigh agus Córais Dhinimiciúla Réadacha	MT480C II *(if funded)*

<u>4th Pure Mathematics and Statistics</u>

Complex Analysis II	MT433P I	COMP
Point-set topology	MT434P II	COMP
Groups II	MT441P I	COMP
Galois Theory	MT442P II	CORE

Number Theory	MT444P II	CORE
Differential Geometry	MT451P I	COMP
Probability	MT461S I	
Linear Models I	MT463S I	
Applied Probability	MT465S I	
Intro to programming	MT471S I	
Statistical Inference	MT462S II	
Linear Models II	MT464S II	
Categorical Data Anal	MT466S II	
Codaigh agus Córais Dhinimiciúla Réadacha	MT480C II *(if funded)*	
Topics in Real Analysis	MT510 II	

Not listed in above tables:
Reading courses 297R, 298R, 397R, 398R, 495R, 496R, 497R, 498R.
Research Projects 490R, 499R.

4th Applied SH students do six extra modules, three in each semester - 461S, 462S, 463S, 464S, 465S, 466S (optional 480C). One of these modules may be in Maths Physics, CS, or a Language. The allowable sets of choices are subject to prerequisites, timetables, and departmental approval (*approval given only after discussion of student's goals*).

4th Pure students take the four COMP (compulsory) modules plus extra modules from the 4th Science Pure list: two extra modules (both second semester) in the case of DH students, and eight extra modules (three in first semester, five in second) in the case of SH students. Any combination that satisfies prerequisite requirements is allowed.
Both COMP and CORE modules are core modules for timetabling purposes, i.e. they are scheduled at times that all students should be free.

In addition to COMP courses, CORE courses are also those that are strongly recommended as prerequisites to graduate studies in Mathematics and attendance at some or all of these courses may be compulsory for admission to some research degree programmes. In particular, any student who wishes to do the Higher Diploma in Mathematics, in order to qualify for admission to a research degree programme, should bear in mind that attendance at these CORE may be required either as part of the Higher Diploma programme, or as part of the first year programme for a Masters by research.

10. Conduct in Laboratories

- No food or drink, or smoking.
- All authorised users (registered Mathematics & Statistics students only) must have a computer account with the Department.

- All problems encountered with systems must be reported to Ms. Janice Love, Senior Technical Officer, Room 105, Middle Logic immediately when they arise: email – Janice.Love@nuim.ie

- Guests are not allowed in the computer laboratories. **Authorised users only**.

11. Student Representatives

Each year-group chooses a student delegate to represent their group. The student delegate can raise matters of particular or general interest with the relevant lecturer or course co-ordinator. The course co-ordinator may, at his/her discretion, decide to call a meeting of relevant staff and student delegates. Individual students may also raise matters with the lecturer or course co-ordinator if they wish.

ANNUAL PRIZES IN MATHEMATICS & STATISTICS

General Prizes

The Hamilton Prize
An annual prize of €1000 is awarded to the best undergraduate mathematics student in his or her **penultimate year of study**, as nominated by each Irish university. It is presented at a ceremony in the Royal Irish Academy by that year's Hamilton Lecturer, often a Nobel Prize winner or Fields Medallist.
The Hamilton Prize in Mathematics celebrates the life and work of the Irish mathematician William Rowan Hamilton (1805-1865), who discovered quaternions and made major contributions to several areas of mathematical science.

The Huxley Prize
This prize is awarded to the student obtaining the highest mark and a First Class Honours mark on the **History of Mathematics module MT382A**, chosen from those who have obtained an overall First Class Honours in Mathematical Studies, Pure Mathematics, or Applied Mathematics.
Instituted in honour of George Huxley, currently Adjunct Professor of Mathematics and Ancient Classics, NUIM.

Prizes in Double and Pure Mathematics

The Delort Prize
This prize is awarded to the student obtaining the best result in **Double Mathematics in the First Year Examinations**.
Instituted in honour of the Peter Justin Delort, first Maynooth Professor of Mathematics and Natural Philosophy (1795–1801).

The McMahon Prize
This prize is awarded for outstanding performance in **Pure Mathematics in the Penultimate Year Examinations**.
Instituted in honour of the late James J. McMahon, a former Maynooth Professor of Mathematics (1960–1974).

The De Brún Prize
This prize is awarded to the student obtaining the best result in **Pure Mathematics in the Degree Examinations**.
Instituted in honour of the late Pádraig De Brún, a former Maynooth Professor of Mathematics and Natural Philosophy (1913–1945), perhaps best known as author of the poem "Thánaig Long ó Valparaiso".

Prizes in Mathematical Studies

The Lennon Prize
This prize is awarded to the student obtaining the best result in **Mathematical Studies in the First Year Examinations**. This prize is open to students of both NUIM and the Pontifical University.
Instituted in honour of the late Francis Lennon, a former Maynooth Professor of Mathematics and Natural Philosophy (1864–1912).

The Pamela Manly Prize
This prize is awarded to the student obtaining the best result in **Mathematical Studies in the Second Year Examinations**. This prize is open to students of both NUIM and the Pontifical University.
Instituted in honour of the late Pamela Manley, a former student at NUI Maynooth.

The Denvir Prize
This prize is awarded to the student obtaining the best result in **Mathematical Studies in the Degree Examinations**. This prize is open to students of both NUIM and the Pontifical University.
Instituted in honour of Cornelius Denvir, a former Maynooth Professor of Mathematics and Natural Philosophy (1813–1826), best known for introducing Nicholas Callan to electricity and magnetism.

Prizes in Science and Applied Mathematics

The Boole Prize
This prize is awarded to the student obtaining the best result in **Standard Mathematics in the First Science Examinations**.
Instituted in honour of the mathematician George Boole (1815-1864), who laid the foundations for Computer Science.

The Gauss Prize
This prize is awarded to the student obtaining the best result in **Standard Mathematics in the Second Science Examinations**.
Instituted in honour of the mathematician Carl Friedrich Gauss (1777-1855), who made major contributions to many areas of mathematical science.

The Donaghy Prize
This prize is awarded to the student obtaining the best result in **Applied Mathematics in the Third Year Examinations**.
Instituted in honour of the late John Donaghy, a former Maynooth Professor of Mathematics and Natural Philosophy (1912–1913).

The Stokes Prize
This prize is awarded to the student obtaining the best result in **Applied Mathematics in the Degree Examinations**.
Instituted in honour of the Irish mathematician George Gabriel Stokes (1819–1903). The Navier-

Stokes equations were named in his honour, and are the subject of a million dollar prize.

Prizes in Statistics

The Edgeworth Prize
This prize is awarded to the student obtaining the best result in **Statistics in either the Third Science or Second Arts (Pure Mathematics and Statistics) Examinations**.
Instituted in honour of Francis Edgeworth (1845–1926), a former Professor of Political Economics and Statistics at King's College, London and later at Oxford.

The Gosset Prize
This prize is awarded to the student obtaining the best result in **Statistics in the B.A. Degree Examinations, the B.Sc. Degree Examinations, or the Higher Diploma in Statistics**. Final Year Pure and Applied Mathematics students taking at least 30 credits of Statistics at level 400 or above are also eligible for this prize on the basis of their marks in Statistics.
Instituted in honour of William S. Gosset (1876–1937), the statistician who published under the pseudonym 'Student', and invented the famous t-test while working for Guinness Brewery in Dublin.

Please Note: The Department may choose not to award a prize in the event that no student obtains a First Class Honours mark in the relevant examination(s).

Entry Awards

The Darré Exhibitions
Instituted in honour of André Darré, a former Maynooth Professor of Logic, Metaphysics and Ethics (1795–1801), and Professor of Mathematics and Natural Philosophy (1801-1813), and author of the textbook Elements of Geometry. These exhibitions are **awarded on entry to students in First Year Double Mathematics**, on the basis of marks in Leaving Certificate Higher Mathematics.

GENERAL INFORMATION

EQUALITY
The department is committed to providing an environment free of sexual harassment. Any student with a complaint is invited to discuss the matter with Professor Stephen Buckley or Dr. Ann O'Shea.

NOTICES
The official Mathematics & Statistics Department notice-board is located in the main entrance hallway of Logic House. Notices placed there are deemed served on all our students. Check it at least once a month.

PAST EXAMINATIONS PAPERS

Previous years examination papers are available on the library database ExPert. You are advised that past examination papers may not provide a reliable guide to the format or content of future examinations. Courses are revised frequently, so a better guide to the kind of questions you should be able to deal with is provided by the homework sheets, class assignments and lecture material.

POSTGRADUATE STUDIES IN THE U.S.

Students thinking of pursuing postgraduate studies in the United States should note that the application process has to begin in October, in order to meet the January deadlines.

NUI graduates taking the MSc by examination should apply for the NUI Travelling Studentship if there is one in Mathematical Science in that particular year. The closing date is usually early in the year.

COMPUTING FACILITIES

The Mathematics & Statistics Department has three computer labs. The largest computer lab. consists of 36 Windows XP Pro workstations and it is situated on the Ground floor of Logic House. This is our main undergraduate computer based teaching facility and it is also where our computer helpdesks are held during term.

The Saotharlann is located on Top Logic, opposite MS2. It houses the Department servers.

The third lab., located in room 215 on Top Logic, consists of ten Windows XP workstations. This is our second, smaller computer based teaching facility.

All students with Mathematical computing components to their modules are given access to the two Windows XP labs.

Mathematical and statistical software is provided in all our labs. The packages currently in use are Maple, Minitab, SPSS and Dev C++. We also provide internet access and use an online resource (MathTutor) in conjunction with online quizzes in Moodle to aid the foundation mathematics classes.

All of our labs require a user name and login. People without an account will not be able to use our labs. Accounts are given to Mathematics and Statistics students only.

LANGUAGE

Úsaidtear Béarla mar gná-theanga oibre na Roinne; bíonn na léachtaí, na nótaí, agus na ceachtanna as Béarla, ach amháin do mhodúl MT480C. Ach ní h-ionnann sin agus a rá nach bhfuil fáilte agus fiche roimh úsáid na Gaeilge, agus fonn orainn chur leis an úsáid sin más féidir. Má tá Gaeilge agat, labhair í! Ar ndóigh, níl mórán chumas sa teanga ag cuid den fhoireann, agus caithfear glacadh leis sin. Cuirfidh na léachtóirí in iúil duit má tá siad toilteanach gnó a dhéanamh leat sa teanga.

Tous les cours sont en anglais. Le seul éxception est MT480C, en irlandais. Certains professeurs parlent le francais, et servant prêts à aider s'il y a des problèmes. Renseignez-vous au bureau.

Cada curso (excepto MT480C) es en inglés. Algunos profesores hablan el Castellano, y pueden ayudarle si encuentras problemas. Pida informació en la oficina.

Die Vorlesungen (ausser MT480C) werden auf Englisch gehalten. Einige Dozenten können Deutsch sprechen und werden Ihnen helfen, wenn Sie Schwierigkeiten haben. Bitte fragen sie im Büro nach.

Tutte le lezioni sono in inglese (solo MT480C e in irlandese). Qualche professore parla italiano, e aiutarle. Chiedere in ufficio.

INFORMATION FOR PROSPECTIVE STUDENTS

Mathematics is one of the oldest academic subjects but it is still very much alive. New developments take place all the time, sometimes as a result of fresh ideas from within Mathematics itself and sometimes stimulated by applications to the physical, biological and social sciences, computing, technology and so on. A university Mathematics course aims to bridge the gap between school Mathematics and current frontiers of knowledge. So, it contains some topics which are a continuation of those studied at school, and others which may seem new and strange at first but which usually turn out to have some logical connection with more familiar areas of the subject.

Because Mathematics has so many important applications, it occupies a pivotal position in our society and our technology, and there is now, as there has always been, a big demand for well-trained mathematicians, offering varied career opportunities. At this stage you may not have any clear ideas about a career; you just know that you enjoy the challenge of mathematical problems and admire the power and elegance of mathematical technique. If this describes your position, if you really *enjoy* doing Mathematics, then this alone is sufficient reason for wanting to study Mathematics to degree level.

Mathematicians are in great demand in many areas of employment because a degree in Mathematics, as well as indicating specialist knowledge in a widely used subject, shows that the graduate is capable of thinking clearly and logically. Thus, Mathematics graduates are welcomed in occupations where these skills are important - for example in the Civil Service, finance and banking, insurance, industrial and commercial management and other areas of administration as well as in technical, scientific and engineering work in industry and in government research and development institutes. Regardless of the employment situation, the graduate mathematician remains in demand.

Many occupations require skills which are directly linked with specific parts of the Maynooth Mathematics syllabus, for example, some of the Mathematics courses are related to the work of a systems analyst in the software industry; others are concerned with topics which would be required by a member of a research team in the aerospace industry, the oil industry, electronic engineering or the Scientific Civil Service; a statistician working in industry, medicine, market research or government service would use techniques included in the Statistics part of the course. These are just a few of the areas in which graduate mathematicians have made their careers in recent years.

The demand for specialist Mathematics teachers remains high and is certain to continue to do so. This is a critical area for the future development of this country. The Mathematics Department is in close contact with the world of Mathematics Education, and takes a keen interest in those students who are considering a career in teaching. Many former students now work in secondary schools and third level institutions around the country.

Since most students are not sure at the outset what career they wish to pursue, studying Mathematics at Maynooth has the advantage of a large range of options open to students.

THE MATHEMATICS COURSES: OUTLINE

The First Year Double Mathematics course, and the first two years of the other courses, are foundational in that they aim to give you a good grounding in each of the main areas of Mathematics: Analysis, Geometry, Algebra, Probability, Statistics and Computing.

The first few weeks of the course provide a smooth transition from school to university Mathematics, strengthening and augmenting the mathematical knowledge and skill you bring with you.

The courses aim to begin the process of teaching you to apply Mathematics flexibly in different contexts, to abstract and generalise, to analyse qualitatively and quantitatively to solve problems, and to read Mathematics for yourself. One of the most important things you will bring away with you from Maynooth is the ability to learn for yourself, when necessary. The rapid pace of technological change means that anyone who lacks this ability is bound to become redundant after a few years.

In the final two years of the Mathematics degrees courses, central areas of Mathematics such as Topology, Complex Analysis and Field Theory are studied in depth, and there is a range of courses in rapidly growing areas such as Differential Geometry, Numerical Analysis, Probability and Statistics and Graph Theory. At this stage, students begin to develop the ability to invent, criticise, and perfect new Mathematics for themselves, and to solve new problems. This is the essential skill that distinguishes the honours Mathematics graduate.

The final year of the Mathematical Studies degree course provides you with a broad perspective on the development and present state of Mathematics. Course options on the History of Mathematics, on the major issues in the development of Mathematics, and on modern computing tools position you to undertake a role in professions where a solid understanding of Mathematics is a prerequisite. There is also the option of taking a module through Irish, which is useful for prospective teachers in the growing all-Irish sector.

Degree and Diploma Programmes:

There are several distinct programmes, each with many options, leading to degrees and diplomas in Mathematics. Some are highly intense and are only for people who are high achievers in higher Mathematics in Leaving Certificate. Others take a more leisurely approach and build up steam as they go along. These would suit you better if you didn't have the opportunity to do the higher course in school or if you have only recently realised how much you like Mathematics. Some of the programmes are primarily focused on preparing future researchers, others are aimed at those who will work in areas of Applied Mathematics or will go on to become teachers. Of course many of the graduates of all our programmes go on to jobs that are not primarily "Mathematical". The skills of self-reliance, independent thinking, organisational ability, computer literacy and problem-solving that we develop in our students are very useful in a wide range of occupations.

Some of the options may lead to exemptions from the examinations of certain professional associations.

All our degrees are honours degrees but some of the programmes are open to students who took OL Mathematics in school.

The Degrees and Diplomas involving Mathematics to <u>degree level</u> are:

MH104:**

- BA (Single Honours) Mathematics (MH104)
- BA (Double Honours) Mathematics (MH104) + X
- BA (Double Honours) Mathematics (MH104) and Statistics

MH206:**

- BSc (Honours) Theoretical Physics and Mathematics (MH206)

MH201:

- BSc (Single Honours) Pure Mathematics
- BSc (Double Honours) Pure Mathematics + X
- BSc (Double Honours) Pure Mathematics + Statistics
- BSc (Single Honours) Applied Mathematics
- BSc (Double Honours) Applied Mathematics + X
- BSc (Double Honours) Applied Mathematics + Statistics
- BSc (Double Honours) Statistics + X

MH101:

- BA (Single Honours) Mathematical Studies
- BA (Double Honours) Mathematical Studies + X
- BA (Double Honours) in Statistics + X

MH401:

- BA (Finance) with minor in Mathematical Studies

MU001 (Pontifical University):

- BA Th. in Theology and Mathematical Studies

Postgraduate:

- Higher Diploma in Mathematics
- Higher Diploma in Mathematical Studies
- Higher Diploma in Statistics
- Masters and Doctoral Degrees

The courses in **Mathematical Studies** are broader, less specialised and more accessible than the pure Mathematics courses and will suit students who plan to teach or work in applied areas.
The programmes in **Applied Mathematics** are also relatively accessible, and focus on modern applications of mathematics in fields such as Finance (Risk Analysis), Telecommunications and Data Storage (Coding), Security (Cryptography), Operations Research, and Mathematical Modelling of

systems of all kinds. The University offers separate programmes in Mathematical Physics which may be combined with Applied Mathematics for the Double Honours degree, or as a minor subject.

** Leaving Certificate Higher Grade B1 or better is required for entry to this course.

Please see the Mathematics Department website for further details.

Apart from the above Mathematics Degree programmes, Mathematics courses are taken by many students as part of their degrees. About a quarter of all students are taking some Mathematics in any given year. Some degree programmes have built-in Mathematics course requirements.

These are:

BA (Finance) Joint-Honours, Years 1 & 2
BSc (Biotechnology), Years 1 & 2
BSc (Computer Science and Software Engineering), Years 1 & 2
BSc (Physics with Astrophysics), Years 1,2 & 3.
BSc (Genetics and Bioinformatics), Years 1& 2
BSc (Biological Science), Years 1 & 2.
BSc (Psychology through Science), Years 1 & 2.
BSc (Chemistry with Pharmaceutical Chemistry), Years 1 & 2.

MH401 BA Finance (Joint Honours) & (Major/Minor)

All First Year BA (Finance) students register to take MT103A, MT104A, MT112A and MT121A.

Students taking Mathematics (Finance) will follow the Joint Honours route, while those taking Mathematical Studies will follow the Major/Minor route in 2nd and 3rd Year.

2nd Finance Joint Honours students may take some Mathematics. If a student has already taken Mathematics in First Year, then:

- 2nd Finance Joint Honours students may chose either MT201A or MT222S.

(MH403 Finance and Accounting students register to take MT103A, MT104A, MT112A & MT121A in Year 1).

MH202 – BSc (Biotechnology)

Year 1: Mathematics MT101S, MT102S, MT111S, MT122S
Year 2: Mathematics MT201S, MT202S, MT211S, MT222S

MH203 – BSc (Computer Science and Software Engineering)

Year 1: Mathematics MT101S, MT102S, MT111S, MT122S.
Year 2: Mathematics MT201S, MT212A

MH204 – BSc (Physics with Astrophysics)

Year 1: Mathematics MT101S, MT102S, MT111S, MT122S.
Year 2: Mathematics MT201S, MT202S, MT211S, MT222S

In Year 3 students take either Pure Mathematics or Applied Mathematics.

Pure Mathematics:
Year 3: MT331P, MT332P, MT333P, MT341P, MT342P, MT344P.

Applied Mathematics:
Year 3: MT301C, MT311S, MT312S, MT314S, MT321S, MT322S

MH208 – BSc (Biological and Biomedical Sciences)

Year 1: Mathematics MT101S, MT102S, MT111S, MT122S
Year 2: Mathematics MT201S, MT202S, MT211S, MT222S

MH209 – BSc (Psychology through Science)

Year 1: Mathematics MT101S, MT102S, MT111S, MT122S
Year 2: Mathematics MT201S, MT202S, MT211S, MT222S

MH210 – BSc (Pharmaceutical and Biomedical Chemistry)

Year 1: Mathematics MT101S, MT102S, MT111S, MT122S.
Year 2: Mathematics MT201S, MT211S, MT222S

MH211 – BSc (Multimedia, Mobile and Web Development

Year 1: Mathematics MT101S, MT102S, MT111S, MT122S.

MH210 – BSc (Science Education)

Year 1: Mathematics MT101S, MT102S, MT111S, MT122S.
Year 2: Mathematics MT201S, MT202S, MT211S, MT222S

Pure Mathematics:
Year 3: MT331P, MT332P, MT333P, MT342P.

Applied Mathematics:
Year 3: MT301C, MT311S, MT312S, MT321S.

Year 4:
Applied Mathematics
MT316A, MT351A, MT432C + one options from MT480C, MT481S

Pure Mathematics
MT433P, MT441P + two options from MT434P, MT444P, MT480C

MARKS THRESHOLDS

Mark Thresholds for Entry to various Mathematics and Statistics Programmes 2011-2012

ARTS

PROGRAMME	REQUIREMENTS
1st Double Mathematics (MH104)	+B1 Higher Leaving Cert. Mathematics
1st Arts Mathematical Studies	+B3 Ordinary Leaving Cert. Mathematics +D3 Higher Leaving Cert. Mathematics
2nd Arts Mathematics	+50% 1st Arts Double Mathematics
2nd Arts Mathematical Studies	+40% 1st Arts Mathematical Studies OR +40% 1st Arts Double Mathematics
3rd Arts Mathematics and Statistics	+40% 2nd Arts Mathematics
3rd Arts Mathematical Studies and Statistics	Pass 2nd Arts Examinations overall and +55% in Mathematical Studies and +55% in Module MT221A
B.A. Statistics and Another Subject	Pass 2nd Arts Examinations overall and +55% in Mathematical Studies and +55% in Module MT221A
3rd Arts Mathematical Studies (Single or Double Honours)	+40% in Mathematical Studies
3rd Arts Mathematics (Single or Double Honours)	+40% in Mathematics or +40% in Mathematics and Statistics combined.

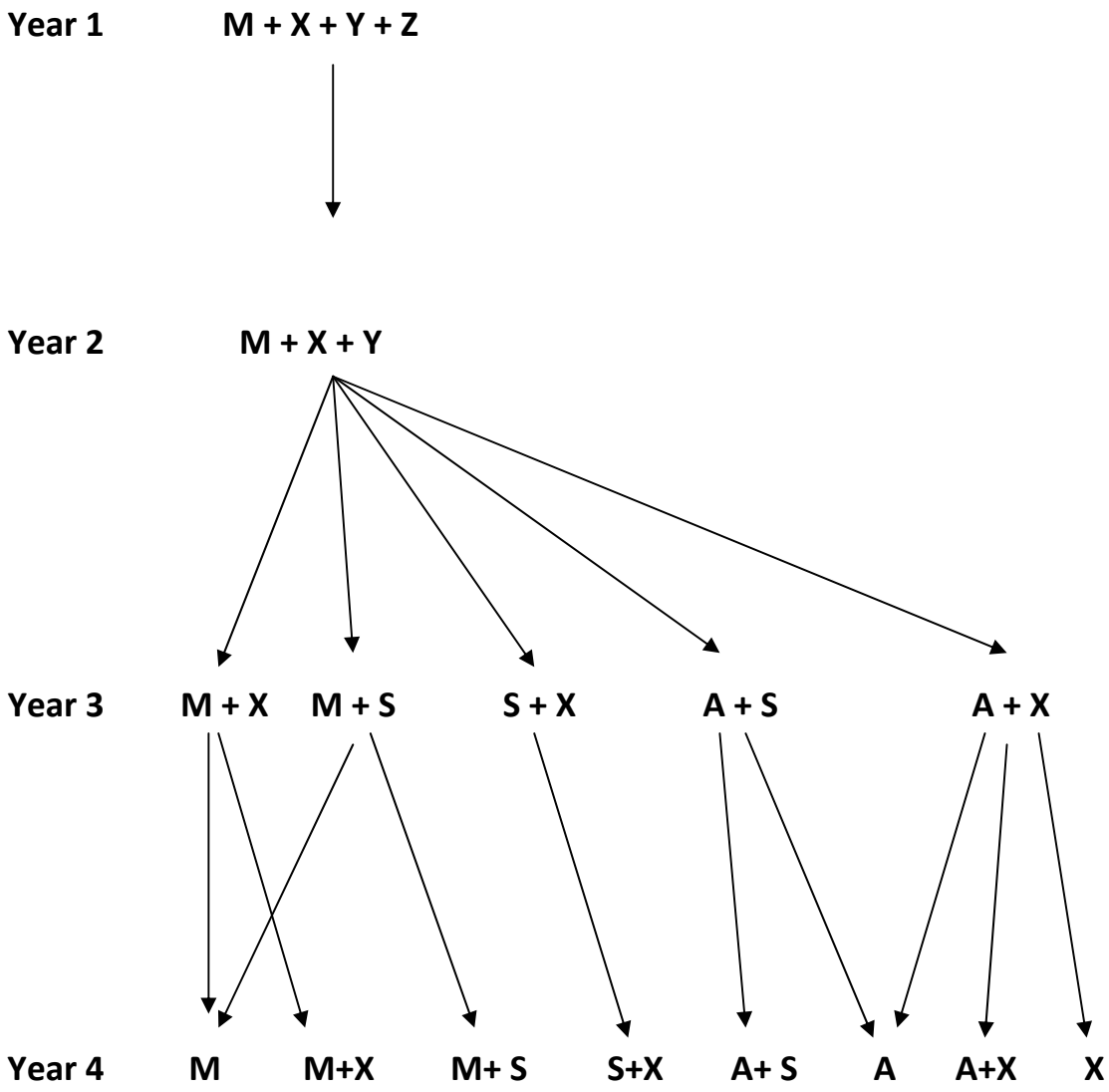
SCIENCE

PROGRAMME	REQUIREMENTS
1st Double Mathematics (MH206)	+B1 Higher Leaving Cert. Mathematics
2nd Theoretical Physics and Mathematics	+50% in 1st Year Mathematics
2nd Advanced Mathematics	+65% in 1st Science Mathematics
3rd Theoretical Physics and Mathematics	+40% in 2nd Year Mathematics
3rd Science Pure Mathematics	+65% in 2nd Science Standard Mathematics or 50% in 2nd Science Advanced Mathematics (+40% in MT236S)
3rd Science Applied Mathematics	Pass 2nd Science Examinations overall and +40% in Standard Mathematics
3rd Science Statistics	+55% in Module MT222S and EITHER +55% in 2nd Science Standard Mathematics OR +45% in 2nd Science Advanced Mathematics
4th Science Single-Honours Pure Mathematics	+45% in 3rd Science Pure Mathematics OR +45% in 3rd Science Pure Mathematics and Statistics combined.
4th Science Double Honours Pure Mathematics and Statistics OR Applied Mathematics and Statistics	+45% in the combination in 3rd Year Science
4th Science Double Honours Pure Mathematics/ Applied Mathematics/Statistics and some other subject.	+45% in the corresponding 3rd year Science subjects.
4th Science Single-Honours Applied Mathematics	+45% in Applied Mathematics in 3rd Year and +55% in Module MT222S and EITHER +55% in 2nd Science Standard Mathematics OR +45% in 2nd Science Advanced Mathematics

ROUTES TO FINAL YEAR

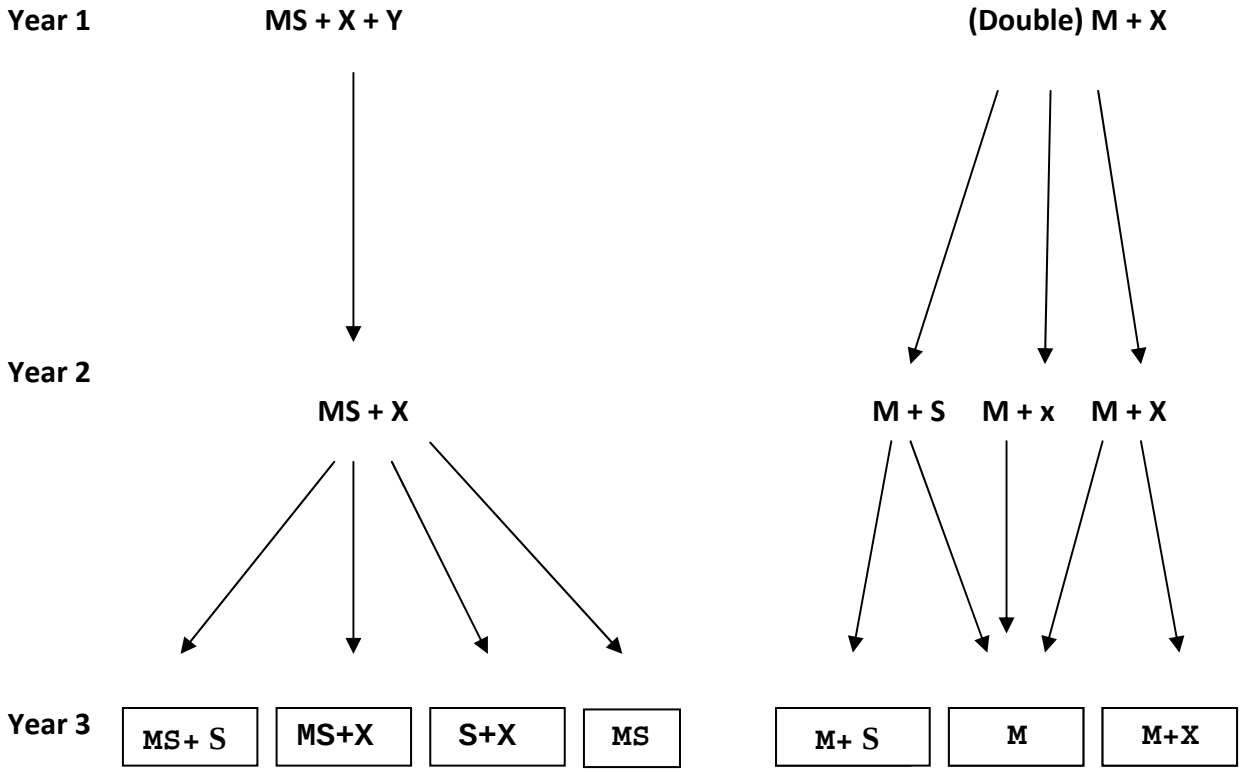
BSc 4-Year Degrees

Pure Mathematics – Applied Mathematics – Statistics (M-A-S)



M = Mathematics
A = Applied Mathematics
S = Statistics
X, Y, Z = Other Science Subjects

BA Degrees
Mathematics - Mathematical Studies - Statistics (M-MS-S)



M = Mathematics
MS = Mathematical Studies
S = Statistics
X, x, Y, Z = Other Subjects

BSc 3-Year Degree

BSc Theoretical Physics and Mathematics
(M Mathematics - MP Maths Physics)

Year 1 **(Double) M + MP**

Year 2 **M + MP**

Year 3 **M + MP**

M = Mathematics
MP = Mathematical Physics

COURSE TITLES, DESCRIPTORS AND ASSIGNMENTS 2011-2012

http://www.maths.nuim.ie/ugmoduledescriptors

NUI CERTIFICATE IN SCIENCE

This is a one-year programme to prepare mature students for University entry.

Course Content and Assessment Procedures for Mathematics:

Maths 1

Duration:
3 lectures plus 1 tutorial per week for 10 weeks.

Textbook:
Anthony Croft and Robert Davison, Foundation Maths, 2nd Edition
(Addison Wesley, 1997- ISBN 0-201-17804-4).

Topics:
The topics are those covered in Chapters 1-12 of the textbook:
Arithmetic, fractions, percentages, ratio and indices
Algebra & algebraic expressions
Factorisation
Algebraic fractions & transposing formulae
Solving equations
Functions
Graphs of functions
The straight line
Exponential & logarithmic function

Maths 2

Duration:
3 lectures plus 1 tutorial per week for 10 weeks.

Textbook:
Anthony Croft and Robert Davison, Foundation Maths, 2nd Edition (Addison Wesley, 1997).

Topics:
The topics are those covered in Chapters 13-24 of the textbook:
Angles
Introduction to Trigonometry
The trigonometrical functions
Trigonometrical Identities & equations
Solution of Triangles
Matrices
Measurement
Gradients of curves
Rules of Differentiation
Optimisation

Assessment

The assessment in each module shall be as follows:

6 assignments (homework) @ 5% each: (These assignments shall be given out in lectures; students submit their solutions in the tutorials, which consist largely of problem solving).	30%
1 mid-semester examination (1.5 hours long; answer 10 multichoice questions)	10%
1 end of semester examination (2 hours long; answer 10 multichoice questions for 40%, and do one of two other questions for 20%).	60%

NUI CERTIFICATE IN ENGINEERING

This is a one-year programme to prepare mature students for University entry.

Core Module 3 units (over 2 semesters)

Maths 2

Review of Basic Algebra: Powers and indices, fractions, factorisation, solving equations and inequalities.

Functions: Introduction to functions, graphs of functions, the straight line, common engineering functions.

Logarithms and Exponentials: Introduction to logarithms and exponentials, solving equations involving logarithms and exponentials, applications to engineering.

Trigonometry: Angles and triangles, the basic trigonometric functions and their graphs, some useful trigonometric identities, Pythagoras's theorem, the sine and cosine rules, applications to engineering.

Matrices: Introduction to matrices, determinants and inverses of 2 x 2 matrices, solving systems of equations using matrices, applications to computer graphics.

Vectors: Notations and arithmetic, the dot product, vector equations of lines and planes.

Complex Numbers: Arithmetic of complex numbers, Argand diagrams and polar forms, the exponential form of a complex number and Euler's formula. Phasors.

Maths 3

Differentiation: Interpretation of derivatives, rules of differentiation, implicit differentiation, implicit differentiation, logarithmic differentiation.

Applications of Differentiation: Tangents and normals, optimisation, Newton's method.

Integration: Antiderivatives, the definite integral, area, techniques of integration.

Applications of Integration: Volume, surface area, lengths of curves, mean values.

Sequences and Series: Introduction to sequences and series, Aps and GPs, the binomial theorem, Taylor ad MacLaurin series.

Probability and Statistics: Data averages, variance and standard deviation, elementary probability, the binomial distribution.

Recommended Reading:
Croft and Davison, *Mathematics for Engineers – A modern interactive approach*, ISBN 0 130 333 484.

Continuous Assessment (40% of total mark)

Six assignments to be set each semester – 30%

One mid-semester exam consisting of 10 multiple choice questions to be set each semester – 10%

Final Examination (60%)

1.5 hour paper each semester. The paper will consist of 10 multiple-choice questions worth 4% each and a partial credit credit question worth 20%.

LOCAL AUTHORITY GRANTS

Amendment to clause 7.7 of the Higher Education Grants Scheme, 2000
&
Amendment to clause 7.7 of the Vocational Education Committees' Scholarship Scheme, 2000.

Under clause 7.7 of the two Schemes, grant-aid was limited to one postgraduate qualification. The only exception to this was a provision in that clause whereby candidates who, on completion of a one year postgraduate course which had not led to the conferral of a qualification, and gained admittance to the second year of a postgraduate course, could be deemed eligible for grant aid.

The terms of Clause 7.7 of the Higher Education Grants Scheme and the VEC Scholarship Scheme have now been amended to provide that candidates who already hold a postgraduate qualification and are pursuing a further postgraduate course at a higher level, and which represents progression from the level at which the first qualification was attained, may be deemed eligible for grant aid.

It is important to note that grant aid for postgraduate students will continue to be limited to a maximum of four years.