

Programme Information		
Programme Title	Programme Code	HECoS Code
Transport with Data Science	H2B5	For Registry Use Only

Award	Length of Study	Mode of Study	Entry Point(s)	Total Credits	
				ECTS	CATS
MSc	1 Calendar Year (12 months)	Full-Time	Annually in October	90	180
PG Diploma	N/A	N/A	N/A	60	120
PG Certificate	N/A	N/A	N/A	30	60

The PG Certificate and PG Diploma are exit awards and are not available for entry. You must apply to and join the MSc.

Ownership			
Awarding Institution	Imperial College London	Faculty	Faculty of Engineering
Teaching Institution	Imperial College London	Department	Civil and Environmental Engineering
Associateship	Diploma of Imperial College (DIC)	Main Location(s) of Study	South Kensington Campus
External Reference			
Relevant QAA Benchmark Statement(s) and/or other external reference points		Master's Degrees in Science	
FHEQ Level		Level 7	
EHEA Level		2nd Cycle	
External Accreditor(s) (if applicable)			
External Accreditor 1:	Joint Board of Moderators (JBM) – Pending Approval		
Accreditation received:	Pending	Accreditation renewal:	Pending
External Accreditor 2:	Institution of Civil Engineers (ICE)		
Accreditation received:	Pending	Accreditation renewal:	Pending
External Accreditor 3:	The Institution of Structural Engineers (IStructE)		
Accreditation received:	Pending	Accreditation renewal:	Pending
External Accreditor 4:	Institute of Highway Engineers (IHIE)		

Accreditation received:	Pending	Accreditation renewal:	Pending
External Accreditor 5:	The Chartered Institute of Highways & Transportation (CIHT)		
Accreditation received:	Pending	Accreditation renewal:	Pending
External Accreditor 6:	The Permanent Way Institution (PWI)		
Accreditation received:	Pending	Accreditation renewal:	Pending
Collaborative Provision			
Collaborative partner	Collaboration type	Agreement effective date	Agreement expiry date
N/A	N/A	N/A	N/A
Specification Details			
Programme Lead		Dr Panagiotis Angeloudis	
Student cohorts covered by specification		2024-25 entry	
Date of introduction of programme		October 23	
Date of programme specification/revision		November 23	

Programme Overview	
<p>Imperial College London is a world-leading research institution, and the Department of Civil & Environmental Engineering is consistently ranked among the very best in the world for studies in our profession. It is delivered by the Transport Section, one of six sections within the department, which has a long history in the Department, dating back to the 1960s. Upon joining our programme, you will become part of a long tradition of several hundred graduates who have benefitted from the teaching and training delivered by the Section.</p> <p>A unique feature of this programme is its close association with Imperial College's Transport Strategy Centre (TSC), which is part of the Transport Section. The TSC is a globally recognised group specialising in transport benchmarking and its world-leading contributions to research and policymaking. Through its collaboration with over 130 urban transport, rail and airport operators, it will offer students a unique insight into the industrial applications of our research and teaching. The TSC's impact over the last decade has been world-leading in its significance, effecting profound changes to transport policy, operations, engineering, and economics on a global scale.</p> <p>Our career-oriented programme will cover theoretical background, practical design, and analysis considerations, central to which are the concepts of efficiency, safety, security, and sustainability. The taught curriculum deals with significant topics in the design, modelling, and operation of civil infrastructure to support ground, air, and maritime transport, as well as the tools and models that would inform and design passenger and freight transportation.</p> <p>The Data Science (DS) stream provides a unique opportunity for our Transport students to specialise in the methods used to analyse large volumes of data and to architect intelligent processes that are central to the design and operation of modern, resilient, sustainable transport systems. Distinctive features of this option are to provide a concise and comprehensive introduction to key scientific methods for data analysis and modelling from both a theoretical and applied viewpoint and skills to apply emerging machine learning methods to solve complex transport engineering applications and aid decision-making in stakeholder environments. The Design Project offers the experience of working in a team on a client-based project, drawing on knowledge from the core modules delivered in statistical modelling, machine learning, and practical advanced computational skills derived from the data engineering module and their application in a real-world scenario.</p>	

The programme is structured in three parts. A programme plan is set out in the schematic below (Figure 1). The taught component is delivered in two parts, during the Autumn and Spring Terms. The modules you will attend in the Autumn Term will equip you with core knowledge of transport fundamentals, its analysis and design, and topics of importance in data science (specifically statistical modelling and machine learning). In contrast, in the Spring Term, the programme content will focus on specific modes (such as mass transit, rail and air transportation), applications (freight transport) and technologies (such as intelligent mobility and autonomous transport systems). This part of the programme will show you how to apply your core knowledge and analytical skills to address challenges and problems across the transport landscape. The final part of the programme is delivered during the summer period (May to end of August). It involves a Group Design Project and a Research Project culminating in a written Dissertation – on both activities you will have an opportunity to select the particular topic that you will be focusing on amongst a range of option and will therefore have an opportunity to topics of particular interest to you. It is possible for projects to be carried out partly at an external organisation, and requests will be considered on a case-by-case basis.

You will be assessed through coursework, group design projects, and examinations that will allow you to demonstrate your understanding of the concepts covered by the taught modules. Examinations will take place at the beginning of the Spring and Summer Terms. You will start working on your individual research project early in the Spring Term, initially alongside other taught modules, and exclusively on it over the Summer Term until the submission of your dissertation at the end of August.

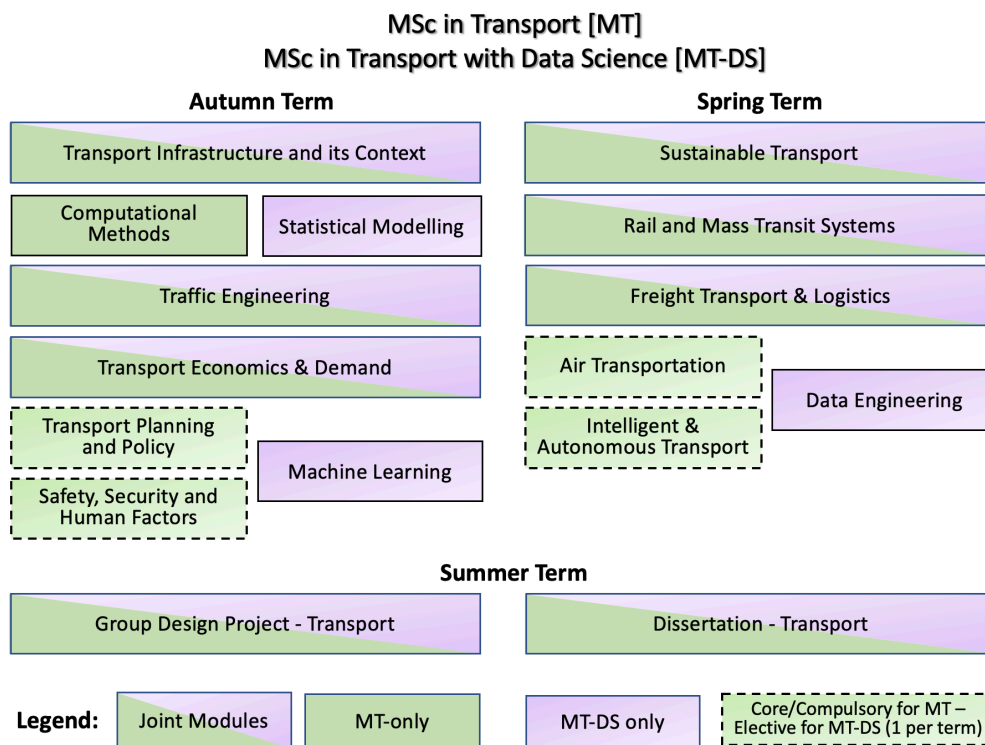


Figure 1: Schematic of the Transport Programmes

Throughout the programme, there are many opportunities for you to work on your own as well as part of a team in group work; experiences which test your communication, leadership, and interpersonal skills as well as your technical competence, time, and project management skills.

The programme is pending accreditation by the Joint Board of Moderators (JBM). Accreditation of the programme will be sought from the Joint board of Moderators (JBM) at the earliest opportunity. The Subject Threads of Sustainability, Design, and Health and Safety are embedded in modules that make up the taught programme, the individual and group design projects, and the individual research projects.

Our programme benefits from teaching and project supervision delivered by research-leading academics of long-standing, with backgrounds in civil engineering, mathematics, statistical modelling, machine learning, data engineering, economics, physics, computer science, planning, safety science, robotics, and systems engineering. The diversity of background amongst the staff is reflected in the extensive and diverse research portfolio and the

experience many have had in leading roles in national and international research activity, providing advice and guidance to the UK and overseas governments, international agencies, and industry.

The course delivery is supported by extensive contributions from industry and business practitioners and overseas academics.

Graduates of our programme benefit from a global alumni network and are employed by high-profile public and private sector organisations. These include major transport and management consultancies, transport operators (including airlines and shipping lines), the technology sector, government bodies and international organisations. Many of our graduates continue their studies to undertake research towards a PhD and have established successful academic careers.

Learning Outcomes

On completion of the MSc in Transport with Data Science programme, you will be able to:

1. Apply knowledge of the fundamental concepts and techniques for the planning, design, management and delivery of transport infrastructure, and critically assess the critical engineering, operational and managerial constraints that affect the provision of transport services.
2. Apply, in a theoretically consistent manner, the fundamentals of traffic flow theory, travel demand, transport supply and simulation for the evaluation of the impacts of any network-level intervention on traffic performance and the appraisal of transport policies.
3. Develop the scope and appropriate statistical and machine learning models from a design brief, to solve complex engineering design problems, working effectively as a group.
4. Identify the principal mechanisms by which different transport modes impact the environment, quantify impacts on air quality, climate change and noise pollution and develop strategies to improve the sustainability of transport operations.
5. Apply your knowledge of public transport fundamentals to design, model, appraise, improve and manage existing and proposed services and interventions.
6. Use analytics and decision models tools to facilitate the safe, cost-efficient and timely distribution of goods within cities, countries and across borders.
7. Develop strategies to improve the efficiency of the air transport system and evaluate the impact of new technologies on the safety and efficiency of air transport operations.
8. Define and develop requirements, system architecture and design standards in establishing new intelligent or autonomous transport systems, assess their lifecycle and apply modelling methods to determine their impacts on society.
9. Develop the scope and analytical process, working effectively as a group, from a design brief to solving complex engineering design problems.
10. Conduct a piece of independent research, setting out a project brief and research plan within a defined timeframe and available resources, applying data science and demonstrate a contribution to knowledge in a research area of interest.
11. Interpret state-of-the-art technical and scientific publications related to a research topic and demonstrate a critical attitude towards the results of others and their own.
12. Produce, as a written output, a research paper which presents coherently the aims/research content, a literature review, research methodology, research results, discussion and conclusions concisely written in the style of a scientific publication.

On completion of the Postgraduate Diploma (PG Dip) in Transport with Data Science, you will be able to fulfil either the learning outcomes 1-9 (corresponding to the Autumn and Spring term modules and including the Design Project) or 1-3 (corresponding primarily to the Autumn term modules) and 10-12 (corresponding to the Dissertation).

On completion of the Postgraduate Certificate (PG Cert) in Transport with Data Science, you will be able to fulfil the learning outcomes 1-3, corresponding primarily to the Autumn term modules

The Imperial Graduate Attributes are a set of core competencies Imperial expects students to achieve through completion of any Imperial degree programme. In accordance with these core competencies set out below, our aim is for our graduates to:

- Demonstrate a deep conceptual understanding of their chosen discipline
- Work effectively in multi-cultural, international teams and across disciplinary boundaries

- Approach challenges with curiosity, critical thinking, and creativity
- Innovatively apply their skills to tackling complex real-world problems
- Understand and value different cultures and perspectives
- Have developed into independent learners with high self-efficacy
- Display a strong sense of personal and professional identity

Entry Requirements	
Academic Requirement	Normally a 1 st class UK Bachelor's or Master's Degree with Honours in Civil Engineering, other branches of Engineering, Economics, Mathematics, Statistics, Natural Sciences, Earth Sciences, or other numerate discipline <i>(or a comparable qualification recognised by the university)</i> . Additionally, an A-level in Mathematics with at least grade B is required. For further information on entry requirements, please go to PG: www.imperial.ac.uk/study/apply/postgraduate-taught/entry-requirements/accepted-qualifications/
Non-academic Requirements	Applicants who do not meet the academic requirements above, but who has substantial relevant industrial and professional experience may be admitted following successful submission as a Special Case according to the Special Cases Policy for Admission: www.imperial.ac.uk/about/governance/academic-governance/academic-policy/admissions/
English Language Requirement	Standard requirement (PG) Please check for other Accepted English Qualifications
Admissions Test/Interview	Applicants may be invited for a face-to-face or telephone interview with the Course Directors. No additional entry assessments are required.
The programme's competency standards documents are available from the department.	

Learning & Teaching Approach
<p>Learning and Teaching Delivery Methods</p> <p>The student cohorts join our programme from various backgrounds across science and engineering disciplines. This richness in diversity is valued and exploited to benefit each student's learning experience. Opportunities for students to learn from one another are encouraged from the outset.</p> <p>This begins with an excellent Induction Programme where students, on the first meeting, are allocated into groups (set up to balance gender, academic background, and culture and chosen specialism for their degree) to work through challenge questions as a team and present their views in a PowerPoint presentation. This initial step sets our expectations of the cohort as an integrated group. It underpins the inclusive teaching and learning that lies at the heart of our programme delivery to enable participation, remove barriers, encourage individuals to voice their views, and build the strength of the student cohort as individuals who will emerge as our future ambassadors.</p> <p>Students will experience different learning and teaching delivery methods, many of which will draw from those cited in Imperial's Educational Development Unit's teaching toolkit but will most likely include:</p> <ul style="list-style-type: none"> • Lectures: are typically delivered to the entire class in timetabled blocks of 2 or 3 hours, with hourly breaks. Lectures will be delivered as traditional-style lectures, flipped classrooms, and online learning supported through pre-recorded lectures. Most lectures involve student engagement with questions posed to the class, while in others, the lecturer may include breaks to allow for small-group exercises or discussions to reinforce learning of the recently covered material. • Tutorials: these sessions will involve problem-solving exercises as individuals or as groups, allowing students to apply the knowledge from the lectures. In many of these tutorial sessions, there will be

support from the department's group of trained graduate teaching assistants (GTAs) – this will involve you either being assigned a GTA as you work in groups, or you may be expected to ask questions of a team of GTAs. Aside from these more formal sessions, you may be assigned tutorial exercises to aid your learning, and to test your knowledge, which you can do in your independent study time.

- **Online Quizzes:** these will be deployed in some modules where you will have the opportunity of testing your knowledge through short online exercises and quizzes. These exercises are used as part of formative learning and assessment, where some will be for credit and others just for practice, for you to test your understanding of concepts taught and your ability to build on and apply that knowledge.
- **Computer Sessions** will focus on training with the latest scientific programming frameworks, and the use of specialist software appropriate timetabled sessions will be run from our computer room facilities. A team of GTAs often supports these sessions to assist you in your learning.
- **Group Exercises and Design Projects:** given the multidisciplinary nature of Transport Engineering, as engineering graduates from this programme, you will rarely work in isolation, but instead will most likely operate in multi-cultural, international teams and across disciplinary boundaries, so the importance of developing leadership and team-building skills cannot be underestimated. To develop and strengthen these skills throughout the programme, you will have opportunities to work in groups on pieces of coursework and significantly in the Design Project Module. In the latter, you will have an opportunity to select a topic that is aligned with your onward career aspirations and will have work with your peers to develop solutions for real-world design problems that have been formulated with inputs from the programme's industrial collaborators. These opportunities will help you hone your skills as a team player, to listen, cooperate, share, respect for, empower team members, and exercise practical project and time management. In your Design project these skills will be further enhanced through the experience of working with industry clients.
- **Individual Research Project:** Imperial College London is a world-renowned research institution, and our department is a world leader in Civil and Environmental Engineering research. You will select the project in the Autumn term, following an allocation exercise that will seek to match students to research topics in accordance with their personal research interests. The projects will run for a period of up to 15 weeks in the final months of your degree programme. During this period, you will be exposed to, benefit from, and be advantaged by, the expertise of your supervisor(s), who are members of our academic staff and are leaders of international renown in their field of research. This will allow you to undertake in-depth research in areas of interest to you, be exposed to state-of-the-art knowledge and develop analytical and communication skills to effectively present your research findings and deliver a research output that contributes to understanding.

As part of the learning and teaching delivery, you will be encouraged to be creative in the art of communication in written and oral presentations. During the programme, you will be challenged to produce different types of output for assessments that rely on your communication skills. Some formats will be familiar to you, whilst others will be new, but each will add to a portfolio of skills that will benefit you as you graduate from the programme. These different formats will include:

- Essays
- Group Reports
- Project Presentations (oral or pre-recorded)
- Programming code and notebooks
- Individual Research Project (written in the style of a Research Paper)

Overall Workload

Your overall workload consists of face-to-face sessions, some video-assisted training in laboratory methods and independent learning. At Imperial, each ECTS credit taken equates to an expected total study time of 25 hours. Therefore, the expected total study time is 2250 hours per year.

In the first two terms, you will spend about 25% of your time on lectures and tutorials with the remainder dedicated to assignments and self-study. Your research project will be selected from a list of available topics. Training includes library induction lectures and data-search, with the remainder as independent study. We expect that research project work will occupy 20% of your independent study time during the spring term and 70% of

your overall workload during the summer period (May to end of August), with the rest being devoted to the exams and the group design projects.

Assessment Strategy

Assessment Methods

To complete the requirements of the degree, all assessments must be undertaken to the appropriate level and will include the following:

- Individual and group coursework assignments
- Lab report summaries
- Group projects and presentations
- Design projects
- Written examinations
- A Research Dissertation
- A Research Poster

The Department aims to use a range of summative and formative assessment methods to maximise student learning. Summative assessment refers to those forms of evaluation set out above that will test your achievement of module objectives, allow you to demonstrate that you have met the intended learning outcomes of each module and contribute towards the programme-level designed learning outcomes.

To support you in identifying areas of strengths and weaknesses to improve your learning, during the programme, we have a range of formative assessments such as problem-solving exercises (in-class and for self-study), online quizzes, etc.

The weighted* balance of the summative assessment across the programme is as follows:

Assessed coursework	50%
Examinations (practical and written)	50%

* Note that individual distributions will differ slightly across the modules.

Academic Feedback Policy

The assessment of our programmes is designed to include a wide range of assessment types, including examinations, group and individual coursework assignments, essays, executive summaries, oral presentations, online tests/quizzes, design projects, lab report summaries, a research dissertation, and a research poster. As detailed below, feedback will be provided to you formally via methods appropriate to the assessment. Feedback will be provided to you in a timely manner, to an appropriate level of detail so that you can benefit from the comments, act on them, and feed-forward this knowledge to the completion of other assignments and pieces of work.

The following are the mechanisms in place for providing prompt feedback to students on their performance in coursework and examinations and processes for monitoring:

- Coursework, marked and annotated by academic staff, is usually returned to students (individually) or for group work, to a group (as appropriate) to a two-three week return schedule. Marking is done, sometimes with the assistance of trained GTAs.
- Academic staff may also provide verbal feedback in class, post general feedback via Blackboard, or distribute written overviews.
- Provisional feedback, in grade format, on examination/assessment performance in a module is given to students, generally within 6-8 weeks of the examinations (in March and July), by the Examinations Officer. The Chair of the Board and Examinations Officer schedule individual meetings with students with borderline performance or failing modules.

- Formative (primarily oral) feedback will be provided to students over the course of the discussions and activities that take place within lectures, tutorial and laboratory sessions.
- Feedback on Research Dissertations is given throughout the research period from the supervisor(s). After the Board of Examiners Meeting, a written feedback summary will be provided to students individually.

Imperial's Policy on Academic Feedback and guidance on issuing provisional marks to students is available at: www.imperial.ac.uk/about/governance/academic-governance/academic-policy/exams-and-assessment/

Re-sit Policy

Imperial's Policy on Re-sits is available at: www.imperial.ac.uk/about/governance/academic-governance/academic-policy/exams-and-assessment/

Mitigating Circumstances Policy

Imperial's Policy on Mitigating Circumstances is available at: www.imperial.ac.uk/about/governance/academic-governance/academic-policy/exams-and-assessment/

Additional Programme Costs

This section should outline any additional costs relevant to this programme which are not included in students' tuition fees.

Description	Mandatory/Optional	Approximate cost
N/A	N/A	N/A

Programme Structure ¹					
Year 1 - FHEQ Level 7					
You will study all core and compulsory modules. You will select one elective from Group A, and one elective from Group B.					
Code	Module Title	Core/ Compulsory	Group	Term	Credits
CIVE70119	Transport Infrastructure and its Context	Core		Autumn	5
CIVE70116	Statistical Modelling	Compulsory		Autumn	5
CIVE70015	Traffic Engineering	Compulsory		Autumn	5
CIVE70111	Machine Learning	Compulsory		Autumn	5
CIVE70118	Transport Economics and Demand	Compulsory		Autumn	5
CIVE70120	Transport Planning and Policy	Elective	A	Autumn	5
CIVE70115	Safety, Security and Human Factors	Elective	A	Autumn	5
CIVE70117	Sustainable Transport	Compulsory		Spring	5
CIVE70113	Rail and Mass Transit Systems	Compulsory		Spring	5
CIVE70122	Data Engineering	Compulsory		Spring	5
CIVE70108	Freight Transport and Logistics	Compulsory		Spring	5
CIVE70106	Air Transportation	Elective	B	Spring	5
CIVE70110	Intelligent and Autonomous Transport	Elective	B	Spring	5
CIVE70109	Group Design Project - Transport	Core		Spring-Summer	5
CIVE70114	Research Project – Transport	Core		Spring-Summer	30
Credit Total					90

¹ **Core** modules are those which serve a fundamental role within the curriculum, and for which achievement of the credits for that module is essential for the achievement of the target award. Core modules must therefore be taken and passed in order to achieve that named award. **Compulsory** modules are those which are designated as necessary to be taken as part of the programme syllabus. Compulsory modules can be compensated. **Elective** modules are those which are in the same subject area as the field of study and are offered to students in order to offer an element of choice in the curriculum and from which students are able to select. Elective modules can be compensated.

Award and Classification for Postgraduate Students

Award of a Postgraduate Certificate (PG Cert)

To qualify for the award of a postgraduate certificate you must have a minimum of 30 ECTS credits at Level 7

Award of a Postgraduate Diploma (PG Dip)

To qualify for the award of a postgraduate diploma you must have passed modules to the value of no fewer than 60 credits at Level 7.

1. and no more than 10 ECTS credits as a Compensated Pass;

Award of a Masters Degree

To qualify for the award of a postgraduate degree you must have:

1. accumulated credit to the value of no fewer than 90 credits at level 7;
2. and no more than 10 ECTS credits* as a Compensated Pass;
3. met any specific requirements for an award as outlined in the approved programme specification for that award.

Classification of Postgraduate Taught Awards

The university sets the class of Degree that may be awarded as follows:

1. Distinction: 70.00% or above.
2. Merit: 60.00% or above but less than 70.00%.
3. Pass: 50.00% or above but less than 60.00%.

For a Masters, your classification will be determined through the weighted average mark in the designated 'taught' and 'research' aspects of the programme each meeting the threshold for the relevant classification band.

Your degree algorithm provides an appropriate and reliable summary of your performance against the programme learning outcomes. It reflects the design, delivery and structure of your programme without unduly over-emphasising particular aspects.

Programme Specific Regulations

The programme is pending accreditation from the JBM and therefore no more than 10 credits as a Compensated Pass are permitted.

Supporting Information

The Programme Handbook is available from the department.

The Module Handbook is available from the department.

Imperial's entry requirements for postgraduate programmes can be found at:
www.imperial.ac.uk/study/apply/postgraduate-taught/entry-requirements/

Imperial's Quality & Enhancement Framework is available at:
www.imperial.ac.uk/registry/proceduresandregulations/qualityassurance

Imperial's Academic and Examination Regulations can be found at:
www.imperial.ac.uk/about/governance/academic-governance/regulations

Imperial College London is an independent corporation whose legal status derives from a Royal Charter granted under Letters Patent in 1907. In 2007 a Supplemental Charter and Statutes was granted by HM Queen Elizabeth II. This Supplemental Charter, which came into force on the date of Imperial's Centenary, 8th July 2007, established Imperial as a University with the name and style of "The Imperial College of Science, Technology and Medicine".
www.imperial.ac.uk/admin-services/secretariat/college-governance/charters/

Imperial College London is regulated by the Office for Students (OfS)
www.officeforstudents.org.uk/advice-and-guidance/the-register/

This document provides a definitive record of the main features of the programme and the learning outcomes that you may reasonably be expected to achieve and demonstrate if you take full advantage of the learning opportunities provided. This programme specification is primarily intended as a reference point for prospective and current students, academic and support staff involved in delivering the programme and enabling student development and achievement, for its assessment by internal and external examiners, and in subsequent monitoring and review.