Mission

E3 aims to develop the knowledge, technologies, and aptitudes to design and actively shape the planet’s natural capital, through its unique integration of engineering, natural and computer sciences.

Vision

To strengthen the interdependence between technological innovation and our natural capital stocks, through world-leading research, education and entrepreneurship.

Values

Foresight, Innovation, Transdisciplinarity, Global Responsibility and Excellence
“Taking up the challenge of ‘Balanced Solutions for a Better World’, E3 will address the challenges of our time; reconciling technological progress with a sustainable future for planet earth”

Dr. Patrick Prendergast
Provost, Trinity College Dublin
As a university we have a responsibility to work with society to address the most pressing issues of our time. Universities are centres of excellence for research and teaching. They act as focal points, working through a time and place, to inspire generations. At their best they uncover new knowledge and foster new ideas for the betterment of society and the planet on which we live.

In 2018 Trinity College Dublin launched its E3 initiative. Representing Engineering, Environment and Emerging Technologies, E3 is a radically new type of collaboration between the Schools of Computer Science and Statistics, Engineering and of Natural Science. It sets out to put the finite nature of our natural resources firmly at the forefront of Irish third-level education.

Coupled with a new capital project that provides purpose-built teaching and learning spaces, E3 will realise trans-disciplinary postgraduate programmes under the research themes of Data, Production, Well-being, Environment, Resources and Communities. These programmes will imbibe students with the skills they need to tackle the global challenges of today and tomorrow and to bring world-changing discoveries within their reach.

E3 presents a future-proofed education for new graduates via a suite of Postgraduate programmes across its constituent schools. These include a variety of new and existing Master programmes, from Environmental Science or Electronic Information Engineering, to Smart and Sustainable Cities.

As Dean of the Faculty, I warmly invite you to consider registering for an E3 Postgraduate Taught Programme. In doing so you will be taking the bold next step, not just in furthering your education but, as a participant in this exciting new venture. With our leading research professors and staff you will become a co-creator of your future and that of generations to come. Together we will seek out ‘balanced solutions for a better world’ and enable society to live on this planet in a more sustainable and equitable way.

Professor Sylvia Draper
Dean of the Faculty of Engineering, Mathematics, and Science
Trinity College Dublin is embarking on an ambitious project to expand education and research activities across three of its Schools: the Schools of Engineering, Natural Sciences, and Computer Science & Statistics.

Recognising the importance for humanity in addressing the challenge of sustainable technological development, the expansion of the three Schools is being executed as a single strategic activity in the area of "Engineering, Environment, and Emerging Technologies", or E3.

The E3 vision enables:

- the creation of a purpose built, multi-disciplinary, foundry for the delivery of innovations in research and teaching within the Schools of Engineering, Natural Science and Computer Science and Statistics.
- a future-proofed education for new graduates who will enable society to live on this planet in a way that is sustainable and equitable.
- the underpinning of the infrastructural and staffing needs of these expanded Schools to ensure that their outputs are world leading.
- An increase in the number of STEM students within Trinity by over one third in 10 years.

With E3, Trinity promotes the Vision of a society where the interdependence between technological innovation and our natural capital is advanced by world-leading research, education and entrepreneurship.

E3 will position Ireland at the forefront of fields of research in Science, Technology, Engineering, and Mathematics (the STEM disciplines), that are crucial for future economic competitiveness. It will educate engineers and scientists for employment in existing and new technology sectors, equip them with the skills and attributes to lead in the creation of new businesses, and place Ireland in a leadership role globally for the quality of graduates in the STEM disciplines.

Research in E3

As inherently curious and creative, humanity will always seek to both understand the world around us and to create tools, systems and processes that enhance our quality of life. As our understanding of our world grows, we now know better the effects, both positive and negative, that our way of living has on the world around us.

These effects lead to challenges that are inherently global, multidisciplinary and complex in nature. E3 will be among the first centres internationally to integrate engineering, technology and scientific expertise at scale in addressing some of the biggest challenges facing Ireland and the world – challenges such as climate change, renewable energy, personalised data, water, connectivity, and sustainable manufacturing, among many others. The span of E3 research has been defined using six E3 Research Challenges:
E3 and 40

The central theme of E3 is ‘balanced solutions for a better world’. E3 will be a crucial component in our transition to a ‘smarter’ economy, developing technological solutions that are more sustainable and more equitable in the use of the earth’s limited natural resources.

The E3 project aims to significantly increase the number of students in the E3 Schools. This will ramp up over ten years. The education of these students with a new pedagogy will be realised through the Martin Naughton E3 Learning Foundry, a state of the art 6,086 square metre facility based on the main Trinity campus, which will deliver new teaching facilities and an innovative interactive learning space for undergraduate and postgraduate students.

It will accommodate the substantial growth in the number of students and staff, and facilitate an innovative curriculum with increased emphasis on team work, design and project-based activities that will draw the teaching activities in the E3 Schools closer together. Work will commence on the space this year, with a projected completion date of 2023 on the cards.

E3 Research Institute

Building on its tradition of innovation, entrepreneurship and engagement, the expected development of the Grand Canal Innovation District (GCID) being championed by Trinity will afford another opportunity to contribute to the development of Dublin as an innovation centre. At the heart of GCID, and ensuring connectivity to the wider innovation ecosystem, the E3 Research Institute will be a venue for large-scale research programmes, especially for those working in collaboration with industry and other stakeholders.

E3 Research Institute will tackle the fundamental issues of a liveable planet, the technological development that is needed for our economy and society, and the social behaviours that emerge or that need to be fostered.

At the core of the E3 Research Institute is a recognition that technology must evolve in symbiosis with the natural and human world. The natural world furnishes us with resources that are needed for economic activity and for society, and that economic activity in turn impacts on the natural world.
An innovation district will connect indigenous and multinational companies together with researchers and venture capitalists. Such a district will produce a sum that is greater than its parts, driving inward investment, new collaborations and jobs. Its benefits will be brought to the regions through virtual connections and the sharing of research, best practice and space.

Science Foundation Ireland centers:
- CONNECT - Ireland’s Research Centre for Future Networks and Communications
- ADAPT - The Global Centre of Excellence for Digital Content and Media Innovation (Irish Centre for Research in Applied Geosciences)
- ICRAG - Ireland’s national geoscience research centre, located at UCD (Advanced Materials and BioEngineering Research) - Centre that provides a partnership between leading researchers in materials science and industry
- Amber - State-of-the-art electron and laser beam equipment for the characterisation of geoscience material
- CRANN - Advanced Microscopy Laboratory (AML) Structures Testhalls - Civil, Structural & Environmental Engineering

Trinity Research Centres:
- Trinity Centre for Creative Technologies & Media Engineering (CHIME)
- Trinity Centre for Biodiversity Research
- Trinity Centre for Biomedical Engineering
- Trinity Centre for Creative Technologies & Media Engineering

Trinity analytical and test facilities:
- iCRAG LAB@TCD - State-of-the-art electron and laser beam equipment for the characterisation of geoscience material
- CRANN - Advanced Microscopy Laboratory (AML) Structures Testhalls - Civil, Structural & Environmental Engineering
Trinity College Dublin, founded in 1592, is the oldest university in Ireland and is recognised internationally as Ireland’s No. 1 university. For over 425 years, this historic university has been a world leader in high-quality, internationally-recognised education. With a global reputation for excellence, Trinity promotes creativity and innovative thinking in students.

Trinity’s bustling 47-acre campus is an oasis in the very heart of Dublin, a vibrant and safe European capital city. The university’s city-centre location offers students a unique opportunity to blend a rigorous academic programme with an unparalleled array of cultural, social and professional experiences. A wealth of museums, theatres, galleries, cafes, restaurants and historic tourist sites are located right on Trinity’s doorstep.

To study at Trinity is to become part of a global community of thinkers, creators, scientists, artists, inventors and entrepreneurs, from over 130 different countries.

The Times Higher Education University Impact Rankings 2020 places Trinity College in Top 5 position in the “Sustainable Cities & Communities” category and a Top 30 spot in “Affordable and Clean Energy”.

Over 400 industry partners
Microsoft, Google, IBM, European Commission

17,000 students from 122 countries

Modules offered in over 12 foreign languages

A deposit library holding over 6 million volumes

200 student societies, sports clubs and publications

Supports 112 startup companies

Over 600 course options

More than 140,000 alumni living in 150 countries

Spread across 47-acres in Dublin’s city centre

Ireland’s Most Innovative University
Reuters Europe’s Most Innovative Universities 2019

No 1 in Europe for producing graduate entrepreneurship (Pitchbook, 2020)

Trinity researchers attract approx €100 million annually in external funding

Approximately 2,500 works of art displayed on campus

Over 1 million visitors to Science Gallery since opening in 2008

The Book of Kells in Trinity’s Old Library was written around the year 800AD

Ranked 1st

QS World University Rankings 2021

Top world 101 university

QS World University Ranking 2021

No 1

QS World University Rankings for Graduate Employability 2020

92nd

Over 31.5 million people pass through Dublin Airport every year. Only one hour from London and five hours from New York, Dublin is a hub for Ryanair and Aer Lingus, low cost carriers connecting to over 180 destinations across the world.

Dublin ranks 37th worldwide for best student cities and has more than 300 worldwide student exchange agreements.

Dublin is home to Europe’s largest urban park, part of the city’s 5000 acres of green space.

Ireland consistently ranks as one of the safest and friendliest countries in the world. Our air is clean; our hilltops are the world’s greenest and our education system is world-class.
University Life

Accommodation at Trinity
Many postgraduate students find accommodation in shared houses or self-catering apartments. Houses and apartments vary in price, depending on size, facilities and location. The Students’ Union offers a useful Accommodation Advisory Service at www.tcdgsu.ie/accommodation. A limited number of students may be housed in University accommodation, including residences on-campus and at Kavanagh Court located just a 15 minute walk to the University, see www.tcd.ie/accommodation.

Student Societies
Trinity’s 120 societies attract dynamic members from all over university. From arts, culture, politics and debating to gaming, advocacy and music, you’re sure to find your niche.

Sports
There are over 50 sports clubs available to Trinity students. Choose from 50 sports clubs in a range of disciplines. Get fit, stay active, and meet people outside the classroom! The university is also home to a state-of-the-art sports centre. All registered Trinity College students can utilise the facilities at the Sports Centre including the 25m pool, climbing wall, fitness centre and classes.

Socialising
The Trinity Ball, Europe’s largest private party and a highlight of every spring term on campus.

Learning Supports
IT Services
As a student at Trinity, you are provided with access to hundreds of computers located across campus, secure WIFI, a Trinity Gmail account and e-learning resources via the Blackboard Learn system, see www.tcd.ie/itservices/students

Library
Trinity’s library is the largest research library in Ireland with six million printed volumes, nearly 500,000 electronic books, 80,000 electronic journals, the country’s largest collection of maps and printed music, and an extensive collection of manuscripts, see www.tcd.ie/library.

Student Services
Academic Registry
Academic Registry provides central academic administrative services to assist students with all queries regarding course applications/admission, fees, registration, timetables, examinations and assessments. E: academic.registry@tcd.ie T: +353 (0)1 896 4500

Careers Service
Plan your future beyond your current course of study with the help of guidance software, skills workshops and personal consultations, see www.tcd.ie/careers

Trinity Health Service
Trinity’s Health Service provides GP services for students. Student consultations are free of charge with modest fees for additional services. All EU students should bring with them a European Health Insurance Card issued in their country of origin. Non-EU students are not entitled to free national health services in Ireland, and are advised to take out insurance cover for hospitalisation or to extend private health insurance before leaving their home country. Private health insurance cover is also available in Ireland and the student health service can advise you on your options, see www.tcd.ie/college_health

Day Nursery
The day nursery caters for children aged three months to four and a half years old. There is a fee for this service, see www.tcd.ie/about/services/daynursery

“arinity education extends beyond the classroom and facilitates student internships and work placements with multi-national industry partners”
Disability Service
The Student Disability Service works closely with academic staff, tutors, administrators and other support services to meet the support requirements of students with any disability, see www.tcd.ie/disability.

Graduate Students Union
The Graduate Students’ Union serves to protect students’ interests and acts as a helpful meeting point. The Union organises a variety of events, receptions and trips each year, see www.tcdgsu.ie.

Post Graduate Advisory Service
The Postgraduate Advisory Service offers a comprehensive range of academic, pastoral, and professional supports dedicated to enhancing your student experience, see www.tcd.ie/senior_tutor/students/postgraduate.

Student Counselling Service
Student Counselling offers a confidential, professional and free of charge service. There is also a Peer Support Network which is confidential and based on student-to-student support, see www.tcd.ie/student_counselling.

Employment
Students from countries within the European Union (EU) are free to take up employment under standard EU free movement of labour regulations. However, mixing employment with study is not easy, and it is recommended that students do not arrive from elsewhere in the EU without possessing the financial resources to complete their chosen course of study.

Non-EU nationals who have permission to undertake postgraduate study in Ireland are entitled to take up casual employment, defined as up to 20 hours part-time work per week or full-time work during vacation periods. In order to encourage talented, skilled graduates to pursue careers in Ireland, non-EU nationals are permitted to remain in Ireland for an additional period of 12-24 months after receipt of results of their final examinations as part of the Third Level Graduate Programme, see www.inis.gov.ie/en/INIS/Pages/StudentPathway.
How to Apply and Fees

Language Requirements
All applicants whose first language is not English and who have not been educated through the medium of English must present one of the following qualifications in the English language:

- IELTS: Grade 6.5 overall
- TOEFL: 88 internet-based, 570 paper-based, 230 computer-based
- University of Cambridge: Proficiency Certificate, Grade C or better (CEFR Level C1 or C2); Advanced Certificate, Grade C or better (CEFR Level C1 or C2)
- Pearson Test of English (Academic) - PTE Academic: a minimum score of 63 to be eligible (with no section score below 59)

Further details available at: www.tcd.ie/study/apply/admission-requirements/postgraduate.

Visa Requirements
If you are a citizen of the European Union (EU), you do not need a visa to enter and live in Ireland. Some, but not all non-EU students require visas to enter Ireland. Students from North America are among those who do not require a visa. The list of visa-required countries can be found at the INIS website: www.inis.gov.ie. It is important to note that ALL non-EU students, whether visa-required or not, must register with the Irish Naturalisation and Immigration Service (INIS) for permission to remain in the state. Students must show their offer letter at airport immigration where they will receive a temporary stamp in their passport. They must register with the INIS within the time limit specified on their temporary stamp. Visa-required non-EU students should contact their nearest Irish Embassy or Consulate for information on visa requirements. Visas can take up to 8-10 weeks to process, so please allow sufficient time. You should apply as early as possible, especially if an Irish visa is required.

For further information:
www.tcd.ie/study/international/before-arrival/visa-immigration.

Fees
Fee details for all courses are available at: www.tcd.ie/academicregistry/feesandpayments. Please note a non-refundable online application fee per course applied for is required for all taught and research courses. An EU application is one made by a person who fulfils one or more of the following criteria: 1. who is ordinarily resident in the EU and who has received full-time further or higher education in the EU for three of the five years immediately preceding admission; or 2. who is ordinarily resident in the EU and has worked full-time in the EU for three of the five years immediately preceding admission; or 3. who holds a passport from an EU state and has received full-time further or higher education in the EU for three of the five years immediately preceding admission. All other applications are considered to be non-EU applications.

Funding & Scholarships
Tuition fees vary by course and can be found on the Academic Registry website. A range of scholarships and funding options are available. Trinity accepts student loans and works with the US federal loan programme.

Postgraduate students should be sure to check with their schools and departments for subject-specific funding. PhD students should discuss funding with their potential supervisors. Unless explicitly excluded, local scholarships and grants can be used towards Trinity fees. Please visit our website for more information on Trinity scholarship opportunities.

Contact us
Academic Registry provides central academic administrative services to assist students with all queries including course applications/admission, fees and registration.

Academic Registry, Watts Building, Trinity College Dublin, the University of Dublin, Dublin 2, Ireland
E: academic.registry@tcd.ie
T: +353 (0)1 896 4500

General enquiries from International students [outside of Ireland and EU/EEA] should be addressed to:
Global Relations, East Theatre, Trinity College Dublin, the University of Dublin, Dublin 2, Ireland
E: international@tcd.ie
T: +353 (0)1 896 4494

Fees details for all courses are available at: www.tcd.ie/academicregistry/feesandpayments. Please note a non-refundable online application fee per course applied for is required for all taught and research courses. An EU application is one made by a person who fulfils one or more of the following criteria:

1. who is ordinarily resident in the EU and who has received full-time further or higher education in the EU for three of the five years immediately preceding admission;
2. who is ordinarily resident in the EU and has worked full-time in the EU for three of the five years immediately preceding admission;
3. who holds a passport from an EU state and has received full-time further or higher education in the EU for three of the five years immediately preceding admission.

All other applications are considered to be non-EU applications.

For further information:
www.tcd.ie/study/international/before-arrival/visa-immigration.

All non-EU fee paying students must pay their full tuition fees prior to registration.

Students considering E3 postgraduate programmes can apply for the E3 Excellence Postgraduate Scholarships in Engineering, Environment and Emerging Technologies and the Global Excellence Postgraduate Scholarships.

How to apply
All course information and online application details are available at www.tcd.ie/courses.

15 16
E3 Postgraduate Taught Programmes

As inherently curious and creative, humanity will always seek to both understand the world around us and to create tools, systems and processes that enhance our quality of life. As our understanding of our world grows, we now know better the effects, both positive and negative, that our way of life has on the world around us. Challenges around health, automation, artificial intelligence, climate change, energy, water and food are inherently global, multidisciplinary and complex in nature. The role of specialists in understanding and shaping developments in these areas will continue to be as important, or more important, than it has been to date. Increasingly however, humanity will require specialists who can contextualise their knowledge in broader circles and who can efficiently and effectively work with experts from other disciplines.

E3 graduates across all its constituent disciplines will share an experience of having learnt and worked in a multidisciplinary environment, been educated by world-leading experts in areas of their specialisation and benefitted from best-in-class pedagogy. E3 graduates will be flexible, adaptable and creative individuals who bring deep disciplinary knowledge and problem-solving expertise to any problem they are presented with. They will be highly sought after by indigenous and multinational companies in Ireland and will be equipped and ready to work in an international context if that is their chosen route. During their studies, E3 students will have opportunities to follow their passions, both inside and outside their chosen disciplines, supported by a flexible and responsible academic support system that allows the abilities of each student to flourish.

E3 graduates will:

- Have strong technical competence in their chosen discipline
- Be comfortable and experienced working in teams, including with specialists from other disciplines, on ill-defined and multidisciplinary challenges
- Be skilled communicators across a range of platforms and to varying audiences
- Have an ability to think at multiple levels of detail and abstraction
- Be comfortable in both practical and theoretical contexts
- Be able to make informed and ethical decisions that balance technical, social and environmental considerations
- Be able to confront the limitations of their own knowledge and to address these limitations through collaboration and life-long learning

Open a world of possibilities with an E3 Postgraduate programme at Trinity College Dublin

### School of Computer Science & Statistics
- MSc Computer Science (Augmented & Virtual Reality)
- MSc Computer Science (Data Science)
- MSc Computer Science (Intelligent Systems)
- MSc Computer Science (Future Networked Systems)
- MSc Interactive Digital Media
- Postgraduate Certificate in Statistics

### School of Engineering
- MSc in Mechanical Engineering
- MSc in Biomedical Engineering
- MSc in Civil Engineering
- MSc in Chemical Engineering
- MSc in Environmental Engineering
- MSc in Geotechnical Engineering
- MSc in Transport Engineering
- MSc in Sustainable Energy Engineering
- MSc in Electronic Information Engineering
- MPhil in Music & Media Technologies

### School of Natural Sciences
- MSc Environmental Science
- MSc Biodiversity & Conservation
- Masters in Development Practice
- MPhil in Environmental History
- MSc in Energy Science

The School of Computer Science & Statistics, School of Engineering, & School of Natural Science

To study at Trinity is to become part of a global community of thinkers, creators, scientists, artists, inventors and entrepreneurs spanning 158 countries and over 425 years.
The School of Computer Science and Statistics at Trinity is recognised for establishing computer science as an academic discipline in Ireland. The School has earned a strong international reputation and has partnerships in education, research and industry across the globe. The School is actively engaged in research across virtually all areas of computer science including artificial intelligence, future networks and the Internet of Things (IoT); graphics, vision, augmented and virtual reality; smart cities; statistics and data science.

In addition, the School leads five major nationally-funded large-scale research centres; ADAPT, LEARNOVATE, CONNECT, ENABLE and V-SENSE.

The school of Computer Science and Statistics has a strong track record of working with industry as research partners and via student internships in Dublin and around the world. Many of our graduates are in leadership positions in the global technology sector or are founders of fast growing startups like Iona Technologies, Havok, Kore, Swrve, Quaternion Labs, LinguaBox, WiFi Guard, CipherApps, Haunted Planet Studios, Haptic, GLANTA, Tolerant Networks, Cara Health, X Communications Ltd, EmpowerTheUser, Insight Statistical Consulting, Xcelerit, Wirpi and Emizar, SoapBox Labs, Good Travel Software, SilverCloud, Danalto, Volgrams and Data Chemist.

The School has a wide range of postgraduate taught and research programmes. School of Computer Science & Statistics (SCSS) also offers a variety of options for students wishing to pursue PhD studies, from working individually with an expert supervisor to engaging in a rich programmes of studies offered by one of the three SFI Centres for Research Training supported by the School.

Whichever career route our programme students choose, we are preparing them with strong research skills and an ability to ask insightful and pertinent questions. Whether they choose to join Ireland’s vibrant R&D sector or to enter academia, our students are helping to ask and answer some of the most pressing questions in Computer Science & Statistics.

Students joining us can look forward to a friendly atmosphere with world-class academic staff supported by a state-of-the-art teaching and research environment. The success of our School depends on the enthusiasm and ingenuity of our staff and students. If you join us, we will work hard to foster your creativity and, in return, we are sure you will enjoy your time with us and help contribute to our reputation as a leading centre for academic excellence.

Computer Science at Trinity is ranked number 1 in Ireland, top 25 in Europe and top 100 worldwide (QS subject rankings, 2019).
MSc/P. Grad. Dip in Computer Science

**Augmented & Virtual Reality**

**About the programme**
The MSc in Computer Science – Augmented & Virtual Reality programme takes one year to complete. In the first two semesters students take a range of taught modules, and then from April to August work full-time on their individual dissertations. All students take a set of core modules but then specialise in Augmented & Virtual Reality.

The programme equips students with the theoretical and practical knowledge to enable them to participate in the design and development of the technology that underpins the fast moving video game market and the wider industries of interactive entertainment, new media and communication. This strand is a modified version of the well-established and successful MSc in Interactive Entertainment Technology and is built on research expertise in the Trinity Centre for Creative Technologies. This Centre is based on a unique collaboration of Computer Science, Engineering, Drama and the Arts; the focus is on the creative technologies including film, interactive multimedia, games, and simulation.

**Curriculum**
All students take a number of common MSc Core Modules, including Research & Innovation Methods and Machine Learning. MSc students also undertake a year-long research project for their Research Dissertation. This substantial individual project exposes students to the leading edge of research in their area. We expect the top projects to deliver publishable quality papers and, during the year, the dissertations will be showcased to an industry audience comprising indigenous, small & medium employers and multinational companies.

Along with the core modules, students take specialised taught modules specific to the area of Augmented and Virtual Reality. The Computer Vision module equips students with knowledge of a range of image processing, feature extraction and shape representation and transformation techniques. It builds on the machine learning module by targeting these techniques in the computer vision domain, which is an essential component of modern autonomous systems and augmented reality applications. The Mathematics of Light & Sound module deals with the mathematical knowledge and skills needed for the synthesis and analysis of audio and video signals. Computer Graphics introduces essential modelling and linear algebra techniques before delving into the 3D computer graphics pipeline, OpenGL, projection and viewing techniques and illumination models required in interactive graphics applications. Real-time Rendering will explore the graphics pipeline, GPUs as well as a variety of shading, illumination and rendering techniques. The Augmented Reality module will equip students with a solid background in alternative 3D compositing techniques. Students will learn to develop interactive applications on both PC and mobile devices. Real-time Animation deals with computational techniques for simulating motion, introducing topics such as blending, kinematics and motion capture, and will involve programming assignments in interactive animation. All students take a module in Advanced Software Engineering, which explores the methods and techniques involved in large-scale software development encompassing Agile and extreme Programming (XP), Test-driven development and Re-factoring.

Finally, students may select two electives from a pool of modules offered to MSc students in the School.

The course is designed and taught by staff who are leading experts in their fields, and the course content is inspired by their cutting-edge work as well as their contacts with leading industry researchers around the globe.

Please note that the course content is updated on an annual basis and some changes may occur from year to year.

**Theoretical/taught modules**

<table>
<thead>
<tr>
<th>Module</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Machine Learning</td>
<td>5</td>
</tr>
<tr>
<td>Research Methods and Innovation</td>
<td>5</td>
</tr>
<tr>
<td>Computer Vision</td>
<td>5</td>
</tr>
<tr>
<td>Computer Graphics</td>
<td>5</td>
</tr>
<tr>
<td>Mathematics of Light and Sound</td>
<td>5</td>
</tr>
<tr>
<td>Real-time Animation</td>
<td>5</td>
</tr>
<tr>
<td>Real-time Rendering</td>
<td>5</td>
</tr>
<tr>
<td>Augmented Reality</td>
<td>5</td>
</tr>
<tr>
<td>Advanced Software Engineering</td>
<td>10</td>
</tr>
<tr>
<td>Options modules</td>
<td>10</td>
</tr>
<tr>
<td>Dissertation</td>
<td>30</td>
</tr>
</tbody>
</table>

**Career Prospects**
We expect our graduates to be in high-demand for top end research and development positions within leading multi-national companies and from startup-companies alike. There will also be opportunities to progress to PhD study with many funded positions available locally. Previous graduates from our M.Sc. programmes have gone on to work for games companies such as Havok, EA, DemonWare and Playfirst, whilst others have joined leading visual effects studios such as Framestore CFC and Double Negative. We expect future graduates from this strand to be equally successful in securing employment in this industry.

**Admission Requirements**
Admission is restricted to graduates who have achieved an upper second class honours degree or better, in computing, information technology, statistics, mathematics or a related discipline, who have acquired good programming skills. Applications from well-qualified candidates from other numerate disciplines who have sufficient knowledge of computing, including the ability to programme may also be considered for admission.

**Contact Us**
Course Director: Dr John Dingliana
Course Email: postgraduate@scss.tcd.ie
Course Tel(s): +353 1 896 1765

I am a senior software developer and software development/project manager at Materialise GmbH in Bremen, a development office of Materialise, NV, with headquarters in Leuven, Belgium. I was contacted by a headhunter from Google in Dublin right after finishing my degree and went through the first rounds of the hiring process but cancelled it myself because I had a job offer with Materialise. We are leading in the software development for Additive Manufacturing/3D printing.

Julian from Germany
MSc/P. Grad. Dip in Computer Science

Data Science

About the programme
Data Science or Big Data has become a hugely important topic in recent years finding applications in healthcare, finance, transportation, smart cities and elsewhere. As part of this programme, Trinity’s leading experts in this field will guide you through how to gather and store data (using IoT and cloud computing technologies), process it (using advanced statistics and techniques such as machine learning) and deliver new insights and knowledge from the data.

The Data Science programme combines statistics, cloud and security technologies with data management. It covers all key aspects of the field: how to securely store and manage data, how to visualise and analyse at scale and how to use analysis to make decisions. Graduates of this strand will be equipped to tackle the huge challenges and opportunities that the big-data revolution is bringing to all aspects of life; in IT, health, transport, science and engineering to name but a few. The School of Computer Science and Statistics is one of the few schools globally that has expertise in all of these elements of data science. Dublin is a centre for several of the major IT players in data science, such as IBM Research, Accenture and Deloitte.

Curriculum
The course is taught over a full calendar year, with two 12-week semesters of taught modules, involving attendance at labs and lectures, followed by dedicated research work over the remaining summer months.

All students take a number of common MSc Core Modules, including Research & Innovation Methods and Machine Learning. MSc students also undertake a year-long research project for their Research Dissertation. This substantial individual project exposes students to the leading edge of research in their area. We expect the top research projects to deliver publishable research and, during the year, the dissertations will be showcased to an industry audience comprising indigenous, small & medium employers and multinational companies.

Along with the core modules, students take specialised modules specific to the area of Data Science. Data Analytics deals with the key techniques of data mining and analysis, including classification techniques, neural networks and ensemble methods. Students discover how large data sets might be gathered and manipulated in large cloud computing facilities in the Scalable Computing module. The module on Optimisation Algorithms for Data Analysis explores topics such as convex optimisation and large dimension simulation. Applied Statistical Modelling deals with many popular techniques such as Markov Chains and Monte Carlo simulation. Applied Statistical Modelling with an emphasis on Machine Learning.

Finally students choose three additional electives from a pool of modules offered to MSc students in the School.

Machine Learning 5 credits
Research Methods and Innovation 5 credits
Data Analytics 10 credits
Scalable Computing 5 credits
Applied Statistical Modelling 5 credits
Optimisation Algorithms 5 credits
Data Visualization 5 credits
Security and Privacy 5 credits
3 x Options modules 15 credits
Dissertation 30 credits

Career Prospects
We expect our graduates to be in high-demand for top-end research and development positions within leading multi-national companies and from start-up companies alike. There will also be opportunities to progress to PhD study with many funded positions available locally. Graduates of this programme have many exciting career opportunities. All of the major information Technology companies, from Google to Facebook to Amazon, employ large teams of data scientists. Another important career path is management consulting with companies such as Accenture, McKinsey & Company and PwC.

Admission Requirements
Admission is restricted to graduates who have achieved an upper second class honours degree or better, in computing, information technology, statistics, mathematics or a related discipline, who have acquired good programming skills. Applications from well-qualified candidates from other numerate disciplines who have sufficient knowledge of computing, including the ability to programme may also be considered for admission.

Contact Us
Course Tel(s): +353 1 896 1765
Course Email: postgraduate@scss.tcd.ie
Course Tel(s): +353 1 896 1765
### About the programme

The M.Sc. Computer Science - Intelligent Systems focuses on smart, interactive web applications and systems, which are becoming an integral part of our daily lives - at home, in the workplace, and in social interaction. Designing and building these systems requires expertise in artificial intelligence, human language understanding and generation, web systems and applications, data analytics and knowledge engineering. The marketplace of the future will see intelligent behaviour becoming the standard for computer systems. This strand is closely linked to the school’s research groups involved in the ADAPT centre.

ADAPT is a national research centre for Digital Content Technology, bringing together world-class expertise in Web Content Technologies; Knowledge and Data Engineering; Information Retrieval; Machine Translation; Graphics, Video and Image Processing; Data Analytics; Personalisation & Adaptive Web; Natural Language Processing; Human Computer Interaction; Artificial Intelligence. ADAPT’s cutting edge research is explored through applications in domains such as health, entertainment, education, digital humanities, aviation and finance.

### Curriculum

The course is taught over a full calendar year, with two 12-week semesters of taught modules, involving attendance at labs and lectures, followed by dedicated research work over the remaining summer months.

All students take a number of common MSc Core Modules, including Research & Innovation Methods and Machine Learning. MSc students also undertake a year-long research project for their Research Dissertation. This substantial individual project exposes students to the leading edge of research in their area. We expect the top projects to deliver publishable quality papers and, during the year, the dissertations will be showcased to an industry audience comprising indigenous, small & medium employers and multinational companies.

Along with the core modules, students take specialised modules specific to their area of study. Information Retrieval & Web Search examines, in-depth, the theoretical and practical issues involved in searching the web or any or large corpus of documents, including text processing, ranking scores, classification etc. In Knowledge & Data Engineering, students learn about the semantic web including model design, reasoning and querying. Artificial Intelligence deals with AI techniques and models of human cognitive architectures, knowledge representation techniques such as ontologies and models of natural language processing. This module is complemented by the Text Analytics module, which demonstrates how finite-state methods, model theory and category theory can be used to analyse content and determine sentiment. The hands-on Adaptive Applications module explores how applications can adapt to suit individual users. All students take a two-semester module in Advanced Software Engineering, which explores the methods and techniques involved in large-scale software development encompassing Agile and extreme programming (XP), Test-driven development and Re-factoring. Finally students choose three additional electives from a pool of modules offered to MSc students in the School.

The course is designed and taught by staff who are leading experts in their fields, and the course content is inspired by their cutting-edge work as well as their contacts with leading industry researchers around the globe.

Please note that the course content is updated on an annual basis and some changes may occur from year to year.

### Theoretical/taught modules

<table>
<thead>
<tr>
<th>Module</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Machine Learning</td>
<td>5</td>
</tr>
<tr>
<td>Research Methods and Innovation</td>
<td>5</td>
</tr>
<tr>
<td>Adaptive Applications</td>
<td>5</td>
</tr>
<tr>
<td>Artificial Intelligence</td>
<td>5</td>
</tr>
<tr>
<td>Knowledge and Data Engineering</td>
<td>5</td>
</tr>
<tr>
<td>Text Analytics</td>
<td>5</td>
</tr>
<tr>
<td>Information Retrieval and Web Search</td>
<td>5</td>
</tr>
<tr>
<td>Advanced Software Engineering</td>
<td>10</td>
</tr>
<tr>
<td>3 x Options modules</td>
<td>15</td>
</tr>
<tr>
<td>Dissertation</td>
<td>30</td>
</tr>
</tbody>
</table>

### Career Prospects

Employment opportunities exist in a wide range of areas such as internet-based services, financial services, mobile communication companies. Students will also benefit from the comprehensive research scope, networks, and wealth of research achievements in both the School and the ADAPT Centre. Graduates will be suited to careers in Web-technology companies such as Google, Facebook, Twitter, Amazon, LinkedIn, PayPal, Symantec, eBay and SAP, Business-intelligence led organisations, Consultancy companies, Innovative start-ups building intelligent applications and IT in large organisations.

### Admission Requirements

Admission is restricted to graduates who have achieved an upper second class honours degree or better, in computing, information technology, statistics, mathematics or a related discipline, who have acquired good programming skills. Applications from well-qualified candidates from other numerate disciplines who have sufficient knowledge of computing, including the ability to programme may also be considered for admission.

### Contact Us

Course Director: Dr John Dingliana  
Course Email: postgraduate@scss.tcd.ie  
Course Tel(s): +353 1 896 1765

About the programme
Computer networking has transformed society over the past 20 years and is continuing to enable new advances from social networking through Internet-of-Things to Cloud computing. The M.Sc. Computer Science – Future Networked Systems builds on research activity within the CONNECT national research centre and a long history of innovation and start-up companies at the school.

Curriculum
The course is taught over a full calendar year, with two 12-week semesters of taught modules, involving attendance at labs and lectures, followed by full-time research work over the remaining summer months.

All students take a number of common MSc Core Modules, including Research & Innovation Methods and Machine Learning. MSc students also undertake a year-long research project for their Research Dissertation. This substantial individual project exposes students to the leading edge of research in their area. We expect the top projects to deliver publishable quality papers and, during the year, the dissertations will be showcased to an industry audience comprising indigenous, small & medium employers and multinational companies.

Along with the core modules, students take specialised modules specific to their area of study. Arising from research within the school’s Smart & Sustainable cities research centre, the Urban Computing module explores techniques for gathering urban data, management of that data, visualization and alerts and involves the development of a complete smart city application. The Next Generation Networks module explores future trends in fixed and wireless communications networks including next-generation access, LTE and Software-Defined network technologies. Scalable Computing looks at how applications and workloads can be serviced by warehouse-scale computing facilities, exploring cloud architectures, resource management and security considerations. The Internet of Things module explores the technology underlying this burgeoning area including middleware, service discovery & composition and sensor & network virtualization. Practical exercises lead students through design, implementation and deployment of an end-to-end IoT application.

Security & Privacy complements other modules, covering topics such as Authentication, Digital Rights Management, Cloud security and user privacy. Distributed Systems deals with concurrency, the science of distributed transactions, web services and advanced application frameworks. All students take a module in Advanced Software Engineering, which explores the methods and techniques involved in large-scale software development encompassing Agile and extreme Programming (XP), Test-driven development and Re-factoring. Finally, students may select two electives from a pool of modules offered to MSc students in the School.

The course is designed and taught by staff who are leading experts in their fields, and the course content is inspired by their cutting-edge work as well as their contacts with leading industry researchers around the globe.

Please note that the course content is updated on an annual basis and some changes may occur from year to year.

Theoretical/taught modules

<table>
<thead>
<tr>
<th>Module</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Machine Learning</td>
<td>5</td>
</tr>
<tr>
<td>Research Methods and Innovation</td>
<td>5</td>
</tr>
<tr>
<td>Scalable Computing</td>
<td>5</td>
</tr>
<tr>
<td>Next Generation Networks</td>
<td>5</td>
</tr>
<tr>
<td>Urban Computing</td>
<td>5</td>
</tr>
<tr>
<td>Internet of Things</td>
<td>5</td>
</tr>
<tr>
<td>Distributed Systems</td>
<td>5</td>
</tr>
<tr>
<td>Security and Privacy</td>
<td>5</td>
</tr>
<tr>
<td>Advanced Software Engineering</td>
<td>10</td>
</tr>
<tr>
<td>Options modules</td>
<td>10</td>
</tr>
<tr>
<td>Dissertation</td>
<td>30</td>
</tr>
</tbody>
</table>

Career Prospects
Previous graduates from the strand have gone on to work in software engineering and financial technology roles in companies such as Facebook, Microsoft, Citi and Genesys.

Admission Requirements
Admission is restricted to graduates who have achieved an upper second class honours degree or better, in computing, information technology, statistics, mathematics or a related discipline, who have acquired good programming skills. Applications from well-qualified candidates from other numerate disciplines who have sufficient knowledge of computing, including the ability to programme may also be considered for admission.

Contact Us
Course Director: Dr John Dingliana
Course Email: postgraduate@scss.tcd.ie
Course Tel(s): +353 1 896 1765
About the Programme
Founded in 1996, the MSc in Interactive Digital Media (IDM) was the first of its kind in Ireland. Its graduates work in the digital media and related sectors, both nationally and internationally. It is delivered on a full-time basis over one year and carries a total ECTS weighting of 90.

This MSc course provides a foundation in the technologies and media relevant to the digital media sector. The course runs full-time over a twelve-month period. Formal teaching is divided into two twelve-week semesters.

Each student selects and undertakes a small individual research project, which must be submitted in the form of a dissertation of 12,000 words by mid-April. Students also complete a larger final project over the summer, which is a team effort with other students from the class. A special laboratory with dedicated hardware and software is provided for the students to support them in the courses and their project work.

Curriculum
The course is designed to help students combine their existing skills – technical as well as non-technical – with the knowledge needed to design and develop digital media applications and content on existing and emerging platforms. To this end, the course covers the programming languages and applications used in digital media, a range of design techniques (graphic design, interactive design, UI/UX design, game design) as well as approaches to content creation in a range of modalities (moving image, audio, sensor technologies).

The MSc in Interactive Digital Media lets students build on knowledge gained at undergraduate level in order to allow them to work and stay current in the digital media sector. Platforms for digital media applications are constantly evolving, and what used to be focused on desktop computers and mobile devices now also include Virtual and Augmented Reality and Internet of Things. The skillsets required to design and build digital media applications and content have expanded and now include analytical, technical and creative skills. Teams creating digital media are practically always multidisciplinary, so communication is more important than ever.

The course also covers critical thinking around digital media, giving the students the ability to situate works in relevant cultural contexts and anchor their ideas in deeper thinking than is often possible in today’s fast-moving world. While the course covers practical aspects of design and technology, it also includes a solid theoretical foundation for each topic, such as scientific, cultural and critical concerns, rather than focusing exclusively on how to use off-the-shelf applications.

Students are accepted from a wide range of backgrounds, and the range of skills each year facilitates exchange and learning between different disciplines. Students work collaboratively on course assignments and their final projects, which are exhibited publicly at the end of each year in our Annual Showcase.

Course Modules
- Programming for Digital Media 10 credits
- Authoring for Digital Media 10 credits
- Contextual Media 10 credits
- Audio, Video and Sensor Technologies 10 credits
- Visual Computing and Design 10 credits
- Research Paper 10 credits
- Final Project 30 credits

Graduate Prospects
Graduates from the IDM programme work in many roles across the digital sector. Current positions held by our graduates include: App Designers and Developers, Web Designers and Developers, Software Developers, Graphic and Visual Designers, UI and UX Designers, Interaction Designers, Game Designers and Developers, Product Designers, Technology Journalists, Project Managers, Security and Data Analysts, Digital Analysts, Corporate Communications Leads, Chief Executive Officers (CEOs), Chief Information Officers (CIOs), Chief Commercial Officers (CCOs), Research Fellows and Professors.

Entry Requirements
Applications will be accepted from good honours graduates in any discipline. Literary, artistic and creative ability is taken into consideration along with mathematical, technical and problem-solving ability.

Contact Us
Course Director: Dr Mads Haahr
Course Email: postgraduate@scss.tcd.ie
Course Tel(s): +353 1 896 2418
www.scss.tcd.ie/postgraduate/mscidm
MSc/P. Grad. Certificate in Statistics

About the programme
This part-time course is intended for graduates of disciplines, other than statistics, who want to develop and deepen their knowledge of statistical methods for solving problems involving data arising in business and industry, in public service agencies or in research agencies. The course is best seen as ‘continuing professional development’ for people who need statistics for their work. The course provides a broad introduction to the statistical ideas and methods relevant to data gathering and analysis in a wide variety of research areas as well as business and administration. The intention is to provide participants with a practical grasp of statistics based on a sound knowledge of the underlying ideas and concepts. Graduates of the course should be well placed to apply the ideas and methods to which they have been introduced in their own work. To this end, all the material is presented in the context of practical examples from a wide range of applications.

Curriculum
The first semester focuses on why and when we use statistical methods, and introduces the basic methods that are the most commonly used in statistics. The emphasis is on choosing the best method and how to interpret its result, rather than the mathematical details. The latter part of the semester introduces the R programming environment for doing a statistical analysis. Students will become familiar with how to run and interpret, through R, the methods that they have learnt and how to output the results in the best way.

The second semester looks at 2 key ideas in statistics that most users of statistical methods will face. Regression is the name to a broad set of tools that are used to discover relationships between different variables and use them for interpretation and prediction. Experimental design looks at ways to set up experiments so that they yield data that answers the questions of interest in the most efficient way. Practical implementation of all of these tools are done through R.

Assessment is through online assessments throughout each semester and individual projects.

From 2021/22 it is intended that this programme will be offered online, allowing students to follow the material at their own pace and to make it available to those who do not have access to the TCD campus.

Curriculum

Introduction to Statistics 10 credits
Statistics using R 5 credits
Regression 10 credits
Experimental Design 5 credits

Admission Requirements
Applications will be considered from any degree-level candidate. While the mathematical level of the course is kept to a minimum, some background in mathematics is essential.

Leaving Certificate mathematics is sufficient.

Contact Us
Course Director: Prof. Simon Wilson
Course Email: PGCert.Stats@scss.tcd.ie
Course Tel(s): +353 1 896 1759
www.tcd.ie/postgraduate/pgcertstats
Welcome to the School of Engineering.....
we are delighted that you’re considering studying here!

The School of Engineering at Trinity has been teaching Engineering since 1841. There have been immense developments since that time, but the continuity of excellence in teaching and learning is a source of pride for the School and its graduates.

The School of Engineering is a vibrant, intellectual community of innovative researchers, teachers and students, which combines high-quality teaching with expansive research activity.

Each year, the Engineering School welcomes growing numbers of visiting and full-time students from around the world who enrich our shared multicultural learning environment. The School has international students from all over Europe, North and South America, Australia, Asia and Africa.

The School strives to educate global citizens who will have a real impact on society and who will enhance engineering throughout the world, by sharing their innovative ideas.

The School of Engineering at Trinity is ranked in the top 200 Engineering Schools in the world and offers outstanding teaching by engineers who are at the forefront of their field worldwide. It has a strong philosophy of research-led teaching and continuously benchmarks itself against the top international engineering schools.
MSC/P. Grad. Dip in Mechanical Engineering

“This course is ideal for those who see themselves as future leaders and innovators, working in research, design and development roles in high-technology areas.”

Prof. David Taylor

About the programme

The M.Sc. in Mechanical Engineering is designed to provide a flexible route to a Masters qualification for students who have completed a Bachelor's degree. It addresses advanced topics over a wide range of Mechanical and Manufacturing Engineering subjects.

Within the M.Sc., there is a wide range of module options and an excellent opportunity to engage in topical research with leading research groups within the School of Engineering, as an important part of this programme is a research dissertation, which directly builds on some of the content of the modules.

Curriculum

The M.Sc. in Mechanical Engineering consists of taught modules and a project together amounting to 90 ECTS. The taught component comprises modules totalling 50 ECTS credits. M.Sc. students will also complete a substantial research project and submit a dissertation which accounts for a further 40 credits to be eligible for the award of the Postgraduate Diploma.

Those not undertaking the dissertation (or who have partially completed it) may, with approval of the Course Director, take the alternative Engineering Project module (10ECTS) in order to be eligible for the award of the Postgraduate Diploma.

Curriculum

Theoretical/taught modules

- Research Project: 40 credits
- Research Methods: 5 credits
- The remaining credits can be made up from the following modules:
  - Flow induced vibration and fluid structure interaction: 5 credits
  - Advanced materials: 5 credits
  - Advanced thermal fluid sciences: 5 credits
  - Engineering Vibrations: 5 credits
  - Control Engineering II: 5 credits
  - Instrumentation and Experimental Techniques: 5 credits
  - Introduction to Computational Fluid Mechanics: 5 credits
  - Micro and Precision Manufacturing: 5 credits
  - Advanced manufacturing: 5 credits
  - Supply chain management: 5 credits
  - Risk management and Safety Assessment Systems: 5 credits
  - Wind Energy: 5 credits
  - Energy Policy and Demand: 5 credits
  - Wave and Hydro Energy: 5 credits
  - Transportation: 5 credits
  - Advanced Spatial analysis using GIS: 5 credits
  - Medical device design: 10 credits
  - Tissue engineering: 5 credits
  - Finite Element Analysis: 5 credits
  - Biomechanics: 5 credits
  - Biomaterials: 5 credits

Some of the module options in either semester may be withdrawn from time to time and some new modules may be added, subject to demand. Additional modules may be chosen, subject strictly to timetabling compatibility, with the prior approval of the Course Director and relevant Head of School.

Career Prospects

This course prepares you to work in a wide range of industries and Ireland and worldwide, including the medical device, aerospace and automotive sectors.

Admission Requirements

Candidates for this course must normally hold a first or second class, first division honors Bachelor degree in engineering or a cognate discipline and pursue the course full-time for a period of not less than 12 consecutive months.

Contact Us

Course Director: Prof. David Taylor
Course Email: dtaylor@tcd.ie
Course Tel(s): +353 1 896 1703/1383
www.tcd.ie/mecheng/postgraduate/mscbymodule
About the programme

The MSc in Biomedical Engineering aims to provide engineers and scientists with the education and creative skills needed to practice in the medical devices industry in Ireland and focus on important clinical needs. Students can opt for the MSc in Biomedical engineering with specialisation strands. All three streams lead to the award of the MSc in Biomedical Engineering and consist of compulsory core modules and optional modules.

Career Prospects

Employment in the biomedical engineering industry in Ireland has grown to the level where the industry now directly employs over 12,000 people in Ireland, of which up to 20% are graduate engineers and scientists (see www.ida-ireland.ie). The engineer working in this industry needs to be both technically competent and capable of integrating those aspects of biology and medicine related to the medical device. Many bioengineers are involved in applying science and engineering knowledge to the manufacture of medical products. The medical device and diagnostic industry continues to be a vibrant growth sector and a cornerstone of the Irish economy.

There are currently over 160 medical technology companies in Ireland, exporting €6.8bn worth of product annually and employing 24,000 people - the highest number of people working in the industry in any country in Europe, per head of population.

The minimum requirement for entry is an Upper Second Class Honours Degree (2.1 or higher) or equivalent in Engineering (for example Biomedical, Mechanical, Electronic, Chemical), Physical Sciences or related discipline from a recognised University. Other degree programmes may be deemed suitable provided that the applicant has proven mathematical ability. This means that the applicant should have achieved at least an A grade in Mathematics (or equivalent subject) at Leaving Cert, A levels or related discipline from a recognised University.

Contact Us

Course Tel(s): +353 1 896 3393
Course Email: bioengmsc@tcd.ie

www.tcd.ie/biomedicalengineering/msc

Many of the world’s top medical technology companies have invested significantly in Ireland and a number of exciting, research-based, indigenous companies are emerging and competing internationally. These companies are involved in developing, manufacturing and marketing a diverse range of products and services from disposable plastic and wound care products to precision metal implants including pacemakers to microelectronic devices, orthopedic implants, diagnostics, contact lenses and stents.

The MSc programme also provides an excellent foundation for students to pursue further research activities and qualifications, with many students pursuing further research in Trinity and in other international leading universities such as Stanford and Harvard as well as in hospital and clinical environments.

Theoretical/taught modules

<table>
<thead>
<tr>
<th>General Stream Modules</th>
<th>ECTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biomechanics</td>
<td>5</td>
</tr>
<tr>
<td>Biomaterials</td>
<td>5</td>
</tr>
<tr>
<td>Design and Innovation</td>
<td>10</td>
</tr>
<tr>
<td>Experimental &amp; Research Methods in Biomedical Engineering</td>
<td>5</td>
</tr>
<tr>
<td>Research Project</td>
<td>40</td>
</tr>
<tr>
<td>Total Mandatory</td>
<td>65</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tissue Engineering Stream Modules</th>
<th>ECTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biomaterials</td>
<td>5</td>
</tr>
<tr>
<td>Current Topics in Cell and Tissue Engineering</td>
<td>10</td>
</tr>
<tr>
<td>Design/Innovation</td>
<td>10</td>
</tr>
<tr>
<td>Experimental &amp; Research Methods in Biomedical Engineering</td>
<td>5</td>
</tr>
<tr>
<td>Laboratory Techniques in Cell &amp; Tissue Engineering</td>
<td>5</td>
</tr>
<tr>
<td>Research Project</td>
<td>40</td>
</tr>
<tr>
<td>Tissue Engineering</td>
<td>5</td>
</tr>
<tr>
<td>Total Mandatory</td>
<td>50</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Medical Device Specialisation Stream Modules</th>
<th>ECTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biomechanics</td>
<td>5</td>
</tr>
<tr>
<td>Biomaterials</td>
<td>5</td>
</tr>
<tr>
<td>Design and Innovation</td>
<td>10</td>
</tr>
<tr>
<td>Experimental &amp; Research Methods in Biomedical Engineering</td>
<td>5</td>
</tr>
<tr>
<td>Medical Device Design Fundamentals</td>
<td>5</td>
</tr>
<tr>
<td>Medical Device Design Innovation Project</td>
<td>5</td>
</tr>
<tr>
<td>Research Project</td>
<td>40</td>
</tr>
<tr>
<td>Total Mandatory</td>
<td>65</td>
</tr>
</tbody>
</table>

Select modules amounting to 25 ECTS from the following 5/10 ECTS modules:

| Advanced Medical Imaging                      | 5 |
| Basic Medical Sciences*                        | 5 |
| Finite Element Analysis**                      | 5 |
| Implantable Devices and Systems***            | 10 |
| Medical Device Design Fundamentals            | 5 |
| Medical Device Design Innovation Project      | 5 |
| Research Project                              | 40 |

Total ECTS

90

* Mandatory for students with no prior Biology/Biomedical background
** Must have approval from module co-ordinator
*** Subject to meeting pre-requisite criteria as set out in the module descriptor
**** MHP35666 is a prerequisite for this module
About the programme
This is a one year full-time or two year part-time postgraduate programme designed to provide graduate engineers with specialist understanding in one of the following areas: Structural and Geotechnical Engineering; Environmental Engineering; Transportation Engineering; or Sustainable Energy Engineering. These programmes reflect our academic expertise and link closely with our research challenges. Our MSc programmes offers you with an opportunity to advance your knowledge and expertise in one of specialist areas of Engineering.

This level 9 programme is accredited by Engineers Ireland, which is a member of the European Network for Accreditation of Engineering Education (ENAEIE) and the Washington Accord and thus internationally recognised by signature countries, including China (CAST), India (NBA), UK and the USA (ABET).

The reputation of the MSc in Engineering programme is evidenced by the quality of students we attract both nationally and internationally, and from industry. In recent years, about 70% of our annual intake of students are international, originating from more than 20 countries such as Brazil, China, France, India, Italy, Mexico, Nigeria, South Africa, UK, USA etc. The MSc in Engineering is highly regarded by the industry. In recent years, about 10% of the typical intake are part time students whom originate from the civil engineering consultancy and construction industry, as well as from local authority engineering departments.

Curriculum
The MSc in Engineering programme is designed around the concept of the T-Shaped learning, which provides a depth of specialist knowledge and skills and a breadth of complementary skills. This approach enhances not only the students’ employability skills, but also self-development skills.

The degree programme is divided into three parts: two semesters of taught courses (September – April inclusive) with an average of 18 lectures per week and a major dissertation (April – September inclusive). Candidates must take twelve modules, namely the four mandatory modules (M1, M4, M5 and M3) together with at least four of their chosen specialisation and four other modules, which in total amounts to 90 ECTS. In the first semester, candidates pursuing the course full-time must take mandatory modules, M1, M4, M5 and M3; along with four other modules selected from options (including at least two from their selected specialisation), listed on the right. In the second semester, candidates pursuing the course full-time must take module M3 along with four other modules selected from options (including at least two from their selected specialisation), also listed on the right:

<table>
<thead>
<tr>
<th>Theoretical/taught modules</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mandatory</strong></td>
</tr>
<tr>
<td>M1 Civil Engineering Management</td>
</tr>
<tr>
<td>M4 Engineering Project</td>
</tr>
<tr>
<td>M5 Research Methods &amp;</td>
</tr>
<tr>
<td>M3 Engineering Dissertation</td>
</tr>
<tr>
<td>(Structural &amp; Geotechnical / Environmental / Transport / Sustainable Energy)</td>
</tr>
<tr>
<td><strong>Environmental Engineering</strong></td>
</tr>
<tr>
<td>Hydrological Processes and Hydrometry</td>
</tr>
<tr>
<td>Air Pollution</td>
</tr>
<tr>
<td>Waste Management and Energy Recovery</td>
</tr>
<tr>
<td>Water Quality and Hydrological Modelling</td>
</tr>
<tr>
<td>Water Resource Planning and Climate Change</td>
</tr>
<tr>
<td>Sustainable Water Supply and Sanitation</td>
</tr>
<tr>
<td><strong>Structural and Geotechnical Engineering</strong></td>
</tr>
<tr>
<td>Geotechnical Engineering</td>
</tr>
<tr>
<td>Advanced Computation for Structures</td>
</tr>
<tr>
<td>Wind and Earthquake Engineering</td>
</tr>
<tr>
<td>Bridge Engineering</td>
</tr>
<tr>
<td>Advanced Concrete Technology</td>
</tr>
<tr>
<td>Offshore Geotechnical Engineering</td>
</tr>
<tr>
<td>A Unified Theory of Structures</td>
</tr>
<tr>
<td>Concrete Durability and Sustainability</td>
</tr>
<tr>
<td>Advanced Theory of Structures</td>
</tr>
</tbody>
</table>
Some of the module options in either semester may be withdrawn from time to time and some new modules may be included, subject to demand. In addition to passing the prescribed examinations, each student must submit a dissertation on an approved topic relating to their chosen specialisation.

Part – Time Option: For candidates taking the course part-time over two years, during the first year, candidates take eight modules, namely: the mandatory modules (M1, M4 and M5), along with five of the module options (including at least two from their chosen specialisation) which amount to 45 ECTS. By the end of the course, part-time candidates must have completed four mandatory modules (M1, M4, M5 and M3), at least four of their specialisation module options and four of the other options, amounting to a total of 90 ECTS. The part-time option runs in parallel with the full-time course. Full and part-time students attend the same lectures which are typically scheduled Monday – Friday, 9-6pm. During the teaching periods, students taking the part-time option are typically required to attend 9-12 hours per week during Year 1 and 3-6 hours during Year 2.

Career Prospects
The market for MSc in Engineering graduates is large. Graduates from this programme have gain employment opportunities with private sector firms such as consulting engineers RPS Group, Arup, and Jones Engineering Group, local county councils such as Dublin county council and contracting companies. Some students chose to pursue further research in Trinity and other international leading universities.

Surveys of our recent MSc course graduates indicate a high level of employability. Three months after completing the programme, over 85% of graduates responding to the surveys reported that they were in full time employment or in further studies, and the majority of them were paid between €35,000 and €60,000 per annum, demonstrating the high value industry is placing on our graduates.

Application Requirements
The entry criteria are an upper second honours degree (or equivalent) in a Civil Engineering or related degree. Relevant Industrial Experience may be taken into account in allocating places, where the course is oversubscribed.

“ I chose Trinity College Dublin as it has an excellent track record of producing successful professionals. The experience and profile of the lecturers was key to my choice. I found the lectures to be comprehensive - while being exam focused, they also equipped me with the tools I needed in my professional career. Since graduating, I have worked as a Structural Design Engineer for PM Group on many challenging projects for blue chip multinationals across the globe. Having spent a number of years working in industry, I for one can vouch that this course provided me with both a strong technical background, and the skills required to succeed in large multidisciplinary teams.”

Killian Shields, Structural Design Engineer at PM Group

Contact Us
Course Director: Dr Liwen Xiao
Course Email: lxiao@tcd.ie / civeng@tcd.ie
Course Tel(s): +353 1 896 1457
www.tcd.ie/civileng/programmes/postgraduate/msc
Curriculum

This M.Sc. course consists of taught modules and a project amounting to 90 credits. The taught component comprises modules totalling 50 credits. In the first semester, students pursuing the course must take modules worth at least 25 credits, and in the second semester they take the balance of the credits. M.Sc. candidates will, in addition, complete a substantial research project and submit a dissertation which accounts for a further 40 credits to be eligible for consideration for the award of the degree. All candidates are required to take the following module(s): Research Project/Dissertation (40 credits), Research Methods (15 credits), Statistical Signal Processing (5 credits), and Introduction to Deep Learning (10 credits). In addition, candidates select a further 20 credits from the following list to bring their total credits to 90:

- Speech and Audio Engineering (5 credits)
- Spatial Audio (5 credits)
- Audio Production Engineering (5 credits)
- Digital Media Systems (10 credits)
- Wireless Networks and Communications (5 credits)
- Complex Systems Science (5 credits)
- Reconfigurable Hardware for Computational Engineering (10 credits)

Some of the module options in either semester may be withdrawn from time to time and some new modules may be added, subject to demand.

Career Prospects

This programme prepares you to work in a wide range of areas including: electrical energy, circuit design, computer gaming, software development, image processing, technical consultancy, academic research, telecommunications, finance and management.

Application Requirements

Admission is normally restricted to graduates who have achieved an upper second class honours degree (2.1), or better, in engineering, science, computing, statistics, mathematics or a related discipline. Well-qualified candidates or industry professionals from other numerate disciplines who have sufficient knowledge of computational aspects of engineering and science, may also be considered for admissions purposes subject to the decision of the Dean of Graduate Studies. We will also accept official MOOC certification from reputable online sources e.g. Coursera, eDX, the IET, the IEEE in relevant numerate topics as appropriate demonstration of pre-requisite knowledge.

Contact Us

Course Director: Prof. Michael O’Riordan
Course Email: ORIORDMI@tcd.ie
Course Tel(s): +353 1 896 2508
www.tcd.ie/eleceng/postgraduate/MSc/index.php

MSc/P. Grad. Dip Electronic Information Engineering

This is a one year full time postgraduate course designed to provide graduate engineers with specialist understanding of modern computational products and systems. There is no aspect of modern life that is not now altered by information processing engines. Examples include digital assistants (speech recognition and synthesis), automotive (remote sensing and electronic control systems), the economy (quantitative automated trading), entertainment (audio/video streaming and cinema visual effects), health (medical imaging), science (computational biology/geography/chemistry/photography) and the digital humanities. The principles enabling the design of this new wave of products are embodied in the discipline of Information Engineering. This course allows graduates to specialise in fundamental theory and applications relating to the generation, distribution, analysis and use of information in engineering and science.

This M.Sc. course is a full-time one year postgraduate course and consists of taught modules and a project amounting to 90 credits. The taught component comprises modules totalling 50 credits. In the first semester, students pursuing the course must take modules worth at least 25 credits, and in the second semester they take the balance of the credits. M.Sc. candidates will, in addition, complete a substantial research project and submit a dissertation which accounts for a further 40 credits to be eligible for consideration for the award of the degree.

Theoretical/taught modules

<table>
<thead>
<tr>
<th>Module</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research Project/Dissertation</td>
<td>40</td>
</tr>
<tr>
<td>Research Methods</td>
<td>15</td>
</tr>
<tr>
<td>Statistical Signal Processing</td>
<td>5</td>
</tr>
<tr>
<td>Introduction to Deep Learning</td>
<td>10</td>
</tr>
<tr>
<td>Speech and Audio Engineering</td>
<td>5</td>
</tr>
<tr>
<td>Spatial Audio</td>
<td>5</td>
</tr>
<tr>
<td>Audio Production Engineering</td>
<td>5</td>
</tr>
<tr>
<td>Digital Media Systems</td>
<td>10</td>
</tr>
<tr>
<td>Wireless Networks and Communications</td>
<td>5</td>
</tr>
<tr>
<td>Complex Systems Science</td>
<td>5</td>
</tr>
<tr>
<td>Reconfigurable Hardware for Computational Engineering</td>
<td>10</td>
</tr>
</tbody>
</table>

Some of the module options in either semester may be withdrawn from time to time and some new modules may be added, subject to demand.
Curriculum

The MMT programme is a full-time, twelve month course (or part-time over twenty four months). During the first semester, students must take the Psychoacoustics 1 module along with a number of elective modules to make a total of 30 credits. In the second semesters students must take the Psychoacoustics 2 and Research Methods modules and again a number of elective modules to make 30 credits. The third semester, which is open to who passed both the first and second semesters, has a greater research orientation and requires the completion of a research project and written thesis.

Part-time students must take a minimum of 30 credits in the first year of which Psychoacoustics will make up 10.

Career Prospects

Many of our graduates have gone on to have successful careers as composers and performers in a wide range of genres from rock/pop/electronica, to contemporary composition, and music for film and TV.

Admission Requirements

Acceptance for the course is based on an overall assessment, which takes into account:

- Academic track record
- Musical/compositional/artistic and/or technological ability as evidenced by a portfolio submission
- Formal musical knowledge - ideally level 5/6
- References
- Interview

Contact Us

Course Director: Dr Dermot Furlong
Course Email: oriordmi@tcd.ie
Course Tel(s): +353 1 896 1864
www.mee.tcd.ie/mmt/index.php

"MMT is an enabling programme of study which seeks to encourage student creativity in New Media related fields through the embrace of both theoretical and practical skill development relating to medias technologies”
Dr Dermot Furlong (Course Director)

"Another really important element of the music and media technologies programme for me it the send of community that it brought. The sense of artists coming from loads of different disciplines and coming together to make music and art together, graphic designers, video artists, musicians, composers, and that is still really important for me today, a sense of community that goes far beyond the course itself".
Linda Buckley, Composer and MMT graduate

Theoretical/taught modules

<table>
<thead>
<tr>
<th>Semester 1</th>
<th>30 credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Psychoacoustics 1</td>
<td>5 credits</td>
</tr>
<tr>
<td>Electroacoustic Composition 1</td>
<td>5 credits</td>
</tr>
<tr>
<td>Contemporary Composition</td>
<td>5 credits</td>
</tr>
<tr>
<td>Theory &amp; Practice 1</td>
<td>5 credits</td>
</tr>
<tr>
<td>Synthesis &amp; Sound Design</td>
<td>5 credits</td>
</tr>
<tr>
<td>Creative Coding</td>
<td>5 credits</td>
</tr>
<tr>
<td>Visual Music 1</td>
<td>5 credits</td>
</tr>
<tr>
<td>Audio Engineering</td>
<td>5 credits</td>
</tr>
<tr>
<td>Introduction to Max</td>
<td>5 credits</td>
</tr>
<tr>
<td>Semester 2</td>
<td>30 credits</td>
</tr>
<tr>
<td>Psychoacoustics 2</td>
<td>5 credits</td>
</tr>
<tr>
<td>Research Methods &amp; Innovation</td>
<td>5 credits</td>
</tr>
<tr>
<td>Electroacoustic Composition 2</td>
<td>5 credits</td>
</tr>
<tr>
<td>Contemporary Composition</td>
<td>5 credits</td>
</tr>
<tr>
<td>Theory &amp; Practice 2</td>
<td>5 credits</td>
</tr>
<tr>
<td>Visual Music 2</td>
<td>5 credits</td>
</tr>
<tr>
<td>Programming Interactive Systems</td>
<td>5 credits</td>
</tr>
<tr>
<td>Audio Production Techniques</td>
<td>5 credits</td>
</tr>
<tr>
<td>Spatial Audio</td>
<td>5 credits</td>
</tr>
<tr>
<td>Introduction to XR Technologies</td>
<td>5 credits</td>
</tr>
<tr>
<td>Motion Picture Engineering</td>
<td>10 credits</td>
</tr>
<tr>
<td>Semester 3</td>
<td>30 credits</td>
</tr>
</tbody>
</table>

About the programme

In recognition of a shared interest in Information Technology and a growing awareness of its relevance for music, Electronic and Electrical Engineering and Music initiated a Master programme in Music and Media Technologies (MMT) in Trinity in 1996. A particular feature of this programme is a balanced approach to musical and technological topics. Musically, a strong emphasis is placed on the development of adaptable compositional skills, while technological topics are addressed from both a hands-on workstation/studio exposure and a fundamental mathematical and scientific basis, which focuses on musically relevant issues.

The first two semesters form a self-contained Postgraduate Diploma course which provides the necessary musical and technological skills to allow creative individuals to engage in computer-assisted composition and production, apply software tools for the music and New Media industries and/or enter the arena of music-on-screen; production for New Media products.

The third (summer) semester of study, leading to the M.Phil. degree, is an option open to those achieving a sufficient standard in their first & second semester module assignments and/or exams. Students are required to complete a thesis which can be of a musical or technological nature. The programme covers a wide range of subjects within the general field of music technology, and provide students with a fully professional qualification. The programme can be taken full-time over a 12 month period or part-time over a 24 month period.
Welcome to the School of Natural Science

The School of Natural Sciences conducts research, and delivers teaching, on all aspects of the natural world, from the formation of the earth, the behaviour of the environment, the evolution and ecology of its organisms and its interactions with human society. The School is engaged with solving some of the major challenges facing human society through our teaching, research and partnership with industry and policy development both nationally and globally.

The School comprises of the Disciplines of Botany, Geography, Geology and Zoology and two research centres, accommodate ca. 40 academic staff, 25 support staff, 20 postdoctoral research fellows and over 100 graduate research students who generate annual research income in excess of €4 million and produce an average of 150 publications per year. The School also delivers three taught masters degree programmes.

School of Physics

The School of Physics has a long and distinguished history of teaching and research. Richard Helsham, the original Erasmus Smith’s Professor, was the first to lay out Newton’s methods in a form suitable for the undergraduate, so that his Lectures in Natural Philosophy were in use for a hundred years in the College and elsewhere in Europe.

Later holders of the chair include G. F. Fitzgerald, famous in relativity theory, and E. T. S. Walton, the only Irish recipient of a Nobel prize in Science. Fitzgerald campaigned for the building of a dedicated Physical Laboratory, but sadly he did not live to see the erection of the elegant building completed in 1906. The Sami Nasr Institute for Advanced Materials, completed in 2000, houses the central part of the School today.

Excellent modern facilities for teaching and research are provided over a number of buildings including CRANN, a state of the art centre for Nanoscience and Nanotechnology research housed in a purpose built 6000m² building.

The School now consists of a very lively community of over 200, including 28 academic staff, 50 postdoctoral fellows and over 100 graduate students, representing many different nationalities.

Trinity offers you the opportunity to study with world leading experts in the School of Physics, with programmes designed to provide you with a qualification for employment across a range of research and industry settings.
The course provides the opportunity to develop interests in particular areas of Environmental Science through tutorials, seminars and an extended desk study.

Following successful completion of the taught modules, students will embark on a closely supervised research project intended to expand the skills and knowledge base acquired in earlier modules. Previous research projects have covered a diverse range of subjects including: groundwater contamination; atmospheric heavy metal deposition; environmental education; sewage processing systems; bio-indicators of marine pollution; and the impacts of erosion in African lakes, ocean chemistry and climate change: and radon in the natural and work environment.

Career Prospects

The course aims to produce environmental scientists with an interdisciplinary background able to tackle the broadest range of environmental protection issues. Previous graduates of this M.Sc. course have been employed by a range of agencies involved in environmental protection, as environmental consultants and in local government. Many graduates have gone on to do further research in a range of environmentally related disciplines. Graduates from the course have pursued their interests in environmental sciences throughout the world.

Admission Requirements

Applications for admission are accepted from:
(i) holders of first or upper second class honors degrees, or their overseas equivalent, awarded by recognised universities, institutions and degree awarding bodies.
(ii) holders of other degrees or relevant qualifications including professional qualifications, who have at least three years’ work experience in an environmental profession.

Late applications from well-qualified applicants may be considered provided all the places on the course have not been allocated. Applications must be made online.

Access to the on-line application system is available here at postgraduate webpages.

“One of the best things about Trinity is that we have access to amazing researchers through our courses. We get to know researchers who are leading in their field which opens up a lot of opportunities for us students and gives us insight into life after university.”

Aneta Nerguti, M.Sc. Environmental Science
MSc/P. Grad. Dip in Biodiversity and Conservation

About the programme
Biodiversity is the diversity of all life on earth, and is currently being lost at an increasing rate. Biodiversity provides us with food, clothing, fuels, construction materials, medicines and a wide range of ecosystem services. We ourselves are part of the biodiversity of this planet: we must understand and conserve biodiversity to secure a sustainable future for humanity.

This programme has been designed to provide students with a sound theoretical and practical grounding in the science of biological diversity and its conservation. The programme is taught in modules, and these are grouped into theoretical components, practical research skills, and modules dealing with individual desk-based and experimental research projects.

"Choosing to do the MSc in Biodiversity and Conservation was definitely one of the best decisions I’ve ever made. This taught Masters is broad enough that you are exposed to a variety of areas and individuals involved in the conservation field, which helped me narrow in on what I wanted to focus on in the future".

Dana Miller (Graduate)

Theoretical/taught modules

<table>
<thead>
<tr>
<th>Module</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction to biodiversity</td>
<td>5</td>
</tr>
<tr>
<td>Introduction to conservation biology</td>
<td>5</td>
</tr>
<tr>
<td>Human interactions with biodiversity</td>
<td>5</td>
</tr>
<tr>
<td>Impacts of global environmental change on biodiversity</td>
<td>5</td>
</tr>
<tr>
<td>Data handling and analysis</td>
<td>5</td>
</tr>
<tr>
<td>Taxonomy, systematics and ID skills</td>
<td>5</td>
</tr>
<tr>
<td>Practical conservation skills</td>
<td>5</td>
</tr>
<tr>
<td>Overseas field course</td>
<td>5</td>
</tr>
<tr>
<td>Individual desk study</td>
<td>10</td>
</tr>
<tr>
<td>Project planning</td>
<td>5</td>
</tr>
<tr>
<td>Individual research project</td>
<td>30</td>
</tr>
</tbody>
</table>

*Students may omit the individual research project to be awarded a Postgraduate Diploma, those wishing to obtain the degree of Master in Science must complete a four month individual research project.

Curriculum
The course is taught through a variety of methods: lectures, practical classes, field-based learning, guided reading and discussion groups, and web-based methods. A variety of assessment procedures are employed – including essay writing, oral presentations, web-based tests, examinations and assessment of dissertations. The approach is to develop, progressively, a high degree of independent thinking and academic excellence in students completing the course, providing a smooth transition for those entering both directly from undergraduate degrees, and for those entering the course from industry.

Students undertake a 10 credit desk-based study and a 30 credit individual research project, both of which are supervised by School of Natural Science staff. Themes for both desk studies and research projects are proposed by staff, but students may also develop their own ideas. A highlight of the programme is the residential field course, currently held in spring and based in South Africa, focusing on practical management of biodiversity conservation (the cost of this field course is not included in the course fee).

Career Prospects
The programme provides in-depth training and experience for those looking to further their career in various aspects of biodiversity and its conservation, for students wishing to pursue further postgraduate research in this area, and for professionals already working in conservation biology wishing to obtain relevant qualifications.

Admission Requirements
Applicants should hold at least an upper second class honours degree, or equivalent qualification, in a science subject that included significant components of botany, zoology or a relevant life science. Non-EU applicants will be required to hold an equivalent qualification. Candidates with relevant experience as professional practitioners in biodiversity management or policy may be accepted with lower qualifications.

Applicants whose first language is not English must submit evidence of competency in English in a test administered by an institution independent of their own university (e.g. IELTS, TOEFL).

Contact Us
Course Director: Dr Stephen Waldren
Course Email: swaldren@tcd.ie
Course Tel(s): +353 1 497 2070
www.tcd.ie/naturalscience.tcd.ie/postgraduate/msc-biodiversity

“Choosing to do the MSc in Biodiversity and Conservation was definitely one of the best decisions I’ve ever made. This taught Masters is broad enough that you are exposed to a variety of areas and individuals involved in the conservation field, which helped me narrow in on what I wanted to focus on in the future".

Dana Miller (Graduate)
Career Prospects
Graduates have been very successful in securing appropriate jobs with international development organisations, such as specialized United Nations’ agencies, national aid agencies and international non-governmental organisations, and in the private and social enterprise sectors.

Admission Requirements
Entry to the program is based on competitive selection. Applications for admission are accepted from holders of first or upper-second class honors degrees (grade point average 3.5 equivalent) awarded by recognised universities and institutions, and recognised degree awarding bodies (e.g. NCEA, CNAA); holders of other degrees from recognised universities or degree granting institutions who have experienced at least three years of appropriate employment; holders of recognised professional qualifications obtained through examinations who have spent at least four years in study and who, in addition, have been employed for at least two years in the work of their profession;

Applicants whose first language is not English must submit evidence of competency in English in a test administered by an institution independent of their own university (e.g. the British Council).

Scholarships Available
Scholarships of up to €5,000 are available.

To be considered for a scholarship you must submit a 200 word statement on “How I will contribute to our Trinity College Dublin community”, along with your offer letter number from Trinity College Dublin. Submissions should emailed to E3.team@tcd.ie

Contact Us
Course Director: Prof. Pádraig Carmody
Course Email: Mdpdub@tcd.ie
Course Tel(s): +353 1 896 2414
www.tcd.ie/naturalscience/postgraduate/mdp

“The opportunity to explore a diverse range of topics within my programme with professors who are always approachable and helpful makes learning very engaging. I have been lucky enough to undertake a field course abroad and present my findings to my peers both in Trinity and further afield”.
Graduate Andrew Neill, M.Sc. Development Practice

About the programme
Established in 2009 following recommendations from the International Commission on Education for Sustainable Development Practice, the Global Masters in Development Practice (MDP) is a world-leading and uniquely innovative interdisciplinary graduate degree programme that blends health, natural, social, and management sciences—combined with cross-sectoral professional field training and placements to better understand international development problems and apply best practices. The Dublin MDP was the only programme in Europe to receive seed funding in the first round from the MacArthur Foundation.

The Dublin MDP is a member of the Global Association of Master’s in Development Practice, headquartered at the UN Sustainable Development Solutions Network, with offices in Columbia University, New York, linking with over 30 universities and thousands of partner organisations worldwide.

Curriculum
The goal of the Dublin MDP is to produce rounded development practitioners with a deep understanding of scientific methods and techniques to reduce global poverty, in addition to extensive on-the-ground training in developing country contexts, and in international organizations. The course modules are categorized according to each of the Global MDP Program’s four pillars—health, natural, social, and management sciences. Some are categorized as cross-disciplinary, although the program as a whole emphasizes the interconnectedness between development issues in these four fields. The MDP is rooted in evidence that effective public policy must be based science-based. Course offerings include a blend of traditional classroom based modules and field training placements.

Theoretical/taught modules

| Globalisation and African Development           | 5 credits |
| Smart and Sustainable Eco-Cities                | 5 credits |
| Impact Measurement                              | 5 credits |
| Gender and Development                          | 5 credits |
| Climate Change: Science, Development and Justice| 5 credits |
| Civil Engineering for Sustainable Development   | 5 credits |
| Development Economics                           | 5 credits |
| Global Health                                   | 5 credits |
| Sustainable Agriculture And Land Use            | 5 credits |
| Geographic Information Systems                  | 5 credits |
| Qualitative Research Methods                    | 5 credits |
| Theories of Development                         | 5 credits |
| Dissertation                                    | 30 credits |
| (including fieldwork preparation)               |           |

Global Classroom:
Foundations for Sustainable Development Practice (Option)

Graduate Andrew Neill, M.Sc. Development Practice
M.Phil/P. Grad. Dip in Environmental History

About the programme
The M.Phil. in Environmental History offers an advanced qualification to graduates in History, Political Science, History of Ideas, Cultural Studies or similar. This course gives students a firm understanding of the interplay of, and feedbacks between, nature and culture over time. The taught full- or part-time degree has a strong methodological focus, including training in digital humanities technologies, mixed (quantitative-qualitative) methods and innovative assessment design, supplemented by an optional self-financed field trip to Iceland. The purpose of this M.Phil. programme is to train students in methods and themes that are directly relevant to the professional workplace at a time when there is an increasing awareness of the need to include the competencies and insights of the humanities in understanding and addressing environmental issues, not least climate change.

The M.Phil programme will be led by and draw upon the resources of the Trinity Centre of Environmental Humanities, a leading research hub in the field of digital environmental humanities, giving students the opportunity to familiarize themselves with the latest developments in the field.

Curriculum
Modules will be assessed by a mix of presentations (pass/fail) and marked written assignments ranging in format from essays to archival and library exercises, seminar reports, digital content creation (e.g. GIS maps) and historical case studies. There will be no written examinations.

Career Prospects
Training in critical thinking and mixed methods research skills (such as qualitative and quantitative approaches in GIS software) will open up students' career perspectives in public management, private consultancies and NGOs, while also being an excellent entry point for doctoral studies.

Admission Requirements
Relevant preparatory courses include NFQ level 8-degree courses in the Humanities (History, Political Science, History of Ideas, Cultural Studies or similar) and the Natural Sciences (Environmental Sciences, Geography, Ecology, Biology or similar). Applicants should normally have at least an upper second class (2.1) Honours Bachelor’s degree or equivalent (for example, GPA of 3.3) in a relevant discipline or specialisation.

Applicants with English as a foreign language should be aware that this course involves extensive written assessment. TCD’s English Language Requirement.

Theoretical/taught modules

<table>
<thead>
<tr>
<th>Module</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Methods and Debates in Environmental History</td>
<td>15</td>
</tr>
<tr>
<td>Oceans and the Anthropocene</td>
<td>10</td>
</tr>
<tr>
<td>Parchment to Pixel: World History through Historical Maps and GIS</td>
<td>10</td>
</tr>
<tr>
<td>Energy and Power in the Modern World</td>
<td>10</td>
</tr>
<tr>
<td>Environmental History Research Seminar</td>
<td>5</td>
</tr>
<tr>
<td>Individual Research Project</td>
<td>30</td>
</tr>
</tbody>
</table>

Students will also be able to choose between a number of optional modules from the School of Histories and Humanities as well as from the School of Natural Sciences.

Contact Us
Course Director: Dr Katja Bruisch
Course Email: BRUISCHK@tcd.ie
Course Tel(s): +353 1 896 3192
www.tcd.ie/naturalscience.tcd.ie/history/postgraduate/taught/environmental-history

“Our Centre is brilliant for the opportunities it has to offer, mostly because of the community and the wide range of backgrounds and expertise that those who are researching here at the Centre can provide.”

Tenaya Jorgenson, PhD student, Trinity Centre for Environmental Humanities
MSc/P. Grad. Dip in Energy Science

(1 year fulltime) / (2 years part-time) (M.Sc. / P.Grad.Dip.)

About the programme
Energy Science is a jointly run programme by the Schools of Physics, Chemistry and Geology. The MSc in Science of Energy consists of six taught modules worth 10 ECTS each. These are structured around a cross-cutting introductory module. The introductory module is designed to furnish students with all of the basic physics, chemistry and engineering concepts that are required to become an “Energy Scientist”. These basics are complemented by essential “Economics of Energy” and “Principles of Energy Policy”.

Then, with the ability to understand and analyse the competing aspects of all of the essential science, engineering and economics pertinent to the energy discipline, the students proceed to five specialised technically orientated core modules; “Conventional Energy Sources & Technologies”, “Electric Power Generation and Distribution”, “Sustainable Energy Sources & Technologies I & II”, and “Managing the impact of Energy Utilisation”.

With these modules completed and examined in the months September to April, students proceed to a 15 month research project worth 30 ECTS in a leading research laboratory or in industry in the months of May-August.

Curriculum
The curriculum is designed to allow students from science, engineering, or other backgrounds with relevant experience, to gain the scientific knowledge needed to contribute to the energy sector. This can be through industry, business, academia, government policy or media communication.

The course will be delivered across 6 modules each worth 10 ECTS, and will include a 30ECTS project

Theoretical/taught modules

<table>
<thead>
<tr>
<th>Module</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction to Energy Science</td>
<td>10</td>
</tr>
<tr>
<td>Conventional Energy Sources and technologies</td>
<td>10</td>
</tr>
<tr>
<td>Electric Power Generation and Distribution</td>
<td>10</td>
</tr>
<tr>
<td>Sustainable Energy Sources and Technologies I</td>
<td>10</td>
</tr>
<tr>
<td>Sustainable Energy Sources and Technologies II</td>
<td>10</td>
</tr>
<tr>
<td>Managing the impact of Energy Utilisation</td>
<td>10</td>
</tr>
</tbody>
</table>

Career Prospects

The cost of energy is a dominant factor in determining the profitability of any manufacturing business. Large multi-national companies are therefore very concerned by the efficiency and sustainability of their energy usage, as are government organisations. Ireland and the other European Union member states are the international leaders in energy efficiency and energy sustainability. Our leadership is driven by the European target to produce a 30% reduction in energy usage and CO2 production by 2030. The energy innovations that will deliver this target will be underpinned by graduates strong in the discipline of energy science.

In addition to environmental and energy regulating authorities, graduates of the MSc in Energy Science have knowledge and skills directly applicable to a host of energy orientated industries, including: power generation and distribution; electronics, automotive, aviation, construction and oil & gas. For graduates interested in academic research, the societal pursuit of clean and secure Energy is at the heart of the research agenda of every major country.

Upon completion students develop a wide range of skills: excellent communication skills, scientific skills, analytical skills, IT, organisational skills and critical thinking which are valued by employers in engineering, oil and gas and many other industries. Transferrable skills gained during M.Sc. Energy Science opens up perspectives to other industries which are not directly related to the degree leaving students with a big spectrum of career opportunities.

‘An important aspect of the degree is that special attention is also given to educate students on the strengths of conventional fossil fuel energy sources, and nuclear energy technologies. By doing this the students understand the strengths of these technologies that made them successful such that they will understand how renewable technologies must be configured to displace them.’

Dr Stephen Dooley, Course Director.

Admission Requirements

This MSc is suitable for graduates who have achieved an upper second-class honours degree or the international equivalent in either physical sciences or engineering. However, applications from similarly qualified candidates from other disciplines are welcome if they can demonstrate a sufficient level of knowledge or interest in the Energy sector.

Scholarship Info

The School of Physics is delighted to offer a number of partial scholarships to students undertaking the MSc Energy Science degree in academic year 2020/21. The value of the scholarship is a 5,000 Euro contribution towards tuition fees (Non-EU). These partial scholarships aim to support and develop gifted postgraduate students and will be awarded to candidates who demonstrate a high level of academic achievement, extracurricular accomplishments or contribution to society.

I’ve been able to study under some world-renowned professors in lecture theatres which once housed famous scientists such as Ernest Walton and Erwin Schrodinger. I’ve used some of the most advanced microscope imaging equipment in the country.

Robert Smyth, Energy Science Graduate 2019

Robert now works for ElectroRoute, providing access to the live Irish power market where he trades on the behalf of power generation companies.

Contact Us

Course Administrator: Jenny Kirkwood
Course Email: energyscience@tcd.ie
Course Tel(s): +353 1 896 2019/086 4044972
www.tcd.ie/courses/energyscience

Times Higher Education World University Rankings 2020, has ranked Trinity College Dublin in the top 5 “Sustainable Cities & Communities” global university rankings category, and in the top 30 “Affordable and Clean Energy” global universities.
M.Sc. in Smart & Sustainable Cities

About the programme
This new MSc in Smart and Sustainable Cities at Trinity approaches the study of smart and sustainable urbanism by drawing from the research based expertise of leading scholars in the area of ‘Engineering, Environment, and Emerging Technologies’, or E3.

The Masters in Smart and Sustainable Cities is the bringing together of a rounded understanding of both ‘smart cities’ and ‘sustainability’ as overlapping areas necessary for the analysis of contemporary cities. The breadth of research across Trinity College can be combined to support a vision for a happy, green and cost-effective city, where we address the required optimisation of resources, harness the growth potential for business, reduce the city’s environmental impact, and improve citizens’ quality of life within urban environments.

Trinity set up the Future Cities Research Centre which undertakes multi-disciplinary research that enables, promotes and facilitates behavioural change for sustainability. The research is supported by the application of sensor, communication and analytical technological solutions to sustainability concerns in urban infrastructure such as energy, water, waste management and transportation systems.

Sustainability will be a crosscutting theme and will permeate the entire degree with the aim of exploring solutions to real-life urban issues and developing strategies for truly ecological and socially just cities. The programme will be highly interdisciplinary and students will study smart urbanism, by combining the methodological and conceptual tools of different, compatible disciplines.

This programme draws upon existing modules within the Schools of Computer Science & Statistics, School of Engineering, and the School of Natural Sciences. The programme will also have a number of novel and ambitious components such as company placements for students and a mandatory field trip to one of three alternating European cities.

Theoretical/taught modules
The M.Sc. in Smart and Sustainable Cities will be delivered full-time over one year. The course comprises 8 compulsory modules, carrying 5 ECTS credits each, and a Dissertation module carrying 30 ECTS credits. In addition, students also take a total of 20 ECTS of optional credits to give a total 90 ECTS for the course, as outlined below:

Core (compulsory modules)
- Urban Governance
- Smart Eco-Cities of the Future
- Geographical Information Systems (GIS)
- Urban Sustainability
- Introduction to Machine Learning
- Research Method
- Fieldtrip
- Placement
- Dissertation

Options (choose 4)
- Transportation Policy
- Transportation Modelling & Planning
- Energy Policy & Building Energy Demand
- Urban Computing
- Artificial Intelligence
- Machine Learning
- Environmental Policies
- Human Interaction with Biodiversity
- Climate Justice, Climate Change & Development

The programme draws upon existing modules within the Schools of Computer Science, Engineering and Natural Sciences as well as introducing new, core modules exclusive to this masters. For some of the optional modules, pre-requisites apply and admission is dependent on getting the module coordinator’s approval, based on prior education and experience.

Career Prospects
The new master’s degree programme is designed to meet the learning needs of students who want to enter an expansive but demanding employment market, preparing them for professional work in institutions and public or private companies, in the field of Smart and Sustainable Cities.

Admission Requirements
Admission to the course is competitive. Applicants will be expected to have an Honours Bachelor degree at 2.1 or above in a Social Science or Science-based course such as Engineering, Sociology, Computer Science, Economics, Geography or cognate fields. In case of heavy competition for places or concerns regarding a particular applicant’s suitability, applicants may be interviewed or asked to submit a written sample for assessment.

Contact Us
Course Email: e3.team@tcd.ie
Course Tel(s): +353 1 497 2070
www.tcd.ie/courses/postgraduate/az/course.php?id=DPTNS-SSCI-1F09
Sinead Lucey,
E3 Business Development Manager
Faculty of Engineering, Mathematics and Science
Trinity College Dublin
the University of Dublin, Dublin 2, Ireland
Email: SILUCEY@tcd.ie

Nora Varga
E3 Student Recruitment & Admissions Office
Faculty of Engineering, Mathematics and Science
Trinity College Dublin
the University of Dublin, Dublin 2, Ireland
Email: nvarga@tcd.ie

Melanie Mai
E3 Student Recruitment & Admissions Office
Faculty of Engineering, Mathematics and Science
Trinity College Dublin
the University of Dublin, Dublin 2, Ireland Email: MAIM@tcd.ie

Contact

Balanced solutions for a better world