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## UCD Science Overview

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Why is UCD Science for me?
Building on a long and distinguished reputation, the UCD College of Science is the largest and most dynamic science research and training facility in Ireland. The College provides world-class research and learning facilities for undergraduate BSc, graduate MSc (both taught and research) and PhD students. Working with internationally-recognised academics, research students in UCD Science tackle questions of vital importance in the areas of human, animal, environmental and global welfare in a supportive, creative community within key thematic areas including:

- Biotechnology, Biomedical & Pharmaceutical Sciences
- Computer Science and Informatics
- Energy, Climate and Environment
- Health and Healthcare Delivery
- Mathematics and Finance
- Nanotechnology
- Physical and Geological Sciences

The College is dedicated to the creation, delivery and communication of new knowledge and innovation across the spectrum of Science. With a staff of 750 and a student population of 5,500 including 1,800 postgraduate students, the College is a vibrant community dedicated to excellence in all our pursuits.

International Students
The UCD experience is internationally and culturally diverse. UCD currently has over 24,000 students. Twenty five percent of these students are from overseas. While distinctly Irish, UCD has a global outlook, with thousands of students and faculty from diverse cultures and backgrounds. The aim of the University is to prepare students for work and life in different cultures and environments across the globe.

Why study at University College Dublin?
Some of the reasons to study at UCD:

- In the top 1% of the world's universities
- Ireland's largest provider of graduate education
- World-class education at one of the world's leading research-intensive universities
- Academic staff who are at the cutting edge of their disciplines internationally
- A curriculum that is informed by the latest research and discoveries
- Emphasis on research and innovation
- Unmatched opportunities to study at top-class partner universities across the globe
- An extensive choice of on-campus clubs, societies, sport facilities
- Purpose-built, modern parkland campus, close to Dublin city centre
- Extensive range of campus accommodation options

Undergraduate Science Courses
UCD offers the most broad and diverse undergraduate Science programme in Ireland, with degree courses in biological, biomedical, chemical, geological, mathematical, physical and computer sciences, all delivered by academic staff at the forefront of teaching and research. After studying the foundations of science in first year of the main Science course, students will have the opportunity to specialise in one of 25 degree subjects such as Zoology, Pharmacology, Genetics, Statistics, Medicinal Chemistry and Chemical Biology and Theoretical Physics. Students also have the option of pursuing a degree in Computer Science or in Actuarial and Financial Studies. By fourth year students will conduct their own research and communicate their discoveries under the guidance of some of Ireland's top scientists. Subjects pathways at http://www.ucd.ie/science/ucdscience2013.pdf
Taught Masters Science Courses
UCD Science has a broad range of Taught Masters courses across key thematic strands including: Biotechnology, Biomedical and Pharmaceutical Sciences, Computer Science and Informatics, Energy and Environment, Food, Mathematics and Finance, and Physical Sciences. A current list of these programmes can be located at: http://www.ucd.ie/science/ucd_taught_graduate_studies.html.

These courses are modularised in a credit-based curriculum to facilitate choice, flexibility, access, continuing professional development and life-long learning for the student. An e-learning environment is also supported. Innovation is an important element of each course. Courses are cross disciplinary incorporating collaboration between Science and Engineering, Business and Human Sciences. The taught Masters Degree is awarded following completion of a programme of one to two years duration.

Science Research Degrees
The research training opportunities available reflect the diversity of talent, experience and tradition available within UCD Science. Students can choose from a wide range of topics from basic science research through applied science in our thematic areas. Research degrees are ideal for anyone interested in pursuing further in-depth study in a specialist area relevant to their primary degree.

Research degrees involve students carrying out their own research and academic study under the one-to-one supervision of an academic supervisor. The precise focus of research is agreed between the supervisor and student. Research can be carried out at Masters or Doctoral level. Please see http://www.ucd.ie/science/ucd_research_degrees.html for further details.

UCD Science Research Institutes and Centres
Increasingly ‘big’ questions require answers that draw on a multitude of skills often situated at the interface of disciplines; for this reason UCD created several institutes and centres, which connect knowledge across boundaries and break down academic silos. Academics from across UCD Science address the research questions of these institutes and centres, for example examining green energy and the environment, biomedical research, complex numerical systems, nanotechnology, sensors and the interface of biology and technology. Research students in UCD Science are increasingly involved in multi-disciplinary programmes and themes that are supported by the Schools and associated research institutes and centres including:

- UCD Centre for Cybersecurity and Cybercrime Investigation
- UCD Conway Institute for Biomolecular & Biomedical Research
- UCD Complex and Adaptive Systems Laboratory
- UCD Centre for Synthesis and Chemical Biology
- UCD Earth Institute
- UCD Centre for BioNano Interactions

Visit our ‘Research Showcase’
Each of the seven schools in the UCD College of Science:

- UCD School of Biology and Environmental Science
- UCD School of Biomolecular and Biomedical Science
- UCD School of Chemistry and Chemical Biology
- UCD School of Computer Science and Informatics
- UCD School of Geological Sciences
- UCD School of Mathematical Sciences
- UCD School of Physics

The Schools and associated research institutes and centres engages in exciting and internationally recognised research, which is funded by a variety of agencies including Science Foundation Ireland, The European Union, the Health Research Board, the Irish Research Council and the Wellcome Trust. Reflecting the level of funding and productivity are over 600 postgraduate research students and a large body of postdoctoral scientists, who play a key role in the research efforts.

Investment in infrastructure, which is crucial to the continued excellence in research training and output, is a continuing priority of UCD's strategy and is exemplified most recently with the upgrading of the UCD Science Centre.

Innovation
www.ucd.ie/innovation/aboutus
Together with teaching and research, innovation is recognised as a third pillar encompassing university activity. In conjunction with UCD’s Innovation and Technology Transfer Centre, Nova, commercialisation of the research on-going in UCD Science is realised through licensing arrangements with established enterprises and the development of spin-out companies including:

1. Celtic Catalysts
2. HeyStaks Technologies
3. Changing Worlds
4. Enzolve Technologies

Contact Us
www.ucd.ie/science/contact.html
UCD Science
Biotechnology, Biomedical and Pharmaceutical
The UCD School of Biology and Environmental Science has an academic staff of 25, with critical levels of expertise covering the disciplines of cell biology, plant science, zoology, evolutionary biology and environmental science. The School offers a diverse range of undergraduate and postgraduate academic programmes dealing with both fundamental and applied aspects of biology that equip graduates with relevant skills for careers in the life sciences in the modern world. Teaching activities are complemented with cutting edge research carried out in world-class facilities in the heart of the UCD Science Centre.

About the UCD School of Biology and Environmental Science

The UCD School of Biology and Environmental Science has an academic staff of 25, with critical levels of expertise covering the disciplines of cell biology, plant science, zoology, evolutionary biology and environmental science. The School offers a diverse range of undergraduate and postgraduate academic programmes dealing with both fundamental and applied aspects of biology that equip graduates with relevant skills for careers in the life sciences in the modern world. Teaching activities are complemented with cutting edge research carried out in world-class facilities in the heart of the UCD Science Centre.

Undergraduate Courses

Undergraduate degrees are one of the cornerstones of the School’s activities. Our friendly and approachable academic staff offer modern and dynamic teaching, with individual staff-student contact time and small group activities being important facets of our approach to learning. Our BSc Honours degrees are in the following subjects:

- Cell and Molecular Biology
- Environmental Biology
- Plant Biology
- Zoology

The first three years of study involve modular learning, with increased specialisation of subject area as you progress. By the fourth year you will conduct your own research and communicate your discoveries under the guidance of some of Ireland’s finest scientists. We welcome international students to study for a semester or year abroad as part of our UCD Science Study Abroad programme and as full-time students. Our graduates are in great demand in Science-based employment both at home and abroad, and are equally sought after in areas other than Science where there are requirements for rigorously trained, numerically competent and analytically proficient graduates.

Graduate Studies

We offer graduate research programmes within internationally recognised research groups that lead to Masters and PhD degrees. We also offer a range of taught graduate programmes at Masters and Higher Diploma levels.

Taught MSc Programmes

Taught MSc degrees are typically between one and two years in length and provide opportunities for graduates with BSc degrees to deepen their knowledge in a particular area of interest. We currently offer the following taught MSc programmes:

- Applied Environmental Science
- Evolutionary Biology
- Global Change: Ecosystem Science and Policy
- Imaging and Microscopy
- Plant Biology - Future Crops
- World Heritage Management

More information on all these programmes is at www.ucd.ie/bioenvsci/grad/taught/

Distance Learning

From September 2012 we are also offering part-time distance learning courses in World Heritage Conservation. Accessible worldwide, the Graduate Diploma and Graduate Certificate will provide a flexible learning environment to professionals and decision makers working in areas related to the nomination and conservation of World Heritage Sites.

PhD Programmes

Academic staff are actively involved in disciplines encompassed by the School and in addition are also involved in interdisciplinary and cross-school PhD programmes such as Bioinformatics & Systems Biology and Earth & Natural Sciences.
Research

Our goal is to establish the School as a leading European centre for integrative biology, exploring and understanding the processes that drive change and response at cellular, organism and ecosystem levels. Our research is tightly linked with other major research initiatives across the UCD College of Science and the wider university. In particular, the School hosts the Cell Screening Laboratory, the Environmental Chemistry Facility, the Aquatic Experimental Facility, the Metabolomics Facility and the PEAC Climate Facility, all of which are key experimental platforms of the University. Staff within the School contribute to major research initiatives, including the UCD Nanomedicine Centre, the UCD Conway Institute for Biomolecular and Biomedical Research, and the UCD Earth Institute.

Our research focuses on four interlinked thematic areas:

- Ecosystems, Global Change and Sustainability
- Evolution and Population Biology
- Plant Sciences
- Cell and Molecular Biology

Multidisciplinary collaboration, both within and beyond the School, is key to the success and impact of our research.

Ecosystems, Global Change and Sustainability

Ecosystems are dynamic systems that respond to a wide range of natural and anthropogenic drivers. Human activities are affecting ecosystem structure and functioning with far reaching consequences for human society. The research under this theme embraces basic research into the processes that underpin ecosystem structure and functioning and also applies research to improve natural resource management. The assessment of impacts of environmental change and pollution on species and ecosystems and the sustainable management of natural resources (through agriculture, forestry and fisheries) are key research areas. The School draws on a unique breadth of expertise to enable a fully integrated approach to these challenges. Researchers communicate closely with environmental policy makers, managers and industrial partners to maximise the positive impact of their work.

Evolution and Population Biology

The evolutionary process is intrinsic to all biological systems and is therefore the unifying theory of every biological science. Understanding and measuring this process will allow us uncover the history of life and can explain the causes of biodiversity. Our evolution and population biology research programme examines evolution at different transects of time using morphological, life-history, and molecular genetic methods. The strength of our programme resides in its multidisciplinary nature. We examine evolutionary processes in both plants and animals using palaeontology, phylogenetics, population genetics, developmental biology, as well as host-parasite interactions, eco-morphology, behaviour and comparative genomics.

Plant Sciences

Changes in global climate and in agricultural policies emphasise the need to develop sustainable environmentally-friendly crop-production systems, and is placing a renewed focus on the response of plants to environmental factors. This requires a greater understanding of plant responses to reduced resource availability and the utilisation of this information for the future development of agronomically-important plants with an increased tolerance to multiple environmental stresses. The knowledge gained is important for the development of novel crops and crop products and provides impetus for both fundamental and applied research in the plant sciences.

Cell and Molecular Biology

The Cell and Molecular Biology theme focuses on the organisation and function of the cell at the molecular level. Seven research groups are housed in newly refurbished cell and molecular biology facilities within the School. Cellular, biochemical and molecular biology approaches are combined with advanced light, confocal and electron microscopy techniques to address fundamental problems in the discipline. Focussed research programmes are devoted to several topics, including analysis of membrane traffic, cell signalling, programmed cell death, organism-organism interactions at the cellular level and cellular responses to stress and environmental change.

Innovation

The UCD School of Biology and Environmental Science recognises the need to foster and promote the transfer of knowledge generated through its research to benefit the wider community and to contribute to the development of Ireland as a knowledge-driven economy. Below is an example of the success of the School in translating its research into an industrial setting.

The development of diagnostic tests for BSE

Research related to BSE detection by Prof. Mark Rogers led to the development of the Transmissible Spongiform Encephalopathy (TSE) diagnostic technology which was licensed to a small Irish company Enfer Scientific Ltd. Enfer subsequently developed a rapid test for BSE which was validated for use across Europe. Enfer generated significant jobs and profits from selling these diagnostic BSE test-kits, and is an internationally successful company based in Ireland developed from innovation which originated in the UCD School of Biology & Environmental Science.

Contact Us

Please email or write to the School for more information on the undergraduate and graduate courses, enquiries on our facilities and services or our innovation and research.

UCD School of Biology and Environmental Science
University College Dublin, Belfield, Dublin 4, Ireland
E: biolandenv@ucd.ie
T: +353 1 716 2243
MSc Biotechnology
UCD School of Biomolecular and Biomedical Science

Why is this course for me?
The UCD MSc in Biotechnology provides a comprehensive programme of education in Biotechnology, a branch of science that demands a broad knowledge of a number of areas of scientific study including Biochemistry, Microbiology and Pharmacology. Biotechnology is one of the major technologies of the twenty-first century and is predicted to provide solutions to major national problems by developing new technologies with great potential for economic impact.

The programme focuses on broadening your knowledge and understanding of the current technologies and processes in the PharmaBiotech industry, including approaches being applied to further advance the discovery and design of new and highly innovative biotech and pharmaceutical products. It also provides modules on food and environmental biotechnology as well as industrially relevant expertise in facility design, bioprocess technology, regulatory affairs and clinical trials.

Why study at University College Dublin?
Some of the reasons to study at UCD:
- In the top 1% of the world’s universities
- Ireland’s largest provider of graduate education
- A diverse university, both in academic disciplines and culture
- Emphasis on research and innovation
- Purpose-built, modern parkland campus, close to Dublin city centre
- Extensive range of campus accommodation options.

UCD College of Science
The College is dedicated to the creation, delivery and communication of new knowledge and innovation across the spectrum of Science. With a staff of 750 and a student population of 5500 including 1800 postgraduate students, the College is a vibrant community dedicated to excellence in all our pursuits.

UCD School of Biomolecular and Biomedical Science
The UCD School of Biomolecular and Biomedical Science focuses on various aspects of Biotechnological application in the fields of Biochemistry, Infection Biology, Neuroscience, Cardiovascular Disease, Diabetes and Cancer. The school is highly research intensive and places special emphasis on translating fundamental discoveries to a greater understanding of health and disease, with the ultimate aim of informing novel drug discovery. The diversity of our expertise is a major facilitator for interdisciplinary scholarship and research and provides the School with a unique forum to investigate biological systems at molecular, cellular and whole organism levels.

What will I study?
This multi-disciplinary MSc in Biotechnology will provide the theoretical background, practical training and ancillary workplace skills to equip you with the essential tools for a successful career in the biopharmaceutical and biotechnology industry both in Ireland and abroad.

You will gain experimental and theoretical knowledge in the following topics:
- Pharmacology and Drug Development
- Medical Device Technology
- Biomedical Diagnostics
- Recombinant DNA Technology
- Microbial and Animal Cell Culture
- Food Biotechnology
- Facility Design
- Environmental Biotechnology
- Regulatory Affairs
- Drug Development and Clinical Trials
- Bioprocessing Laboratory Technology

Lectures are delivered by staff of international renown in their fields of research. Semesters one and two will be devoted to classroom or lab-based activities.
You will spend the remaining time carrying out a substantial research project, chosen in consultation with academic staff.
Projects
During the third semester you will conduct research in an academic or industrial lab. Projects will be carried out within research groups of the UCD School of Biomolecular and Biomedical Science using state-of-the-art laboratory and computational facilities or in multinational pharmaceutical companies.

Programme outcomes
On successful completion of the programme students will:

■ be able to demonstrate the analytical and technical skills required for experimental research and / or the exploitation of scientific discovery in industry, including experimental design, problem solving and interpretation of new data.
■ understand regulatory compliance and the procedures involved in management of clinical trials.
■ be able to identify and appropriately manage the professional, ethical and wider social aspects and impacts of product development within the biotech and pharmaceutical industry.
■ have improved your communication skills, and your ability for independent thinking and for developing creative solutions.

What are the career opportunities?
This advanced graduate degree in Biotechnology has been developed in consultation with employers and therefore will be recognised and valued by them. A key feature is the opportunity to carry out a project in industry which will allow graduates to develop connections with prospective employers, thereby enhancing chances of employment on graduation. You will also have the opportunity to become part of a network of alumni in the field of Biotechnology.

Prospective employers
Abbott; Allergan; Alpha Technologies; Amgen; Avonmore Foods; Baxter Healthcare; Beckman Coulter; Biotrin International Ltd.; Boston Scientific; Elan Corporation; Eli Lilly and Co.; Celltech; GlaxoSmithKline; Icon Clinical Research; ImmunoGen Inc.; Janssen Pharmaceutical Ld.; Johnson & Johnson Ltd.; Kerry Group Plc.; Medtronic; Merck Sharp & Dohme; Olympus Diagnostica; Quintiles; Quest International; Sandoz.; Schering-Plough; Serology Ltd.

Graduate testimonial
Alumnus
Sean Mateer

The MSc in Biotechnology introduced me to the wider biotechnology industry, introducing me to green biotechnology and waste water treatment and also to pharmacology, clinical trials and regulatory affairs, subjects in which I had no previous experience.

A major part of the programme is the research project undertaken during semester three. I had the opportunity to undertake this in Pfizer where not only did I learn new scientific techniques but also how to engage with staff and management in various departments in a large pharmaceutical company.

I found this experience invaluable in securing a position immediately following graduation.

How do I apply?
Entry qualifications
Candidates are normally expected to have an upper Second Class Honours Grade or equivalent in a biology or chemistry primary degree. This includes a BSc in Biotechnology, Biochemistry, Microbiology, Genetics, Neuroscience, Pharmacology, Physiology, Medicinal Chemistry or an equivalent qualification.

Graduates with equivalent qualifications in related areas of science and technology or with proven relevant industrial experience will be considered for places. The number of places is limited and selection will be made on the candidate's performance in his/her primary degree and experience.

Contact
For further information please contact biotech@ucd.ie

Applying online
To apply online, please go to: http://www.ucd.ie/apply

Fee information
For information on fees, please visit: www.ucd.ie/registry/adminservices/fees

Useful links
www.ucd.ie/biotech
Why is this course for me?

The UCD MSc in Biotechnology and Business is an exciting programme designed for non-business graduates who want to become managers/entrepreneurs in complex business environments in technology and science-based fields. The programme is the result of a close collaboration between UCD School of Biomolecular and Biomedical Science and UCD Smurfit School of Business. The UCD MSc in Biotechnology and Business provides you with a solid knowledge of techniques used in modern biotechnology including hands-on experience of bioprocessing. You will also receive a comprehensive business education. You will learn to identify and solve business problems in local and international settings, enhance your communication and leadership skills and improve your ability for independent thinking and developing creative solutions.

Why study at University College Dublin?

Some of the reasons to study at UCD:

- In the top 1% of the world's universities
- Ireland's largest provider of graduate education
- A diverse university, both in academic disciplines and culture
- Emphasis on research and innovation
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UCD School of Biomolecular and Biomedical Science
The UCD School of Biomolecular and Biomedical Science focuses on various aspects of Biotechnological application in the fields of Biochemistry, Infection Biology, Neuroscience, Cardiovascular Disease, Diabetes and Cancer. The diversity of our expertise is a major facilitator for interdisciplinary scholarship and research and provides the School with a unique forum to investigate biological systems at molecular, cellular and whole organism levels. Lectures will be delivered by staff of international renown in their field of research.

UCD Smurfit School of Business
The UCD Smurfit School of Business is Ireland’s leading graduate business school and research centre. The School’s academics hold the highest qualifications from the world’s leading universities. This, with their business experience, helps provide an environment of excellence in teaching and research where students study a wide range of subjects through a variety of teaching methods.

What will I study?

You will spend 50% of your time studying biotechnology, and 50% of your time studying business. You may choose optional biotechnology modules to ensure that you specialise in your area of interest. Depending on chosen subjects you will also gain experimental and theoretical knowledge in the following topics:

- Drug Discovery
- Medical Device Technology
- Biomedical Diagnostics
- Regulatory Affairs
- Bioprocessing
- Marketing Management
- Corporate Finance
- Entrepreneurship
- Business Plan Development

The UCD MSc in Biotechnology and Business is an exciting programme designed for non-business graduates who want to become managers/entrepreneurs in complex business environments in technology and science-based fields. The programme is the result of a close collaboration between UCD School of Biomolecular and Biomedical Science and UCD Smurfit School of Business. The UCD MSc in Biotechnology and Business provides you with a solid knowledge of techniques used in modern biotechnology including hands-on experience of bioprocessing. You will also receive a comprehensive business education. You will learn to identify and solve business problems in local and international settings, enhance your communication and leadership skills and improve your ability for independent thinking and developing creative solutions.
Research projects
A Biotechnological Case Study and the development of a Business Plan forms a major part of your summer semester and gives you the opportunity to combine your knowledge of Science and Business into a realistic vision for a Biotechnology company.

Programme outcomes
On successful completion of the programme you will have a solid knowledge of techniques used in modern biotechnology and a knowledge of the fundamentals of business, understand innovation, product development, intellectual property, ethics, and market issues of relevance when commercialising novel technology, appreciate the importance of professional development and the resources available to keep up to date with new developments in the field.
This unique skill-set will position you ideally to translate biotechnological advances into successful business opportunities either by setting up a company or by expanding the product pipeline in existing companies.

What are the career opportunities?
This advanced graduate degree in Biotechnology and Business has been developed in consultation with employers and therefore will be recognised and valued by them. A key feature is the opportunity to carry out a business development plan which will allow graduates to develop connections with prospective employers, thereby enhancing chances of employment on graduation. You will also have the opportunity to become part of a network of alumni in the field of Biotechnology.

Prospective employers
Abbott; Allergan; Alpha Technologies; Amgen; Avonmore Foods; Baxter Healthcare; Beckman Coulter; Biotrin International Ltd.; Boston Scientific; Elan Corporation; Eli Lilly and Co.; Celtech; GlaxoSmithKline; Icon Clinical Research; ImmunoGen Inc.; Janssen Pharmaceutical Ltd.; Johnson & Johnson Ltd.; Kerry Group Plc.; Medtronic; Merck Sharp & Dohme; Olympus Diagnostica; Quintiles; Quest International; Sandoz.; Schering-Plough; Serology Ltd.

Graduate testimonial
Alumna
Karen Hanrahan
The MSc Biotechnology and Business has been a truly invaluable experience for me. By bridging the gap between academic research and that of the wider industry this unique MSc in Biotechnology and Business was precisely the graduate programme I was looking for and for the first time in my academic studies I was exposed to the entrepreneurial and commercial side of biotechnology.

The most rewarding part of the MSc for me was being given the opportunity to provide business consultation to a NovaUCD start-up biotech company as part of my studies at the UCD Smurfit Graduate School of Business.
This enabled me to leverage the business skills I had obtained from modules such as marketing management and entrepreneurship with that of my biomedical knowledge to develop a business plan for a spin-out R&D company from UCD Conway institute.

How do I apply?
Entry qualifications
Candidates are normally expected to have an upper Second Class Honours Grade or equivalent in a biology or chemistry primary degree. This includes a BSc in Biotechnology, Biochemistry, Microbiology, Genetics, Neuroscience, Pharmacology, Physiology, Medicinal Chemistry or an equivalent qualification. Graduates with equivalent qualifications in related areas of science and technology or with proven relevant industrial experience will be considered for places. The number of places is limited and selection will be made on the candidate’s performance in his/her primary degree and experience.

Contact
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Applying online
To apply online, please go to: http://www.ucd.ie/apply

Fee information
For information on fees, please visit: www.ucd.ie/registry/adminservices/fees

Useful links
www.ucd.ie/biotech
Why is this course for me?

The ability to visualise an object or specimen of interest has always been a fundamental aspect of biological and biomedical research. In recent years, imaging techniques and approaches have been revolutionised through advances in computing, instrumentation and automation, novel fluorescent tools, and the ability to resolve and accurately quantify ever smaller structures. This MSc will provide students with an in depth knowledge of current imaging and microscopy technologies, with hands-on experience of their application in biology. A suite of specialised modules will inform students about the physics of imaging, analysis of images, use of electron microscopy, confocal microscopy, atomic force microscopy, and automated screening microscopy, and students will be provided with the opportunity to use state-of-the-art equipment in each of these areas. An extended laboratory-based project utilising knowledge gained during this programme is also a key feature of this course. This MSc provides an outstanding opportunity for students to gain extensive practical expertise in all the major types of biological imaging using state-of-the-art microscopy equipment.

What will I study?

Students on this programme will learn both the theory and practical use of a wide range of imaging and microscopy approaches as used in the life science and biomedical arenas. Emphasis is placed on experimental design, sample preparation, the practical use of imaging equipment, and image analysis. In addition to lectures and laboratory classes, workshops run by academics and industry partners will also provide the opportunity for students to gain practical experience of microscope design and use. The programme is designed around a suite of modules, including the following:

- Electron Microscopy
- Biological Atomic Force Microscopy
- High Content Screening Microscopy
- Light Sheet Microscopy
- Practical Fluorescence Microscopy
- Flow Cytometry
- Diagnostic and Medical Imaging
- Image Analysis and Processing
- BioOptics and NanoBio Imaging

An extended laboratory based research project is a central component of this MSc.
Research Projects
Research projects are carried out within research groups of the UCD School of Biology & Environmental Science and appropriate collaborating groups across the university.
Previous research projects have included:

- Laser-fixation methods for cultured cells
- Characterisation of the electrostatic properties of protein films by AFM
- Single endocytic organelle tracking
- High content analysis of small GTP binding proteins

Programme outcomes
Graduates of this programme will be competent in confocal microscopy, electron microscopy, atomic force microscopy, automated screening microscopy and use of image analysis software.
They will also possess in depth information about sample preparation and processing of a wide variety of biological samples. Graduates will also have gained knowledge in complementary imaging technologies such as flow cytometry and diagnostic imaging.
They will have the ability to work as part of a team, confidently engage in technical research projects and communicate findings.

What are the career opportunities?
The knowledge and skills learned in this programme will empower its graduates with a clear competitive advantage when seeking further graduate training (such as a PhD position) or employment in either the academic or industrial sectors.

Prospective Employers
Graduates from this MSc will have a distinct advantage when applying for PhD studentships or other graduate training programmes. This MSc will also be of great value to individuals wishing to pursue scientific careers in academic, health-related or bio-pharma environments.

Staff Profile
Prof. Jeremy C. Simpson

“Imaging technologies have played a central role in my research career so far. In recent years there has been a massive increase in the possibilities that imaging provides with respect to understanding biological systems, and so there is a real need to equip students with the appropriate skills in this area, as it impacts upon basic science through to the pharmaceutical sector.”
Prof. Simpson is Professor of Cell Biology and an SFI Principal Investigator in the UCD School of Biology and Environmental Science & UCD Conway Institute of Biomolecular and Biomedical Research.

Graduate Profile
Sanju Ashraf

“During my BSc in India I became interested in working with microscopes and in searching for a related course I came across the MSc Imaging and Microscopy at UCD. This course was exactly what I was looking for as I learned about and got lots of valuable hands-on experience with the latest imaging and image analysis equipment and techniques across different biological disciplines. I particularly enjoyed the time I spent working on my research project in Prof. Simpson’s lab. Both staff and students were very welcoming and highly supportive and the experience of living and studying in a vibrant city and University was brilliant. This MSc has a lot to offer academically and helped me to secure a Wellcome Trust funded PhD position in the University of Edinburgh, UK.”

Prospective Employers
Graduates from this MSc will have a distinct advantage when applying for PhD studentships or other graduate training programmes. This MSc will also be of great value to individuals wishing to pursue scientific careers in academic, health-related or bio-pharma environments.

How do I apply?
Entry Qualifications
Entrance to the programme requires a recognised BSc honours degree (or equivalent) with at least a second class honours grade two overall result in an appropriate sciences discipline, such as biology, microbiology, cell biology, molecular biology, biochemistry, genetics, pharmacology, physics.
If English is not your native language, proof of your proficiency in English will be required, unless you took your primary degree through English in an English speaking country. The minimum acceptable score on the TOEFL Internet Based Test is 100, on the IELTS system it is 6.5.

Duration
This MSc programme is one year long comprising of 90 ECTS.

Contact
Susan Wilson / Prof. Jeremy Simpson
Email: bioimaging@ucd.ie
Tel: + 353 1 716 2243
www.ucd.ie/bioenvsci

Applying Online
To apply online please go to www.ucd.ie/apply, create a user account, select “Graduate Taught Courses” as your application type from the drop down list and then select “MSc Imaging and Microscopy (X415)”.

Fee Information
For information on fees, please visit: www.ucd.ie/registry/adminservices/fees

Useful Links
www.ucd.ie/bioenvsci
**Why is this course for me?**

The last decade has seen rapid developments in our understanding of plants and their significance to our wellbeing into the 21st century. This has been achieved through advances in a range of disciplines including genetics, genomics, cell biology, physiology, ecology and studies on climate change. This knowledge is the foundation for improving existing crops and for the development of novel crops to meet future challenges. Graduates of this one year MSc will be equipped with the knowledge and skills in these recent advances to rise to the future challenges in academia, industry and policy development. Innovation and entrepreneurship permeate the course as central themes and in addition a specific module on entrepreneurship in plant biology is delivered.

This MSc covers a wide diversity of both topics and approaches and is taught by a high-profile research oriented group of academics. Students will have full involvement in active research groups and access to, and experience of, a large array of state-of-the-art facilities and technologies.

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- Extensive range of campus accommodation options.

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**UCD School of Biology & Environmental Science**

The UCD School of Biology and Environmental Science has an academic staff of 25, with critical levels of expertise covering the disciplines of cell biology, plant science, zoology, evolutionary biology and environmental science. The School offers a diverse range of undergraduate and postgraduate academic programmes dealing with both fundamental and applied aspects of biology that equip graduates with relevant skills for careers in the life sciences in the modern world. Teaching activities are complemented with cutting edge research carried out in world-class facilities in the heart of the UCD Science Centre.

**What will I study?**

This 90 ECTS one year taught MSc is comprised of 60 ECTS of taught modules and a 30 ECTS independent research project / minor thesis component. Students can tailor the taught component of the course to their individual requirements through module selection.

Modules include:

- Entrepreneurship in Plant Biology
- Current Developments in Plant Biology
- Environmental Biotechnology
- Plant-Atmosphere Climate Interactions
- Developmental Plant Genetics
- Programmed Cell Death in Plants
- GMOs in the Environment
- Insect-Plant Interactions
- Biological Invasions
- Ecological Significance of Different Photosynthetic Pathways
- Biological Atomic Force Microscopy
Research Projects
Research projects are normally carried out within research groups of the UCD School of Biology & Environmental Science.

Previous research projects have included:

- Root water uptake in barley at varying light intensity
- Effect of elevated CO₂ and light intensity on leaf physiognomy and vein density
- Control of leaf size in plants
- New EU food labeling rules, their implementation and impact.

Programme outcomes
On successful completion of the programme graduates will:

- have gained advanced knowledge of Plant Biology, with emphasis on specific areas of research, which will provide the basis for the development and application of original ideas.
- have the ability to generate and test hypotheses.
- have the ability to interpret datasets generated in Plant Biology research.
- understand how to take scientific research to the marketplace.
- have the ability to communicate research to both specialist and non-specialist audiences.

What are the career opportunities?
Graduates will have a distinct advantage when applying for PhD studentships or other more advances graduate training. This MSc also holds great value to individuals wishing to pursue scientific careers in academia, agriculture and plant science based or bio-industries.

- Further post-graduate education and research
- Plant biotechnology companies
- Scientific journalism/publishing
- Governmental and non-governmental policy

Staff Profile
Dr. Paul McCabe
“...My research group is involved in trait selection at the single cell level. For example, somatic embryogenesis is a propagation technique that can solve problems associated with tree breeding such as long reproductive cycles. Using somatic embryogenesis to improve tree breeding has the potential to dramatically increase forest productivity. We are currently collaborating with Coillte on research to increase the embryogenic potential of several important commercial species. In another research project we are collaborating with the horticultural industry to develop a cell culture based technology to regenerate plants expressing chloroplast mutations in order to generate novel varieties of ornamental plants with attractive, marketable, changes in foliage colour.”

Dr. Paul McCabe is a senior lecturer in the School of Biology and Environmental Science. His group is undertaking research funded by SFI, Enterprise Ireland, Department of Agriculture, Irish Research Council and the European Union.

How do I apply?
Entry Qualifications
A recognised BSc honours degree (or equivalent) in an appropriate life science discipline. The number of places is limited to 10.

If English is not your native language, proof of your proficiency in English will be required, unless you took your primary degree through English in an English speaking country.

The minimum acceptable score on the TOEFL Internet Based Test is 100 and IELTS is 6.5.

Duration
This MSc is a one year full-time course, comprising of 90 credits.

Contact
Susan Wilson / Dr. Paul McCabe
Email: futurecrops@ucd.ie
Tel: + 353 1 716 2243
www.ucd.ie/bioenvsci

Applying Online
To apply online please go to www.ucd.ie/apply, create a user account, select “Graduate Taught Courses” as your application type from the drop down list and then select “MSc Plant Biology – Future Crops (X476)”.

Fee Information
For information on fees, please visit: www.ucd.ie/registry/adminservices/fees

Useful Links
www.ucd.ie/bioenvsci
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What will I study?

This interdisciplinary MSc provides fundamental theoretical and practical training in the key areas of environmental science and related methods and tools. The course gives due consideration to key legislative requirements and policy developments. Students have the opportunity to select from a wide range of modules including:

- Water Resources Engineering
- Environmental Impact Assessment
- Core Skills for Research
- Freshwater Resources Assessment (included biological and chemical assessment of water quality)
- Global Change Ecology
- Wildlife & Resources Management
- Marine/Coastal Ecology
- Soil Ecology
- Environmental Geology
- Ecotoxicology & Air Quality Monitoring
- Vegetation Ecology
- Geographic Information Systems (GIS) and Data Analyses
- Remote Sensing
- Ecological Modelling
- Integrated Municipal Solid Waste Management
- Water, Waste & Environmental Modelling

Why is this course for me?

The UCD Masters Programme in Applied Environmental Science has been running for over 25 years and will provide you with the knowledge base, skills and confidence to address challenging environmental problems and develop a career in environmental assessment, evaluating potential change in environmental quality in response to various land-use and other activities and in the development of management and conservation strategies as well as contributing to policy formulation. There is a heavy emphasis on practical training in fieldwork, laboratory analyses, information sourcing, data analysis, planning, reporting and communication. You will work with an interdisciplinary team of experts covering the key aspects of Environmental Science, encompassing marine, freshwater and terrestrial systems, to make this an exceptionally practical multidisciplinary programme. This is the only environmental science course in Ireland to include a major input from civil engineering relating particularly to water quality, hydrology and waste treatment processes. The course is designed for recent graduates in science, engineering or architecture or graduates employed by local authorities, state or semi-state agencies, industry and environmental consultants.
Lectures are delivered by staff of international renown in their fields of research. About 50% of each module’s time allocation is devoted to field or lab-based activities. Additionally, you will spend three months carrying-out a research project, chosen and run in consultation with academic staff and in many cases outside agencies/industry.

Research Projects
Research projects are carried out both within research groups of the UCD School of Biology & Environmental Science using state-of-the-art laboratory and computational facilities and with outside agencies/industry. Previous research projects have investigated:

- Biofouling issues for marine energy converters
- Biological nitrification in the rhizosphere of contrasting plants.
- The impact of alien flowers on bumble bee foraging.
- Changes in the aquatic invertebrates as a result of invasion by the Asian clam Corbicula fluminea.
- The potential effect of forestry operations on water quality in upland streams.
- Bioremediation of polycyclic aromatic hydrocarbon (PAH) contaminated soils

What are the career opportunities?
Our graduates are building successful varied careers in environmental resources assessment, management and protection. A considerable number have been employed in consultancy positions but some are also with the Inland Fisheries Ireland, local authorities, Department of the Environment and the EPA. Some graduates have also continued their studies at PhD level.

Programme outcomes:
On successful completion of the programme you will be able to:

- Demonstrate an in-depth understanding of the topics underpinning Environmental Science.
- Apply technical skills in laboratory and field analyses.
- Confidently engage with interdisciplinary teams to address environmental problems.
- Work independently or as part of a team, and effectively communicate research findings.
- Plan, develop and execute research and other environmental investigations including the preparation of professional reports.
- Appreciate the importance of professional development and the resources available to keep up to date with new developments in the field.

Graduate Profiles

Lorraine Benson

‘With a great team of lecturers, in addition to highly relevant lab and fieldwork, this course gave me an excellent overview of the science behind major public policy challenges facing us today in the areas of climate change, management of water resources and the environment’

Irish Representative to the European Union, Brussels.

Paul O’Callaghan

The MSc opened up many opportunities for me and as a direct result I have been able to further my studies to PhD level undertaking very exciting research on watercourses in a cloud forest in Honduras. I would highly recommend the masters whether pursuing a career in academia or industry.

Currently pursuing PhD studies in UCD School of Biology & Environmental Science.

How do I apply?

Entry Qualifications
Entrance to the programme requires an honours primary degree in science, engineering, geography, architecture or related subject is required. If English is not your native language, proof of your proficiency in English will be required, unless you took your primary degree through English in an English speaking country. The minimum acceptable score on the TOEFL Internet Based Test is 100 or 6.5 in IELTS.

Flexible delivery options
This 90 ECTS MSc is available as a 1 year full-time or 2 year part-time course.

Contact
Susan Wilson / Dr. Jan-Robert Baars
Email: mscenvsci@ucd.ie
Tel: + 353 1 716 2243
www.ucd.ie/bioenvsci

Applying Online
To apply online please go to www.ucd.ie/apply, create a user account, select “Graduate Taught Courses” as your application type from the drop down list and then select either “MSc Applied Environmental Science FT (X062)” or “MSc Applied Environmental Science PT (X204)”.

Fee Information
For information on fees, please visit: www.ucd.ie/registry/adminservices/fees

Useful Links
www.ucd.ie/bioenvsci
MSc Evolutionary Biology
UCD School of Biology & Environmental Science

Why is this course for me?

This MSc course is tailored for bright and motivated science graduates wishing to advance their career in evolutionary biology, either by bridging the gap between undergraduate and doctoral level education, or by providing the basis to build up a career in science communication, policy or conservation. The course entails taught modules, including field-work, museum and laboratory experience, data analysis, modeling and an independent research project. You will be taught by the strongest and broadest team of evolutionary biologists in the country, whose research regularly features in the world’s top evolutionary journals, including Evolution, BMC Evolutionary Biology,

Molecular Ecology, Molecular Biology & Evolution, Journal of Evolutionary Biology, Heredity, Palaeontology, Genetics, Genome Research, as well as Science, Nature, TREE, PNAS and the Proceedings of the Royal Society of London. You will have full involvement in active and vibrant research groups with state of the art laboratory and computational technologies. This MSc gives you the chance to collect, analyse and write up your own data into a manuscript to be submitted to an international peer-reviewed journal. You will have the opportunity to develop your presentation skills for both specialist and lay audiences.

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What will I study?

- A prescribed taught course ‘Current Developments in Evolutionary Biology’ will run through two semesters and will include a regular guest lecture by a specialist in a given area of evolutionary biology.
- A field programme at the beginning of the first semester (September).
- An individual research project chosen in consultation with academic staff.

A selection of elective modules:
- Introduction to Evolutionary Biology
- Molecular Phylogenetics
- Palaeobiology
- Evolution of Humans
- Plant-Atmosphere and Climate Interactions
- Ecological Modelling
- Developmental Plant Genetics
- Epigenetics
- Insect-Plant Interactions
- Cellular Architecture
Research Projects
For your project you will be part of a research group in the UCD School of Biology & Environmental Science, or collaborate with the National Botanic Gardens of Ireland or the National Museum of Ireland.
Previous research projects have included:

- What is a fossil plant species in the context of changing atmospheric composition?
- The biogeographical origins of holly (Ilex aquifolium) in Ireland
- The phylogenetic position and evolutionary history of Myozopda aurita, the Madagascar sucker-footed bat
- “Chaotic” population genetics of the invasive slipper limpet (Crepidula fornicata)
- Evolution of salivary proteins in phloem-feeding insects
- The origin of the invasive greater white-toothed shrew (Crocidura russula) in Ireland

Programme outcomes
On successful completion of the programme students will have:

1) An advanced knowledge of evolutionary processes, mechanisms and theory, which will provide the basis for the development of your original ideas.
2) The ability to apply your knowledge to formulate hypotheses and to test them using appropriate tools and problem-solving skills.
3) The ability to interpret morphological, molecular and simulated data using approaches based on evolutionary theory and the maturity to forecast the wider implications and consequences of your interpretations and conclusions.
4) The ability to clearly communicate evolutionary science to specialist and non-specialist audiences. Strong focus will be put on writing (popular articles, scientific papers) and presenting orally.
5) The confidence and the maturity to continue studying and critically appraising the scientific literature – especially in areas of controversy.

What are the career opportunities?

- Further post-graduate education and research
- Museum and public education/understanding of science
- Scientific journalism/publishing
- Governmental and non-governmental policy
- Wildlife management/environmental conservation

How do I apply?

Entry Qualifications
Entrance to the programme requires a recognised BSc honours degree in a related subject such as biology, ecology, zoology, geology, palaeontology, cellular/molecular biology, biochemistry, environmental biology, marine biology.

If English is not your native language, proof of your proficiency in English will be required, unless you took your primary degree through English in an English speaking country. The minimum acceptable score on the TOEFL Internet Based Test is 100 and on IELTS it is 6.5.

Duration
This MSc is a one year full-time course, comprising of 90 credits.

Contact
Susan Wilson / Dr. Jon Yearsley
Email: evolution@ucd.ie
Tel: +353 1 716 2243
www.ucd.ie/bioenvsci

Applying Online
To apply online please go to www.ucd.ie/apply, create a user account, select “Graduate Taught Courses” as your application type from the drop down list and then select “MSc Evolutionary Biology (X418)”.

Fee Information
For information on fees, please visit: www.ucd.ie/registry/adminservices/fees

Useful Links
www.ucd.ie/bioenvsci
Why is this course for me?

Global change (referring to planetary-scale changes of the planet’s natural cycles, which are affected by climate change as well as changes in human society) is occurring in complex socio-ecological systems. Understanding the intricate, medium to long-term changes in our land, air and water requires advanced knowledge in measurement, modeling and prediction. Devising effective environmental policy to address global change requires not only sound scientific information but also interdisciplinary dialogue and effective communication of the science.

This Joint International MSc course is the response to these challenges and will suit skilled motivated science graduates wishing to develop a scientific career in ecosystem research as well as those aiming to contribute to evidence-based environmental policy. Graduates will receive a joint international degree from UCD and JLU Giessen, Germany, two well-established universities combining their complementary and multidisciplinary research profiles and cutting-edge expertise.

You will be involved in active research groups in both countries, contributing to their on-going ecosystem studies in order to experience the process of creating scientific knowledge in ecosystem science. In addition to acquiring skills in measuring, analysing and understanding what is behind scientific data you will have the opportunity to develop your analytical, presentation and communication skills to enable you to participate in the policy making process.

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Justus Liebig University, Giessen, Germany

JLU, Giessen is located in the heart of Europe near Frankfurt airport. It is a modern institution which can take pride in some four centuries of past achievement. With around 24,000 students, 11 faculties and 8 scientific centres, the university has truly developed an international profile and is prepared to meet any challenges that the future may bring. JLU Faculty of Biology and Chemistry is a vibrant faculty with 78 academics representing all major subjects of natural and life sciences research.

What will I study?

The 16 month long 120 ECTS course entails taught modules with field components and practicals, seminars, group work and critical discussions as well as a mandatory work placement and an independent research project. The first semester is based at UCD, followed by the 6 weeks minimum contact-time work placement. The second taught semester is based at JLU and the third semester is comprised of the individual research project which can be undertaken in either UCD or JLU.

You will gain experimental and theoretical knowledge in the following topics:

- Global change (soil, air, water): introduction & advanced techniques
- Plant-soil-atmosphere interactions
- Science and society
- Core skills for research
Modelling in geo-ecology
- Policy consultancy
- Economics and environmental management
- Biodiversity informatics
- Palaeo-climatolgy

In addition, you will be able to choose an optional module during each taught semester to complement your knowledge in an area of your choice. You will be taught by academics who are internationally recognised in their fields of research. About 50% of the time is devoted to classroom or lab-based activities. The student spends the remaining time carrying out a substantial research project, chosen in consultation with academic staff.

**Independent Research Project**
The research project is an important element of the Masters in Global Change as it involves the planning, execution and communication of a research question that the student wishes to investigate in depth. During the third semester, a period of 14 weeks will be devoted entirely to the project work. The research projects are normally carried out within research groups at UCD or JLU. Students will maintain regular contact with their supervisor, who will assist by guiding the project and providing advice as necessary. On completion of the research project, the student will produce a minor thesis in the format of a scientific paper.

**What are the career opportunities?**

Graduates of the MSc in Global Change are ideally placed to gain employment in a wide range of organisations in the environmental field. Graduates may pursue roles as policy adviser, scientific analyst or researcher, be it in government, international organisations, NGOs, research institutes or consulting companies. There are also many opportunities for further studies. The skills you acquire, particularly through the completion of the Minor Thesis provides a strong foundation for PhD research.

**Prospective Employers**
Environmental Protection Agency, Governmental Departments (Environment; National Parks and Wildlife Service), European Commission, European Environment Agency, International organisations (e.g. Intergovernmental Panel on Climate Change; United Nations Environment Programme; International Union for the Conservation of Nature).

**Staff Profile**

Prof. Christoph Müller

Prof. Müller is Professor of Experimental Plant Ecology and Director of the Institute of Plant Ecology in JLU, Giessen as well as adjunct Professor of Soil Science in UCD. His research deals mainly with the effects of various environmental factors (e.g. elevated CO2, ozone, salinity) on plant communities and whole ecosystems as well as investigating global biogeochemical cycles. The scientific methods he uses and teaches range from biochemical, eco-physiological and microbiological laboratory analysis and process-oriented modeling.

**Work Placement**
This Masters programme is distinctive in that it offers students the opportunity to spend a minimum of 6 weeks on a work placement. You will be placed in a setting that reflects your own interests. Placements may vary considerably but students will normally be placed in industry, government, non-government or research agencies where they will obtain a breadth of practical experience to complement their degree programme. Through this work placement, you will acquire transferable skills which will make you a sought after and effective employee.

**Programme outcomes**
On successful completion of the programme, graduates will be equipped with 3 generic skills sets namely (1) Global Change: Science, (2) Policy & Communication and (3) Data Management, Analysis & Reporting, and will be able to:

- Understand the ecosystem science underpinning our knowledge of global environmental change
- Participate in ecosystem research using latest research methods and data management tools
- Communicate in an unambiguous way policy-relevant evidence to diverse target audiences
- Understand and promote the development of policy in terms of adaptation and mitigation for natural and managed ecosystems supporting sustainable livelihoods.

**How do I apply?**

**Applying Online**
To apply online please go to www.ucd.ie/apply, create a user account, select “Graduate Taught Courses” as your application type from the drop down list and then select “MSc Global Change: Ecosystem Science and Policy (F038)”

**Entry Qualifications**
Entrance to the programme requires a recognised BSc honours degree (or equivalent) with at least a second class honours grade one overall result (ECTS equivalent B-) in an appropriate life sciences discipline, such as biology, agriculture or environmental science (including zoology, ecology, geology, biochemistry). If English is not your native language, proof of your proficiency in English will be required, unless you took your primary degree through English in an English speaking country. The minimum acceptable score on the TOEFL Internet Based Test is 100, on the IELTS system it is 6.5

**Duration**
This MSc is 16 months in length, comprising of 120 ECTS.

**Contact**
Susan Wilson / Dr. Florence Renou-Wilson
Email: globalchange@ucd.ie, Tel: + 353 1 716 2243, www.ucd.ie/bioenvsci

**Fee Information**
For information on fees, please visit: www.ucd.ie/registry/adminservices/fees

**Useful Links**
www.ucd.ie/bioenvsci   www.uni-giessen.de
Atmospheric science is a fascinating area of study. From sunny spells and scattered showers, to climate change and greenhouse gases, a wide range of meteorological and climate topics are examined during the M.Sc. course in Meteorology. Students get scientific training in theoretical and applied meteorology and climatology, so that they not only learn what happens, but also why it happens, and how we predict it. Alongside the taught modules, there are a variety of other activities. In the first semester, there is a field trip to Valentia Observatory in Cahirciveen, where students get to witness a radiosonde launch and learn about the geomagnetic and seismological work in addition to the meteorological programme of the Observatory. They also go on walks around the countryside taking meteorological measurements. In the second semester, an intensive one-week course in practical weather forecasting gets underway. Met Éireann forecasters help teach this course, which lets students learn first-hand the issues and problems of operational forecasting, as well as visit the RTE weather studio and prepare and present forecasts on-screen. All through semester 1 and 2 there are weekly weather discussions, which bring the classroom theory to life. And in the summer months, students get to work on a relevant research project of their choice with a member of staff to help out. Overall, the course provides a solid foundation in physical, dynamical and synoptic meteorology, climate dynamics and numerical weather prediction. It supplies the scientific training needed for a career in applied meteorology within the public or private sectors, and is also an excellent starting point for an academic research career in meteorology and climate.

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UCD School of Mathematical Sciences
The school is the largest of its kind in Ireland. It is a dynamic, multi-disciplinary department spanning the three disciplines of Mathematics, Applied and Computational Mathematics and Statistics and Actuarial Science. The school engages in research of international renown and teaches students in almost all of the colleges of the university. As well as having a strong commitment to basic research, several members in the school are involved in the UCD Complex Adaptive Systems Laboratory (CASL) and the Claude Shannon Institute for Coding, Cryptography and Discrete Mathematics.

What will I study?
The course is modular, and may be taken on either a full time or part time basis. Most students opt for full time study. The M.Sc. lecture courses cover the following areas:

- Physical Meteorology
- Dynamical Meteorology
- Climate Dynamics
- Numerical Weather Prediction
- Synoptic Meteorology

An intensive one-week practical course in Forecasting Techniques takes place in the Spring. This is presented in collaboration with staff from Met Éireann. In October there is a Field Excursion to Valentia Observatory, the Met Éireann Geophysical Observatory in Caherciveen, Co Kerry.
Research Projects
Students get to do a research project over the summer months, and they write up the results in the form of a thesis. The student can choose any (relevant) area to do their research on, in collaboration with their supervisor. Research work for the projects takes place from early June until mid-August but it is wise to start planning your projects early in the academic year. The project reports are typically about fifty to one hundred pages in length.

Previous research projects have included:

- Using the COSMO Model to Simulate Historical Irish Storms
- Site Assessment for Wind Energy at UCD
- Analysis of the Xynthia Storm
- Predicting Typhoons in the Hong Kong Region
- Hurricanes and Global Warming.
- Meteorological Factors affecting Air Corps Operations at Casement Aerodrome
- Surface wind and temperature extremes over Ireland and Britain

Programme outcomes
On successful completion of the programme students will be able to:

- Apply the fundamental principles that govern the motion of the atmosphere.
- Explain the structure and role of the primary components of a Numerical Weather Prediction model.
- Describe the processes that control climate and how it evolves.
- Explain the connection between basic thermodynamic concepts and the processes that act in the Earth's atmosphere and drive our weather and climate.
- Apply the basic concepts of dynamical and physical meteorology to practical situations.
- Analyze plotted charts and develop a synoptic description of the atmosphere.
- Prepare forecasts using a combination of current weather data and NWP model outputs.

Staff Profile and Testimonial

Staff
Dr Conor Sweeney

“Meteorology and Climate Science is a brilliant area to be working in. I’m working on two main research areas at the moment. In one, we are developing new methods to improve wind forecasts which will help to make wind energy cheaper. In the other, we are studying data from global climate models to predict future climate change. There are always new challenges, and the demand for improved weather and climate forecasting data is increasing all the time!”

Dr Conor Sweeney in the Meteorology and Climate Centre is a lecturer in the School of Mathematical Sciences.

Graduate
Aisling Creevey
(Msc Meteorology, 2009)

“In September 2008, I commenced studying the one thing I have always wanted to learn about the most, Meteorology. Although it was difficult returning to an academic environment, it has been perhaps the best decision I have made, and now one year later I am working and training as a Meteorologist. It was worth every bit of hard work.”

Aisling is now working as a Meteorologist for MeteoGroup

What are the career opportunities?
The thorough grounding in meteorology and climate science offered by this M.Sc. course will enable graduates to pursue careers in national meteorological and environmental agencies and in various branches of the private sector such as broadcast and aviation meteorology, the insurance industry, commodity investors, utilities, and renewable energy firms. It is also an excellent starting point for those aiming at a Ph.D. and a research career within a university or specialised research institution.

Prospective Employers

How do I apply?
Entry Qualifications
Applicants should hold a good bachelor's degree (Second Class Honours, Grade 2 or higher; Grade Point Average (GPA) 2.48 or higher) in mathematics, physics, statistics, engineering or other subject with a strong mathematical content. Though previous training in meteorology is not required, the course is strongly quantitative, and a solid foundation in mathematics (including vector calculus, linear algebra and ordinary differential equations) and classical physics (including mechanics and thermodynamics) is essential.

Contact
Any queries about the courses should be directed to the Graduate Administrator (pgstudies@maths.ucd.ie; Tel. +353-1-716 7152).

Applying Online
To apply online, please go to: http://www.ucd.ie/apply

Fee Information
For information on fees, please visit: www.ucd.ie/registry/adminservices/fees

Useful Links
For more information please visit our website: http://mathsci.ucd.ie/sms/postgraduate.html
Why study at University College Dublin?

In the top 1% of the world’s universities
Ireland’s largest provider of graduate education
A diverse university, both in academic disciplines and culture
Emphasis on research and innovation
Purpose-built, modern parkland campus, close to Dublin city centre
Extensive range of campus accommodation options.

UCD College of Science
The College is dedicated to the creation, delivery and communication of new knowledge and innovation across the spectrum of Science. With a staff of 750 and a student population of 5500 including 1800 postgraduate students, the College is a vibrant community dedicated to excellence in all our pursuits.

UCD School of Biology & Environmental Science
The UCD School of Biology and Environmental Science has an academic staff of 25, with critical levels of expertise covering the disciplines of cell biology, plant science, zoology, evolutionary biology and environmental science. The School offers a diverse range of undergraduate and postgraduate academic programmes dealing with both fundamental and applied aspects of biology that equip graduates with relevant skills for careers in the life sciences in the modern world.

Why is this course for me?
The MSc in World Heritage Management at UCD is for applicants motivated about protecting and conserving the world heritage values of biodiversity, the natural environment and cultural sites around the world.

This multi-disciplinary programme will equip students with skills to develop a career in the conservation and management of heritage sites and protected areas worldwide.

This MSc is the only World Heritage Management course in Ireland and was one of the first of its kind in the world. In a world of depleting natural resources and a fast changing climate, this programme provides increasingly important skills relevant to the economic and cultural value of natural and cultural heritage as well as examining cultural diversity, sustainable development and community involvement in heritage protection.

You will develop a comprehensive understanding of international legislation and the World Heritage Convention and of the management and conservation challenges facing site managers and policy-makers. This MSc programme unites tangible and intangible cultural heritage with the biological aspects of heritage studies in a unique way, equipping graduates with a truly interdisciplinary perspective of the field.

What will I study?
You will gain the theoretical knowledge and practical skills necessary to work as a conservation manager at a protected site anywhere in the world.

Topics include:
- Heritage and Environmental Interpretation
- International Strategies and the World Heritage Convention
- Sustainable Development
- Conflict Resolution and Conservation
- Cultural Heritage
- Global Biodiversity and Heritage
- Conservation Biology
- Remote Sensing
- Climate Change
- Archaeology & World Heritage Management
- Historic Urban landscapes

Experts in natural and cultural heritage from within UCD, from other universities and related national and international agencies contribute to make this an exceptional multidisciplinary programme. The course entails lectures, seminars, group work, critical discussions, fieldtrips and practical projects.

Teaching activities are complemented with cutting edge research carried out in world-class facilities in the heart of the UCD Science Centre.
Research Projects
The research project is carried out in the field and is designed to explore and resolve a practical management problem at a World Heritage Site or equivalent reserve (in your home country or abroad).

Previous research projects have included:
- Conservation and management of endangered species
- Co-management and community involvement in heritage protection
- Threats to urban historic heritage and the role of the buffer zone
- Assessment of tourism and conservation issues

Programme outcomes
On successful completion of the programme students will be able to:
- Analyse necessary conditions for selection, protection and management of cultural and natural world heritage sites;
- Monitor, report and mitigate threats to sites including climate change effects and demonstrate the technical skills to produce species and habitat action plans;
- Demonstrate in-depth understanding of the key stages of the processes of inscription and monitoring of UNESCO World Heritage Sites and the role of international legislation in the strategy for global heritage conservation;
- Design and implement project planning and budgeting methods and appreciate the role of site interpretation in communication and management of tourism in protected sites;
- Confidently engage in communication & mediation skills and appreciate the need for reconciliation of the often conflicting agendas of stakeholders.

What are the career opportunities?
Our graduates are building successful careers in the inter-disciplinary field of heritage protection, management and research in Australia, China, England, Ethiopia, France, Ireland, Italy, Tanzania, Uganda and the U.S. to name a few countries. Graduates are working with international organizations, national authorities, and in the private sector. They have secured positions in World Heritage Sites, National Parks and Museums, in senior government positions and positions in education. Graduates have also continued their research at PhD level and pursued further studies.

Career Opportunities Include:
- World Heritage and Protected Area Manager, Park warden and Park ranger
- Heritage Officer and Education Officer, Managerial & Policy positions in government, Natural Resources Manager
- Consultancy firms and Research, International Conservation agencies.
- World Heritage and Protected Area Manager, Park warden and Park ranger
- Heritage Officer and Education Officer, Managerial & Policy positions in government, Natural Resources Manager
- Consultancy firms and Research, International Conservation agencies.

Staff Profile
Dr Claire Cave
“The WHM programme is focussed on providing the training for people who are or who want to get involved in the management and sustainable development of critical natural habitats and cultural landscapes worldwide. Students participate in fieldtrips, workshops and group projects and the opportunity to share their experiences and insights creates a dynamic and diverse learning environment for all the participants on the WHM programme. Students carry out research projects designed to tackle key problems in sites at home and abroad and leave the course with good practical experience and a strong alumni network of colleagues and friends in the interdisciplinary field of heritage protection.”

Dr Claire Cave is the WHM programme coordinator in the School of Biology & Environmental Science.

Graduate Profile
Amanda Sosa Avendano
“My highlight was to share the room with so many people from other countries and different disciplinary backgrounds. This diverse group was a great place to exchange ideas and hear other points of view. On the course we were able to experience the theory, practical and research elements by visiting sites such as Donana World Heritage Site in Spain and Bru na Boinne, Ireland.”

Pilar Martin
“If you are interested in the diversity of heritage this is the course for you”

How do I apply?
Enter Qualifications
Applicants are normally expected to have an honours primary degree as well as knowledge of conservation heritage issues. Applicants with diverse academic backgrounds including Archaeology, Architecture, Geography, Biology, Arts, Agriculture, Engineering and Economics will be considered.
If English is not your native language, proof of your proficiency in English will be required, unless you took your primary degree through English in an English speaking country. The minimum acceptable score on the TOEFL Internet Based Test is 10, on the IELTS system is 6.5.

Flexible delivery options
This 120 ECTS MSc is 2 academic years in duration when taken full-time (minimum 16 months). The part-time option is 4 years in duration.

Contact
Susan Wilson/Dr. Claire Cave
Email: worldheritage@ucd.ie Tel: + 353 1 716 2243 www.ucd.ie/bioenvsci

Applying Online
To apply online please go to www.ucd.ie/apply, create a user account, select “Graduate Taught Courses” as your application type from the drop down list and then select “MSc World Heritage Management FT (X182)” or “MSc World Heritage Management PT (X347)”

Fee Information
For information on fees, please visit: www.ucd.ie/registry/adminservices/fees

Useful Links
www.ucd.ie/bioenvsci
http://whc.unesco.org/en/list
www.iucn.org/worldheritage/
http://www.iccomos.org/en/
http://www.worldheritageireland.ie/
Why is this course for me?
This is a flexible, innovative, online course that takes on board your training needs, giving you the opportunity to choose (i.e. negotiated learning), with the assistance of UCD academic staff, the modules that best align with your career objectives. This course not only offers you the flexibility to negotiate your own learning but also gives you the opportunity to study at your own pace and in your own time, online. We will facilitate you to study as few, or as many modules as permissible at one time, thereby providing you with a professional competitive advantage. This is a customised educational experience, tailored to your individual needs and interests. Successful completion enables the award of a Graduate Certificate (30 credits), Graduate Diploma (60 credits) or a Masters degree (90 credits). The Masters degree requires students to complete a research project and of course you can choose to take a smaller selection of our modules as part of the Module to Masters initiative (see our website for more information). The course provides the widest coverage of environmental topics drawing on the significant teaching and research experience of world-class academics from eight schools in UCD. The course will focus on delivery of the knowledge and skills required to address sustainability challenges across a broad spectrum of activities such as agriculture, industry, green technology, resource management, environmental regulation and policy.

Why study at University College Dublin?
Some of the reasons to study at UCD:

- In the top 1% of the world’s universities
- Ireland’s largest provider of graduate education
- A diverse university, both in academic disciplines and culture
- Emphasis on research and innovation
- Purpose-built, modern parkland campus, close to Dublin city centre
- An innovative digital campus, with dedicated IT support for students

What will I study?
The MSc, Diploma and Certificate will provide you with the theoretical background, practical training and ancillary workplace skills needed for a successful career in your chosen field. You can negotiate your learning needs and chose relevant modules from the wide range on offer with the assistance of academic staff. Eight schools contribute to the course capturing the significant strengths of UCD Science and Engineering in renewable energy resources, sustainable energy systems, environmental engineering and resource management, water quality assessment, protection/management and conservation science. You will gain a broad understanding of sustainability issues and have the opportunity to specialise more deeply in one or more of these areas of study.

The course aims to develop your understanding of the environmental issues and sustainability goals facing society. You will be challenged to apply your scientific and technical knowledge to develop solutions to local and global problems and needs. Through discussion and research work you will learn to handle complex issues, analyse and interpret scientific data and information, use your judgement and ultimately communicate your findings and ideas. The course will develop your capacity for self-directed learning, within a supportive framework facilitated by online fora, discussion boards and virtual tutorial/classroom sessions.
For the Master’s degree you will be required to undertake a research or desk-based project. You can take any combination of the following modules, depending on your specific interests and needs.

- Energy Systems & Sustainable Environments
- Green Technology Project
- Energy Systems & Climate Change

- Technical Communications
- People Information & Communication
- Managing the Interface between Science & Policy

- Water Quality Assessment, Protection & Management
- Water Resources Engineering 1
- Water Resources Engineering 2
- Air Pollution
- Environmental Geoscience
- Soil Resources
- Peatlands & Global Change
- Ecology & its Application
- Genetics for Environmental Scientists
- Applied Ecotoxicology
- Impact Assessment Procedures
- Environmental Legislation
- Management of Sustainable Fisheries
- Wildlife Management/Conservation
- GMOs & the Environment
- Bioinvasions: Impact to Management
- Management Plan

- Natural Heritage Conservation
- Cultural Heritage Conservation
- World Heritage Legislation

- Data Analysis & Interpretation
- Design of Experiments
- GIS for Environmental Investigations
- Java-Based Data Structures
- Java Technologies
- Java Programming 1
- Java Programming 11

- Practicum (Research; lab/field)
- Practicum (Desk Study)

- Career Zone – non-credit bearing, free additional module offering

Who delivers the course?
This is a highly interdisciplinary course with modules designed and delivered by academics with world-class expertise from eight Schools across UCD:

- School of Biology and Environmental Science
- School of Agriculture & Food Science
- School of Biosystems Engineering
- School of Civil, Structural & Environmental Engineering
- School of Computer Science & Informatics
- School of Geological Sciences
- School of Mathematical Sciences
- School of Mechanical & Materials Engineering

What are the career opportunities?
Successful completion of this course will provide you with the professional competitive advantage to choose from careers in the application of green energy technology, environmental engineering, environmental monitoring and protection, resource and waste management, consultancy, research, heritage, conservation and education either within regulatory bodies or in a wide range of industries, both multinational organisations as well as small and medium size enterprises. The course also opens up opportunities to pursue further studies including up to PhD level.

Entry Qualifications
Applicants must hold a minimum of a 2.2 honours level degree in a science, engineering or related discipline. Applicants with pass degrees and who also have substantial relevant work experience will also be considered. If English is not your native language, proof of your proficiency in English will be required, unless you took your primary degree through English, in an English speaking country. The minimum acceptable score on the TOEFL Internet Based Test is 100, on the IELTS system it is 6.5.

Contact
Dr. Mary Kelly-Quinn/Susan Wilson
Email: sustainabilityonline@ucd.ie
Tel. +353 (0)1 716 2243
Web Address: www.ucd.ie/online

How do I apply?

Applying Online
To apply online, please go to: http://www.ucd.ie/apply

Fee Information
Fees are calculated on a per-credit basis. Students can choose to pay for individual modules e.g. €278 for a 5-credit module. For more information on fees, please visit: www.ucd.ie/registry/adminservices/fees

Useful Links
UCD Online: www.ucd.ie/online
UCD Website: www.ucd.ie
Why is this course for me?

The MSc in Chemistry by negotiated learning is a flexible MSc programme delivered through the UCD School of Chemistry and Chemical Biology. Within the programme students select a collection of credit-bearing modules from a wide selection of taught modules. The particular choice of each student (is made in collaboration with the programme co-ordinator) and is matched closely to the student’s needs.

For example, students wishing to broaden their understanding of chemistry would choose a range of modules from across the entire chemical science discipline, while those that are intent on following up this course with a doctoral programme might choose to concentrate on available modules in a specific area, e.g. chemical biology, medicinal or pharmaceutical chemistry, nanochemistry, sustainable chemistry, materials chemistry etc. For this reason it is useful for students that wish to progress to industry or to further research.

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- Extensive range of campus accommodation options.

UCD College of Science

The College is dedicated to the creation, delivery and communication of new knowledge and innovation across the spectrum of Science. With a staff of 750 and a student population of 5,500, including 1,800 postgraduate students, the College is a vibrant community dedicated to excellence in all our pursuits.

UCD School of Chemistry and Chemical Biology

The UCD School of Chemistry and Chemical Biology has a rich tradition of teaching, research and innovation in the chemical sciences that can be traced back over 200 years. Currently we have 21 faculty members, 100 graduate students, 35 postdoctoral fellows, and a typical graduating undergraduate class of 60 students. Our faculty, who hail from widespread parts of the globe, are world renowned researchers in the three main disciplines of chemistry. Our postgraduate and postdoctoral researchers in particular are from all parts of the world with representatives of over 40 countries studying here over the past 10 years.

We offer a range of undergraduate programmes (Chemistry, Medicinal Chemistry and Chemical Biology, Chemistry with Environmental and Sustainable Chemistry, Chemistry with Biophysical Chemistry) and graduate degree programmes (Taught MSc in Chemistry by Negotiated Learning, Research MSc and thematic PhDs). A thematic PhD is offered through Dublin Chemistry, a joint Postgraduate Programme in Chemistry with the Department of Chemistry in Trinity College Dublin.

The School has a superb research environment with world leading research groups and recently refurbished state-of-the art facilities, a large and vibrant PhD programme with a wide variety of research topics. Our research activities span the core disciplines of organic, inorganic, and physical chemistry and the interdisciplinary frontiers of the life and physical sciences.

What will I study?

The 90 credit MSc is a 12 month programme. During semesters 1 and 2 the students register for a range of taught modules. These modules carry between 2.5 and 7.5 credits. During the third semester the students are placed within the research groups of a member of staff in the school and here they carry out a 3 month research project (which carries 30 credits).

The specific material studied will – to a large extent – depend on the choices of the incoming student since the programme will be modelled according to their particular requirements.

However modules will be offered across all the major themes of chemistry including advanced synthetic organic and inorganic chemistry, surface science, materials chemistry, advanced spectroscopy, advanced crystallography, commercialisation of laboratory research, biological, medicinal and pharmaceutical chemistry, sustainable and environmental chemistry, nanochemistry, biophysical chemistry, polymer chemistry, computational chemistry etc.
Research Projects

The research project that the student will carry out will be hosted within the research laboratories of one of the faculty members of the school. These recently refurbished laboratories are state-of-the-art.

Since the faculty have an extremely wide range of research interests, the types of projects that students can carry out will vary widely.

These can range from purely synthetic projects where novel pharmaceutical compounds are synthesised and analysed, to projects in environmental chemistry where gas phase pollutants are monitored to projects where solid phase catalysts are applied in biofuel production or nanochemistry projects where nanomaterials are synthesised characterised and applied in a range of areas. The research interests of the faculty members are covered in the school's staff members website - http://www.ucd.ie/chem/staff/

The MSc students meet our faculty through the taught components in semesters 1 and 2, are encouraged to discuss possible projects with them and then are assigned project supervisors midway through semester 2. As with all parts of the course the assignment is done in collaboration with the student. The projects run through semester 3.

What are the career opportunities?

The MSc in Chemistry through negotiated learning provides a basis for graduates to enter the chemical, pharmaceutical, bio-pharmaceutical and materials industries and UCD graduates have traditionally found employment within these sectors. Analytical services, environmental protection and primary and secondary school teaching present other possible opportunities. Furthermore, through judicious choice of modules within one particular sub discipline of chemistry the programme is an attractive route into a doctoral programme, i.e. students can get an in-depth grounding (including a small research project) in a particular area of chemistry such that you can hit the ground running in a PhD in that area.

Staff Profile and Testimonial

Staff
Dr. Xiangming Zhu, Lecturer
School of Chemistry & Chemical Biology

The MSc in Chemistry by Negotiated Learning taught programme trains students to a high level of knowledge and proficiency in a specialised area of chemistry such as Medicinal Chemistry, Chemical Biology, Pharmaceutical Chemistry, Energy and Sustainable Chemistry, Biophysical Chemistry or Nanotechnology. Students participate in laboratory work based in our newly developed ergonomic, high specification, modern laboratories in the UCD Science Centre. Our core facilities are at internationally competitive levels, including NMR spectrometry, Mass Spectrometry/Chromatography, X-ray crystallography and Microanalysis.

How do I apply?

Entry Qualifications
1. Applicants should possess a minimum of an upper level 2nd class (2Hi) in an honours degree in Chemistry or equivalent, or a degree with a significant component of Chemistry is required.
2. Since the language of instruction of this Programme is English, competence in both spoken and written English is mandatory. If the primary degree is not in English, the candidate must provide evidence of competence in the English language by producing an English language certificate. Accepted as language proofs are: 550 points in TOEFL (Test of English as a Foreign Language) or 6.5 points in IELTS Academic Test (International English Language Testing System). Required appropriate scores for other types of English language examination are available on the UCD website.

Contact
Dr. James Sullivan, Email: james.sullivan@ucd.ie

Applying Online
To apply online, please go to: http://www.ucd.ie/apply

Fee Information
For information on fees, please visit: www.ucd.ie/registry/adminservices/fees

Useful Links
http://www.ucd.ie/chem/staff/
About the UCD School of Mathematical Sciences

The UCD School of Mathematical Sciences is the largest of its kind in Ireland, and dates back to the founding of the university. We are a dynamic, multi-disciplinary school which engages in research and teaching across all areas of the mathematical sciences. We welcome applications from any students interested in pursuing undergraduate or graduate degrees within our school.

Undergraduate Courses

We offer BSc Honours degree programmes in the following subjects:

- Mathematics
- Statistics
- Applied and Computational Mathematics
- Mathematical Science
- Theoretical Physics (taught with the UCD School of Physics)

We also offer a BAFS Honours degree in Actuarial and Financial Studies. Students who achieve a sufficiently high standard in the degree will gain some exemptions from the examinations of the Institute of Actuaries or the Faculty of Actuaries.

All these degree programmes take four years. We welcome international students to study for a semester or year abroad as part of our UCD Science Study Abroad programme and as full-time students.

Graduate Studies

The School delivers a very wide range of taught and research programmes at the graduate level which reflect the breadth of our disciplines and research activity. They also reflect the ubiquity of mathematical sciences in modern scientific research.

The Higher Diplomas offer a student with the appropriate background a chance to achieve the equivalent of an Honours B.Sc degree in the relevant discipline. This course may also be taken as a foundation for more specialised graduate-level study and research.

The taught Masters programmes are intended to bring the student to a level of knowledge and understanding where they can confidently prepare to embark on a research project of their own (under supervision). A crucial component of these programmes is a dissertation counting for up to one third of the workload.

The research graduate programmes provide an opportunity to engage in supervised research on a topic of current interest in one of the disciplines of the School. The prospective student should have a strong background and proven ability in the relevant discipline. If you are interested in pursuing this option we would advise you to familiarize yourself with the research done within the School and to contact prospective supervisors among the academic staff.

We offer the following programmes:

Postgraduate Research Programmes

- PhD - Doctoral Studies
- Research Masters

Postgraduate Taught Programmes

- Master of Science in Mathematics
- Master of Science in Statistics
- Master of Science in Mathematical Sciences
- Master of Science in Meteorology
- Master of Science/Graduate Diploma in Actuarial Science
- Master of Science in Simulation Science

Higher Diplomas

- Higher Diploma in Mathematical Science
- Higher Diploma in Mathematical Studies
- Higher Diploma in Statistics
Research
All of our academic staff are engaged in active research and have a strong record of publications in international journals. Our staff have been very successful in obtaining funding from national and international agencies and from industry. The School conducts research in many fields including:

Applied Mathematics and Theoretical Physics
- Computational black hole physics
- Extreme waves and ocean dynamics
- Fluid Dynamics and Turbulence
- Mathematical Biology
- Meteorology and Climate Science
- Nonlinear dynamics and chaos

Mathematics
- Complex Analysis
- Cryptography
- Error Correcting Codes
- Functional Analysis
- Infinite Dimensional Analysis
- K-Theory
- Matrix Theory
- Number Theory
- Potential Theory
- Quadratic Forms

Statistics & Actuarial Science
- Bayesian Statistics
- Computational Statistics
- Environmental Statistics
- Epidemiology
- Insurance and Actuarial Modelling
- Social Statistics
- Statistical Modelling

Academics from within the UCD School of Mathematical Sciences are affiliated with a number of research centres and institutes.

UCD Meteorology and Climate Centre
www.mathsci.ucd.ie/met
The School of Mathematical Sciences leads research in Meteorology and Climate through the UCD Meteorology and Climate Centre. This is Ireland’s leading academic centre for research and education in meteorology and climate science. Research interests at UCD in this area include dynamic meteorology, numerical weather prediction (NWP), regional climate modelling and climate variability. This Centre will form part of the new UCD Earth Institute.

Claude Shannon Institute
www.shannoninstitute.ie
This institute spans four universities in Ireland and supports research in coding theory and cryptography. The research is inter-disciplinary, involving mathematicians, engineers and computer scientists. Industry collaborations with companies such as Intel and Western Digital have resulted from the work, in areas of error-correction coding and encryption.

CASL
www.ucd.ie/casl
The Complex and Adaptive Systems Laboratory (CASL) is an institute in UCD with a dynamic interdisciplinary research community advancing scientific knowledge through mathematics and computation. Several members of the School of Mathematical Sciences are working in CASL, and the school leads the Simulation Science PhD programme through CASL.

Contact Us
Please email or write to the School for more information on the undergraduate and graduate courses, enquiries on our facilities and services or our innovation and research.

UCD School of Mathematical Sciences
University College Dublin, Belfield, Dublin 4, Ireland
E: mathsciences@ucd.ie
T: +353 1 716 2560/2580
Web: www.ucd.ie/mathsciences/
The MSc Actuarial Science (MSc Act. Sci.) is designed for students from quantitative disciplines who ultimately wish to train as an actuary upon completion of the programme. The MSc can help fast-track your career as an actuary by supporting you through the initial examinations of the Institute & Faculty of Actuaries (UK). You will develop an understanding of the theory and principles underlying actuarial science. The programme provides a solid foundation in mathematics, statistics, economics and finance for future actuarial studies. You will also have the opportunity to undertake a dissertation in a topical area of actuarial science under the supervision of a member of the School of Mathematical Sciences. The dissertation will allow you to develop an understanding of how the theory and principles covered in the CT subjects are applied in practice. The MSc Actuarial Science offers potential exemptions from the Core Technical subjects 1 to 8 (CT1-8) of the examinations of the Institute & Faculty of Actuaries. If you have prior actuarial exemptions you may choose to study all or part of the syllabus for examination Core Applications 1 (CA1) of the Institute & Faculty of Actuaries. The programme is therefore suitable for students with no prior exemptions and for students who wish to add to any exemptions they already have. In addition you may also be able to take advanced courses in finance at the world class UCD Smurfit School of Business.

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■ Ireland’s largest provider of graduate education
■ A diverse university, both in academic disciplines and culture
■ Emphasis on research and innovation
■ Purpose-built, modern parkland campus, close to Dublin city centre
■ Extensive range of campus accommodation options.
■ UCD was the first university in Ireland to offer an actuarial programme and has by far the greatest experience in delivering the highest quality graduates to the actuarial profession.

UCD College of Science
The College is dedicated to the creation, delivery and communication of new knowledge and innovation across the spectrum of Science. With a staff of 750 and a student population of 5500 including 1800 postgraduate students, the College is a vibrant community dedicated to excellence in all our pursuits.

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UCD School of Mathematical Sciences
The UCD School of Mathematical Sciences is one of seven Schools within the College of Science. The School is the largest of its kind in Ireland. The School is a dynamic, multi-disciplinary department which engages in research and teaching in three disciplines: Mathematics, Applied and Computational Mathematics; Statistics and Actuarial Science. We offer more degrees in the Mathematical Sciences than anyone else in Ireland. Masters Degrees available in the School include: MSc Actuarial Science, MSc Mathematics, MSc Mathematical Science, MSc Meteorology, MSc Simulation Science, MA Statistics and MSc Statistics. We also provide PhD degrees in Mathematics, Statistics and Applied and Computational Mathematics. In addition we offer the following Higher Diplomas and Graduate Diplomas which allow students with Bachelors degrees in cognate disciplines the opportunity to achieve a recognised qualification in the mathematical sciences: HDip Mathematical Science, HDip Statistics, HDip Mathematical Studies and Graduate Diploma Actuarial Science. All of our academic staff are engaged in active research with a strong record of publications in international journals. Our staff has been very successful in obtaining funding from national and international agencies and from industry. Graduates from our degree programmes have skills that are rare and in high demand. Even in the current economic climate all of our recent graduates are either in employment or further study.

What will I study?
The MSc Actuarial Science covers the Core Technical subjects 1 to 8 (CT 1-8) and subject Core Applications 1 (CA1) of the examinations of the Institute and Faculty of Actuaries (UK). Depending on your background and subject to the approval of the programme director, you may select between five and eight subjects to study. The Core Technical subjects are:

■ Financial Mathematics (CT1)
■ Finance & Financial Reporting (CT2)
■ Probability and Mathematical Statistics (CT3)
■ Models (CT4)
■ Contingencies (CT5)
■ Statistical Methods (CT6)
■ Business Economics (CT7)
■ Financial Economics (CT8)
Depending on your subject choices in semesters 1 and 2 you may also undertake advanced modules in finance at the UCD Smurfit School of Business – the modules offered will vary from year to year but possible topics may include regulation, corporate governance, ethics in finance, asset valuation, and financial management. In semester 3 you will undertake independent research in an area of actuarial science under the supervision of a member of the School of Mathematical Sciences with the aim of submitting a thesis on your research findings at the end of the semester.

Programme outcomes
On successful completion of the programme students will be able to:
- Apply a variety of complex statistical and financial models in appropriate settings.
- Model cash flows and summarise economic activity through the use of a variety of metrics.
- Quantify risks associated with complex financial contracts and understand how to mitigate them.
- Calculate the value of complex financial contracts, allowing for mortality and morbidity.

What are the career opportunities?
As a graduate of the MSc Actuarial Science you can look forward to a career ranging from the traditional areas of insurance and pension consultancy to the rapidly expanding areas of investment and risk management. Successful graduates can expect early responsibility in their chosen career and the opportunity to work in a variety of challenging roles. Throughout your actuarial career you can rely on the support and guidance of the Actuarial Profession and upon qualification you can expect a rewarding career that will continue to offer opportunities for further development. The Actuarial Profession is a global profession with actuaries in demand in Europe, America, Asia and Australia.

Prospective Employers
Accenture, AIB, AIG, AllState, Anglo-Irish, Bank of Ireland, Barclays, Canada Life, Centre, Deloitte, Ernst and Young, Hibernian, ING, Irish Life, KIl, KPMG, Lloyds, New Ireland, Paddy Powers, Permanent TSB, Santander, SIG, Swiss Re, Towers-Watson, Zurich.

How do I apply?
Entry Qualifications
Applicants will normally be expected to have a very good foundation in mathematics and/or statistics and should have the equivalent of an Irish 2.1 honours degree in a quantitative area such as mathematics, statistics, computer science, engineering or economics and/or finance. We will however consider applications from prospective students who do not meet these entry requirements provided they can demonstrate an ability and commitment to study actuarial science. UCD reserves the right to analyse applications in the context of a student’s degree performance in subjects directly linked to Actuarial Science and make an admissions decision on this basis. The minimum requirement for English is an IELTS score of 6.5 with a minimum of 6 in each section or equivalent.

Delivery Options
This MSc is a 1 year (3 Semesters), 90 ECTS course comprising 70 taught ECTS credits and 20 research ECTS credits (completed in Semester Three). There is no option to complete the MSc on a part-time basis.

Funding Opportunities
A number of scholarships covering part of the MSc programme fee are available each year. Furthermore, there are opportunities for some MSc students to attain paid placements with actuarial firms in Semester Three as a means of completing their research thesis requirements.

Contact
For further information on the content of the MSc Actuarial Science please contact Dr. Adrian O’Hagan at adrian.ohagan@ucd.ie

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Useful Links
http://www.ucd.ie/mathsciences/
http://www.ucd.ie/graduatestudies/coursefinder/taughtprogrammes/msc-actuarial-science/
The Graduate Diploma in Actuarial Science is designed for students from quantitative disciplines who ultimately wish to train as an actuary upon completion of the programme. The Graduate Diploma can help fast-track your career as an actuary by supporting you through the initial examinations of the Institute & Faculty of Actuaries (UK). You will develop an understanding of the theory and principles underlying actuarial science. The programme provides a solid foundation in mathematics, statistics, economics and finance for future actuarial studies. The Graduate Diploma in Actuarial Science offers potential exemptions from the Core Technical subjects 1 to 8 (CT1-8) of the examinations of the Institute & Faculty of Actuaries (UK).

If you have prior actuarial exemptions you may choose to study all or part of the syllabus for examination Core Applications 1 (CA1) of the Institute and Faculty of Actuaries. The programme is therefore suitable for students with no prior exemptions and for students who wish to add to any exemptions they already have.

Why study at University College Dublin?
Some of the reasons to study at UCD:
- In the top 1% of the world's universities
- Ireland's largest provider of graduate education
- A diverse university, both in academic disciplines and culture
- Emphasis on research and innovation
- Purpose-built, modern parkland campus, close to Dublin city centre
- Extensive range of campus accommodation options.
- UCD was the first university in Ireland to offer an actuarial programme and has by far the greatest experience in delivering the highest quality graduates to the actuarial profession.

UCD College of Science
The College is dedicated to the creation, delivery and communication of new knowledge and innovation across the spectrum of Science. With a staff of 750 and a student population of 5500 including 1800 postgraduate students, the College is a vibrant community dedicated to excellence in all our pursuits.

UCD School of Mathematical Sciences
The UCD School of Mathematical Sciences is one of seven Schools within the College of Science. The School is the largest of its kind in Ireland. The School is a dynamic, multi-disciplinary department which engages in research and teaching in three disciplines: Mathematics, Applied and Computational Mathematics; Statistics and Actuarial Science. We offer more degrees in the Mathematical Sciences than anyone else in Ireland. Masters Degrees available in the School include: MSc Actuarial Science, MSc Mathematics, MSc Mathematical Science, MSc Meteorology, MSc Simulation Science, MA Statistics and MSc Statistics. We also provide PhD degrees in Mathematics, Statistics and Applied and Computational Mathematics. In addition we offer the following Higher Diplomas and Graduate Diplomas which allow students with Bachelors degrees in cognate disciplines the opportunity to achieve a recognised qualification in the mathematical sciences: HDip Mathematical Science, HDip Statistics, HDip Mathematical Studies and Graduate Diploma Actuarial Science. All of our academic staff are engaged in active research with a strong record of publications in international journals. Our staff have been very successful in obtaining funding from national and international agencies and from industry. Graduates from our degree programmes have skills that are rare and in high demand. Even in the current economic climate all of our recent graduates are either in employment or further study.

What will I study?
The Graduate Diploma in Actuarial Science covers the Core Technical subjects 1 to 8 (CT1-8) and subject Core Applications 1 (CA1) of the examinations of the Institute & Faculty of Actuaries (UK). Depending on your background and subject to the approval of the programme director, you may select between five and seven subjects to study. The Core Technical subjects are:
- Financial Mathematics (CT1)
- Finance & Financial Reporting (CT2)
- Probability and Mathematical Statistics (CT3)
- Models (CT4)
- Contingencies (CT5)
- Statistical Methods (CT6)
- Business Economics (CT7)
- Financial Economics (CT8)
Programme outcomes
On successful completion of the programme students will be able to:
- Apply a variety of complex statistical and financial models in appropriate settings.
- Model cash flows and summarise economic activity through the use of a variety of metrics.
- Quantify risks associated with complex financial contracts and understand how to mitigate them.
- Calculate the value of complex financial contracts, allowing for mortality and morbidity.

What are the career opportunities?
Upon successfully completing the Graduate Diploma in Actuarial Science you can look forward to a career ranging from the traditional areas of insurance and pension consultancy to the rapidly expanding areas of investment and risk management. Successful graduates can expect early responsibility in their chosen career and the opportunity to work in a variety of challenging roles. Throughout your actuarial career you can rely on the support and guidance of the Actuarial Profession and upon qualification you can expect a rewarding career that will continue to offer opportunities for further development. The Actuarial Profession is a global profession with actuaries in demand in Europe, America, Asia and Australia.

Prospective Employers
Accenture, AIB, AIG, AllState, Anglo-Irish, Bank of Ireland, Barclays, Canada Life, Centre, Deloitte, Ernst and Young, Hibernian, ING, Irish Life, Klin, KPMG, Lloyds, New Ireland, Paddy Powers, Permanent TSB, Santander, SIG, Swiss Re, Towers-Watson, Zurich.

Staff Profile and Testimonial
Staff
Dr Adrian O’Hagan
“Actuarial Science is the discipline of measuring, monitoring and controlling risk. There is a natural synergy between statistical modeling and the aforementioned tasks. My related research interests include modeling long-tail risks using the multivariate normal inverse Gaussian distribution, Bayesian model averaging and clustering skewed and heavy-tailed data to ensure homogeneity of risk groups. Students will have the ability to conduct research in both technical areas of this nature as well as in more applied settings with direct industrial applications.”
Dr Adrian O’Hagan is a graduate of UCD’s undergraduate BAFS actuarial programme, holds a PhD in Statistics and is the Director of Postgraduate Actuarial Science at UCD.

Graduate
Alex Clarke
(Higher Diploma Actuarial Science 2011/2012):
“I chose to study the Higher Diploma in Actuarial Science in UCD because I felt that it would give me an edge when applying for actuarial jobs, rather than having only my mathematics undergraduate degree. The agreement between The Institute and Faculty of Actuaries and UCD means that a diligent student has an excellent opportunity to get the first series of Core Technical (CT) qualifying exam under their belt in just one year. In practice this usually translates to a higher starting salary when joining the workforce. The quality of the education was excellent, arising from the level of experience and dedication of the lecturers. Within 3 weeks of completing my final exam I had 4 job offers and chose what I felt was the most interesting area for me.” Alex is now working as an actuarial trainee on the Lloyd's market in London.

How do I apply?
Entry Qualifications
Applicants will normally be expected to have a very good foundation in mathematics and/or statistics and should have the equivalent of an Irish 2.1 honours degree in a quantitative area such as mathematics, statistics, computer science, engineering or economics and/or finance. We will however consider applications from prospective students who do not meet these entry requirements provided they can demonstrate an ability and commitment to study actuarial science. UCD reserves the right to analyse applications in the context of a student’s degree performance in subjects directly linked to Actuarial Science and make an admissions decision on this basis. The minimum requirement for English is an IELTS score of 6.5 with a minimum of 6 in each section or equivalent.

Flexible Delivery Options
This Graduate Diploma is a 9 month (2 semesters), 60 ECTS course. All 60 ECTS credits are taught credits, with no research component. There is no option to complete the Graduate Diploma on a part-time basis.

Contact
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Useful Links
http://www.ucd.ie/mathsciences/
http://www.ucd.ie/graduates studies/coursefinder/taughtprogrammes/gradip-actuarial-science/
The MSc in Mathematical Sciences is designed for mathematics and applied mathematics graduates with a passion for their subject and a desire to upskill to a level required to embark on a career in research. This MSc programme combines a taught masters and dissertation. It is an extremely versatile programme, giving students the opportunity to choose from a range of modules and projects from the different disciplines of Mathematics, Applied and Computational Mathematics and Statistics within the School of Mathematical Sciences.

If you have
- demonstrated a flair for mathematics,
- done a primary degree or higher diploma in mathematics, applied mathematics or statistics,
- want to apply your mathematical creativity in a specialist area,
- want a career that relies on a quality mathematical training, then this course is for you.

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As well as having a strong commitment to basic research, several members in the school are involved in the UCD Complex Adaptive Systems Laboratory (CASL) and the Claude Shannon Institute for Coding, Cryptography and Discrete Mathematics.

Why is this course for me?
The MSc in Mathematical Sciences is designed for mathematics and applied mathematics graduates with a passion for their subject and a desire to upskill to a level required to embark on a career in research. This MSc programme combines a taught masters and dissertation. It is an extremely versatile programme, giving students the opportunity to choose from a range of modules and projects from the different disciplines of Mathematics, Applied and Computational Mathematics and Statistics within the School of Mathematical Sciences.

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What will I study?
You will study from a range of exciting topics taught by experts in these fields of study. In addition to the taught component, you will also get a chance to work on a short research project and complete a dissertation. There are 90 credits of work to do spread over a full calendar year. You will complete six modules with a total value of 60 credits. The remaining 30 credits are allocated to project work. Courses offered change from year to year. A representative list of course offered is given below.

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- Number Theory
- Matrix Theory
- Mathematical Theory of PDEs
- Operator Theory
- Potential Theory
- Problems in Hilbert Space
- Representation Theory of Finite Groups
- Wavelet Analysis
- Simulation Modelling and Analysis
- Statistical Data Mining
- Stochastic Models with Actuarial Applications
- Survey Sampling
- Survival Analysis
- Time Series Analysis
Programme outcomes
On successful completion of the programme you will:
- have the knowledge, experience and confidence to pursue a PhD in mathematics, applied mathematics, statistics, or a related discipline;
- have attained an advanced and modern mathematical training: developed excellent presentation skills;
- have acquired a much sought after qualification that can be applied to a wide variety of careers.

What are the career opportunities?
Employers love mathematical sciences graduates. Why? Because mathematical sciences graduates are highly numerate, organized, logical and have excellent problem solving skills. If you feel like you don’t necessarily have these skills just yet, don’t worry! Studying for a degree within the mathematical sciences is the perfect way to develop and nurture these skills. Numeracy, organization and problem solving skills are required in every walk of life, from the trading floor of an investment bank, to the mathematics classroom, to predicting the weather, so you can see why mathematical sciences graduates are rarely out of work!

Some of the careers chosen by our graduates include: research mathematicians in academia and in industry, actuarial consultants, risk analysts, meteorologists, systems biologists, IT consultants, 2nd and 3rd level teachers.

Prospective Employers
Aquamarine Power, Bell Labs, Bureau Veritas, Campbell Scientific, IBM, IFSC, Intel, Google, Lloyds, Marine Institute, Met Eireann, Microsoft, Nokia, Norkom, Numerica Corporation, OpenHydro, Phillips, RIM, Simula Research, Tyndall Institute.

Entry Qualifications
Applicants should hold a degree in Statistics, Mathematics, Mathematical Physics, Applied Mathematics, or Theoretical Physics with a grade of Second Class Honours or higher, and for which the course requirements are of comparable content and standard to that of the UCD BSc degree. Those who have been awarded a distinction, or Second Class Honours Grade 1, in the Higher Diploma in Mathematical Sciences are eligible for the programme.

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Useful Links
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Staff Profile and Testimonial
Staff
Professor Frederic Dias
(Applied and Computational Mathematics)

“We study the formation of extreme waves on the surface of the ocean. These waves can be damaging and are a threat to navigation and possibly to wave energy converters in the future when they are operational. Better forecasting extreme waves is a key focus for my research. This area of research requires knowledge in statistics, fluid mechanics, wave motion, partial differential equations and numerical modeling.”

Professor Frederic Dias originally comes from France and is an ERC Advanced Grant Awardee and SFI Principal Investigator in the UCD School of Mathematical Sciences.

Professor Gary McGuire (Mathematics)

“I have taught Elliptic Curve Cryptography in the MSc, which takes students from the mathematical theory of elliptic curves to its real-world applications in cryptography. I am the director of the Claude Shannon Institute, where we have a team doing cutting-edge research in cryptography and coding theory, and some students have gone on to do their PhDs with us.” Gary McGuire is the director of the Claude Shannon Institute for Coding Cryptography and Discrete Mathematics, which is part of the Security and Trust cluster of CASL.

Graduate
Richard Moloney, MSc in Mathematical Sciences, 2008

“I completed the MSc course in Mathematical Sciences as the first year of my PhD. I chose UCD for my postgraduate studies in mathematics because it enabled me to study cryptography and information security from a mathematical point of view. The courses I studied through the MSc were invaluable in getting me started on my research topic. Within my first year I was not only working on academic research, but I gained an internship placement at Intel, where I was able to apply recent research to a practical cryptography project. The MSc course is a good choice if you want to widen your career options, whether in academia or elsewhere.” Richard completed his PhD in Mathematics in 2011 and now works at Synopsis.
Higher Diploma in Mathematical Studies
UCD School of Mathematical Sciences

Why is this course for me?
This programme is for you if you have a passion for mathematics, for problem-solving and for deep understanding of the structures which underlie much of everyday experience. If you have already been exposed to a small amount of university-level mathematics and would like to find a path into teaching or more advanced studies in the subject, then this programme provides the necessary bridge. The programme may be of particular benefit to teachers or potential teachers who would like to include mathematics among the subjects that they are eligible to teach at Leaving Certificate level. It brings the student to the level of a 3-year honours undergraduate mathematics major.

Why study at University College Dublin?
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What will I study?
You will study a wide range of topics in mathematics, mostly at a second and third year university level. There are 60 credits of work spread over two semesters (full time course) or four semesters (part time course). The programme consists of twelve 5-credit undergraduate-level mathematics modules (representative list):

- Calculus of several variables
- Number theory and combinatorics
- Algebraic structures
- Linear algebra
- History of mathematics
- Introduction to coding and/or cryptography
- Graphs and networks
- Financial mathematics
- Analysis
- Geometry
- Differential equations
- Statistics and data analysis
Programme outcomes
On successful completion of the programme students will be able to:

- demonstrate a level of mathematical understanding equivalent to that of a mathematics major in a 3-year honours degree programme
- qualify to continue with more advanced studies in mathematics
- demonstrate the valuable understanding and technical skills associated with advanced mathematics
- certify that they have sufficient university-level mathematics to make them eligible to teach mathematics at Leaving Certificate level

What are the career opportunities?
The programme covers the mathematics necessary to qualify the student to teach mathematics to Leaving Certificate level (when combined with a Postgraduate Diploma in Education (PGDE)).

With further study in mathematics or a related discipline a wide range of careers become available:

- financial engineer/quantitative analyst
- meteorologist
- computer animation
- graduate entry into banking/accountancy
- systems biologist
- internet security, software
- statistician

Prospective Employers
Bell Labs, Campbell Scientific, IBM, Intel, IFSC, Google, Met Eireann, Microsoft, Nokia, Norkom, Phillips, RIM, Tyndall Institute

Staff Profile and Testimonial
Staff
Dr Robert Osburn

“Mathematics is a universal language which underpins science, education and industry. The Higher Diploma in Mathematical Studies programme at UCD is a demanding and rewarding endeavour which prepares students for careers as researchers, highly-qualified teachers and innovators. The training and development of a skilled workforce in these areas are of vital importance to Ireland’s growth as a competitive and dynamic economy in the EU”.

Graduate
Cathal Dempsey

“I chose to study the H.Dip. in Mathematical Studies as I had an interest in Mathematics and now possibly more than ever graduates with qualifications in Mathematics are in high demand. Having completed a BComm a few years previously, choosing to then study Mathematics was initially daunting and very challenging but thankfully the design of the course and in particular the support from lecturers was excellent. The approachability of lecturers and their genuine desire to see you improve and learn was a huge help. Overall I found the course so interesting and enjoyable that I decided to continue on and study the UCD H.Dip. in Mathematical Sciences for which the H.Dip. in Mathematical Studies is an excellent foundation.”

Entry Qualifications
Entry to the programme is granted to students with a good (usually honours) undergraduate degree with at least 10 credits of university level mathematics, including a course in calculus and a course in linear algebra.

Contact
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What will I study?

You will study from a range of exciting topics taught by experts in these fields of study. In addition to the taught component, you will also get a chance to work on a short research project and complete a dissertation. There are 90 credits of work to do spread over a full calendar year. You will complete six modules with a total value of 60 credits. The remaining 30 credits are allocated to project work.

Courses offered change from year to year. A representative list of course offered is given below.

- Modules and Ring Theory
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- Finite Group Theory
- Functions of Several Complex Variables
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- Number Theory
- Matrix Theory
- Mathematical Theory of PDEs
- Operator Theory
- Potential Theory
- Problems in Hilbert Space
- Representation Theory of Finite Groups
- Wavelet Analysis

In undertaking a dissertation you will have the opportunity to develop and demonstrate your ability to read and assimilate advanced mathematical literature, to show that you can organise and present mathematical concepts clearly and to demonstrate mathematical originality in how you present known results or by discovering new ones. You will not be completely on your own doing this! A faculty member will oversee your project and guide you through the process. You will get the chance to present your results by participating in the Postgraduate Seminar Series.
Programme outcomes
On successful completion of the programme you will:
■ have the knowledge, experience and confidence to pursue a PhD in Mathematics or a related discipline,
■ have attained an advanced and modern mathematical training, developed excellent presentation skills,
■ have acquired a much sought after qualification that can be applied to a wide variety of careers.

What are the career opportunities?
Employers love mathematical sciences graduates. Why? Because mathematical sciences graduates are highly numerate, organized, logical and have excellent problem solving skills. If you feel like you don’t necessarily have these skills just yet, don’t worry! Studying for a degree within the mathematical sciences is the perfect way to develop and nurture these skills. Numeracy, organization and problem solving skills are required in every walk of life, from the trading floor of an investment bank, to the mathematics classroom, to predicting the weather, so you can see why mathematical sciences graduates are rarely out of work!
Some of the careers chosen by our graduates include: research mathematicians in academia and in industry, actuarial consultants, risk analysts, meteorologists, systems biologists, IT consultants, 2nd and 3rd level teachers.

Prospective Employers

Staff Profile and Testimonial

Staff
Professor Gary McGuire (Mathematics)
‘I have taught Elliptic Curve Cryptography in the MSc, which takes students from the mathematical theory of elliptic curves to its real-world applications in cryptography. I am the director of the Claude Shannon Institute, where we have a team doing cutting-edge research in cryptography and coding theory, and some students have gone on to do their PhDs with us.’
Gary McGuire is the director of the Claude Shannon Institute for Coding Cryptography and Discrete Mathematics, which is part of the Security and Trust cluster of CASL.

Graduate
John Sheekey
(MSc in Mathematics Graduate, 2009):
"On completion of my degree in Mathematics and Mathematical Physics in UCD, I pursued the M.Sc. in Mathematics as part of the structured Ph.D. programme. This gave me the opportunity to study a broad range of interesting topics, while introducing me to the world of research mathematics. I found the course both enjoyable and intellectually stimulating, and would highly recommend it to anyone interested in mathematics.”
John completed his PhD in 2011 and is now a post doctoral researcher at the University of Padua, Italy.

How do I apply?

Entry Qualifications
You should hold a degree in Mathematics with a grade of Second Class Honours or better, comparable in content and standard to that of the UCD BSc in Mathematics. Those who have been awarded a distinction, or Second Class Honours Grade 1, in the Higher Diploma in Mathematical Science (Mathematics stream) are eligible for the programme.

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Useful Links
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Simulation is providing a radically new approach to science addressing problems beyond the scope of traditional experimental or theoretical science. The use and application of Simulation Science is critical to drive forward future innovations in the competitive environment of industry and scientific research; educating tomorrow's scientists requires that students acquire substantial depth in these techniques. The multidisciplinary training in Simulation Science (or Computational Science) allows for a multi-level set of marketable skills that employers find attractive.

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UCD Simulation Science – an innovative interdisciplinary programme

Every facet of the physical, biological, social, economic and engineering sciences is now critically dependent on insights gained from simulations of complex systems. Simulation is providing a radically new approach to science addressing problems beyond the scope of traditional experimental or theoretical science. Simulation Science is central in enabling everything from developing new materials and new technologies for energy, information processing, and communication, to designing new medicines and treatments, and predicting how biological and social networks respond to different stimuli, from infections to financial crashes.

What will I study?

A list of representative modules:

**Core Modules**

- Numerical Algorithms
- Mathematical Methods
- Stochastic Modelling
- C/C++ Programming
- Case Studies in Simulation Science
- High Performance Computing

**Optional Modules include:**

- Simulation Modelling and Analysis
- Natural Computing and Applications
- Mathematical Biology
- Environmental Fluid Mechanics
- High Performance Heterogeneous Computing
- GPGPU programming
- Bioinformatics
- Financial Applications
Research - Dissertation

The MSc in Simulation Science provides core intensive modules in Mathematical Modelling, Data Intensive Science, and High End Computing coupled with a specialist discipline specific research experience through an extensive research project.

Programme outcomes

On successful completion of the programme students will have:

- knowledge and skills in the modelling of real-world phenomena
- knowledge and skills in computational science and computer programming
- scientific communication skills
- preparation for Ph.D. studies
- preparation for a career in research, either in academia or industry
- preparation for the job market

What are the career opportunities?

Simulation Science (often known as Computational Science) is heavily used in the engineering disciplines for design of aircraft, integrated circuits, construction equipment and aerospace structures.

The need for computing has emerged into more diverse scientific areas such as biology (genetics and gene sequencing, design of new medications, biostatistics), chemistry (nanotechnology), environmental science (long term modeling of the effects of environmental hazards), geology (plate tectonics, sedimentation and erosion) and meteorology (weather prediction).

A more recent need for computational science has arisen in areas that might not traditionally be viewed as computing intensive. Some examples include the financial markets (modeling of the options and derivative markets, hedge fund analysis, portfolio optimization), physical education (kinesiology, biological physics), acoustics (aeroacoustics, medical acoustics, underwater acoustics) and computer graphics (gaming, ray tracing and CGI rendering).

Staff Profile and Testimonial

Professor Frederic Dias

(Applied and Computational Mathematics)

"Together with Aquamarine Power we have set up a research group to focus on high end simulation modelling for wave energy systems. The group’s research primarily focuses on Aquamarine Power’s Oyster wave power technology and will contribute significantly to the evolution of their wave energy device. In addition to our collaboration with Aquamarine Power we are also sharing expertise with two major French research institutes Ecole Normale Supérieure de Cachan (ENS Cachan), and Ecole Centrale de Nantes (EC-Nantes).”

Frédéric Dias is an applied mathematician at UCD who has been the leader of an innovative, world-class research group in fluid mechanics for the past 10 years. In 2011 he was awarded a prestigious ERC Advanced Grant on the formation of extreme waves, together with Prof. John Dudley, a physicist who has made numerous pioneering contributions in nonlinear optical physics.

How do I apply?

Entry Qualifications

A 1st or 2nd class Honours Degree (or equivalent) in a Science or Engineering subject with a strong mathematical content is required.

Contact

Any queries about the courses should be directed to the Graduate Administrator (pgstudies@maths.ucd.ie; Tel. +353-1-716 7152). For further information contact Dr. E. A. Cox (Mathematical Sciences), Dr. N. Hurley (Computer Science and Informatics).

Applying Online

To apply online, please go to: http://www.ucd.ie/apply

Fee Information

For information on fees, please visit: www.ucd.ie/registry/adminservices/fees

Useful Links

For more information please visit our website http://www.ucd.ie/simulationscience/
The M.Sc. in Statistics is aimed at students who have an undergraduate degree in Statistics or a degree in a discipline related to Statistics and with numerate skills. It consists of a mixture of compulsory and optional modules and a major project. Compulsory modules are intended to ensure all students have appropriate basic statistical skills, knowledge and experience, while optional modules provide depth and exposure to the diverse range of statistical applications and methods. This latter aspect provides students with the opportunity to specialize in specific areas. The major project provides the students the chance to work extensively on either theoretical or practical problems. An M.Sc. in Statistics will open a host of interesting and rewarding career opportunities and gives skills that are much in demand. Former M.Sc. in Statistics students have found employment in industry, government, IT, economics and finance. Demand for graduates continues to be strong both in Ireland and abroad. The M.Sc. is also intended to be a good stepping stone for doctoral studies. The UCD MSc in Statistics is fully accredited by the Royal Statistical Society.

Why is this course for me?

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- Emphasis on research and innovation
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- Extensive range of campus accommodation options.

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What will I study?

You will study from a range of exciting topics taught by experts in these fields of study. In addition to the taught component, you will also get a chance to work on a research project and complete a dissertation. There are 90 credits of work to do spread over a full calendar year. You will complete modules with a total value of 60 credits and the remaining 30 credits are allocated to project work.

Modules offered change from year to year and the list includes:

- Mathematical Statistics
- Monte Carlo inference
- Actuarial Statistics
- Survival Analysis
- Data Mining
- Time Series
- Multivariate Analysis
- Linear Models with Complex Structure
- Experimental Design

Research - Dissertation
In addition to the course work, students undertake a research project (30 credits) supervised by a member of staff. The dissertation is a fairly substantial piece of work – one third of the overall workload in the M.Sc programme – much of which is done in the summer semester.
Programme outcomes
On successful completion of the programme students will:

■ Be able to demonstrate in-depth understanding of statistical concepts, apply basic statistical reasoning, techniques and models in the analysis of real data and employ technical computing skills;
■ Have learned from experiences gained in different contexts and how to apply knowledge across discipline boundaries to solve problems;
■ Developed excellent presentation skills;
■ Appreciate the importance of professional development and the resources available to keep up to date with new developments in the field;
■ Have acquired a much sought after qualification that can be applied to a wide variety of careers.

What are the career opportunities?
Career prospects on completion of the MSc in Statistics are excellent. Many students pursue careers in the pharmaceutical industry (e.g. Elan, Quintiles). Students also enter careers in banking, finance and risk management. There is an increase in demand for statisticians from the IT sector (e.g. Google, Intel, data mining companies). In addition many government departments employ statisticians including the Central Statistics Office. Many past students embarked on a career in academia by proceeding to study for a PhD in Statistics.

How do I apply?
Entry Qualifications
At least a second class honours degree (or equivalent) in Statistics or a cognate subject area is required for entry and for which the course requirements are of comparable content and standard to that of the UCD BSc degree. Those who have been awarded a distinction, or Second Class Honours Grade 1, in the Higher Diploma in Statistics are eligible for the programme. Alternatively students may qualify for enrolment for the four semester M.A. in Statistics which brings them to the same level as the M.Sc. in Statistics.

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Useful Links
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This programme is intended for students with a numerate background but who may have insufficient background knowledge to gain entry to the MSc programme. The MA in statistics is of 16 months duration (4 semesters) and will bring students to the same level as the 1 year MSc degree in Statistics. Currently, students without sufficient statistical background knowledge can attain Masters level proficiency by first completing the Higher Diploma in Statistics followed by the MSc in Statistics, which together takes 2 years. The MA in Statistics provides an alternative pathway in 16 months. There is no comparable programme in Ireland or the UK. The M.A. in Statistics consists of a mixture of compulsory and optional modules and a major project. Compulsory modules are intended to ensure all students have appropriate basic statistical skills, knowledge and experience, while optional modules provide depth and exposure to the diverse range of statistical applications and methods. This latter aspect provides students with the opportunity to specialize in specific areas. The major project provides the students the chance to work extensively on either a theoretical or practical problem. An M.A. in Statistics should open a host of interesting and rewarding career opportunities and give skills that are much in demand. For example, former M.Sc. in Statistics students have found employment in industry, government, IT, economics and finance. Demand for graduates continues to be strong both in Ireland and abroad. The M.A. is also intended to be a good stepping stone for doctoral studies.

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What will I study?

You will study from a range of exciting topics taught by experts in these fields of study. There are 120 credits of work to do spread over four semesters. The first two semesters involve taking nine 5-credit modules (45 credits) from the Higher Diploma in Statistics programme and two modules at 7.5 credit (15 credits) from the M.Sc. in Statistics programme. The third semester involves a 30 credit dissertation or data analytic project. The fourth semester involves taking four modules at 7.5 credits (30 credits) at level 4 from the M.Sc. in Statistics programme.

Modules offered change from year to year and the list includes:

- Linear Models
- Data Mining
- Time Series
- Multivariate Analysis
- Experimental Design
- Mathematical Statistics
- Monte Carlo inference
- Actuarial Statistics
- Survival Analysis
- Stochastic models
- Bayesian analysis
MA in Statistics

Research - Dissertation

In addition to the course work, students undertake a research project (30 credits) supervised by a member of staff. The dissertation is a fairly substantial piece of work completed in the summer semester.

Programme outcomes

On successful completion of the programme students will:

- be able to demonstrate in-depth understanding of statistical concepts, apply basic statistical reasoning, techniques and models in the analysis of real data and employ technical computing skills;
- have learned from experiences gained in different contexts and how apply knowledge across discipline boundaries to solve problems;
- developed excellent presentation skills;
- appreciate the importance of professional development and the resources available to keep up to date with new developments in the field;
- have acquired a much sought after qualification that can be applied to a wide variety of careers.

What are the career opportunities?

Career prospects on completion of the M.Sc. in Statistics are excellent and the M.A. in Statistics provides an equivalent qualification. Many students pursue careers in the pharmaceutical industry (e.g. Elan, Quintiles). Students also enter careers in banking, finance and risk management. There is increased demand for statisticians from the IT sector (e.g. Google, Intel, data mining companies). In addition many government departments employ statisticians including the Central Statistics Office. Some past students embarked on a career in academia by proceeding to study for a Ph.D. in Statistics.

Staff Profile and Testimonial

Staff

Dr Andrew Parnell
School of Mathematical Sciences, Complex and Adaptive Systems Laboratory

I obtained my first degree from the University of Kent at Canterbury in 1999 with a degree in Mathematics and Management Science, followed by a Masters degree in Statistics at the same institution. I worked in marketing in London for 2 years before obtaining a PhD at the University of Sheffield in 2005. Between 2005 and 2008 I was a research fellow at Trinity College Dublin. I was appointed Lecturer in Statistics in the School of Mathematical Sciences in UCD, gaining tenure in 2011. My main statistical interest is in Bayesian stochastic processes and computational statistics. I am particularly interested in Gaussian processes, stochastic volatility models, compositional data analysis and monotonic processes. I have applied such models to a variety of environmental, biomedical and ecological science problems relating to: spatio-temporal climate reconstruction, stable isotope mixing models, the development of biomarker panels for prostate cancer, sea-level change and radiocarbon dating.

How do I apply?

Entry Qualifications

Our standard admissions requirement is at least a 2.1 honours degree in mathematics, economics, finance, certain engineering degrees or similar quantitative disciplines where statistics has formed some component of the degree. However in exceptional circumstances we will consider applications from students who do not satisfy these requirements but can demonstrate an interest and ability in statistics. Alternatively students may qualify for enrolment to the Higher Diploma Statistics from which they can gain entry to the 1-year M.Sc. in Statistics.

Contact

Any queries about the courses should be directed to the Graduate Administrator pgstudies@maths.ucd.ie; Tel. +353-1-716 7152.

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Useful Links

For more information please visit the website: http://www.ucd.ie/graduatemanuscripts/coursefinder/taughtprogrammes/
This programme is aimed at graduates whose level of statistical or mathematical training is high, but below that of the BSc Degree Honours in Statistics, and who have demonstrated numerical ability. It enables them to reach in one year a level of statistical knowledge equivalent to that of BSc Honours graduates. It provides students with a good background in statistical theory and methods, which can be used in a variety of areas of application. In general, those who successfully complete this programme have excellent employment prospects. Those who have been awarded a distinction, or Second Class Honours Grade 1, in the Higher Diploma in Statistics are qualified to enter the MSc degree in Statistics.

The programme extends over two semesters and involves 60 credits of taught modules. It may be taken full-time over one year or part-time over two years. The programme commences in early September and finishes in May each year.

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What will I study?
Students take 12 modules (some of which are compulsory) from a list that include:
- Probability Theory
- Statistical Inference
- Biostatistics
- Survey Sampling
- Models – Stochastic
- Data Mining
- Linear Models
- Actuarial Statistics
- Time Series
- Categorical Data Analysis
- Multivariate Analysis

Programme outcomes
On successful completion of the programme students will be able to:
apply basic statistical reasoning, techniques and models in the analysis of real data, understand the context in which statistical work is done, select appropriate statistical models for different applications and interpret results, demonstrate programming skills, report writing skills and presentation skills.
Higher Diploma in Statistics

What are the career opportunities?
Career prospects on completion of the H.Dip. in Statistics are excellent. Many students pursue careers in the pharmaceutical industry, banking, finance and risk management. There is an increase in demand for statisticians from the IT sector (e.g. Google, Intel, data mining companies). In addition many government departments employ statisticians including the Central Statistics Office. Many students embarked on the MSc in Statistics programme offered by UCD, based on achieving a Second Class honours, first division grade in the H dip in Statistics.

Prospective Employers
Vodafone, Google, Irish Life, Paddy Power, ESRI, SPSS, Bank of Ireland, Quintiles, Accenture, Tesco, Ebay, Aviva.

Staff Profile and Testimonial

Staff
Dr. Gabrielle Kelly (Statistics and Actuarial Science)

“Advances in GIS means that geographical coordinates of subjects or units of measurement are now available in many studies. My current interest is in the field of spatial statistics, a term used to describe a wide range of statistical methods and models intended for the analysis of spatially referenced data. These models can describe, for example, how relationships between different measurements vary over space and if observations cluster in space. They can also be useful in constructing maps of spatial variation. I have developed spatial models for the spread of bovine TB in cattle and wildlife badgers. Such models help determine important epidemiological parameters and inform policy in the control of the disease. I also supervise research students in the area of forestry. Important questions here include determining via spatial models how the proximity of trees to each other affects their growth and how this varies with species and mixtures of species, with the aim of assisting in efficient forest management.”

Dr. Gabrielle Kelly was educated in UCC and Stanford and has worked in University College London, Columbia University and UCC. She has been in UCD since 1990.

Graduate

“I enrolled in the H.Dip.Statistics programme as a part-time student both in order to gain a more thorough grasp of the statistical techniques I was using in my political science research, and to better understand the needs of students and researchers in my role as Director of the Irish Social Science Data Archive. The range of topics offered provided a challenging and ultimately rewarding environment in which I not only succeeded in meeting my goals as a social scientist, but also gained a deeper understanding and respect for the role of statistics across the entire spectrum of the sciences. The material covered in the core lecture courses was underpinned by an excellent tutorial system which further enhanced my understanding of the topics. I cannot recommend this course highly enough for anyone wishing to strengthen their statistical skills, whether to pursue a career in academic research or in the broader job market.” James McBride was Director of the Irish Social Science Data Archive from 2000-2012.

How do I apply?

Entry Qualifications
Applicants must be graduates who are familiar with the basics of the statistical approach.

Contact
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Applying Online
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Useful Links
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Why is this course for me?
This course will help you analyse and understand the large data sets that are regularly being created via the huge growth in freely available online information. This is an exceedingly valuable skill and in strong demand from employers. We see Data Analytics as a subject at the crossroads between statistics and computer science, and our online Professional Diploma contains elements of both. We will give you the tools to apply these advanced skills to maximum effect in any work-related environment. There are no lectures to attend. Students will be given videos, online demonstrations, and interactive games to enhance their learning, with regular feedback and interaction via course tutors through the UCD website.

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- An innovative digital campus, with dedicated IT support for students

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What will I study?
The Online Professional Diploma in Data Analytics covers four 5-credit modules, two per semester. The first two modules cover introductory data analytics and computing. The second two modules concern data mining and multivariate analysis. Thus in the first semester those with a numerate background would be brought up to speed with advanced statistical inference and computational techniques, whilst in the second semester they cover many of the most up to date topics for gaining insight from data at scale. These include:

- Large scale classification techniques such as random forests and support vector machines
- Model-based classification via Gaussian mixtures
- Association rules and heuristic classification techniques
- Parallel processing and large scale analysis using the R environment
- Ensemble methods and boosting
- Dimension reduction techniques such as multidimensional scaling and principal components analysis

What are the career opportunities?
Data Analysts are in strong demand from industry. Those who are successful in completing the course would be highly employable in fields as diverse as: pharmaceuticals, finance and insurance, cloud computing, online services, and many government agencies.

Prospective Employers
ICT companies (e.g. Google, eBay, Facebook), the pharmaceutical industry (e.g. Jansen, Merck, GSK), the financial services industry (e.g. Bank of Ireland, Morgan Stanley, PWC) or any company that requires detailed, robust analysis of data sets.

How do I apply?
Entry Qualifications
Students must have obtained a first degree in a numerate subject to standard 2:1. Those without this requirement but with equivalent experience in industry will also be considered on a case-by-case basis.

Contact
Any queries about the courses should be sent to the course administrators via the email address DataAnalyticsOnline@ucd.ie.
Or
call Nuria Garcia Ordiales at +353 1 7167152.

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Fee Information
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Useful Links
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UCD Science

Physical Sciences
Atmospheric science is a fascinating area of study. From sunny spells and scattered showers, to climate change and greenhouse gases, a wide range of meteorological and climate topics are examined during the M.Sc. course in Meteorology. Students get scientific training in theoretical and applied meteorology and climatology, so that they not only learn what happens, but also why it happens, and how we predict it. Alongside the taught modules, there are a variety of other activities. In the first semester, there is a field trip to Valentia Observatory in Caherciveen, where students get to witness a radiosonde launch and learn about the geomagnetic and seismological work in addition to the meteorological programme of the Observatory. They also go on walks around the countryside taking meteorological measurements. In the second semester, an intensive one-week course in practical forecasting gets underway. Met Éireann forecasters help teach this course, which lets students learn first-hand the issues and problems of operational forecasting, as well as visit the RTE weather studio and prepare and present forecasts on-screen. All through semester 1 and 2 there are weekly weather discussions, which bring the classroom theory to life. And in the summer months, students get to work on a relevant research project of their choice with a member of staff to help out. Overall, the course provides a solid foundation in physical, dynamical and synoptic meteorology, climate dynamics and numerical weather prediction. It supplies the scientific training needed for a career in applied meteorology within the public or private sectors, and is also an excellent starting point for an academic research career in meteorology and climate.

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What will I study?

The course is modular, and may be taken on either a full time or part time basis. Most students opt for full time study. The M.Sc. lecture courses cover the following areas:

- Physical Meteorology
- Dynamical Meteorology
- Climate Dynamics
- Numerical Weather Prediction
- Synoptic Meteorology

An intensive one-week practical course in Forecasting Techniques takes place in the Spring. This is presented in collaboration with staff from Met Éireann. In October there is a Field Excursion to Valentia Observatory, the Met Éireann Geophysical Observatory in Caherciveen, Co Kerry.
Research Projects

Students get to do a research project over the summer months, and they write up the results in the form of a thesis. The student can choose any (relevant) area to do their research on, in collaboration with their supervisor. Research work for the projects takes place from early June until mid-August but it is wise to start planning your projects early in the academic year. The project reports are typically about fifty to one hundred pages in length.

Previous research projects have included:

- Using the COSMO Model to Simulate Historical Irish Storms
- Site Assessment for Wind Energy at UCD
- Analysis of the Xynthia Storm
- Predicting Typhoons in the Hong Kong Region
- Hurricanes and Global Warming.
- Meteorological Factors affecting Air Corps Operations at Casement Aerodrome
- Surface wind and temperature extremes over Ireland and Britain

Programme outcomes

On successful completion of the programme students will be able to:

- Apply the fundamental principles that govern the motion of the atmosphere.
- Explain the structure and role of the primary components of a Numerical Weather Prediction model.
- Describe the processes that control climate and how it evolves.
- Explain the connection between basic thermodynamic concepts and the processes that act in the Earth’s atmosphere and drive our weather and climate.
- Apply the basic concepts of dynamical and physical meteorology to practical situations.
- Analyze plotted charts and develop a synoptic description of the atmosphere.
- Prepare forecasts using a combination of current weather data and NWP model outputs.

Staff Profile and Testimonial

Staff

Dr Conor Sweeney

“Meteorology and Climate Science is a brilliant area to be working in. I’m working on two main research areas at the moment. In one, we are developing new methods to improve wind forecasts which will help to make wind energy cheaper. In the other, we are studying data from global climate models to predict future climate change. There are always new challenges, and the demand for improved weather and climate forecasting data is increasing all the time!”

Dr Conor Sweeney in the Meteorology and Climate Centre is a lecturer in the School of Mathematical Sciences.

Graduate

Aisling Creevey
(Msc Meteorology, 2009)

“In September 2008, I commenced studying the one thing I have always wanted to learn about the most, Meteorology. Although it was difficult returning to an academic environment, it has been perhaps the best decision I have made, and now one year later I am working and training as a Meteorologist. It was worth every bit of hard work.”

Aisling is now working as a Meteorologist for MeteoGroup

What are the career opportunities?

The thorough grounding in meteorology and climate science offered by this M Sc. course will enable graduates to pursue careers in national meteorological and environmental agencies and in various branches of the private sector such as broadcast and aviation meteorology, the insurance industry, commodity investors, utilities, and renewable energy firms. It is also an excellent starting point for those aiming at a Ph.D. and a research career within a university or specialised research institution.

Prospective Employers


How do I apply?

Entry Qualifications

Applicants should hold a good bachelor’s degree (Second Class Honours, Grade 2 or higher; Grade Point Average (GPA) 2.48 or higher) in mathematics, physics, statistics, engineering or other subject with a strong mathematical content. Though previous training in meteorology is not required, the course is strongly quantitative, and a solid foundation in mathematics (including vector calculus, linear algebra and ordinary differential equations) and classical physics (including mechanics and thermodynamics) is essential.

Contact

Any queries about the courses should be directed to the Graduate Administrator (pgstudies@maths.ucd.ie; Tel. +353-1-716 7152).

Applying Online

To apply online, please go to: http://www.ucd.ie/apply

Fee Information

For information on fees, please visit: www.ucd.ie/registry/adminservices/fees

Useful Links

For more information please visit our website:
http://mathsci.ucd.ie/sms/postgraduate.html
Why is this course for me?

The MSc in NanoBio Science at UCD is for students excited at the prospect of studying and researching in this emerging interdisciplinary area, where physics, chemistry, engineering and life sciences all come together. Manipulating matter at the nanoscale is already leading to new and improved imaging and display technologies, biomedical sensors, and solar cells for environmentally friendly energy production. The design, fabrication and control of devices with nanoscale (billionth of a metre) dimensions is an engine of innovation in almost every sector. In addition, understanding the structure, function and regulation of biological systems at the nanoscale and in real time requires nanometre and femtosecond (quadrillionth of a second) technologies that will ultimately lead to devices and techniques that mimic those found in nature, such as high-efficiency solar cells based on photosynthetic processes and adaptive biocompatible materials for regenerative medicine. This MSc programme unites the technological with the biological aspects of the field in a unique way, equipping graduates with a truly interdisciplinary perspective of the field.

Why study at University College Dublin?

Some of the reasons to study at UCD:

- In the top 1% of the world’s universities
- Ireland’s largest provider of graduate education
- A diverse university, both in academic disciplines and culture
- Emphasis on research and innovation
- Purpose-built, modern parkland campus, close to Dublin city centre
- Extensive range of campus accommodation options.

UCD College of Science

The College is dedicated to the creation, delivery and communication of new knowledge and innovation across the spectrum of Science. With a staff of 750 and a student population of 5500 including 1800 postgraduate students, the College is a vibrant community dedicated to excellence in all our pursuits.

UCD School of Physics

The UCD School of Physics is one of seven Schools within the College of Science. We have a proud tradition of excellence in teaching and internationally reputed research, spanning the range of modern physics, from particle physics, astrophysics and spectroscopy, to condensed matter theory and nanoscience. We have a strong graduate programme at MSc and PhD level. More than 40% of our graduate students are from overseas. In addition, there are a number of associated UCD Institutes involving School of Physics researchers, including the Conway Institute of Biomolecular & Biomedical Research, Systems Biology Ireland and the Complex Adaptive Systems Laboratory (CASL), where students and staff have access to major technology platforms essential to the conduct of world-class cutting-edge research.

What will I study?

You will gain experimental and theoretical knowledge in the following topics:

- Nano-Optics and Bio-Photonics
- Physics of Nano-Materials
- Spectroscopy and Lasers
- Nano-Mechanics
- Atomic Force Microscopy
- Computational Biophysics
- Biophysics at the Nanoscale
- Biomimicry
- Bio-Fluid Mechanics
- Innovation
- Journal Club and Presentation Skills

Lectures are delivered by staff of international renown in these fields of research. About 50% of the time is devoted to classroom or lab-based activities. The student spends the remaining time carrying out a substantial research project, chosen in consultation with academic staff.
Research Projects

Research projects are normally carried out within research groups of the UCD School of Physics using state-of-the-art laboratory and computational facilities. Previous research projects have included:

- Plasmon-enhanced solar cells
- Scattering of light in the human cornea
- Atomic force microscopy in a liquid environment
- Fabrication and characterisation of Nanowires
- Molecular Dynamics simulations in relation to Alzheimer’s disease.

Programme outcomes

On successful completion of the programme students will be able to:

- demonstrate in-depth understanding of the topics underpinning NanoBio Science along with technical skills in computation (e.g. molecular simulations) and experimentation (e.g. scanning probe microscopy)
- appreciate innovation, product development, intellectual property, ethics, and market issues of relevance when commercializing novel technology
- confidently engage in technical research projects, independently or as part of a team, and effectively communicate research findings
- learn from experiences gained in different contexts and apply knowledge across discipline boundaries to solve problems
- appreciate the importance of professional development and the resources available to keep up to date with new developments in the field.

What are the career opportunities?

The programme prepares you for industry or further research. Career opportunities include the pharmaceutical industry, telecommunications, diagnostic imaging, green technologies and sensor applications, both in Ireland and internationally. It is also a stepping stone to PhD research in the areas of nanoscience, biophotonics and nanotechnology.

Prospective Employers


Staff Profile and Testimonial

Staff

Dr Brian Vohnsen

“Dr Brian Vohnsen originally comes from Denmark and is a Stokes lecturer and SFI Principal Investigator in the UCD School of Physics.”

Graduate

JiaJun Li

(MSc NanoBio Science, 2009):

“I chose to study NanoBio because of its huge potential. The subjects in this course cover areas from physics to biology. It is not only a ‘taught’ MSc, but the cutting-edge experiments and research will benefit you in your future career. The international aspect definitely brings new ideas and lets you know the people in your area of study. Overall, I think this is a very good choice whether aiming for a career in research or in applied science.”

Jiajun is now pursuing a PhD in the area of biomedical optics.

How do I apply?

Entry Qualifications

Entrance to the programme requires a BSc with a 2.1 or equivalent in physics, chemistry, engineering, materials science or a related discipline with a significant physics component. In exceptional circumstances, and with a strong physics background, a 2.2 may be accepted. There is an English language requirement with a 6.5 IELTS score.

Flexible delivery options

This MSc is a 1 year long, 90 ECTS course, that may also be taken as a 2-year part-time option, or as a 30 ECTS graduate certificate (FT or PT), without the research project component.

Contact

For further information on the content of the MSc NanoBio Science please contact Dr. Brian Vohnsen at brian.vohnsen@ucd.ie

Applying Online

To apply online, please go to: http://www.ucd.ie/apply

Fee Information

For information on fees, please visit: www.ucd.ie/registry/adminservices/fees

Useful Links

www.ucd.ie/nanobio
www.ucd.ie/physics
Why is this course for me?
The Masters in Physics by Negotiated Learning (PNL) at UCD offers graduates the opportunity to tailor the MSc curriculum to a targeted area of expertise in physics. Graduates wishing to apply their degree expertise in the space sector should choose the PNL specialisation Space Science & Technology. Space is a growth industry, driven by the increasing demands of space exploration, Earth observation, and commercial services such as telecommunications and satellite navigation. The sector is highly international, multi-disciplinary, and benefiting from significant investment worldwide. This MSc specialisation prepares students who wish to pursue a career in this exciting sector. The programme incorporates physics and space science, provides exposure to a variety of applications, and facilitates professional development.

What will I study?
You will gain exposure to the following topics:

Core modules
- The Space Environment
- Applications of Space Science
- Satellite Subsystems Laboratory
- Space Sector Seminars
- Professional Development

Specific optional modules
Optional modules are available to allow you to customise the MSc according to your academic background and career objectives. You may choose from within the following areas:
- Physics, Astrophysics & Planetary Science
- Mechanical & Materials Engineering
- Project Management & Technical Communication
- Programming & Mathematics
- Foreign Language

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Programme outcomes
On successful completion of the programme, students will be able to:
- Demonstrate knowledge and understanding of topics underpinning space science and technology
- Rely on technical skills in relevant areas of space research
- Display a broad awareness of all aspects of the highly cross-disciplinary space science sector
Appreciate innovation, industry links, product development, intellectual property, and market issues of relevance when developing novel technology, in particular for the space sector.

Confidently engage in technical research projects within a space context, independently or as part of a multi-disciplinary team, and effectively communicate research findings to non-specialists.

Learn from experiences gained in different contexts and apply knowledge across discipline boundaries to solve problems.

Appreciate the importance of professional development and global networking, and be familiar with the resources available to keep up to date with new developments in the field.

What are the career opportunities?

Career opportunities, both in Ireland and internationally, include the following areas:

- Launchers
- Earth Observation
- Satellite Navigation
- Space Transportation
- Satellite Communications
- Space Science Experiments
- Life and Physical Sciences
- General Support Technology

The MSc can also be used as a stepping-stone to PhD research in physics or engineering.

Prospective Employers

Prospective employers include agencies, such as ESA and NASA, as well as Irish and international industry.

Ireland’s Space Industry Sample Listing

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Staff Profile and Testimonial

Staff

Prof Lorraine Hanlon

“Space offers a global perspective - of our planet and the cosmos. Satellites looking back at the Earth can monitor the effects of climate change on the polar ice caps, or map the Earth’s gravity field to find new continents. Meanwhile, satellites looking outwards into space allow us to assess the threat to Earth from near-Earth asteroids, to explore our solar system for signs of life and to probe the most violent explosions in the universe. This MSc aims to prepare graduates for a career in the growing space sector.”

Lorraine Hanlon is Associate Professor of Astronomy in UCD School of Physics, and has worked at the European Space and Technology Research Centre in the Netherlands.

Graduate

Ronan Wall, PhD
(BSc, UCD 1996):

“My education at UCD School of Physics provided a crucial foundation in the key physical principles of space, which have aided in my understanding and implementation of a diverse range of projects from complex multi-spacecraft mission studies to rocket engine development. Given the calibre of staff and research output at the School, I have no hesitation in recommending this course. I only wish it had been available when I graduated!”

Ronan Wall is currently Programme Manager at MOOG (Dublin), a major player in the aviation and aerospace industry.

How do I apply?

Entry Qualifications

Entrance to the programme requires a BSc (Hons) or equivalent in physics, engineering, computer science or a related discipline. For non-native speakers, an English language requirement must be met via a IELTS score of 6.5.

Flexible delivery options

This MSc is a 90 ECTS course, which may be taken full-time in one year or part-time over two years. Other options include a 30 ECTS graduate certificate or a 60 ECTS graduate diploma (full-time or part-time), without the practicum component.

Contact

For further information on the content of the MSc in Physics (Negotiated Learning) specialising in Space Science & Technology, please contact Dr. Deirdre Coffey at deirdre.coffey@ucd.ie

Applying Online

To apply online, please visit: www.ucd.ie/apply

Fee Information

For information on fees, please visit: www.ucd.ie/registry/adminservices/fees

Useful Links

www.ucd.ie/physics
www.ucd.ie/physics/pnl
ucd.ie/spacescience
Why is this course for me?
Our MSc in Petroleum Geoscience offers bright and motivated geoscience graduates a vocational training in the key skills required for a career in the hydrocarbon industry and for further studies at PhD level. The course, the only one of its kind in Ireland, covers all aspects of exploration, appraisal and development geoscience. It includes significant components of fieldwork, software training and practical experience of industry-style work. You will be taught by staff in the UCD School of Geological Sciences who are international leaders in a variety of petroleum geoscience disciplines, including basin studies, deep water sedimentology, geophysics, reservoir modelling and structural geology: their work is amongst the most cited in the field and their technical innovations are incorporated in some of the leading petroleum industry software systems. Co-opted industry instructors will contribute to some modules. This one-year taught course includes a 12 week independent research project providing an opportunity to work with active research groups within the School or directly with industry in the form of a work placement.

Why study at University College Dublin?
- In the top 1% of the world’s universities
- Ireland’s largest provider of graduate education
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- Emphasis on research and innovation
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- Extensive range of campus accommodation options

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UCD School of Geological Sciences
The UCD School of Geological Sciences is the largest geoscience school in Ireland. With 13 academic and 7 post-doctoral research staff, as well as over 40 PhD students, it has an international reputation for excellence in research, much of it directly relevant to the petroleum industry.

The School hosts a vibrant and international community comprising researchers from over 15 countries. Research is supported by significant income (typically >£2m/year), much of it from industry, and a range of modern equipment including laser ablation facilities, a suite of radiogenic isotope mass spectrometers, desk-top SEM, broadband seismometers and seismic workstations.

In early 2013, the School embarked on a new collaborative initiative with Tullow Oil plc that has supported the appointment of three new academic positions specifically in Petroleum Geoscience. This collaboration will facilitate world-class research and education over a broad range of petroleum-related scientific disciplines.
What will I study?

The main aims of the MSc programme are to:

- Deliver a comprehensive technical grounding in exploration and production geoscience of conventional and unconventional hydrocarbon resources.
- Nurture and develop critical reasoning skills using ‘problem-based’ learning and a wide range of practical exercises using subsurface, outcrop, behind-outcrop and geophysical datasets.
- Provide quality vocational training in subsurface and related data acquisition, quality-control, interpretation, data integration and uncertainty.
- Deliver hands-on experience of typical industry workflows including the use of a suite of software packages (basin analysis, seismic interpretation, fault modelling and reservoir modelling).
- Develop essential transferrable skills (e.g. effective report writing, project management, team working) and the ability to communicate and work with cognate disciplines (e.g. drillers, petroleum engineers).

Course modules comprise:

- Petroleum systems (5 credits)
- Introduction to seismic techniques (2.5 credits)
- Petrophysics (2.5 credits)
- Basin analysis and modelling (5 credits)
- Depositional systems and sequence stratigraphy (5 credits)
- Structural geology (5 credits)
- Fieldwork (Ireland, UK, Spain; 15 credits)
- Exploration and prospect evaluation (10 credits)
- Production geology and field management (10 credits)
- Individual research project chosen in consultation with staff (30 credits)

What are the career opportunities?

Petroleum geoscientists are much in demand and find employment in a wide range of companies, consultancies, regulatory agencies, governmental organisations and academia. Petroleum products are important for power generation, transport and as a chemical feedstock and are likely to remain so for decades despite emerging new technologies. Geoscience plays a pivotal role in guiding exploration and helping to plan and manage efficient and profitable oil and gas production. It is also essential for understanding and confronting many of the associated risks, safety issues and environmental concerns facing the industry.

Entry Qualifications

Course entry will normally require a minimum 2.1 Honours degree or equivalent in Geology, Geoscience, Earth Science, Geophysics or a cognate discipline. In exceptional circumstances, credit will be given for those with a 2.2 degree with relevant work experience.

If English is not your native language, proof of proficiency in English will be required, equivalent to an IELTS score of 6.5 or better.

Contact

Prof. Peter D.W. Haughton (Course Director) at Peter.Haughton@ucd.ie or Dr Tom Manzocchi (Course Admissions Tutor) at Tom.Manzocchi@ucd.ie.

Applying Online

To apply online, please go to: www.ucd.ie/apply

Fee Information

For information on fees, please visit: www.ucd.ie/registry/adminservices/fees

Useful Links

www.ucd.ie/geology
www.ucd.ie/geophysics
www.fault-analysis-group.ucd.ie
www.ucd.ie/geology/petroleumgeoscience.htm
About the UCD School of Computer Science and Informatics

The UCD School of Computer Science and Informatics has an excellent reputation among students, other staff and employers, for the number and quality of its programmes. The School is currently enjoying its most successful period to date. Its rapidly expanding curriculum and research agenda is matched with unprecedented growth in student and staff numbers. This growth, together with our modern facilities, will allow UCD School of Computer Science and Informatics to lead the way into the future.

Undergraduate Courses

Do you ever wonder how Google, Skype, internet banking or computer games work? Would you like to develop the next generation of cutting-edge computing technologies? Computer Scientists have for example produced the data compression technology that underlies the digital media revolution, seen in e.g. DVDs, mp3s and YouTube video streaming.

If you're a logical thinker who likes problem-solving and you enjoy subjects like Mathematics, a degree in Computer Science could be for you. We offer a BSc (Honours) degree in Computer Science, in a four year programme where students develop many skills - for instance in object-oriented programming languages such as Perl, Ruby, C++ and Java; in the latest Internet technologies; in software engineering, mobile application development, database technology, and various operating systems. Students take on an individual project in their final year working alongside active researchers on topics such as Artificial Intelligence, Computer Security, Software Engineering, Mobile Computing and many more. There are internship opportunities available at the end of third year, and there are opportunities for our students to study abroad. We also welcome international students to come to us either full-time, or for one semester, or for one full year.

Graduate Studies

The UCD School of Computer Science and Informatics currently has over 530 registered taught postgraduate students and an additional 120 research postgraduates. More than 20% are international students.

MSc and PhD programmes

Students are involved in diverse research projects across the entire spectrum of Computer Science. In many cases, we offer funded studentships. Completion of a PhD typically takes about 4 years after a Bachelor’s degree. Our students generally have a strong primary degree in Computer Science or a cognate discipline, but we welcome applicants from diverse backgrounds.

Taught graduate programmes

The UCD School of Computer Science and Informatics offers a range of taught graduate programmes at CPD, Certificate, Diploma and Masters level. These courses are modularised to facilitate access, continuing professional education and life-long learning. In fact, we even allow students to customize their learning contracts in line with their individual upskilling needs, through our innovative and award-winning Negotiated Learning model. Upon entering one of our graduate programmes you will begin on a path of intense intellectual stimulation, learning new skills and dramatically expanding your knowledge of your chosen discipline. It is a tremendously rewarding experience and one that will both enrich your life and enhance your career prospects. Here is a list of programmes available:

- MSc Advanced Software Engineering
- MSc Digital Investigation and Forensic Computing
- MSc Computer Science by Negotiated Learning
- MSc Computer Science (Conversion)
- MA/MSc Cognitive Science
- MSc Forensic Computing and Cybercrime Investigation
- Graduate Certificate in Computer Science
- Graduate Diploma in Computer Science
Research

Computer Scientists are trying to answer the following question: How can we efficiently and accurately automate tasks using computers? Our academic staff and researchers have made many important research contributions to this broad field. Our accomplishments are focused around the following research themes:

- **Knowledge Discovery**: This theme deals with the application of sophisticated algorithmic solutions, including machine learning techniques, to carry out research in the sciences, industry and finance, extending to modelling and visualisation of phenomena.
- **Language and Cognition**: This theme focuses on the modelling of cognitive phenomena relating to speech and language processing.
- **Software and Systems Engineering**: This theme deals with the design and construction of large scale, distributed and embedded software systems, including sensor, autonomic and pervasive systems.
- **Networks and Distributed Systems**: This theme focuses on the design and optimisation of networks and distributed systems, including multimedia networking, mobile and wireless systems, and high-performance heterogeneous distributed systems.

Knowledge Discovery

The Knowledge Discovery theme encompasses a broad range of distinct research areas that focus on the transformation of various data sources into sources of knowledge, e.g. predicting protein structure from gene sequencing data. In many cases, the modelling, learning, reasoning and visualisation techniques used in this transformation process are computationally expensive. Hence, the manipulation of data not only requires the development of effective algorithms, but also efficient ones. CSI researchers are applying their ground-breaking knowledge discovery techniques to interesting real-world problems in the sciences, industry and finance.

Language and Cognition

Language and Cognition research at CSI focuses mainly on the modelling of cognitive phenomena relating to speech and language processing, and the design of real-world systems that automate complex processes such as speech synthesis, language translation and text understanding.

Software and Systems Engineering

Software and Systems Engineering is concerned with concepts, processes and tools that support the timely and cost-effective development and maintenance of quality software systems. Although Software and Systems Engineering are considered distinct disciplines they have a synergistic relationship, where developments in one field influence the other. This relationship is also evident in CSI research output where contributions from both fields are used to inform the design and development of embedded, sensor, autonomic and pervasive systems.

Networks and Distributed Systems

This theme focuses on the design and optimisation of networks and distributed systems, including multimedia networking, mobile and wireless systems, and high-performance heterogeneous distributed systems. Distributed Systems consist of a collection of autonomous computers, connected through a network and managed with distributed system software that coordinates their activities so that users perceive the system to be a single, integrated computing facility. Next Generation Networks and Distributed Systems: This theme deals with the design and construction of large scale, distributed and embedded software systems, including sensor, autonomic and pervasive systems.

Innovation

The School is committed to fostering entrepreneurship and innovation and works closely with NovaUCD (www.ucd.ie/nova), the Innovation and Technology Transfer Centre, which is the hub of innovation and knowledge transfer activities at University College Dublin.

Changing Worlds www.changingworlds.com

UCD CSI Professor Barry Smyth co-founded award-winning software company ChangingWorlds, which transformed the burgeoning area of online personalisation and which was purchased by Amdocs in 2008. Professor Smyth now heads up CLARITY, a massive industry-linked research consortium on gathering, sorting and delivering information to consumers (www.clarity-centre.org).

HeyStaks Technologies www.heystaks.com

HeyStaks Technologies is a UCD social Web search start-up that helps to make mainstream search engines like Google and Bing more social. It allows searchers to collaborate with friends and colleagues as they search for information online, and, according to the company, it improves the productivity of the average searcher by up to three times.

Forkstream www.forkstream.com

CSI researcher Dr. John Fitzpatrick and Dr. Hamid Nafaa founded Forkstream in 2012 as a spin-out from UCD and recently secured commercialization funding for it. Forkstream allows mobile network operators to switch data traffic between cellular and WiFi networks to maximise the customer’s quality of experience and reduce network load.

Wattics www.wattics.com

Wattics is a UCD spin-out company founded by Dr Antonio Ruzzelli, Research Fellow at CLARITY Centre for Sensor Web Technologies at UCD. Now based at NovaUCD, Wattics has developed software that lets a company see where its power is being used without the need for extensive metering.

Logentries www.logentries.com

Logentries was founded in 2010 by Viliam Holub and Trevor Parsons on the back of a decade of research at UCD CSI’s Performance Engineering Laboratory. The company helps large organisations discover the root cause of IT issues and manage their software systems better.

Scream Technologies www.screamtechnologies.com

UCD CSI Lecturer Dr Peter Cahill is founder of Scream, which develops custom voice technologies and tools for enterprise and video games that take the headaches out of large-scale professional voice recording and production.

Strategia strategia.hyden.it

UCD CSI Senior Lecturer Damian Dalton is founder and CEO of Strategia an international company which designs and delivers power analysis solutions and service for the Cloud and data centre environment that support the Green agenda, reduce operational costs and increase efficiencies.

Contact Us

Please email or write to the School for more information on the undergraduate and graduate courses, or our innovation and research.

UCD School of Computer Science and Informatics, University College Dublin, Belfield, Dublin 4.
Email: csi.secretary@ucd.ie
Tel: +353 1 716 2483 +353 1 716 2469
Fax: +353 1 269 7262
www.ucd.ie/csi
Twitter @UcdCompSci
MSc in Advanced Software Engineering
UCD School of Computer Science & Informatics

Why is this course for me?
The MSc in Advanced Software Engineering is designed for industry-based software engineers. In recent years Software Engineering has undergone a shift in emphasis from the traditional, process-oriented approach to more lightweight approaches where the emphasis is on the programmer, and the development of flexible, maintainable code. This masters programme aims to provide the industrial software engineer with the foundational skills necessary to apply new developments in their own work. They are exposed to technologies, methodologies, processes and theories currently under research and development but which may become mainstream in the future. The 2-year part-time programme starts in January and comprises a set of 6 specialised modules and a Masters dissertation. Each module runs as a full-time, intensive course over five consecutive days in order to facilitate the participation of industry-based software engineers. Modules typically comprise lectures, hands-on laboratory work, and assignment/essay work. The MSc may also be taken full-time over 1 year in which case it follows a slightly different structure.

What will I study?
Specialised Modules
(This is an indicative list – three or four specialised modules are offered in each year.)
- Performance of Distributed Systems
- Design Patterns
- Managing Software in Production (in conjunction with Google)
- Mobile Application Development for Android Platforms
- Mobile Application Development using CocoaTouch
- High-Performance Computing
- Agent-Oriented Software
- Comparative Software Engineering Process Frameworks
- Knowledge-based Techniques

Programme outcomes
Students gain knowledge of the latest theories and research in software engineering, learn about some new, emerging technologies and methods and develop new skills through labs and practical work. Learning outcomes will vary depending on module choices and availability and are detailed on our web site.

What are the career opportunities?
This Masters programme aims to give industrial software engineers the skills to incorporate new concepts, methodologies, tools and practices they learn on the course into the projects they are working on in their companies. Students may be experienced software development professionals who feel that they are missing out on certain developments, new technologies or topics in software engineering that they would not normally be exposed to in their job. Participants value the opportunity to meet other professional software engineers from different backgrounds and experiences and get a different perspective, opening their minds to new and different aspects of software engineering.

For some, the course will open the door to the research world and opportunities to publish a paper on their Masters project and present it at a conference. Many participants have used this masters as a stepping stone to a significant career advancement.

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UCD School of Computer Science & Informatics
The School is one of seven Schools within the College of Science. It has an excellent reputation among students, staff and employers, for the range and quality of its programmes. The 2011 QS World University Ranking exercise revealed UCD to be the highest ranked University in Ireland for the subject discipline of computer science. The School is currently enjoying its most successful period to date with a rapidly expanding curriculum and research agenda matched with growth in student and staff numbers. The School currently has over 530 registered taught postgraduate students and an additional 120 research postgraduates. More than 20% are international (non-EU) students.
Graduate testimonials

Paddy Fagan (MSc 2007), Chief Architect - Platform Group, Cúram Software, IBM Software Group, Ireland

The structure of the course, with week long intensive modules, appealed to me. I really enjoyed the opportunity to study with a varied group of motivated people with a range of industry experience who always brought a new take or interesting perspective to each topic on the course. The course also brought me into contact with topics in Computer Software that I hadn’t previously been exposed to in my professional or academic experience. I found the course to be a rewarding experience, both in personal and professional terms, and feel that having completed it I have a more rounded set of experience to draw on, even though I’m still with the same employer!

Dinh Doan Van Bien (MSc 2008), DevOps Lead / Release Manager at Renaissance Re Ltd.

What I liked the most were the lectures and the interaction with the lecturers and the other students. It was a real change from the daily work routine and it was great to meet motivated and smart people from different horizons and countries. Returning to college to do this Masters has been one of my smartest career moves. It has boosted my self confidence, motivated me to improve my writing skills (English is not my first language), and helped me land a new job at a top company in a tough economical environment (first quarter of 2009). Personally, the achievement I value the most was getting two academic papers published in 2009 and getting to go to a conference to present my work. These papers were based on my masters’ dissertation work. This was something I did not imagine I could do. I believe the masters’ structure and scope have really enabled me to exceed my own expectations and become a better software engineer.

Melania Fedeli (MSc 2009), Team Leader / Project Manager at Ardency - Milan

After several years of experience I didn’t really want to specialise on something very narrow and the UCD proposal is quite broad and gives you the latest on research on some amazing technologies and methods while valuing the pragmatism of labs and practical results. It was also refreshing going back to college and brought me back to regain a deep level of concentration that is simply unreachable in an open space! I highly recommend this masters degree; it’s a great chance to meet interesting people and broaden your knowledge on the hottest topics in Software Engineering.

Google Excellence Award

Since 2010, Google provides a coveted Excellence Award to the best project annually on the MSc in Advanced Software Engineering. The previous winners of this prestigious award are:

■ 2012, Maire Regan, A Comparison of Android and iOS application development, supervised by Dr. Mel Ó Cinnéide.
■ 2011, Fergus McCann, An Exploration of General Purpose Programming on Graphical Processing Units, supervised by Dr. Neil Hurley.
■ 2010, Kevin Foley, Multi-criteria Optimisation of Non-negative Matrix Factorisation Problems Using Pareto Simulated Annealing Techniques, supervised by Prof. Pádraig Cunningham. Kevin subsequently published a paper on his project and won the best paper award at AICS 2011.

Why study at University College Dublin?

Some of the reasons to study at UCD

■ In the top 1% of the world’s universities and Sunday Times University of the Year 2012
■ Ireland’s largest provider of graduate education
■ A diverse university, both in academic disciplines and culture
■ Emphasis on research and innovation
■ Purpose-built, modern parkland campus, close to Dublin city centre
■ Extensive range of campus accommodation options.

How do I apply?

Entry Requirements

Students entering this programme are expected to have at least a 2.1 honours bachelor’s degree in Computer Science (or a cognate discipline), and have a subsequent two or more years of industrial experience in software development. Prerequisite skills include a high degree of proficiency in object-oriented programming, a working knowledge of object-oriented design using e.g. UML, and experience in software development as part of a team. Each application will however be assessed on a case-by-case basis, and exceptions to these rules may be made. Applicants are required to demonstrate a high level of competence in English. See website for details of our requirements.

Application process

All applicants must register their application through the UCD Online Graduate Applications System (www.ucd.ie/apply). Applications completed fully by the last day of the month will be processed in the following month. Please note that the final date to apply for the part-time masters starting in January is in the preceding November. If you have problems or questions while making your application online, please email the Online Applications Team applications@ucd.ie.

Flexible delivery options

Most people take this Masters part-time whilst working full-time in the software industry, but it is also possible to study full-time.

Part-time programme

The 2-year, part-time programme starts in January and comprises 6 specialised modules (60 credits) and a Masters dissertation (30 credits). If the candidate passes all modules at honours standard, he/she may proceed to the dissertation component. Otherwise, the candidate graduates with a Graduate Diploma. Each module runs as a full-time, intensive unit over five consecutive days (9am–5pm, Mon–Fri). The dissertation period commences in May of the second year and the dissertation must be submitted by the following December. Each specialised module typically comprises 24 hours of lectures, 16 hours of hands-on laboratory work, as well as assignment/essay work to be undertaken in the student’s own time.

Full-time programme

The 1-year, full-time programme starts in September and comprises coursework (60 credits), undertaken between September and May, and a Masters dissertation (30 credits), undertaken during the subsequent summer months (June-August). Candidates must pass all modules at honours standard to proceed to the dissertation component. Full-time students take 3 or 4 of the specialised modules, amounting to 30 or 40 credits in total. The remaining 20 or 30 credits of their coursework is made up of general modules.

Contact

The Programme Director - Dr. Mel Ó Cinnéide mel.ocinneide@ucd.ie
Programme Administrator - Ms. Imelda Huggins imelda.huggins@ucd.ie
UCD School of Computer Science and Informatics
University College Dublin
Belfield, Dublin 4, Ireland
Telephone: +353 (0) 1 716 2906

Fee Information

For information on fees, please visit: www.ucd.ie/registry/adminservices/fees or email studentdesk@ucd.ie

Useful Links

www.ucd.ie
www.csi.ucd.ie
http://csserver.ucd.ie/~meloc/MScASE/Introduction
Why is this course for me?

Cognitive Science is an interdisciplinary field that has evolved during the past few decades at the intersection of a number of existing disciplines, including linguistics, computer science, philosophy, psychology and neuroscience. Each discipline makes its own distinctive contribution to the goal of teasing out the relationships between minds, brains and behaviour. A wide range of lecturers from the UCD Schools of Computer Science & Informatics, Philosophy, Psychology and Linguistics contribute to this programme. We offer a range of degrees in Cognitive Science.

The most common option is the one year (12 months) taught masters degree, in which students take 9 months of courses and complete a substantial research project, which counts for 30% of the final grade, leading to either an MA or MSc (depending on the background of the student).

We also offer thematic research degrees at Masters and PhD level and a Graduate Diploma where the student takes the taught modules of the Masters programme, but does not do the research project.

The programme is aimed at those who are interested in issues relating to the understanding of the human mind from philosophical, psychological, and computational perspectives. Advanced computational skills are not a pre-requisite. The course is not a vocational training, but would be an ideal preparation for students hoping to tackle advanced research topics at PhD level.

What will I study?

Course offerings may vary somewhat from year to year, and additional modules may be made available as resources permit. Students enrolled in the taught masters and graduate diploma programmes take 8 modules, usually all of the 7 core modules and either General Linguistics or Biostatistics. Course choices are agreed between the student and the course directors. Research students also take 8 taught modules selected from the cognitive science offering, and may include some modules in generic and transferrable research skills. http://cogsci.ucd.ie

Core Modules
- Philosophy of Mind
- Cognitive Psychology
- Behavioral Neuropsychology
- Connectionism and Dynamical Systems
- Cognitive Modelling
- Advances in Neuroscience
- Topics in Cognitive Science: Post-cognitive approaches

Additional Modules
- Biostatistics
- Linguistics
- Human Computer Interaction

What will I learn?

In the course of the programme, students will:
- Come to be familiar with the problems associated with minds, brains, and behavior and the theoretical approaches to them

What are the career opportunities?

This is not a vocational course. In the course of one year we cover a very broad range of material, thus greatly increasing the breadth of academic exposure of our students. Historically, about half of the students go on to do PhD studies, and many others look for work in research. Critically, this course will not make a psychologist out of a non-psychologist, or an IT specialist out of someone who is not an IT specialist upon entry. It will hopefully enable students to tackle research issues they might not have been able for before, and to do PhDs in areas that would not have been possible before. It also has the potential to enrich one's engagement with a very broad range of challenging material. Many students pursue this course because of a passionate interest in our scientific understanding of what it is to be human.

Please note that a cognitive science degree is not part of an accredited programme towards a clinical degree.
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Graduate testimonials

Eileen Wahl
Eileen Wahl (MSc Cognitive Science) is from Kentucky and gained her Bachelor of Science in Biological Sciences from the University of Notre Dame, Indiana. She likes the interdisciplinary approach of Cognitive Science. Her favourite class was Advances in Neuroscience where every week they got a couple of papers to read and discuss in class. “I felt that I really grew as a scientist by being able to critique other people’s papers and to think about those issues when I am doing my own science work. I would certainly recommend this programme to international students as you get to meet people from all different countries.”

Robert Foley
Robert Foley took the course after completing a single major in philosophy. “Taking the cognitive science MA provided me with the context, the resources and impetus to explore the questions I was interested in from a multitude of new angles. It afforded me the opportunity to get to grips with state of the art neuroscientific, psychological and linguistics literature as well as learning the fundamentals of computer programming, robotics, modelling, AI, and research methods and statistics. More importantly, it provided me with a breadth of understanding and a depth of knowledge that I feel has been essential for my ability to go on and do the research I am doing (which crosses the boundaries between philosophy, psychology and neuroscience). The restriction on the number of applicants accepted, which has been kept admirably low, means that you have genuine contact with your instructors and a real sense of community amongst the people who attend the course. Since, I have returned to do my PhD. I have been impressed by the consistent quality of the students who take the course and by how the course itself has developed and become even richer than I remember it being when I took it. The cognitive science MA provides you with options as to which direction you will go afterward if you are intending to continue in academia as well as providing many skills that are much sought after in the private sector.”

How do I apply?

Applications for MA, MSc and Graduate Diploma courses are accepted up to mid-July for the September start each year. PhD students are admitted on a continual basis throughout the year.

Entry Requirements
Prospective students must have a good honours undergraduate degree in one of computer science, psychology, philosophy, linguistics, neuroscience, or a cognate discipline. Typically a minimum final grade of 8.1 or equivalent is expected. Applicants are required to demonstrate a high level of competence in English as the course requires a lot of written work and reading in primary literature in a variety of fields, including philosophy. Our website gives details of our requirements.

Application process
All applicants must register their application through the UCD Online Graduate Applications System (www.ucd.ie/apply). Your online application will request details of previous degrees, references from two academic referees, as well as a 400-600 word statement of research interest which outlines your reasons for wanting to follow this course. Official transcripts from your university will also be required. The Cognitive Science programme is listed under the School of Computer Science and Informatics. Application instructions and relevant documents are available on our web site http://cogsci.ucd.ie. If you encounter difficulties, please contact us. Applicants to the PhD programme must first establish direct contact with the programme director. Before an application can be considered, a topic of research and an appropriate supervisor must be agreed upon.

Flexible delivery options
We also offer the programmes on a part-time basis over 2 years. A study plan will be arranged on an individual basis to suit the needs of the student. Part-time students typically attend campus for one day a week, and conduct further study on their own time. Contact the course directors for more information.

Teaching and Learning
Modules typically comprise one two-hour lecture per week for one semester with 12 two-hour lectures in total. Students will spend a significant amount of time in self-directed reading, as well as the lectures and labs. Some modules also require a significant amount of project work in groups.

Evaluation
Courses are evaluated using a wide variety of instruments including essays, examinations, exercises, group projects, blog posts, etc. Satisfactory attendance and active contribution is required of all students.

Contact
Enquiries on the programme or application process may be directed to the course directors:
Fred Cummins (Computer science) email: fred.cummins@ucd.ie
Maria Baghramian (Philosophy) email: maria.baghramian@ucd.ie
School of Computer Science and Informatics
UCD, Belfield, Dublin 4, Ireland

Fee Information
For information on fees, please visit: www.ucd.ie/registry/adminservices/fees or email studentdesk@ucd.ie

Useful Links
Programme web site: http://cogsci.ucd.ie
UCD Online applications page: http://www.ucd.ie/apply/howtoapply.html
www.ucd.ie/
www.csi.ucd.ie
Why is this course for me?

At a time when sustainable employment is under threat, skilled IT professionals are in high demand. UCD is now offering a skills conversion course for individuals who hold a primary degree in another discipline (e.g., Arts, Commerce), and would like to enter into an IT related career. This 15-month intensive postgraduate programme provides a thorough foundation in the practical aspects of the development and management of modern information systems. UCD offers this MSc in conjunction with the Institute of Public Administration (IPA), which is a recognised college of the National University of Ireland. High achieving graduates from this degree may then be eligible to pursue a research postgraduate degree.

What will I study?

This full-time MSc runs over three semesters, over 15 months from September 2013 to December 2014. Semesters 1 and 2 run from September to July of Year One, Semester 3 runs from September to December of Year Two. Students take course modules worth 90 credits in Semesters 1 and 2. Students may exit after Semester 2 with either a Graduate Certificate (30 ECTS) or a Higher Diploma (60 ECTS), provided they have obtained the appropriate number of credits. The module list below is indicative of current module availability and this may change depending on resources. Please check with the School before applying for the course to find out which modules will be available for you.

Course Structure:

Students will take all the following modules. Modules consist of between 24 and 48 hours of lectures, supplementary practicals and autonomous student learning.

Semester 1 (Sept – Dec 2013)
- 1. Introduction to Internet Technologies.
- 2. Introduction to Java Programming.
- 4. Foundations of Hardware and Software (Course extends over two semesters).

Semester 2 (Jan – April 2014)
- 4. (Continuation)
- 5. Introduction to Databases & Information systems.
- 6. Advanced Java, Data structures and Algorithms.
- 8. Programming project commencement.

Summer Term (May – July 2014)
- 8. (continuation)
- 9. Systems Management

Programme outcomes

On completion of the programme and depending on which modules have been selected, students will:

- Be familiar with the concepts and technologies involved in the creation of feature rich web sites and in the management of such projects (html, html5, xml, scripting, databases, Flash, Photoshop etc)
- Understand the core principles of programming and be able to write simple programs that solve problems, process different types of information, and control file input and output
- Understand how to design, develop and query databases and gain experience in building a relational database.
- Understand Operating Systems, networking and hardware components and provide support and troubleshoot these areas and devices
- Understand the fundamentals of SQL and how to build a database
- Have the knowledge and skills necessary for a career supporting a Windows network environment
What are the career opportunities?
Statistics will show that even in Ireland’s recession, there are approximately 4,000 IT jobs available at any point in time, and it is expected that this demand will continue. However, the School cannot guarantee any job to an individual student. An employer will not judge a potential employee solely on their academic performance. Other factors based on the character, attitude and non-academic disposition of the employee, are equally important for most employers and these are outside the scope of the course.

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UCD College of Science
The College is dedicated to the creation, delivery and communication of new knowledge and innovation across the spectrum of Science. With a staff of 750 and a student population of 5500 including 1800 postgraduate students, the College is a vibrant community dedicated to excellence in all our pursuits.

Graduate testimonials
Anthony McCourt
Anthony McCourt (MSc 2012) had worked as a pharmacist for 10 years before starting the MSc. He had an interest in IT and software and sought a career change into this area. After graduating he went straight into working in a software start-up in the area of speech technologies. “The sheer volume of content on the course is great. You get a taste of the full spectrum of subjects, so by the end of the course you are pretty sure what you like and what you’re good at. The biggest challenge was the huge amount of work and the associated time pressures, especially considering I had no prior IT training and was still working every weekend as a pharmacist. I would say to anyone thinking of doing the course to prepare yourself for a lot of work, but the reward is huge. The amount you will learn is incredible.”

Emily Castles
Emily Castles (MSc 2012) is now a Ruby on Rails developer at RedHills Software. “Having studied Civil Engineering, I already had a technical background and had completed a couple of Computer Science modules involving Visual Basic and C++. I had picked up some basic programming logic from these but I’m not sure that it gave me much of an advantage over other students in the masters. I knew I wanted to work in the area of web development. Initially, I was exploring the idea of e-commerce and multimedia courses that included development modules but in the end I decided that I would prefer to get a good base knowledge in programming before specialising into any area. The Data Structures and Algorithms course I took in the final semester was vital for succeeding in interviews and technical tests. Other modules, such as Context Sensitive Service Delivery and the summer project, required us to conceive and build our own applications, which allowed me to practically demonstrate my skills to potential employers. I would advise anyone undertaking the course to try to accumulate a portfolio over the course of the masters which will be useful during the subsequent job hunt. To someone thinking of doing this course I would say that the global IT industry at the moment is alive and kicking. There’s such a vibrant community that I’m glad to be involved with. Undertaking the MSc in Computer Science will position you to be a part of this community. You will not be an expert programmer by the end of the course but it will give you the foundation to enter the IT workforce and continue to learn on the job.”

UCD School of Computer Science & Informatics
The School is one of seven Schools within the College of Science. It has an excellent reputation among students, staff and employers, for the range and quality of its programmes. The 2012 QS World University Ranking exercise revealed UCD to be the highest ranked University in Ireland for the subject discipline of computer science. The School is currently enjoying its most successful period to date with a rapidly expanding curriculum and research agenda matched with growth in student and staff numbers. The School currently has over 530 registered taught postgraduate students and an additional 120 research postgraduates. More than 20% are international students.

How do I apply?
Entry Requirements
Applicants are required to demonstrate a high level of competence in English. See website for details of our requirements. In order to qualify for admission to the degree, a student must have a good honours undergraduate degree in another discipline. Computer Science is a mathematical subject involving logical understanding and reasoning. While a primary degree with some element of maths is not required, typically students with such a degree would find the course more challenging than those who have studied maths to a higher level.

Application process
All applicants must register their application through the UCD Online Graduate Applications System (www.ucd.ie/apply) Only complete applications will be considered.

Flexible delivery options
The course is delivered concurrently in UCD Belfield and the IPA in Lansdowne Rd, Dublin 2. Students have full access to all IPA facilities: computer labs, library, canteen and gardens and in UCD they will enjoy all services and facilities of full-time registered students e.g. access to the campus library, sports centre etc. There are normal vacation periods at Easter, Christmas and the month of August. In the academic year there are approximately 15–20 hours of scheduled lectures and tutorials per week. However, it is expected that students apply an equal number of hours of private study. Some of the teaching is live and streamed on-line, depending on the modules chosen. Students can also avail of the UCD School of Computer Science Computer Programming Support Centre which provides assistance on a range of topics including programming and web support.

Assessment
Each of the IPA subjects will be assessed by an IPA examinations- and/or also by an in–house assessment. Each of the UCD subjects will be assessed by a series of ongoing assessments and a final examination for each subject. The MSc uses the grading scheme in use in UCD. The program team will be jointly responsible for the assignment of final grades.

Course Directors
(UCD) Director_MSc_Conv@ucd.ie
Tel: +353 (0) 1 7162477 (IPA) Mr Martin Speers, Director of M.Sc. (Conversion), email: martin.speers@ipa.ie,
tel: 353 (0) 1 2403651

Contact
Enquiries on the programme or application process may be directed to:
Ms Clare Comerford,
Programme Administrator
UCD School of Computer Science and Informatics
University College Dublin
Belfield, Dublin 4, Ireland
Email: csi.secretary@ucd.ie
Telephone: +353 (0) 1 716 2483

Fee Information
For information on fees, please visit: www.ucd.ie/registry/adminservices/fees or email studentdesk@ucd.ie

Useful Links
www.ucd.ie/
www.csi.ucd.ie
Once a student is accepted onto the programme they undergo a detailed assessment of their personal training needs. During the training needs assessment (TNA) the prior experience of the student, their personal knowledge gaps, and their career plans are carefully considered. The objective of the TNA is to use this information to guide the negotiation of a student-centered learning contract that consists of 60 credits of taught modules and a 30-credit research practicum. Currently there are more than 100 module options offered in conjunction with the UCD Schools of Business, Physics, Information & Library Studies, Mathematical Sciences, Philosophy, Psychology, Law and The NovaUCD Innovation and Technology Transfer Centre. Importantly, modules are subject to regular feedback and review in line with rapidly changing industry needs. Students may prefer to negotiate a learning contract with a very specific thematic focus. Support and guidance is also given to students seeking to do this. Alternatively, they may opt to make their module selections from one of the pre-defined thematic streams covered by the programme.

Samples of thematic streams include:
- Mobile Application Development & Advanced Programming
- Information Security & Digital Forensics
- Applied Computing & Innovation
- Simulation Science
- Cloud Computing
- Sensor Technologies & Social Computing
- Knowledge Discovery & Information Management
- Software & Systems Engineering
- Networks & Distributed Systems
- ICT & Bioinformatics
- Language & Cognition
- Artificial Intelligence

Why is this course for me?

Our MSc in Computer Science is the most flexible and innovative programme of its kind in Europe. It implements a negotiated learning (NL) model that is attractive to those with specific learning goals coming from an ICT background. The NL model is vastly different from the traditional structured graduate programme model where students tend to have restricted choice (if any), and are often expected to take modules that have little relevance to key areas where they have personal learning requirements. Instead, the NL approach allows for learning contracts to be negotiated with the objective of addressing the specific needs and career aspirations of each individual. Module choices range from programming in Java/C/C++/Ruby... to Cloud Computing... to Bioinformatics... Data Mining... Mobile Application Development... Robotics, as well as other relevant modules in complimentary disciplines.

Unique Benefits to Students
- Flexible module choice (<100 module offerings)
- Individual assessment of training needs
- Negotiation of a personal learning contract
- Recognition of prior learning (certified and experiential)
- Industry-informed curriculum in line with employment opportunities
- Elective modules offered across complimentary disciplines (e.g., Mathematics, Innovation, Business)
- Winner of 2012 GradIreland Postgraduate Programme of the Year – IT
- Supported by the National Academy for the Integration of Research, Teaching and Learning (NAIRTL)
- Fees are subsidised by the Graduate Skills Conversion Programme as part of the NDP

What are the career opportunities?

Graduates of the programme have quickly secured employment both in Ireland and overseas. The prospects are many and diverse. Previous graduates have been recruited to roles in areas such as: hardware design, software engineering & QA, data programming & analysis, commercialisation of technology, teaching & training, senior management & CEO roles, security & forensics consultancy, bioinformatics R&D, etc. Examples of industrial graduate employers include: Google, SAP, Intel, PayPal, Deloitte, Microsoft, Symantec, HMH, Vilicom, Murex, NYSE Technologies, Realex Payments, Version1, Salesforce, Pfizer, Ericsson, Intune Networks and Eircom.

A further unique aspect of the programme is that we continually invite our ICT industry partners to get involved in the formation, design, and delivery of cooperative thematic streams where they see real growth/employment opportunities within their own business.
Graduate testimonials

Paul Kelly, Test Engineer at PMI Software

“In 2009 I became unemployed. Interviews were scarce. When I became aware of this programme I felt it was an excellent opportunity to up-skill and reinvent myself. This proved to be the case. The modules available were varied and flexible enough for a student to design a particular stream of learning. I negotiated a ‘contract of modules’ in ‘applied computing’ that would complement my work experience. Although the course was challenging it was facilitated by an excellent communication flow between course director, lecturers and administration. There was plenty of lab assistance and resources available. Stand out modules were the innovative ‘collective intelligence’ and new programming languages like ‘Ruby on rails’. After graduation I felt more confident and equipped for applying for work. I am now employed full time as a QA Engineer. I would unquestionably recommend this rewarding programme to postgraduates who want to up-skill with innovative learning in a flexible encouraging environment.”

Suzanne Cotter, QA Lead at Houghton Mifflin Harcourt

“I found the Masters in Computer Science by Negotiated Learning very innovative and challenging. It was a great initiative to allow students to effectively choose their own Masters, allowing a good deal of flexibility among subjects while still retaining a structured syllabus. There was a good mix of coursework and exams making the workload very manageable. There was also quite a bit of practical work involved in the different modules, showing the application of the information in real life scenarios clearly. I was able to specialise in two different areas that I found interesting and this has led to me getting two different roles since I’ve graduated. Employers are very impressed by a Masters in Computers Science, I have discovered.”

Rohan Singla, Consultant, Deloitte

“Choosing to come to UCD, Ireland for a Masters in Computer Science (Negotiated Learning) was one of the best decisions I’ve ever made. After working in India for a year I thought of going abroad for further studies. I had been exploring a lot of options for my Masters and selected UCD. Although the MSc in Computer Science (Negotiated Learning) course I attended was just in its 2nd year of initiation, UCD Computer Science School’s reputation made me feel safe about my decision. I personally found the course to be very good, offering a wide range of modules from different schools and not only Computer Science. The degree has provided me with both a theoretical and practical background allowing me to apply my knowledge in practical and verbal ways in the industry. Apart from studies, UCD is a great campus with many activities going on every day. I have recommended the MSc in Computer Science course to many students since graduating from it. I would recommend UCD’s MSc in Computer Science to anyone looking to pursue a degree in this area.”

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How do I apply?

Entry Requirements

This programme is intended for applicants with a Computer Science or ICT background.

Applicants are required to have:

- A minimum second-class honours degree in computer science or related area or a minimum of three years’ relevant industrial work experience.

Other criteria include:

- A high level of competency in English. See link for details [http://www.csi.ucd.ie/files/u54/English_Lang_Req.pdf]

Online Application Process

All applicants must apply online at www.ucd.ie/apply

Flexible delivery options

The MSc programme may be taken full-time over 12 months or part-time over 24 months. Generally lectures and practicals for modules follow the standard daytime schedule. However, there is an opportunity to take a limited selection of both online and evening modules. For further information on the full list of modules and their related descriptors, please follow the link [http://www.csi.ucd.ie/content/module-offerings].

Contact

Ms Imelda Huggins [MScNL Programme Manager]
UCD School of Computer Science and Informatics,
University College Dublin, Belfield, Dublin 4, Ireland.
Email: imelda.huggins@ucd.ie
Telephone: +353 (0) 1 716 2906

Fee Information

www.ucd.ie/registry/adminservices/fees

Useful Links

www.csi.ucd.ie/msc
www.csi.ucd.ie/graduate-studies
www.csi.ucd.ie
What will I study?

The programme is highly practical and uses tutors from industry and law enforcement as well UCD academics. This course is open to both law enforcement and civilian experts.

Programme outcomes

On successful completion of the programme students will be able to:

- Perform forensic analysis of a personal computer running Windows operating system
- Understand legal issues in keeping information secure and in the conduct of investigations
- Understand the role and the use of digital evidence in litigation
- Prepare investigation reports and court testimony
- Analyse user activity in Windows OS
- Use crime scene search techniques, handle evidence and interview witnesses
- Prepare investigative reports and court testimony
- Perform investigations into misuse of IT in a corporate environment
- Investigate crime against computer systems including malware
- Deploy information security mechanisms
- Conduct independent research and convey the knowledge discovered to colleagues

Why is this course for me?

The MSc in Digital Investigation & Forensic Computing is designed for information technology specialists who need to acquire skills for the prevention and investigation of computer-related incidents. It introduces concepts, principles and professional practice in digital investigation, yet is highly practical and gives you information, knowledge and skills that you can apply straight away. It is delivered simultaneously in the classroom in Dublin and online allowing you to attend and participate from your home or office, coming to UCD only for workshops and examinations each year. You can take the MSc part time over two years or full time over one year. The programme is delivered in cooperation with the leading Irish experts in the field with an engaging mix of learning sessions, hands-on labs, case studies, tool demonstrations and in-depth discussions. A unique aspect to the course is the international student and alumni network that gives you an international perspective and global contacts that will be valuable in your future career.

Modules

- Computer Forensic Foundations
- Law for IT Investigators
- Application Forensics
- Investigative Techniques
- Corporate Investigations
- Information Security
- Digital Investigation Project

This is an individual research project on a real-world topic in digital investigation.
Why study at University College Dublin?
Some reasons to study at UCD:
- In the top 1% of the world’s universities, winner of The Sunday Times University of the Year award for 2012
- Ireland’s largest provider of graduate education
- A diverse university, both in academic disciplines and culture
- Emphasis on research and innovation
- Purpose-built, modern parkland campus, close to Dublin city centre
- Extensive range of campus accommodation

UCD College of Science
The College is dedicated to the creation, delivery and communication of new knowledge and innovation across the spectrum of science. With a staff of 750 and a student population of 5500 including 1800 postgraduate students, the College is a vibrant community dedicated to excellence in all our pursuits.

UCD School of Computer Science & Informatics
The School is one of seven Schools within the College of Science. It has an excellent reputation among students, staff and employers for the range and quality of its programmes. The School is currently enjoying its most successful period to date with a rapidly expanding curriculum and research agenda matched with growth in student and staff numbers.

Centre for Cybersecurity & Cybercrime Investigation (CCI)
Since 1998, CCI has been working closely with law enforcement agencies and industry practitioners in seeking solutions to technology related crimes. CCI are special advisors to the European Cybercrime Training & Education Group at Europol and are members of the INTERPOL steering committee for the regional working parties on Hi Tech Crime Training. UCD CCI scientists continue to work on applied research and have developed a number of forensic tools.

What are the career opportunities?
Cybercrime and identity theft are among the fastest growing crimes, yet employers cannot find people who have the right mix of skills to work in this area. Graduates of the MSc are employed as project managers, developers and information security specialists, computer forensics and security analysts, test, audit and engineering specialists.

They work at IT companies such as Dell, Detica Group, Jinny Software, Symantec, Oracle, IBM Global Services, as well as in law enforcement agencies, in banks and financial institutions such as J.P. Morgan, Bank of Ireland, Central Bank of Ireland, Pioneer Investments and consultancies such as Ernst & Young.

How do I apply?
Entry Qualifications
Applicants to the MSc Digital Investigation and Forensic Computing normally have a bachelor’s degree in computer science or equivalent work experience. However, all applicants are assessed on a case by case basis.

Flexible delivery options
Most participants take the MSc part time over 2 years but it is also possible to do it full time over 1 year. Lectures are held at UCD two evenings every week during term time. A part time student doing the course over two years will attend 4 hours of lectures on Tuesday evenings in Year 1, switching to Wednesday evenings in year 2. Full time students attend lectures on Tuesday and Wednesday evenings. As some students choose to follow the course online, lectures are simultaneously broadcast live via the classroom website. While personal attendance at weekly lectures is not mandatory, students are required to come to Dublin for approximately 5-10 days each year to complete examinations & workshops. These sessions are normally held in May or June. In addition to lectures, students perform self-study assignments during the year, using their personal computers and UCD’s online computer lab. Hands-on practical assignments, which require laboratory equipment, take place at the end of the year in the form of intensive full-day workshops during the examination period. In addition, students may book time in UCD’s digital forensic lab and use the equipment for self-study during the year.

Applying Online
To apply online, please go to http://www.ucd.ie/apply

Fee Information
www.ucd.ie/registry/adminservices/fees
www.ucd.ie/registry/adminservices/fees
www.ucd.ie/apply
www.ucd.ie/apply

Contact
For general enquiries please contact the Programme Office:
Centre for Cybersecurity & Cybercrime Investigation
School of Computer Science and Informatics
University College Dublin,
Belfield, Dublin 4, Ireland.
Ms Eithne Bowen
Tel: +353 1 716 2486 Email: cci.info@ucd.ie

For further information on the content of the course please contact
Programme Director Dr. Pavel Gladyshev Tel: +353 1 716 2917
Email: pavel.gladyshev@ucd.ie

Useful Links
www.ucd.ie/cci
http://www.csi.ucd.ie/
http://www.ucd.ie/science/
http://www.ucd.ie/
https://twitter.com/UCDCCI
MSc in Forensic Computing & Cybercrime Investigation
UCD School of Computer Science & Informatics
UCD Centre for Cybersecurity & Cybercrime Investigation

Why is this course for me?
This programme has been specially designed for the law enforcement community. To develop the programme over the past ten years we brought in specialists to review and advise on content considering the needs of digital forensics investigators, computer crime specialists and IT security analysts. A unique aspect is the international graduate network from 47 countries. On the course, you share experiences, knowledge and ideas and gain a global perspective and contacts that will be valuable in future investigations. We offer a comprehensive programme of study options from short Continuing Professional Development courses to Master of Science. The MSc may be taken part time over two years or full time over one year. Lectures are delivered online allowing you to attend and participate from your home or office and attend UCD only for examinations each year. Learning takes place through an engaging mix of lectures, hands-on labs, case studies, tool demonstrations and in-depth discussions. The courses are highly practical and designed to give you information, knowledge and skills that you can apply straight away in investigations.

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■ Emphasis on research and innovation
■ Purpose-built, modern parkland campus, close to Dublin city centre
■ In the top 50 universities worldwide for international students and staff

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What will I study?
Courses are highly practical and use tutors from industry and law enforcement as well as UCD academics. They are designed to give you information, knowledge and skills that you can apply straight away. We offer two programmes in this exciting and fast-moving field. As well as the Forensic Computing & Cybercrime Investigation Programme we also offer an MSc in Digital Investigation & Forensic Computing which is open to both law enforcement and civilian experts working in the field of digital investigation & forensic computing.

Forensic Computing & Cybercrime Investigation Programme
This programme is available to participants from organisations which are responsible for the enforcement of national or local legislation. You may study as little as a single module taken as CPD or you can apply for qualifications at Master of Science, Graduate Diploma and Graduate Certificate level. The MSc is completed by building 90 credits from modules shown below.

Core Modules
MSc candidates are encouraged to take the following Core Modules in their first year:
■ Computer Forensics (10 credits)
■ Network Investigations (10 credits)
■ Introduction to Programming for Cybercrime Investigators (10 credits)
■ and one optional module
Module options

- Malware Investigation (10 credits)
- Mobile Phone Forensics (5 credits)
- Live Data Forensics (10 credits)
- Linux for Investigators (10 credits)
- Advanced Scripting (10 credits)
- VoIP and Wireless Investigations (10 credits)
- Money Laundering Investigations (5 credits)
- Open Source Intelligence (5 credits)
- Investigation of Sexual Abuse of Children on the Internet (5 credits)
- Case Study (10 credits)
- Research Project (30 credits – only available to MSc students)

Programme outcomes

Depending on the modules taken, on successful completion students will be able to:

- Conduct forensic analysis of a computer and use common network investigation techniques
- Investigate malware-based intrusions
- Perform mobile phone forensics
- Preserve and analyse volatile evidence contained in the main memory (RAM) of a computer system
- Use Linux forensics analysis tools and techniques
- Write custom tools for data analysis and build forensic applications
- Recover data using advanced techniques
- Overcome investigative challenges of VoIP and locating mobile users
- Investigate money laundering and trace illicit funds
- Find, use and analyse open source intelligence for actionable results
- Investigate cases of child sexual exploitation on the Internet

What are the career opportunities?

For law enforcement officers, having this qualification has the additional advantage of adding credibility to their testimony as expert witnesses. More and more crime is committed on the Internet, so the career development possibilities in this field are excellent. To date, over 300 law enforcement officers from agencies in 47 countries have completed the programme. Graduates include senior staff at Europol and INTERPOL, members of national and regional police forces and police training colleges, government ministries and agencies with LE powers, defence forces, specialist cybercrime agencies, revenue, customs and border protection.

Graduate testimonials

Many of our graduates are happy to speak to people who are considering taking the course. Ask to be put in touch.

Cindy Murphy – Detective, City of Madison, WI Police Department, USA.

“I would say to anyone considering doing the course to do it. It’s a good quality course, which fills a really needed space in law enforcement training and education. I found the collaboration with international law enforcement on of the most useful aspects of the course. I believe that the MSc is a great credential for court, and for my professional future. My dissertation has been published in a peer reviewed journal and has generated interest for other papers, a book chapter, and international speaking opportunities. Attending UCD provided an opportunity for my work to be noticed, and to begin to make a difference, on an international level.”

Richard Ross – Senior Forensic Investigator, HM Revenue & Customs, UK.

“The diverse backgrounds of the students on the program led to some interesting challenges when undertaking some of the group activities, not least from a geographical perspective. However, if anything, the cultural differences, different levels of experience and the opportunity to exchange information on local practices made the completion of these tasks even more fulfilling.”


“I am very honored that I have received this award! I would like to thank my family and all the members of the staff of FCCI. The result would not have been the same without their support! Also I would like to thank my employer for giving me the opportunity to study. Because this is the only Law Enforcement Masters in the field of FCCI, I felt I had to follow this course. With this qualification I think I can call myself an expert. This is a great course with excellent teachers. Also the administrative support is great! All you learn can be used almost directly in your work. UCD is a great University! It was a pleasure to study here!”

Detective Liam Walker – Computer Forensic Expert at the Police Service of Scotland.

“It was a very comprehensive course. I made many good contacts and friends, despite the fact that it was distance learning. But be prepared for the work involved!”

How do I apply?

Entry Qualifications

The programme is for members of law enforcement organisations including police, revenue and customs, government and defence forces. Applicants will normally have either relevant law enforcement qualifications or a bachelor’s degree or equivalent. However, applications are assessed on a case by case basis and CPD course applicants do not need to have a degree. CPD students without a computer science degree who perform well in their courses may apply for the MSc at a later stage; however, such progression is subject to agreement of the Programme Director and is not automatic.

Flexible delivery options

The Masters degree may be taken part-time over two years or full-time over one year. Lectures are pre-recorded and provided online via a virtual online learning environment. Students are required to come to Dublin, USA or the Netherlands for approx. 10 days to complete examinations and workshops in May/June each year. We hope to open an exam centre in North America in the near future. Depending on your module choices and whether you take the part- time or full-time option, be prepared to put 10-20 hours per week into your study. Despite the challenges, such as the different time zones of participants, many students have completed a MSc with a full-time job, children and other activities.

Applying Online

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Fee Information

www.ucd.ie/registry/adminservices/fees

Contact

For general enquiries please contact the Programme Office: Office: CSI/A0.03 Centre for Cybersecurity & Cybercrime Investigation School of Computer Science & Informatics University College Dublin, Belfield, Dublin 4, Ireland Tel: +353 1 716 2947 Email: cci.info@ucd.ie

Useful Links

www.ucd.ie/cci http://www.csi.ucd.ie/