



College Dublin

Computing • IT • Business

CCT College Dublin
Programme Handbook

NFQ Level 9

Master of Science in Data Analytics

(90 ECTS)

Including the embedded Awards of

NFQ Level 9

Post Graduate Diploma in Science in Data Analytics (60 ECTS)
Certificate in Statistics for Data Analysis (NFQ Level 9, 10 ECTS)
Certificate in Data Preparation and Visualisation (NFQ Level 9, 10 ECTS)
Certificate in Machine Learning for Data Analysis (NFQ Level 9, 10 ECTS)

Awarding Body

Quality and Qualifications Ireland

Contents

1. Programme Aims and Objectives	3
1.1 Transferrable Skills and Graduate Vision	3
1.2 Faculty and Administration	5
2. Programme Outline	6
2.1 Programme Schedule	6
2.2 Academic Calendar and Key Dates	7
3. Programme Learning, Teaching and Assessment Strategy	7
3.1 Blended Delivery Modes (Full and Part-time)	8
3.2 Assessment Weighting (indicative and may be subject to change)	9
3.3 Programming Skills Bootcamp	9
3.4 Technical requirements	10
4. Assessment Regulations	10
4.1 Assessment Schedule, Rules for Submitting, and Deadlines	10
4.2 Award & Repeats	10
5. CCT College Student Handbook	11
6. Academic Support	11
7. Useful resources	12
Appendix I – Module Aims	13

1. Programme Aims and Objectives

This proposed programme aims to provide an opportunity for successful applicants to specialise in Data Analytics at MSc level (level 9). The programme provides graduates with the skills and competencies to facilitate the ever-increasing demand for the upgrading of legacy data solutions in line with the emerging necessity for digital transformation of multiple sectors to incorporate the vast amount of data available into a more advanced and insightful model. The programme aims to incorporate the emerging technologies of machine learning and artificial intelligence to allow graduates to have a marketable skill set for today's technical employment environment.

Objectives

The overall objectives of this programme are:

1. To provide a progression pathway to further specialise in the area of Data Analytics for graduates of level 8 major awards in ICT or cognate discipline.
2. To provide graduates with an award at level 9 on the National Framework of Qualifications.
3. To provide graduates with the ability to advance their career by attaining a qualification that enables them to secure or advance in employment in a range of intermediate and advanced industry positions specific to Data Analytics.
4. To provide the IT sector with graduates who possess the requisite attributes to make a positive contribution to industry.
5. To provide graduates with the foundation upon which they can further their studies at level 10 (PhD) in Computing or one of many Computing-related disciplines (in Ireland or abroad) such as Computer Science, Computational Science, Information Systems, IT Management, Technology and Innovation Management, Information Security & Digital Forensics, Information Systems Processes, and others.

The objectives of the minor awards are:

1. To provide graduates with a minor award at level 9 on the National Framework of Qualifications
2. To provide industry / employees with accredited CPD options in niche areas specific to data analysis to facilitate the upskilling and career advancement.
3. To provide industry with employees who possess the requisite attributes to make a positive contribution.

1.1 Transferrable Skills and Graduate Vision

The general objectives of this programme are graduate focussed. Graduates of this programme will be qualified to fill professional roles at entry or junior level positions in a range of industries requiring data analytics development and integration, and to progress beyond these roles by developing the knowledge, skills and competencies skills learned in the programme curriculum. The graduate will also be prepared to pursue further academic studies at NFQ level 10.

Transferrable Skills

The Transferable Skills developed by the learner on this programme include:

- Critical analysis: through analysing the outcomes of module work, case study, and project work.

- Advanced evaluation: through practical work, group work, and individual project work.
- Self-analysis and personal reflection: through group work and individual project work, in which the learner conducts a thorough review of their own participation on the programme and specialises their knowledge in a specific, focussed area of Data Analytics.
- Investigation: through research and applied project work and designing and developing solutions addressing real-world problems.
- Problem-solving: through the exploration of various computing concepts and the use of computing tools to design and implement solutions to a diverse range of data driven problems, including exposure to group/team working, PBL and EBL-based techniques, and project work;
- Communication skills: using presentations, teamwork, reports conveying concepts, designs, implementations and results, peer-based discussion and debate, and in-depth research project work.
- Written communication skills: through the presentation of assignments, reports, and the preparation of self and peer-evaluation reports.
- Time management: through the attention to group and individual submission of assessments and preparation of assignments and meeting deadlines for project deliverables and milestones.
- Team management and group-work: through group-based activities and interaction with peers and project supervisors.
- Professionalism: through a dedicated module on professional codes of practice, interacting with other professionals, and through project work where a specialised industry focused project is completed under the direction of a supervisor.

In addition to the programme learning outcomes, transferrable skills and graduate vision, the programme strives to:

1. Provide learners with an intellectually challenging and rigorous education at NFQ Level 9;
2. Facilitate learners in attaining the professional, social and communicative skills necessary for a graduate of what is a multifaceted discipline;
3. Fostering a culture of learning to learn and continuing personal and professional development;
4. Develop the learner's intellectual ability to analyse problems, issues and needs.

There is an institution-wide belief within CCT that many different environments, not all of which need to be classroom-based, can provide genuine learning, or the 'teaching moments', that we feel are essential to a more holistic style of learning.

1.2 Faculty and Administration

Aldana Louzan Grandi, Lecturer
Amanda Russell, QA and Exams Officer
Amilcar Aponte Jimenez, lecturer
Anne Hannan, Careers Advisor
David Gonzalez, Lecturer
David McQuaid, Lecturer
Dermot Glanville – ICT Faculty Co-ordinator
Dr Graham Glanville – Dean of School
Justin Smyth - Librarian
Ken Healy – School Manager
Dr. Malika Bendechange, Lecturer
Marie O' Neill, Head of Enhancement
Mark Morrissey, Lecturer
Marina Iantorno, Lecturer
Michael Weiss
Mikhail Timofeev, Lecturer
Dr. Muhammad Iqbal, Lecturer
Noel Cosgrove, Lecturer

2. Programme Outline

2.1 Programme Schedule

Year	Semester	Module Title	ECTS Credits
1	1	Programming for Data Analysis	5
		Statistics for Data Analysis	10
		Machine Learning for Data Analysis	10
		Data Preparation and Visualisation (Semesters 1 & 2)	10
	2	Research and Professional Ethics	5
		Big Data Storage and Processing	10
		Advanced Data Analysis	10
	3	Data Analytics Project	30

For the aims and objectives of each module in this programme, see Appendix I.

2.2 Academic Calendar and Key Dates

The academic calendar, programme timetable and key dates including examination periods, College holidays, semester start and end dates are issued to all students at induction and a copy is made available on the CCT Learning Space at learningspace.cct.ie. All students are required to familiarise themselves with the key dates and their timetable and ensure that they attend all classes, assessments and examinations. Further information is available from the Main Office or your Faculty Coordinator.

Given the practical blended nature of the programme, contact time is a combination of traditional face-to-face classroom learning and virtual classroom also incorporating face to face and virtual lab sessions / workshops. The full-time mode of delivery for the programme takes place over 3 semesters of 12 teaching weeks each (2x semesters delivering core modules, 1x semester dedicated to the capstone project). The part time mode of delivery takes place over 4x 12-week semesters, three semesters dedicated to the delivery of the core modules, and the final semester dedicated to the capstone project. The Minor awards are each offered over a 10-week period.

3. Programme Learning, Teaching and Assessment Strategy

Learners will attend lectures and practical lab sessions during the programme, both face to face and online elements. A variety of different instruments and formats will be used including textbooks, code, statistical data, journal articles, case studies, problem sets, and web-based content. These may feature as part of class-based activities or provided through Moodle. The programme and its curriculum are designed with the premise that teaching and learning is not restricted to teacher/student interaction solely during lectures. Learners will be given the opportunity to undertake additional learning outside of the classroom through independent or collaborative study activities in turn facilitated through the use of online collaborative technology. In addition to this, faculty delivering the programme are encouraged to engage in cross modular assessment to allow a further blending and assimilation of knowledge and skills.

CCT recognises the value of lectures for the delivery of information to learners. However, over-reliance on lectures creates a passive-receptive student learning experience which is not necessarily conducive to applied learning or to the detailed provision of feedback to learners. Within this programme the traditional lecture is only one element of a module, forming the basis for other elements that integrate teaching and learning techniques which require the learner to actively engage in individual and group activities. Active learning enables students to talk and listen, read, write, and reflect as they approach course content through problem solving exercises, informal small groups, simulations, case studies, role playing and other activities, all of which require students to apply what they are learning. It is this approach that underpins the teaching and learning strategy for the proposed programme.

CCT continually monitors learner progress and engagement across all of its programmes and prides itself on providing a supportive and nurturing environment that facilitates and promote success for struggling learners or those with additional needs, be they literacy, numeracy, IT, specific learning needs, language support, or disability support. A range of support mechanisms and programmes are in place through Student Services, the Library and the Centre for Teaching and Learning, and this preemptive and proactive ethos to student success will be also be adopted on this programme. Students are also introduced to the online teaching and learning tools and the technologies that will be employed as part of a dedicated blended learning induction programme.

A combination of both exams and continual assessment will be employed within the MSc and the embedded awards. Summative assessment will be achieved through interim and end of module assessments, utilising a variety of assessment tools. The assessment load is planned at programme level to reduce the potential for over assessment, provide an effective assessment schedule that is manageable for learners and facilitate timely feedback to support future learning and progression. The programme employs an authentic assessment approach to provide learners with an insight into real work tasks which require them to evidence their technical knowledge and skills as well as their transversal skills.

The nature and type of assessment activities varies within modules but includes online quizzes and MCQs, polling activities, reflective journals and e-portfolio tasks, project drafts, practical demonstrations and presentations, case studies and group activities. Within all modules formative feedback is also issued to students in relation to assessment tasks. Faculty will also use an Integrated Assessment (I.A.) approach where these opportunities arise in both the full and part-time running of the principal programme. This means that a completed project is produced by students containing sufficiently developed elements from different modules to satisfy the continuous assessment assignments of individual modules and minimise the possibility of over-assessment. Integral pieces of these assessments may also be carried out using online collaborative tools and technologies.

The result of this assessment approach is a reduction in learner workload in relation to the amount of assessments and the benefit of the experience of dealing with the integration of subfields of Data Analytics into a coherent whole. The blended learning approach also allows learners to assimilate information at their own pace with the 'always available' ability of online content. This also reflects the industry environment where nothing is developed in isolation. The inclusion of an Integrated Assessment in all modularised semesters affords the opportunity for the learner to showcase the knowledge, skills and expertise they have gained during each semester.

Integrated assessment applies to the principal programme only. Assessment for the minor awards will be specific to the module concerned and distinct from that utilised for the module as part of the principal programme.

Collaborative, enquiry and problem-based learning with a focus on authentic assessment are at the core of the programme's teaching and learning strategy. The programme has a strong focus on group learning. This approach also addresses the recommendation of employers, which repeatedly emphasised the importance of graduate capacity in respect of teamworking.

3.1 Blended Delivery Modes (Full and Part-time)

Knowledge acquisition is predominantly facilitated through directed asynchronous e-learning activities such as pre-recorded lectures, reviewing online multimedia and text based materials in combination with synchronous (online and on campus) activities such as lectures and demonstrations, again recognising the specific needs of the intended learners and the nature and level of the programme. Asynchronous learning is a general term used to describe forms of education, instruction, and learning that do not occur in the same place or at the same time. Synchronous learning is a general term used to describe forms of education, instruction, and learning that occur at the same time e.g. an online lecture.

The applied nature of this programme has resulted in the need for on campus face to face engagements in addition to online components. On campus sessions are predominantly demonstrations, practical workshops and lab-based activities that provide learners with the opportunity to apply their learning in a supervised environment.

3.2 Assessment Weighting (indicative and may be subject to change)

Module	Continuous Assessment Weighting	Exam Weighting
Programming for Data Analytics	100%	
Statistics for Data Analysis	100%	
Data Preparation and Visualisation	100%	
Machine Learning for Data Analysis	100%	
Big Data Storage and Processing	100%	
Research and Professional Ethics	100%	
Advanced Data Analysis	100%	
Data Analytics Project	100%	

3.3 Programming Skills Bootcamp

In recognition of the varied level of baseline knowledge, skill and competence in programming upon entry to the programme, the curriculum has been designed to facilitate students to successfully complete the programme through the incorporation of a boot camp induction programme. This is a mandatory, non-credit bearing part of the programme designed to ensure all learners commence the taught modules with a shared baseline knowledge, skill and competence in programming with Python. This ensures a minimum threshold has been attained by all students prior to commencing the Programming for Data Analysis module.

The combined approach of boot camp and the Programming for Data Analysis module provides opportunities to develop the knowledge, skills and competence that are essential for the completion of individual modules and prepares students for the application of core concepts and skills in subsequent modules. Closely monitored formative and summative assessment tasks are employed to support and inform learning and development, identifying progress and areas for further support as applicable. Additional student support and resources are also employed, from induction and throughout the duration of the programme, tailored to individual student or cohort needs.

3.4 Technical requirements

In order to fully participate in the programme, learners will require internet access and a laptop or pc with webcam and microphone. The minimum recommended specification is windows OS with a basic RAM Memory of 8GB DDR4 RAM with a basic processor Intel i5 (7th Gen and above) with a dedicated graphics card (or equivalent graphics option). If you require support in relation to these technical requirements, please email Juan Murguey, CCT's IT Faculty Assistant and Network Administrator at: jmurguey@cct.ie

4. Assessment Regulations

4.1 Assessment Schedule, Rules for Submitting, and Deadlines

Continuous assessment will take place on an on-going basis. Details will be provided by programme lecturers.

For more details on submitting continuous assessment and CA deadline policies, please see the

General Student Handbook, section 3.3. See also the CCT Quality Assurance Manual at: <https://www.cct.ie/quality-assurance/>

4.2 Award & Repeats

Attainment of minimum intended programme learning outcomes, including through pass by compensation where this applies, will result in recommendation for the award concerned. Pass by compensation does not apply to minor awards. The Data Analytics Project cannot be passed by compensation. In the best interest of learners, in order to commence the project, notwithstanding where PMCs or potential pass by compensation apply, a pass mark should normally be attained in all preceding modules. The Board of Examiners has the authority to determine entitlement to progress to the project. The minimum pass mark is 40% with learners required to pass the module overall, except where pass by compensation applies.

Learners are entitled to repeat opportunities in accordance with CCT policy which affords a maximum of three repeat opportunities per module, with the exception of Masters level capstone assessments which are limited to two repeat opportunities. Where the fail in a module overall includes the requirement to recover failure in an integrated assessment, the learner is only required to repeat the specific tasks within the integrated assessment that are aligned to the module which has been failed.

Repeat assessment performance is only for the purpose of recovering failure and cannot be used to improve on a pass mark in an already passed module. Repeat assessments must be completed at the specified repeat assessment period in the academic calendar. As the minor awards comprise of one module only, the integrated approach outlined does not apply.

Where a learner is required to repeat an unseen assessment, a new assessment will be issued. In respect of all seen assessments the learner is normally required to enhance the original submission (or complete the original assessment in the case of non-submission). In some circumstances an alternative assessment, equivalent and appropriately weighted, will be issued. This normally only applies where specific factors prevent the recovery of failure through enhancement of the previous attempt e.g. where group work is no longer an option.

Learners who fail to achieve the minimum intended learning outcomes associated with a given assessment will receive constructive feedback (in addition to the normal assignment feedback) on the submitted work and the brief of the repeat assessment. In the case of group work, the group may be directed to recover the failed element of a group assignment, and/or individuals within groups may be directed to recover the individual assessment elements of a group project.

Please see CCT's Assessment Policy in the CCT Quality Assurance Manual: <https://www.cct.ie/quality-assurance/>

5. CCT College Student Handbook

The CCT Student Handbook which is available on Moodle sets out all of the policies and procedures applicable to all registered learners of CCT. The handbook also contains details in relation to key support services and staff including the provision of virtual services. All students should be familiar with this document. Full details of all College policies and regulations are also available on the College website and in the CCT Quality Assurance Handbook at: <https://www.cct.ie/quality-assurance/>

6. Academic Support

Speak to your **lecturer** if you are struggling with course content. The Library also conducts a **Student Success Programme** of classes on:

- Effective group work
- Academic integrity
- Academic writing
- Referencing
- Applied projects
- Career preparation workshops

Student Success Classes are delivered on both a face to face and online basis. For information on the Library's Student Success Programme please email Justin Smyth, Librarian at: jsmyth@cct.ie.

Other academic support services include:

- ✓ The **CCT Student Mentoring Academy** which facilitates peer learning and support. For information on the Student Mentoring Academy, email lecturer Amilcar Aponte at: amilcar@cct.ie.
- ✓ **CCT's Computer Support Hub**. Please contact Programme Design Lead Mark Morrissey for further information at: mmorrissey@cct.ie
- ✓ **A virtual as well as face to face induction** is offered via Moodle that provides additional information on CCT academic support services and resources.

7. Useful resources

The CCT Learning Space

Learningspace.cct.ie

The CCT Learning Space contains online guides on a range of topics such as the CCT Academic Calendar, academic integrity, academic writing, referencing and effective group work. Please note that a dedicated academic integrity page is also available on Moodle which contains a wide range of academic integrity resources including interactive content.

The CCT Online Learning Toolkit

<http://40.115.124.2/sp/subjects/guide.php?subject=Onlinelearning>

The CCT Online Learning Toolkit contains tips on how to succeed in the online learning environment. The Toolkit also contains tips on digital well-being, privacy and online assessments.

ARC

arc.cct.ie

Arc is an open access repository of scholarly works by CCT staff and students including high quality applied projects undertaken by students. By viewing exemplars of student work you will understand what constitutes a well written, researched and structured applied project.

The CCT Expert Gallery

<https://www.cct.ie/cct-college-dublin-staff-profiles-expert-gallery/>

The CCT Expert Gallery contains online open access profiles of the staff that work at CCT including lecturing and student support staff.

The CCT Quality Assurance Manual

<https://www.cct.ie/quality-assurance/>

The CCT Quality Assurance Manual contains details of all College regulations including assessment and examination regulations.

QQI- My Own Work

<https://myownwork.qqi.ie/>

Video and resources from QQI's National Academic Integrity Network that highlight the dangers of engaging with commercial essay writing companies and mills and encourages students to always do their own work.

Appendix I – Module Aims

Programming for Data Analytics

1. Fundamental analytical programming concepts.
2. Problem solving techniques applied in real world domains
3. Complex data manipulation operations
4. Optimising and improving concurrency in existing programs
5. Testing, quality control and maintenance

Statistics for Data Analysis

1. Numerical and statistical tools used to describe and summarise data.
2. The utility and application of inferential statistical methods.
3. The purpose and limitations of regression analysis and modelling.
4. The laws of probability and their application to data analysis
5. Software tools used for the analysis of business data

Data Preparation and Visualisation

1. Basic programming principles and the importance of exploratory data analysis as an essential first step in the data analytical process.
2. Methods of encoding data for specific machine learning algorithms. The value of data visualization as a means of offering rapid insights into large quantities of data.
3. The theory, concepts, techniques and processes of data representation and visualisation.
4. The types of data visualisation and their associated cognitive load.
5. The current range of software tools available for data visualisation.

Machine Learning for Data Analysis

The learning aims of this module are:

1. The different categories of machine learning techniques.
2. The different stages of the Knowledge Discovery life cycle.

3. The major Supervised, Unsupervised and Semi-Supervised learning techniques
4. The application, optimisation and validation of various machine learning techniques

Research and Professional Ethics

This module aims to provide the underlying research concepts and skills necessary for students to undertake data driven projects within the legal, social and ethical context of a professional work environment with consideration for governance, risk and compliance.

1. Learning through reflection and performing skill audits for continuing professional development;
2. Research methods, tools and approaches for designing and developing a computing research project, incorporating literature review synthesis and source data analysis;
3. Professional codes of practice and ethics in computing research, Machine Learning and Cognitive Systems;
4. IT governance, risk and compliance
5. Ethics of the commercialisation of customer data

Big Data Storage and Processing

1. Fundamentals of big data storage and data management paradigms
2. Underlying principles of parallel and distributed computing
3. Current solutions for retrieving, integrating and processing Big Data
4. Big Data programming models and their efficient usage at scales
5. Big Data Streams and their processing techniques

Advanced Data Analysis

The aims of this module:

1. The theory of cognitive systems.
2. The application and integration of cognitive systems in everyday life.
3. The state of the art in cognitive systems
4. The practical skills required to deploy appropriate cognitive systems to a specific problem.

Data Analytics Project

1. To give the students the opportunity to coalesce their knowledge from the taught elements of the programme into a coherent real-world project supplied by our industry partners.
2. To facilitate the investigation and integration of insights gained throughout the course of study and disseminate these findings to diverse audiences.
3. To facilitate the formation of a personalised world view of the students own learning through the use of reflective techniques to identify skill and knowledge gaps and to actively seek out new knowledge to enhance their contribution to both their own professional development and self-efficacy.