Master of Science in Smart & Sustainable Cities

Course Handbook 2023/24

[1]

M.Sc. in Smart & Sustainable Cities
2022/23

Table of Contents

[2]

Welcome to the M.Sc. in Smart & Sustainable Cities

With thousands of smart-city initiatives around the world, smart urbanism is now one of the dominant models of urban development. Projects for smart cities involve the regeneration of existing urban areas as well as the creation of large new settlements, and have a major positive impact on the many environmental, social and economic systems that underpin the planet. Meanwhile, and with a strong overlap with smart city initiatives, cities around the world are reacting to broader environmental challenges, such as climate change through measures aimed at developing sustainable solutions.

Smart-city initiatives have a multi-dimensional nature. As projects that are aimed at improving urban spaces, they are deeply connected to issues of urbanisation and urban planning. Moreover, projects for smart cities involve the production of a number of technologies such as wireless sensor networks designed to produce data on how the city operates, and innovative efficient or low-waste electrical grids. Therefore, because of their focus on technological innovation, the development of smart cities goes beyond the science of the city and is also the product of studies in computer science and engineering. Finally, once implemented, smart interventions take place not upon a blank canvas, but rather within complex ecological and social systems whose dynamics must be taken into account, in order to avoid environmental degradation and biodiversity loss.

Particularly in terms of sustainability, the multi-dimensional nature of smart-city initiatives can be understood only through an interdisciplinary approach. This new MSc in Smart and Sustainable Cities approaches the study of smart and sustainable urbanism by drawing from the research-based expertise of leading scholars from Trinity's Energy, Environment and Emerging Technologies Institute (E3). The programme, which is the first dedicated programme of its kind, will provide students with an in-depth understanding of smart and sustainable cities, using (a) the tools of urban geography and planning to examine the spatial formation of smart cities; (b) methods in engineering and computer science to analyze the functions and applications of smart technologies, and (c) insights from ecology to explore the environmental impact of both 'smart-city projects' and wider transformations of contemporary cities. The programme is thus of interest to a wide range of students from different backgrounds. Career options after graduation include working in planning and in the private sector engaged in smart city initiatives.

This booklet contains contact information on the module coordinators and other personnel associated with the programme; an outline of the course and module structure; key deliverables and milestones; and general information on requirements and expectations.

The full timetable for each semester will be available via the my.tcd.ie portal.

Resources and Credits

The course comprises 8 compulsory modules (including fieldtrip, carrying 5 ECTS credits and a Placement, which carries 10 ECTS) and a Dissertation module, carrying 30 ECTS credits. In addition, students also take a total of 15 ECTS of optional credits, to give a total 90 ECTS for the course

Students will have access to all library facilities in TCD, including the Freeman Library in the Museum Building. Students are encouraged to avail of all resources and materials locally and online.

Supervision

Students are required to secure an appropriate supervisor for their dissertation. Supervisors can be drawn from across all faculties in TCD. Students should identify an appropriate supervisor on the basis of the topic they have selected, and their general research interests in consultation with the module coordinator.

Contacts

Course Director: Dr. Philip Lawton at philip.lawton@tcd.ie

Course Administrator: Ms Elaine Elders at elderse@tcd.ie

[4]

Governance Structure

Course Committee:

This committee has responsibility, in conjunction with the Head of the School of Natural Sciences, for the day to day running of the programme and for its future development. The committee participates in the implementation of and compliance with the TCD Quality Assurance procedures and assists in the periodic reviews of the programme.   This committee reports into the Graduate Studies committee.

Membership of the Course Committee:

Ex officio members:

Course Director (Dr. Philip Lawton)

School Director of Teaching and Learning (Postgraduate)

Head of School of Natural Sciences

Course Administrator

All module coordinators

Student representative

Module Coordinators (Core Courses)

Dr. Philip Lawton (Director)

Philip Lawton joined Trinity College Dublin as Assistant Professor in Geography in September, 2017. His research interests are focused on the intersection between urban economic change, urban policy making and social life in cities. Outputs from his research have included the analysis of residential preferences of creative-knowledge workers (*Cities*, 2013), the ideal of the 'European city' in Dublin policy making (*International Journal of Urban and Regional Research*, 2014), and the connections between uneven development and suburban transformation in Adamstown, Dublin (*European Journal of Urban and Regional Studies*, 2018). Prior to joining Trinity College, Philip held positions in Maynooth University, NUI Galway, and Maastricht University. Through these experiences, Philip has sought to develop an approach to teaching that is centred on student discussion and interaction.

Dr. Lawton is course director and the coordinator for Urban Governance, Fieldtrip, Placement and Dissertation

Dr Federico Cugurullo

Federico Cugurullo is Assistant Professor in Smart and Sustainable Urbanism at Trinity College Dublin. His research is positioned at the intersection of urban geography, political philosophy and experimental urbanism, and explores how ideas of sustainability are cultivated and implemented across geographical spaces, with a focus on projects for eco-cities and smart cities.

Federico has done extensive empirical research in the Middle East and Southeast Asia where he has investigated the sustainability performance of supposedly experimental cities such as Masdar City in Abu Dhabi and Hong Kong. His work has been used by the United Nations and the United Kingdom's Department for Environment, Food & Rural Affairs (DEFRA) to foresee future urban challenges and develop preventive policies.

Building upon empirical grounds, Federico's main theoretical aspiration (also the subject of his forthcoming book) is the development of *urban equations* for a sustainable urbanism. Other theoretical contributions include the concept of *urban eco-modernisation*, and the theory of *de-composed urbanism* and *Frankenstein cities*.

Before joining Trinity College Dublin, Federico held positions at the University of Manchester, King's College London and the London School of Economics and Political Science.

[6]

Dr Cugurullo is the coordinator for Smart-eco Cities of the Future and Qualitative Research Methods.

Dr. Giovanni Di Liberto

Giovanni received his Bachelor's degree in Information Engineering in 2011 and his Master's degree in Computer Engineering in 2013, both from the University of Padova, Italy. After a period working on his thesis at University College Cork (UCC, Ireland), he joined Edmund Lalor's research lab in Trinity College Dublin where he pursued a PhD in auditory neuroscience in the School of Electronic and Electrical Engineering. He received his PhD in 2017 and he joined the Laboratoire des Systèmes Perceptifs at École Normale Superieure (Paris) immediately after, under the supervision of Alain de Cheveigné and Shihab Shamma. He holds the title of Assistant Professor in Intelligent Systems in the School of Computer Science and Statistics at Trinity College Dublin.

Giovanni's scientific interests centre on understanding the brain mechanisms underlying speech comprehension. In his work, he develops data analysis methods and applies them to brain data to identify the neural processes responsible for the transformation of a sensory stimulus into its abstract meaning. Brain electrical data is measured with either non-invasive (e.g., electroencephalography - EEG) or invasive (e.g., electrocorticography - ECoG) technologies. The first aspect of his research is methodological and has produced novel experimental and analysis frameworks to investigate cortical auditory processing. The second aspect of his research is to use such novel methods to test theories on auditory perception, such as the hierarchical processing of speech and predictive processing theories (e.g. predictive coding). Finally, the third part of his work is translational and involves the identification of solutions to utilise his novel methods in applied settings, for example as tools to develop brain-computer interfaces (COCOHA project) or as objective measures for the monitoring of language development and healthy ageing.

Giovanni will coordinate the Introduction to Machine Learning module.

[7]

Dr. John Connolly

Dr. John Connolly is The Kinsella Assistant Professor in Geographical Information Systems and Remote Sensing and leads the Trinity Geospatial Research Group. He joined Trinity College Dublin in September 2020. He teaches GIS and remote sensing at both undergraduate and postgraduate levels. John's research uses GIS and Earth Observation to study the terrestrial environment including land use change; landscape carbon dynamics; solar mapping and habitat assessment using EO. John will take a role in the GIS course which will be lead by Dr. Jean Wilson (see below)

Dr. Jean Wilson

Jean's research interests lie in environmental applications of remote sensing, GIS and spatial analysis and she is funded as a Research Fellow by the Environmental Protection Agency (EPA) under the STRIVE Water Research Programme 2012 (2012-W-MS-13). Her research project "CONNECT" (COmbiNed Earth ObservatioN and GEochemiCal Tracing for Groundwater Detection and Evaluation in Ireland) is being undertaken within the Biogeochemistry Research Group, headed by Prof. Carlos Rocha.

Dr. Marcus Collier

Professor Collier's many research interests include land use and land-use change, resilience thinking and societal transitioning, collaborative management and planning, urban and rural governance. Notable examples of his research include the contentious policy issues of biomass/bioenergy land-use policies and implications, afforestation policies and acidification processes, field boundaries and agri-environmental change, resource use and after-use policies, rewilding, GM crops and biodiversity, marine and coastal governance, (cultural) ecosystem services, and well-being. In recent years he has researched and published extensively on contested issues such as novel ecosystems and nature-based solutions.

Professor Collier will deliver the Urban Sustainability Module

Affiliated Staff (Optional Modules)

The MSc in Smart and Sustainable Cities also draws upon the expertise of a number of modules delivered via participating schools and programmes. The following list is of staff members associated with respective available courses.

Dr. Ivana Dusparic, School of Computer Science and Statistics

Dr. Susan Murphy, School of Natural Sciences

Dr. Owen Conlan, School of Computer Science and Statistics

Dr Brian Caulfield, Civil, Structural and Environmental Engineering

Dr. Gaye Stephens, School of Computer Science and Statistics

Dr Dave Lewis, School of Computer Science and Statistics

Dr Bidisha Ghosh, Civil, Structural and Environmental Engineering

Dr Mélanie Bouroche, School of Computer Science and Statistics

Prof Douglas Leith, School of Computer Science and Statistics

Dr Sean McClenaghan, School of Natural Sciences

Prof Jane Stout, School of Natural Sciences

Requirements and expectations

Attendance:

Prompt attendance for **all** taught components, including fieldtrip, placement and dissertation preparation, is a requirement of this course. Prior permission for absence should be sought *in writing* from the module co-ordinator. *Failure to attend classes is regarded as a failure to comply with the fundamental course requirements.* For modules and projects that include field work, students are required to read the safety guidelines (available online at http://www.tcd.ie/estatesandfacilities/health-and-safety/). In addition to attending a safety briefing, students are required to complete health and safety forms and insurance forms.

The course aims to develop key transferable skills of both independent work and working together as part of a group. For group work, it is essential that students participate fully with assigned groups; take the initiative and do not leave it to others. Group work will be subject to peer group assessment.

This is a post-graduate qualification and therefore contains a considerable component of independent study. It is vital that students effectively manage the time spent outside of classes. The course structure assumes a nominal 40 to 50 hour week, although there will inevitably be some variability of workload throughout the year.

IMPORTANT: non-attendance due to paid employment is not an acceptable excuse or mitigating circumstance.

Code of conduct

All students are expected to comply with the TCD student code of conduct.   Students are expected to be courteous and professional at all times, and in their dealings with all persons connected to the programme. Failure to do so will result in disciplinary action. Inappropriate or unprofessional conduct will be brought to the attention of the course committee and appropriate penalties will be applied. Additional information is available from the college website. It is the student's responsibility to familiarise themselves with this information and ensure that all standards are maintained at all times throughout the programme.
https://www.tcd.ie/Junior_Dean/student-discipline/

Course Information

Programme Aims, Objectives, and Learning Outcomes

On successful completion of the course students should be able to:

- Explain the drivers, nature and evolution of smart and sustainable urbanism as a
- modality of urbanisation.
- Analyse big data sets using technical tools to enable the better planning of cities.
- Develop integrated plans to deliver smart and sustainable city interventions.
- Deploy their excellent practical understanding of Geographic Information Systems to deliver improvements to urban efficiency and sustainability.
- Apply their advanced level understanding of ecology and the potential for nature-based solutions to urban problems.
- Effectively design, develop and deliver independent research focused on key elements of smart and sustainable urbanization.

Description of the European Credit Transfer System

The European Credit Transfer and Accumulation System (ECTS) is an academic credit system based on the estimated student workload required to achieve the objectives of a module or programme of study. It is designed to enable academic recognition for periods of study, to facilitate student mobility and credit accumulation and transfer. The ECTS is the recommended credit system for higher education in Ireland and across the European Higher Education Area. The ECTS weighting for a module is a measure of the student input or workload required for that module, based on factors such as the number of contact hours, the number and length of written or verbally presented assessment exercises, class preparation and private study time, laboratory classes, examinations, clinical attendance, professional training placements, and so on as appropriate. There is no intrinsic relationship between the credit volume of a module and its level of difficulty. The European norm for full-time study over one academic year is 60 credits.

1 ECTS credit represents 20-25 hours estimated student input, so a 5-credit module will be designed to require 100-125 hours of student input including class contact time and assessments. ECTS credits are awarded to a student only upon successful completion of the course year.

Course Structure and Modules

The programme will run over a twelve-month period and will consist of several modules in different disciplines, with the aim of capturing the many different dimensions of the smart city. Modules in urban geography and sustainable urban development will address the urban dimension of smart cities, including their social dimensions and approaches to urban governance. Modules in computer sciences, simulation and engineering, will analyse how the latest smart technologies operate. Modules in ecology and environmental geography will examine the impact that smart-city projects have on local, regional and global environmental 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.

Modules

Core (compulsory modules)

- Urban Governance
- Smart Eco-Cities of the Future
- Geographical Information Systems (GIS)
- Urban Sustainability
- Introduction to Machine Learning
- Approaches to Smart and Sustainable Cities
- Fieldtrip
- Placement
- Dissertation

Options (choose 3)

- Transportation Policy
- Transportation Modelling & Planning
- Energy Policy & Energy Storage
- Urban Computing
- Artificial Intelligence
- Machine Learning
- Environmental Policies
- Human Interaction with Biodiversity
- Climate Justice, Climate Change & Development

[12]

•Collaboration with industry partners for placements

The course will incorporate a mandatory industrial in-company placement module. The placement is designed to allow students to link their in-class learning to hands-on approaches within a particular sub-area of smart cities and urban sustainability. This will be achieved both through the experience of the work placement itself and through the completion of a report, which will form the majority of the coursework on this module (80%). As well as improving the potential learning outcomes for the students, this will also allow for the development of longterm professional relations between the Masters and key industry partners. Students will be expected to seek out and secure their own placements. However, students will be given assistance in finding relevant organizations.

•Fieldtrip
A central pillar of the Masters is a residential fieldtrip, which will allow students to relate the themes and concepts from the Masters to everyday examples in different contexts. A novel aspect of this module will be the encouragement of student-led learning via the development and delivery of an original piece of research revolving around a particular theme. The fieldtrip will alternate between three European cities that have been central to both smart and sustainable approaches to urban transformations. This allows students to gain insights into the ways in which different approaches emerge within specific social, political and economic contexts in which they are embedded. The destination for the Fieldtrip for 2022-2023 is Amsterdam. Students will need to budget an additional 500-600 Euros for the Fieldtrip. Also, the Fieldtrip will take place during Reading week in semester 2 (week beginning Monday 6th March 2023). In TCD, the Reading Week in Semester 2 is often used for the purposes of a Fieldtrip.*

It should be noted that at the time of writing, we are in a time of uncertainty due to Covid-19. Should this remain as a challenge for the delivery of a fieldtrip, the module can be amended to a 'Site-Specific' approach to Smart and Sustainable Cities, whereby a focus is placed on learning about one of the aforementioned locations through a desk-based piece of research.

Urban Governance (Core)

5 ECTS

Module Contact Hours 20

Module Coordinator Dr. Philip Lawton

Module description

This module will introduce students to the role of urban governance in shaping contemporary urban space. The module will promote an understanding amongst students of the complex forces that serve to bring about processes of urbanization. Here, in drawing upon relevant examples, the module will begin through an analysis of the different forces at work in shaping urban space, including economic, social, cultural and political dynamics. Upon completion of this section of the module, the students will have knowledge of the inter-relationship between governance structures and the wider dynamics of urban change. This will include both 'smart' and 'sustainable' approaches to governing urban space, but this specific focus will also be expanded upon within the 'Smart EcoCities of the Future' course.

Module learning aims/objectives

The key learning objectives for this module are as follows: to gain an in-depth knowledge of the meanings of urban governance structures for the everyday workings of contemporary cities; to understand the intertwining of social and political forces in shaping everyday urban environments; to enhance the critical reading and writing skills of students, with a particular focus on urban theory.

Module learning outcomes

On successful completion of the module students should be able to:

- Explain the linkage between the nature of cities and the history of urbanization.
- Explain the complexity of social and political forces at work in urban space.
- Engage critically with the role of urban theory and how it can be applied to real-world solutions.

- Develop and hone critical skills in reading and writing across different research areas and traditions.

Module assessment

Discussion journal (precis) to be kept by students and filled in after each class: 10%

Term essay: 80%

Class engagement/Discussion: 10%

Smart-Eco cities of the future (Core)

Module Coordinator: Dr Federico Cugurullo (cugurulf@tcd.ie)

5 ECTS – 24 Teaching Hours; 100 hours reading

Outline:

The world is entering an urban age. There is a direct correlation between global development challenges such as climate change, poverty and resource scarcity, and urban issues. The way cities are designed, planned, governed and experienced, has a direct impact not only on local societies, economies and environments, but also on the planet.

However, while cities are responsible for the majority of the environmental, social and economic problems of the twenty-first century, they can also be drivers of change and steer the development of nations towards a condition of sustainability. Today, it is clear that current cities have to evolve, but how and when this will happen are questions which are still surrounded by a veil of mystery.

In this module, we will examine the main models of sustainable urbanism currently under development across the world. We will learn how projects for smart cities and eco-cities are developed, drawing upon a number of case studies from different continents. We will explore new and existing cities in Southeast Asia, the Middle East and Europe, in order to evaluate how the idea of urban sustainability is cultivated and implemented across geographical spaces, seeking to discover a formula for sustainable city-making.

This module is highly interdisciplinary and interactive, and uses the tools of geography, planning, politics and sustainability science to accomplish the following objectives:

[15]

- Understand and evaluate mainstream models of sustainable urban development such as the smart city and the eco-city

- Reflect over the meaning of the idea of sustainability

- Develop urban agendas which can lead to a condition of urban sustainability

- Undertake analysis of projects for smart and eco-cities from a sustainability perspective

- Contribute to the emerging field of experimental urbanism and design strategies through which cities can experiment with alternative models of development.

Assessment:

Group project (worth 100%). The assignment will ask you to explore a city of your choice, where a smart-city agenda is currently being developed, and write a report. Your aims will be:

1. To identify what key urban sustainability challenges that city is experiencing

2. To critically assess the extent to which the existing smart-city agenda is helping the city become more sustainable, particularly in relation to the challenges that you have identified

3. To discuss how the identified problems can be mitigated by drawing upon ideas of sustainable urbanism and case-studies explored through the module.

Key readings

Cugurullo, F. (2018). Exposing smart cities and eco-cities: Frankenstein urbanism and the sustainability challenges of the experimental city. *Environment and Planning A: Economy and Space*, 50(1), 73-92.

Jong, M., Joss, S., Schraven, D., Zhan, C., & Weijnen, M. (2015). Sustainable–smart–resilient–low carbon–eco–knowledge cities; making sense of a multitude of concepts promoting sustainable urbanization. *Journal of Cleaner production*, *109*, 25-38.

Evans, J., Karvonen, A., & Raven, R. (Eds.). (2016). *The Experimental City*. Routledge, London

Exposing smart cities and eco-cities: Frankenstein urbanism and the sustainability challenges of the experimental city. *Environment and Planning A*, 0308518X17738535.

Shelton, T., Zook, M., & Wiig, A. (2015). The 'actually existing smart city'. *Cambridge Journal of Regions, Economy and Society*, 8(1), 13-25.

[16]

Research Methods: GIS (Core)

Coordinator: Dr Jean Wilson (wilsonj1@tcd.ie)

5 ECTS: 24 - 30 teaching hours 80 - 100 hours lab work, assignments.

Description

The aim of this 5-credit course is to introduce students to the fundamental principles, methods, techniques and tools in GIS for spatial analysis including data management and visualisation; and their application in the context of development practice. Following completion of this course students are prepared to think geographically and understand what a GIS comprises and how GIS and spatial analysis can be used to support operational and strategic decision making across health, natural, social and management sciences. The course will be delivered through lectures, research activities and laboratory practical exercises using industry standard software. This is a hands-on GIS course and students are expected to be in attendance each day to work through the practical learning material and complete assignments. Students are required to bring 1) a portable hard drive device (e.g. usb key) with at least 2GB of storage and 2) a hardback notebook (for use as a GIS journal) to class.

Learning outcomes

- Demonstrate knowledge of the key components of a GIS and fundamental concepts that underlie use of spatial data within a GIS in the context of development practice

- Take cognizance of the value and limitations to the use and application of publicly available multidisciplinary geospatial datasets in research

- Use GIS tools and methods as a research aid for visualization (mapping), spatial analysis and communication (present high-quality GIS based outputs in report format)

- Apply GIS techniques to development practice

Assessment: 100% coursework [GIS essay (25%) short answer quiz (25%), practical exercises (50%)].

Urban Sustainability (Core)

5 ECTS

Module Contact Hours 22 Hours of Lectures

Module Coordinator Dr. Marcus Collier

Module description

This module will offer students a grounding in core approaches to sustainable urban development. The module will first introduce students to the basic tenets of sustainable urban development, with a focus on the interconnections between the ecological, social, economic, and cultural aspects of meanings of sustainability and its significance for understanding urbanization and cities. In drawing upon a range of expertise from practitioners and researchers, the module will then explore a range of different examples across the spectrum of urban sustainability. This will include knowledge of grounded approaches, such as through 'nature-based solutions' and their applicability in different contexts; the practices of social sustainability and how it connects to ecological approaches; the role of justice in promoting sustainability; how 'smart' technologies can aid in the development of sustainable practices.

Module learning aims/objectives

- to introduce students to the core tenets of sustainable urban development.
- to guide students through the development of the UN Sustainable Development Goals and how they can be implemented at different scales, with a focus on the scale of the urban region.
- to develop a strong understanding of the intertwining of the social and technical aspects of sustainable urban development.

Module learning outcomes

On successful completion of the module students should be able to:

- develop cognitive skills for assessing an in-depth meanings of urban sustainability.
- explain the potentials of sustainable practices and the challenges contained within sustainability-oriented policies (at local, regional, national and global levels).
- to acquire skills of the hands on approaches (including technical skills) necessary for sustainable urban development.

Module assessment

Class Engagement: 10%

Core Essay based upon direct essay under guidance/engagement with expert within particular sub-topic: 90%

Approaches in Smart and Sustainable Cities (Core)

5 ECTS

Module Coordinator: Dr Philip Lawton

This module aims to bring together cutting-edge approaches to Smart and Sustainable Cities. It draws from the top expertise across different schools in Trinity College Dublin, with the ultimate aim of providing an overview of the different approaches to smart and sustainable cities within the framework of E3 and across schools of Computer Science, School of Natural Sciences, and Engineering. Throughout the duration of the semester, different experts within each of the schools will draw out from their own research experience in order to offer key insights into the different ways of conceptualizing and researching smart and sustainable cities. This will include details of setting up and beginning a research project, carrying out the research and subsequently writing up of their findings. The course will be structured as follows: The majority of the course will involve different experts delivering insights on their approach to smart and sustainable cities. For these lectures, different experts will outline their experiences and approaches. A smaller sub-section of the course will be focused upon the development of a literature review as a core element of your wider research approach. This will be delivered by the course coordinator, Dr. Philip Lawton. As is outlined below, the core aim of this part of the course is to demonstrate the link between a body of literature and a wider approach to research.

Link to Dissertation:

It is important to note that this module also serves as a way of introducing students to potential topics their dissertation. While it is a stand-alone module, it serves the dual purpose of allowing students to think about their dissertation topic and potentially identify a supervisor (if they have not already done so). Although some students will already have chosen their topic, others can use the time to think through the different approaches in Smart and Sustainable Cities.

Assessment:

1: Dissertation Proposal (2000 Words):

As part of this module, students are asked to prepare a Dissertation Proposal. This will involve developing a research topic, research question, as well as setting aims and objectives of the thesis.

2: Literature Review (3000 Words):

One of the key parts of your dissertation will involve the development of a literature review. This involves undertaking a critical analysis of, and write-up of, the key literatures and debates within the sub-area that you will focus upon in your dissertation. As such, it forms a crucial backbone of your dissertation. Whereas the 'Synthesis Essay' seeks to draw from across different sub-areas of research, in the Literature Review, for this part of the assignment, you are free to engage in the literature that you would like to draw upon for your dissertation.

It should be noted from the outset that it is expected that what you produce for this module will be substantially updated and expanded for your dissertation.

- To identify and learn about different approaches within Smart and Sustainable Cities from throughout different disciplines, including Computer Science, Engineering, Natural Science, and Social Science; To synthesize approaches and results from different approaches across different disciplines; To understand the requirements of setting up and carrying out a stand-alone research project; To enable students to develop a focused literature review on a topic related to smart and sustainable cities.

Introduction to Machine Learning (Core)

5 ECTS

Module Contact Hours 22

Module Coordinator Dr Giovanni Di Liberto

Module description

Introduction to Machine Learning is designed to offer an introduction to the basics of ML, specifically with a hands-on curriculum aimed at developing knowledge and skills in establishing ML pipelines with state of the art languages and toolkits. This module is designed for students with limited prior experience of programming. It will introduce the fundamentals of programming, with a focus on setting up an effective pipeline for processing datasets to execute common ML techniques such as Scalable Vector Machines and Linear Regression.

Module learning aims/objectives

- The core aims of the Introduction to Machine Learning module are as follows:
- introduction to programming with Python and/or R.
- knowledge of where ML is situated within the broader topic of Artificial Intelligence.
- preparing datasets (and develop knowledge of the consequences of manipulations made) for processing.
- establishing and configuring a processing workflow in Python and/or R using state of the art toolkits.
- assessing the performance of the pipeline.
- evaluating the outputs of the ML pipeline.

Module learning outcomes

On successful completion of the module students should be able to:

- Configure a programming environment suitable for exploring ML techniques.

- Prepare datasets for ML processing and understand the consequences of decisions made in cleaning data.

- Assess the performance of a ML pipeline.

- Critically evaluate the outputs of a ML pipeline.

Module assessment

2 hour exam (40%); Coursework (60%)

Dissertation (Core)

30 ECTS

Module Contact Hours 10 Hours Tutorials; 740 Hours Student Dissertation Work

Module Coordinator Dr. Philip Lawton

Supervisors can be drawn from various academic staff from across the Schools of Natural Sciences, Computer Science and Statistics, and Engineering and are not confined to those teaching on existing modules. Lists of academic staff in the participating Schools are available here:

https://naturalscience.tcd.ie/people/

https://www.scss.tcd.ie/personnel/

https://www.tcd.ie/Engineering/staff/

Module description

The dissertation will entail students developing a piece of original research through a grounded and prolonged engagement with a research question from either/or both 'smart' and 'sustainable' approaches to contemporary cities. The students will be able to draw upon a range

of methodological approaches but will be largely dictated through their engagement with earlier modules, such as their choice of methods module.

Module learning aims/objectives

The core aim of this module is to develop in students a capacity for individual learning through the development of an original piece of research. As such, the key learning aims are as follows:

- Development of a research question/research aim.
- Moving from research question to a clear outline/proposal.
- The carrying out of a piece of research through the development of a clear methodology.
- The development of written skills through the completion of a final thesis/dissertation.

Module learning outcomes

On successful completion of the module students should be able to:

- develop clear writing skills.
- improve critical and analytical skills.
- develop key methodological skills, whether qualitative,
- quantitative, or a combination of both.
- to demonstrate a high level of knowledge of a niche area of research with real-world applicability for relevant industries linked to both/either or smart and sustainable cities.

Module assessment

The development of the research proposal and presentation: 10%

The development and completion of the final thesis: 90%

[23]

Placement (In-Company Placement) (Core)

10 ECTS

Module Contact Hours 6 Week Placement

Module Coordinator Dr. Philip Lawton

Module description

The placement offers an opportunity for students to apply the key learnings from the course in a hands-on and practical manner. In working with key industry partners, students will be offered the opportunity to work in a team environment for six weeks. The output from this placement will be the development of a report on a key element or focus of the work being carried out while the student is on placement with the relevant company.

It should be noted from the outset that the format of the Placement will depend significantly upon the structure of the organization and the working arrangements of the particular individual/partner involved with the MSc SSC. Thus, while for some students there will be a greater emphasis of 'in-place' operations, for others, the Placement will involve project work that has been pre-arranged with the partner organization.

Module learning aims/objectives

The key aim of this module is to develop connections between the different modules and the hands-on approach of different stakeholders within organizations engaging in smart and sustainable approaches to cities.

Module learning outcomes

On successful completion of the module students should be able to:

Explain the applicability of key class-based learnings to real life situations.

enhance their communication skills, both in written and oral formats.

further developed their skillsets within both/or either smart and/or sustainable city tools.

Module assessment

Proposal as developed prior to placement: 20%

Final report on experience of placement and its relationship to key elements of MSc in Smart and Sustainable Cities: 80%

*The finalization of these grades is dependent upon the satisfactory completion of placement, including communication from organization or company in which placement takes place that it has been completed in a satisfactory manner. Should students be unable to finish the placement due to illness or similar unforeseen circumstances, they will undertake an alternative piece of work, which will comprise of a systematic literature review on a topic agreed with the course director.

Residential Fieldtrip (Core)

5 ECTS

Module Contact Hours 8 Hours preparation time: 3 full days in the field

Module Coordinator Dr. Philip Lawton

Module description

The fieldtrip offers students the opportunity to experience application of concepts from both core and optional elements of the course first-hand. Through a visit to a key location (Such as London, Amsterdam, Copenhagen, or other relevant European city), students will be exposed to a range of approaches to both smart and sustainable solutions for urban development. There will be two key elements to the fieldtrip. First, the students will be introduced to a range of key projects in the selected cities (prereading of policy documents, arranged visits, talks), and a grounded piece of group work, with groups selected based upon an the bringing together of complimentary skillsets.

Module learning aims/objectives

[25]

The core aims of this module are for students to gain direct insights into the workings of different bodies/authorities – local and regional authorities, private companies, social enterprises, community organizations, activist groups – in engaging with smart and sustainable approaches to contemporary cities. As a field-based module, this will be made possible through a hands-on approach that will promote a mix of grounded research, active learning, dialogue, presentations and report writing.

Module learning outcomes

On successful completion of the module students should be able to:

- analyse the development and implementation of urban policies in different contexts (London, Amsterdam, Brussels to alternate).
- enhance/improve discussion and presentation skills.
- improve written and verbal communication skills.
- evaluate urban policies through engagement and dialogue with key texts in urban theory and urban policy.

Module assessment

Grade Breakdown:
- Pre-Fieldtrip Outline of Topic:
  - A: brief outline (max 300 words), covering theme and location in Amsterdam (This will be approved in the days after submission)
  - B: Once theme and location are approved, you will need to submit a 1000 words pre (30%) justifying how your case-study/example fits within the themes of smart and/or sustainable cities and giving detail of its links to the relevant theme or topic you are working on
- On-Site Presentation: PPT presentation or similar (30%) – (Maximum slides 10 ppt slides and 15 minutes)
- On-Site Visit: Site Visit with Discussion and/or discussion with key individual involved in relevant project (30%) (c.30 minute on-site visit)
- Peer Response (10%): You will be asked to lead the questions/discussion with one of your fellow students during the fieldtrip

Climate Change: Science, Development and Justice (Option)

Coordinator: Dr. Susan Murphy (susan.p.murphy@tcd.ie)

5 ECTS – 25 to 30 hours teaching; 3 hour debate; 100 hours reading, assignments, specified learning activities (SLA's).

Description:

This module aims to provide MDP and MSc SSC students with an overview of the implications on sustainable development of various aspects of climate change, including social, economic, environmental, and moral dimensions. Students will also examine the strengths and weaknesses of approaches used to anticipate future climate change and its impacts. The science of Earth's systems which influence our climate are introduced and the scientific basis for climate change explored. The module also provides an examination of the moral dimensions of climate justice, human rights and development. Students on the module are, without exception, expected to read widely, to think deeply, to discuss fully and to analyse critically – and to work to a high standard both individually and as part of a group. Information on readings relevant to particular classes/discussions will be circulated in advance.

Learning Objectives:

This module aims to provide MDP and MSc SSC students with the following:

- An understanding of climate change in the context of earth system science, planetary 'tipping points', and the effects of recent anthropogenic activities on climate change;
- An introduction to anticipating (i.e. modelling) the future physical effects of climate change and their societal impacts, particularly with regard to development;
- An understanding of how concerns regarding the impacts of climate change in the developing world came to influence the climate change agenda, and an overview of relevant legislative and policy frameworks concerning climate change at international and national levels (including adaptation and mitigation approaches to dealing with climate change in the developing world);
- A projection of potential climate change impacts to public health;
- Examine and critically assess justice-based issues to which climate change can give rise.

Learning Outcomes:

Having successfully completed this module a student should expect to:

- Understand the concepts of earth system science and planetary boundaries, particularly within the context of recent anthropogenic activity and climate change;
- Be conscious of relevant global climate processes and climate dynamics;
- Be conversant with current relevant climate and development discourses and negotiations;
- Be aware of the main organisations, mechanisms and legislative frameworks through which climate change is being mainstreamed within development strategies at international and national levels;
- Be aware of the potential role of climate in major areas of concern for development workers, including food security, public health, water availability and security;
- Understand concepts and conceptions of justice, human rights, and climate change in the light of sustainable development policy and practice;
- Demonstrate an understanding of climate justice debates;
- Understand the basics of computer-based modelling of climate change and of development-relevant climate change impacts; and
- Be able to communicate effectively the results of their research and project work to a wider audience.

Assessment:

Attendance at lectures is mandatory. Participation in the debate is mandatory. A debate protocol will be provided during the course of the module. Assessment is via coursework (100%). Details of the assignments and deadlines will be provided to students at the beginning of the module:

- A 3000-word essay (70%);

- Class debate & write up (20%); and

- Debate self-reflection (10%).

Transportation Policy (Option)

5 ECTS

Module Contact Hours 27 hours

Module Coordinator Dr. Bidisha Ghosh

Module description

This optional module runs in the first semester. It provides a comprehensive overview of the different approaches to modelling transportation networks, equipping students with a variety of tools for examining transportation problems. This module covers the following topics: data, four stage transport modelling (including trip generation, distribution, modal split and assignment; user and social equilibrium), discrete choice modelling, activity based models, transport and land use planning, public transport planning.

Module learning aims/objectives

Students will learn how to:

- Develop an overview of transportation and traffic engineering.
- Develop knowledge of queuing models and traffic paradoxes.
- Discuss and design the layout of a traffic junction.
- Design and evaluate fixed-time traffic signal plan of a junction.
- Implement land-use models to manage traffic demand.
- Develop knowledge of urban transportation management policies.
- Evaluate the impact of public transport policies.

Module learning outcomes

On successful completion of this module the student will be able to:

- Evaluate transport networks using the four-stage model.
- Discuss how transport networks are designed.
- Apply discrete choice models to transportation problems.
- Explain how activity based transport models link into the traditional four stage model.
- Explain the links between land use and transport planning.
- Design and plan public transport routes.

Module assessment

Assignments (20%)

Exam (80%)

Transportation Modelling & Planning (Option)

5 ECTS

Module Contact Hours Lectures: 27; Assignments: 26; Directed Learning: 15

Module Coordinator Dr. Brian Caulfield

Module description

This module covers the following topics: data, four stage transport modelling (including trip generation, distribution, modal split and assignment; user and social equilibrium), discrete choice modelling, activity-based models, transport and land use planning, public transport planning.

Module learning aims/objectives

A comprehensive overview of the different approaches to modelling transportation networks is provided in this module, equipping students with a variety of tools for examining transportation problems.

Module learning outcomes

On successful completion of this module students will be able to:

- Evaluate transport networks using the four-stage model.
- Discuss how transport networks are designed.
- Apply discrete choice models to transportation problems.
- Explain how activity-based transport models link into the traditional four-stage model.
- Explain the links between land use and transport planning.
- Design and plan public transport routes.

Module assessment

Assignments (20%)

Exam (80%)

J4: Energy Policy and Energy Storage (Option)

5 ECTS

Semester taught - Semester 1

Module Coordinator/s: Prof. Sarah McCormack

Other lecturer(s): Prof. Brian Caulfield, Asst. Prof Mohammad Reza Ghaani

Module Learning Outcomes

On successful completion of this module, students should be able to:

LO1. Develop and discuss the main areas of energy policy.

LO2. Understand requirements for LEED/Zero Energy and Net Passive buildings.

LO3. Evaluate energy projects using economic analysis tools.

LO4. Compare and evaluate various energy storage technologies in terms of their strengths, limitations, and cost-effectiveness for different energy systems and applications.

LO5. Design energy storage systems to support grid stability, integrate renewable energy sources, and optimize energy dispatch and management.

LO6. Evaluate the environmental sustainability of energy storage technologies, considering factors like resource utilization, emissions, and end-of-life management.

Graduate Attributes: levels of attainment

To act responsibly - Introduced

To think independently - Attained

To develop continuously - Enhanced

To communicate effectively - Enhanced

Module Content

This module is an optional module which runs in the first semester. The module will develop knowledge in current energy policy and our energy storage options. It will include topics in energy economics, policy, energy storage options and circular economy and sustainability in storage systems will be addressed.

Teaching and Learning Methods

Core content via lectures

Individual assignments

Assessment Details

Assessment Component	Assessment Description	LO Addressed	% of total	Week due
Examination	3 hours examination	ALL	75%	N/a
Continuous Assessment	Energy Storage Project	LO4-6	25%	12

Reassessment Requirements

100% Examination (3 hours), weighted at 50% to pass.

Contact Hours and Indicative Student Workload

Contact hours: 30 hours

Independent Study (preparation for course and review of materials): 20 hours

Independent Study (preparation for assessment, incl. completion of assessment): 75 hours

Recommended Reading List

Sustainable energy systems engineering; P Gevorkian (2007)

Storing Energy - with Special Reference to Renewable Energy Sources; Trevor Letcher (2022)

Urban Computing (Option)

5 ECTS

Module Contact Hours 22 hours of lectures; 94 hours independent study

Module Coordinator Dr. Mélanie Bouroche (Assistant Professor in Computer Science)

Module description

Students will be exposed to the wide range of principles and challenges associated with urban computing, and will learn how ubiquitous sensing, advanced data management and analytic models, and autonomic computing need to come together to address those. The module also aims to highlight some of the relevant ongoing research and innovation in the space taking place in Ireland and internationally. Specific topics addressed in this module include:

- Gathering urban data, resources (environment/pollution/energy, human mobility and vehicular traffic, water) monitoring and data mining
- Urban big data management and heterogeneous data management, knowledge fusion across heterogeneous data,
- closing the feedback loop, model/analyse/plan/execute loop and associated requirements and challenges
- Citizen engagement, including participatory and opportunistic sensing
- Urban data visualization and decision support systems
- Anomaly detection and event discovery in urban areas
- Urban-scale ubiquitous/pervasive intelligent systems

Module learning aims/objectives

This module aims to provide both a theoretical and practical knowledge of urban computing and associated cyber-physical concepts, principles, challenges and solutions. Urban computing is a process of acquisition, integration, analysis of and actuation upon big and heterogeneous data generated by a diversity of sources in urban spaces, to improve the management of constrained urban resources, thereby enhancing the urban environment, human life quality, and city operation.

Module learning outcomes

On successful completion of this module, students will be able to:

[33]

- Describe the purpose, scope, and challenges associated with urban computing.
- Describe and discuss about cyber-physical systems, including closing the feedback loop.
- Describe, compare and contrast existing approaches and associated challenges to data collection and management, including participatory and opportunistic sensing.
- Contrast, select and apply state of the art city-scale intelligent optimization techniques.
- Analyse, specify, design, implement and test a complete smart city application NS4LO1.

Module assessment

2 hour written examination 60%

Group assignment Smart city case study (report and presentation): 10%

Individual assignments: 30%

Artificial Intelligence (Option)

5 ECTS

Module Contact Hours 22 Hours Contact Time (Lectures); 94 Hours Independent Study

Module Coordinator Dr. Ivana Dusparic

Module description

Specific topics addressed in this module include:

- Problem solving
- Control satisfaction Problems
- Markov Decision Process
- Representing and reasoning with uncertainty
- Learning, including reinforcement learning
- Intelligent agents and multi agent systems
- Real-world applications

Module learning aims/objectives

This module aims to provide students with a thorough overview of the artificial intelligence techniques and algorithms that underlie intelligent systems and an ability to apply these techniques to real-world problems.

Module learning outcomes

On successful completion of this module, students should be able to:

- Explain the scope, applications and limitations of artificial intelligence.
- Apply search, reasoning and planning strategies.
- Develop intelligent systems that handle uncertainty.
- Choose and use appropriate AI techniques for various kinds of problems.
- Apply knowledge search skills, CSP, MDP, learning techniques to real-world problems.

Module assessment

Examination: 50%

Individual Assignment: 20%

Group Assignment: 30%

Machine Learning (Option)*

5 ECTS

Module Contact Hours 44 Hours Contact Time (Class/Lecture Time); 72 Hours Independent study time

Module Coordinator Professor Douglas Leith

*Please note that there are pre-requisite expectations for this course. Any student interested in taking the course must first discuss it with Dr. Philip Lawton. There is an expectation that students undertaking this course will be able to demonstrate previous experience in Machine Learning or similar area.

Module description

This module introduces students to the following key components of machine learning:

- Machine Learning Basics (Application Areas, Challenges, Alternatives to Machine Learning).
- Machine Learning in Action (Datasets, Frameworks, Evaluation).
- Machine Learning Foundations (Statistics).
- Machine Learning Algorithms (e.g. Linear Regression).
- Classification, Support Vector Machines, Neural Networks).

Module learning aims/objectives

This module aims to introduce students to Machine Learning with a key focus upon:

- An in-depth knowledge of what Machine Learning is, how it works, and its application.
- The decisions necessary for when the use of Machine Learning is appropriate.
- The connection between Machine Learning and relevant forms of data analysis.
- The hands-on/practical uses of machine learning for everyday or 'real world' problems.

Module learning outcomes

On successful completion of this module, students should be able to:

- Explain what machine learning is and how it works.
- Decide when machine learning is an appropriate method to solve a problem.
- Apply machine learning algorithms such as linear regression, SVM, kNN and (deep) neural networks.
- Apply machine-learning frameworks (e.g. scikit-learn) to solve real-world problems.

Module assessment

Assignments (20%) Exam (80%)

[36]

Environmental Policies (Option)

5 ECTS

Module Contact Hours 26 lecture hours, a half day student seminar and one-hour quiz.

Module Coordinator Dr. Sean McClenaghan

Module description

This module is designed to provide a high-level overview of environmental law, an introduction to the fundamentals of law that governs how society interacts with the environment. It introduces students to environmental policy making and implementation through expert and practitioner-led lectures, set readings and research activities. Examples of environmental policy will be covered at a range of scales from global to local, involving public, private and civil society actors. The module will encourage critical analysis of environmental policy tools, techniques and outcomes, and develop group work and policy briefing writing skills.

Module learning aims/objectives

As future environmental scientists, conservationists, researchers and consultants, it will be impossible to successfully deliver either research or projects without careful attention to the legal framework protecting the environment. The overall aim of the module is to introduce students to environmental policy and legislation relating particularly to environmental protection at national and European level. The module seeks to provide foundations of both theoretical and empirical knowledge of environmental law, as well as knowledge of the contemporary debates and critical issues in, and perspectives on, environmental regulation.

Module learning outcomes

On successful completion of this module, students should be able to:

- Demonstrate broad knowledge of environmental law and principles relevant to its application.
- Describe the legal framework within which environmental law in Ireland operates and identify the scheme of environmental regulation at national, European and International level
- Describe the legal requirements for and process of environmental impact assessment, appropriate assessment and strategic environmental assessments.

- Advise management on compliance with the requirements of key environmental legislation, regulation and policy.

Module assessment

Essay (30%), Group report and presentation (45%), Short Answer

Quiz (20%), Peer review (5%)

Human Interaction with Biodiversity (Option)

5 ECTS

Module Contact Hours 14 hours, plus two field days

Module Coordinator Professor Jane Stout

Module description

This module will address how the concepts of ecosystem services and natural capital can be used in the conservation of biodiversity. Students will explore how and why businesses might integrate biodiversity into their practices, and discuss conflicts between biodiversity conservation and human well-being.

Module learning aims/objectives

This module aims to introduce students to contemporary issues with regards to human-biodiversity interactions, including the ecosystem services and natural capital concepts, urban "naturebased solutions", and human-wildlife conflicts.

Module learning outcomes

On successful completion of this module students should be able to:

- Demonstrate knowledge of the links between biodiversity and ecosystem functioning and the flow of ecosystem services which benefit human well-being.
- Articulate the pros and cons of the "Natural Capital Approach" to nature conservation.
- Develop business cases for biodiversity initiatives for corporate enterprises.

- Explain human-wildlife conflict in urban temperate and tropical biodiverse areas and debate in situ nature conservation vs human livelihoods.
- Carry out independent and group research, synthesise information and present in a variety of formats.

Module assessment

Business and biodiversity presentation (group mark) 20%

Policy Note 20%

Written article 60%

Assessment and Examination Procedures

Submission & Deadlines

Assignments must be submitted by the time and date stipulated by the module coordinator in the timetable; submission will be via Blackboard. *Each assessment must include a completed title page template and a plagiarism declaration form.*

It is your responsibility to ensure work is submitted on time. It will be date stamped in Blackboard. You should keep copies of all work that you submit. Assessments submitted after the deadline will receive a **10% deduction in the final mark for each working day late**. Assessments will not be marked if more than two working days late unless by prior, written agreement with the module co-ordinator.

Marking and Award of MSc

The M.Sc. in Smart & Sustainable Cities will be awarded Pass or Pass with Distinction.

Pass with distinction shall require at least 70% in dissertation and at least 70% in the final aggregated mark.

Assessment of individual assignments will be based on common grading criteria as follows:

Grade	Mark (%)
A+	>75
A	70-74
B+	65-69
B	60-64
C+	55-59
C	50-54
FAIL	<50

Table 1: Indicative grades and associated provisional mark range for formative feedback. Marks are finalised at the Court of Examiners.

Unless otherwise stated, indicative grades will be circulated within **one month** of submission. All assessed work **MUST BE RETURNED** prior to the first Court of Examiners meeting. The deadline for return of work will be circulated during the semester.

Note: these grades are indicative. **All marks are provisional** until passed by the Court of Examiners meeting, which is held after the end of module teaching.

[48]

Plagiarism

Plagiarism is interpreted by the University as the act of presenting the work of others as one's own, without acknowledgement. Plagiarism is considered as academically fraudulent, and an offence against University discipline. The University considers plagiarism to be a major offence, and subject to the disciplinary procedures of the University. Plagiarism can arise from deliberate actions, and also through careless thinking and/or methodology. The offence lies not in the attitude or intention of the perpetrator, but in the action and in its consequences. **It is your responsibility to familiarise yourself with the regulations regarding plagiarism. These are clearly outlined in Part 3 of the College Calendar. This can be downloaded from the College website.**

https://www.tcd.ie/calendar/graduate-studies-higher-degrees/

In general, ensure that you fully reference all previously published work, and check with the module co-coordinator if you are not clear of the requirements relating to group assessment exercises. Do not copy information from internet sources. Any work submitted may be assessed through recognised plagiarism detection software in use in College.

Progression rules

Students are assessed for each taken module with a grade/numerical percentage mark (%) at the end of the semester/term during which delivery of a module is completed. All end-of-module marks will be distributed by the module coordinators directly to the students (normally via Blackboard). The Pass mark for a module is 50% of the total marks available for the module. Compensation is not permitted for any module.

Students are entitled to one supplemental examination and/or can re-submit failed assignments once in any failed module. **The maximum grade which can be awarded to a supplemental assignment/exam is 50%.** Resubmission of failed assessments is normally due by August 31st along with dissertations, or as arranged with the module lecturer and course co-ordinator.

An exit award of Postgraduate Diploma in Development Practice will be considered. The graduand who has been awarded the Postgraduate Diploma is not eligible to re-register on the course in the future for the award of the MSc degree.

Students must pass all modules on the course, including the dissertation, in order to be considered for an award of MSc Degree.

Graduation (conferring)

The Academic Registry will contact students directly with full information regarding graduation.

Appeals, re-marking of assessments, and disciplinary redress process

Complaints procedure in relation to modules

If there are issues/concerns in relation to a particular module this should first be brought to the attention of the module coordinator by the class representatives. In the event that this is not resolved at this level to the satisfaction of the class the class representatives should then contact the director of the programme. This protocol also applies to requests for additional feedback on assignments or second readers for these by individual students.

Review procedure in relation to module grades

If there are issues/concerns in relation to the grading of assignments, or a request for more feedback, this should first be brought by the student to the attention of the module coordinator in question. In the event that this is not resolved at this level to the satisfaction of the student they should then contact the director of the programme.   The student may request a second marker for the assignment in question.

Requests for feedback and/or second marking must be lodged within one week of receipt of module marks. Students must always bring their request pertaining to any module taught on the course to the module coordinator in the first instance.

In the case of an appeal whose nature goes beyond module-related issues, and unless otherwise recommended by the course committee, the appeal will follow the appeal procedure for taught postgraduate courses.

The appeal procedure to be followed is that laid down in relevant paragraphs of the Appeals process for Graduate Students in the "University of Dublin, Trinity College Calendar Part 3, Graduate Studies and Higher Degrees" for a given academic year.

https://www.tcd.ie/calendar/graduate-studies-higher-degrees/

** N.B. Appeals must be lodged within 30 days of the result of the assessment being made available to you.

The regulations for re-checking/re-marking and retention of examination scripts and assignments to be followed are described in relevant paragraphs of the *Regulations for re-*

checking/re-marking and retention of examination scripts in the *"University of Dublin, Trinity College Calendar Part 3, Graduate Studies and Higher Degrees"* for a given academic year.

At all stages of the appeal and/or re-checking/re-marking processes consultation with the Course Director about the implications of offence and penalty is necessary. The same applies to fitness to practice issues, where relevant, and performance at the fieldwork training.

Health, Safety, and Security

Health

Please inform either the Programme Director of medical conditions or other problems that may require special attention from staff. In case of illness, students may attend the Student Health Centre (House 47).

Accidents

All accidents must be reported to the Safety Officer (Alison Boyce ext: 3506) as soon as possible after they occur. Victims should be escorted to the Student Health Centre for treatment if necessary. An ambulance should be called in the event of a serious accident (9-999 on phones with outside lines and inform the security office). Victims should not be taken to hospital in a private car or taxi.

Fire Safety

Fire extinguishers and copies of the College General Fire Notice are displayed at various locations in the campus. These are normally located in hallways. Fire extinguishers provided are water, powder, carbon dioxide or a fire blanket.

Help to prevent fires from starting or spreading by the following:

- Do not store flammable materials in corridors and other open-access areas.
- Exercise caution when using flammable materials and electrical equipment.
- Do not place smouldering items in bins
- Keep filing cabinets and presses closed when not in use
- Turn off and switch off at the socket (or unplug) electrical equipment that is not in use.

The college buildings are equipped with fire alarms. On hearing the alarm, leave the building quickly and in an orderly manner, and assemble at the designated meeting point for that building.

Bomb Alerts

Watch out for suspicious packages at all times and, if one is observed, alert a staff member immediately. If there is a bomb alert, follow the same procedures as for a fire alert.

Risk Assessment

A risk assessment must be carried out for research activities such as field work. Risk assessment forms are available from the Safety Officer and will also be available on Blackboard. Detailed safety guidelines on fieldwork are available from the department's Safety Officer and should be consulted before fieldwork is undertaken. A risk assessment should be completed **BEFORE** conducting fieldwork.

IMPORTANT NOTE: Failure to complete the relevant forms may prevent you from undertaking fieldwork or participating in field trips, and can result in you forfeiting marks for associated.

Useful Numbers:

Course Director (Philip Lawton)	896 2663
Course Administrator (Elaine Elders)	896 2920
Front Gate Security	896 1999
Academic Registry	896 4500
IT Services Helpdesk	896 2000
Student Health Centre	896 1556

The Postgraduate Advisory Service is a unique and confidential service available to all registered postgraduate students in Trinity College. It offers a comprehensive range of academic, pastoral and professional supports dedicated to enhancing your student experience.

Who?

The Postgraduate Advisory Service is led by the Postgraduate Support Officer who provides frontline support for all Postgraduate students in Trinity. The Postgrad Support Officer will act as your first point of contact and a source of support and guidance regardless of what stage of your Postgrad you're at. In addition each Faculty has three members of Academic staff appointed as Postgraduate Advisors who you can be referred to by the Postgrad Support Officer for extra assistance if needed.

Contact details of the Postgrad Support Officer and the Advisory Panel are available on our website: http://www.tcd.ie/Senior_Tutor/postgraduate/

Where?

The PAS is located on the second floor of House 27. We're open from 8.30 – 4.30, Monday to Friday. Appointments are available from 9am to 4pm.

Phone: 8961417

Email: pgsupp@tcd.ie

What?

The PAS exists to ensure that all Postgrad students have a contact point who they can turn to for support and information on college services and academic issues arising. Representation assistance to Postgrad students is offered in the area of discipline and/ or academic appeals arising out of examinations or thesis submissions, supervisory issues, general information on Postgrad student life and many others. If in doubt, get in touch! All queries will be treated with confidentiality. For more information on what we offer see our website. If you have any queries regarding your experiences as a Postgraduate Student in Trinity don't hesitate to get in touch with us.

[45]

Careers Advisory Service

What do you want to do? How will you get there? We are here to support you in answering these and other questions about your career.

Junior and Senior Fresh Students

Get Involved: Remember that your course of study, extra- curricular activities, voluntary and part-time work all provide opportunities for developing skills and gaining an insight into your career preferences. In your Senior Fresh year, look out for short-term internship opportunities.

MyCareer: Log in to MyCareer to keep abreast of jobs, study and careers events of interest to you.

Junior Sophisters

Attend class seminar: Typically this takes place in Hilary term and includes information on applying for work experience and internships and postgraduate study.

Get work experience: The programme of summer work experience and internships is particularly relevant to Junior Sophisters. Personalise your MyCareer profile to receive email alerts tailored to your preferences.

MyCareer: Log in to MyCareer to keep abreast of jobs, study and careers events of interest to you.

Finalists and Senior Sophisters

Meet Employers and/or Explore Further Study: You may have decided to seek employment directly after graduation and many employers visit Dublin to actively seek out talented graduates. For others, further study may be their preferred option. Your MyCareer dashboard will keep you informed.

Find Jobs: Personalise your MyCareer profile to receive email alerts tailored to your interests.

Attend class seminar: Typically this takes place in Michaelmas term and includes information on applying for postgraduate study and jobs.

GradLink Mentoring: An opportunity to get advice and support from a Trinity graduate.

Drop-In CV/ LinkedIn Clinics: We also provide support at a practical level, helping you to improve your applications, which will benefit you in securing your future, whether in employment or further study.

Practice Interviews: A practice interview tailored to the job/ course of your choice with practical feedback.

MyCareer: Log in to MyCareer to keep abreast of jobs, study and careers events of interest to you.

MyCareer

An online service that you can use to:

• Apply for opportunities which match your preferences - vacancies including research options
• Search opportunities- postgraduate courses and funding
• View and book onto employer and CAS events
• Submit your career queries to the CAS team
• Book an appointment with your Careers Consultant

Simply login to MyCareer using your Trinity username and password and personalise your profile.

Careers Advisory Service
Trinity College Dublin, 7-9 South Leinster Street, Dublin 2
01 896 1705/1721 | Submit a career query through MyCareer

MyCareer: mycareerconnect.tcd.ie

TCD.Careers.Service

TCDCareers

www.tcd.ie/ Careers/students/postgraduat

@TCDCareers

tinyurl.com/LinkedIn-TCD-Connecting

Opening Hours: Term: 9.30am - 5.00pm, Monday – Friday **Out of Term:** 9.30am - 12.30pm & 2.15 - 5.00pm, Monday - Friday