Programme Information		
Programme Title	Programme Code	HECoS Code
Computing (Artificial Intelligence and Machine Learning)	G5U10	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 – G5U10D	N/A	N/A	N/A	60	120
PG Certificate - G5U10C	N/A	N/A	N/A	30	60

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

The Certificate and Diploma are offered in Computing and do not include the specialism in the title. This is due to the fact that it would be very difficult to identify if a student has indeed covered 30 or 60 ECTS worth of credit within the specialism. We want to help the students with the exit awards, so keeping this generic would only increase the flexibility of the awards.

Ownership			
Awarding Institution	Imperial College London	Faculty	Faculty of Engineering
Teaching Institution	Imperial College London	Department	Computing
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		QAA Subject Benchmark Statement: Computing www.qaa.ac.uk/quality-code/subject-benchmark-statements/computing	
FHEQ Level		Level 7 – Master's	
EHEA Level		2nd Cycle	
External Accreditor(s) (if applicable)			
External Accreditor 1:	N/A		
Accreditation received:	N/A	Accreditation renewal:	N/A
Collaborative Provision			
Collaborative partner	Collaboration type	Agreement effective	Agreement expiry date

		date	
N/A	N/A	N/A	N/A

Specification Details	
Programme Lead	Dr Pancham Shukla
Student cohorts covered by specification	2024-25 entry
Date of introduction of programme	October 2019
Date of programme specification/revision	August 2024

Programme Overview

This programme specialises in the foundations and advanced tools and techniques of logic and statistical based approaches in artificial intelligence, including machine learning. It differs from the MSc Artificial Intelligence by catering to students who already have a Computing background while the MSc AI is a conversion degree. Students in the MSc Computing (Artificial Intelligence and Machine Learning) can start taking advanced modules in this area from the start.

This taught postgraduate programme is aimed at students who may not have studied computing exclusively, but who have studied a considerable amount of computing already. If you want to become a specialist in artificial intelligence, this degree will provide a first crucial step towards that goal.

The programme enables you to develop and master skills in a broad range of advanced computing concepts and technologies. You are given liberty to tailor the programme to your own needs and interests whilst engaging in modules delivered by world-renowned subject experts. Most of the subjects studied will be in artificial intelligence and machine learning, but you have the flexibility to supplement this with three modules from any of the master's level subjects taught in the Department of Computing, subject to timetable constraints. These range from blockchain to quantum computing, from formal program analysis to computational finance. It is expected that the modules build upon knowledge gained in a good first degree in computer science or a closely related subject such as electrical engineering. The expectation of graduates is that this programme enables them to have rewarding careers in computing or in a profession that has computing as a core component.

The programme is taken over 12 months, full-time, with a single entry point per year in October. In the Autumn and Spring terms, timetable permitting, you will study modules from a very large range (approximately 20 per term) of taught electives. This high level of choice will allow you to extend and deepen your knowledge in the areas of computing that fit best with your individual background and interests. Pre-sessional material as appropriate will be provided to help with any pre-requisites. To further enhance the flexibility and research proximity of the programme, you will have the option of replacing one taught elective with the Independent Study Option (ISO) module in the spring term. The ISO involves individual study of an advanced topic selected by you, under the supervision of a member of staff, culminating in a written report and presentation. The remainder of the degree, from May to September, is devoted to a major individual project, resulting in a written dissertation and oral presentation.

You will be taught by leading academic staff who are experts in their fields, and whose research has been recognised to be at the forefront of current advances in computer science. The teaching is also well-recognised to be informed by this research. The programme is delivered in the world-leading Department of Computing at Imperial College London. The Department has leading research groups in Programming Languages, Artificial Intelligence, Software Engineering, Data Science, Theory and Algorithms and Visual Computing. Many groups and members of our research staff are at the forefront of research in their respective fields: 56% of the research in the Department of Computing ranked at 4*, for "Quality that is world-leading in terms of originality, significance and rigour" in the 2021 Research Excellence Framework exercise. The department has many collaborations with other faculties at Imperial, and leading international institutions, as well as with industry. We also the home of dedicated research centres, including the Dyson Robotics Lab, the Data Science Institute, the Centre for Integrative Systems Biology and Bioinformatics, the Hamlyn Centre for Medical Image Computing and Robotics, and more.
Graduates from the Department of Computing have gone on to work in leading companies such as Microsoft, Amazon, DeepMind, Facebook, Google, and Twitter; many have also progressed to PhD research at Imperial and

elsewhere. A graduate of the department recently had his company valued at $1 billion, and two other graduates sold their AI start-up to Twitter for $150 million.

Throughout the year, leading companies visit the department to give presentations on the Applications of Computing in Industry. These are on a broad range of industrially-relevant topics including AI, Data Science, Programming Languages, Natural Language Processing and Software Engineering. We pride ourselves in presenting you with a great opportunity to learn about the relevance and application of what you are studying and enabling you to speak directly with people working on industrial applications. You will also have the opportunity to attend dedicated extracurricular tutorials and seminars on computing from guest speakers, held at a time that does not overlap with elective modules.

All software packages required to undertake this degree programme are provided to the students as part of the programme fee. We use digital technology to bring further benefits to our education programmes, drawing from investments made and skills gained during the pandemic. We deliver our education as a useful blend of face-to-face and digital learning. This will also prepare our students well for a more hybrid work culture of the future.

Learning Outcomes

Upon successful completion of the programme you will have be able to demonstrate the following learning outcomes.

On achieving the PG Certificate:

1. To translate abstract and mathematical concepts into computer-based solutions for practical problems
2. To effectively use state-of-the-art computing tools and techniques
3. To develop and test software solutions to computational problems using a variety of programming languages and paradigms

On achieving the PG Diploma, ILOs 1-3 above, and:

4. To formalise problems in artificial intelligence and machine learning, and employ an appropriate approach to solving them
5. To design and engineer solutions that combine artificial intelligence with other fields in computer science and engineering
6. To plan and conduct a programme of original research and software development related to artificial intelligence
7. To communicate effectively through technical oral presentations and written reports.

On achieving the MSc, ILOs 1-7 above, and:

8. To develop computer-based systems in a manner that respects relevant legal, social, ethical and other professional practices
9. To adapt, integrate and transfer methods and skills between established areas and emerging trends in artificial intelligence
10. To organise and successfully implement study of advanced research level information, from diverse sources, both within instructor-led and research-based educational settings
11. To devise and conduct practical experiments in order to push the boundaries of understanding in computer science and its application to artificial intelligence

The Imperial Graduate Attributes are a set of core competencies which we expect students to achieve through completion of any Imperial degree programme. The Graduate Attributes are available at: https://www.imperial.ac.uk/about/education/our-graduates/

Entry Requirements

Academic Requirement	1st class honours degree in a subject with a substantial computing component. The amount of computing studied should equate to two years of a computer science undergraduate programme.

	For further information on postgraduate entry requirements, please visit: www.imperial.ac.uk/study/apply/postgraduate-taught/entry-requirements/
Non-academic Requirements	N/A
English Language Requirement	Higher requirement (PG) Please check for other Accepted English Qualifications
Admissions Test/Interview	There are normally no admissions tests or interviews.

The programme's competency standards documents can be found at:
www.imperial.ac.uk/computing/prospective-students/courses/competence/

Learning & Teaching Approach

Teaching
You will be taught through a combination of interactive sessions, lectures, team-based learning, tutorials, computer laboratory sessions, guest lectures, and individual project meetings.
Module lecturers employ a variety of these teaching methods, depending on the content of the module. A typical module might combine teaching by lectures, with tutorial sessions supported by the lecturer and their tutorial assistants. Tutorial sessions can involve practical coding tasks (run in our extensive computer laboratories), written exercises, or discussion groups.

Assessed coursework
Most modules set assessed coursework. This is sometimes to be completed in groups, and sometimes individual. It may consist of practical coding tasks, or written exercises, or a combination of the two. The portion of a module's final grade which is determined by assessed coursework typically ranges from 20% to 50%.

Individual project
The degree includes a substantial individual research project, which runs from May to mid-September. You will choose your project in January from a wide list of topics. The academic proposing each topic will be available to discuss the idea with you and help decide if it is right for you. If you have chosen the Independent Study Option, then your project can be a continuation of the same work, enabling you to progress further down your chosen research path.

The research project can be conducted with academics in the Department of Computing, or within other departments at Imperial. Some students also elect to do a research project in collaboration with industry, jointly supervised by an academic in the Department of Computing. The project is evaluated with a final report and presentation. It may be possible for projects to be carried out partly or wholly at an external organisation and requests will be considered on a case-by-case basis.

Independent learning
You are expected to spend significant time on independent study outside of face-to-face contact time.
This will typically include accessing resources online, reading journal articles and books, undertaking research in the library, reviewing lecture notes and watching lecture recordings, working on the individual project, working on coursework assignments and revising for exams.

Overall workload
Your overall workload consists of face-to-face sessions and independent learning. While your actual contact hours may vary according to the optional modules you choose to study, the following gives an indication of how much time you will need to allocate to different activities at each level of the programme. 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.

Typically, you will spend in the order of 12.5% of your time on lectures, tutorials, and similar; and in the order of 87.5% of your time on independent study.

Assessment Strategy

Assessment Methods

You can expect a variety of different types of assessment methods.

Written assessment

- Coursework exercises
- Reports on practical coding
- Short-form written answers
- Essays
- Written examinations
- Report writing
- Peer assessment reports

Programming

- Programming coursework (for taught modules)
- Programming examination

Oral assessment

- Oral presentations

Modules provide a range of formative activities to allow you to test and develop your understanding of the subject, and the ways you are expected to demonstrate the intended learning outcomes, before you complete the summative assessments that count towards your final mark. Formative activities include tutorial exercises, coding tasks, quizzes, and worked in-class problems supported by discussion. There is summative assessment during and/or at the end of each module. Summative assessments demonstrate that you have met the intended learning outcomes for each module and contribute towards your achievement of the programme learning outcomes, detailed above.

Balance of assessment

The percentages below are based on a typical pathway through the course and have been rounded to the nearest whole number.

Assessed coursework	10%
Examinations (practical and written)	40%
Individual project	50%

Academic Feedback Policy

Feedback on formative exercises may be given in various forms. Automatic testing is commonly provided for programming exercises, both as files that you can run in a development environment and through the department's online pre-submission testing system. For both programming exercises and written problems, model solutions are commonly provided after the work is submitted. These can be used for self-assessment but will also be the subject of in-class group discussion. More individualised discussion is available during tutorial sessions and via online forums for each module.

For summative work, the department operates in accordance with Imperial's policy on academic feedback, and procedures are consistent across all taught Computing programmes. Feedback will normally be provided on coursework within two weeks of submission. This will be in the form of, for example:

1. Marked-up coursework, laboratory exercises or tests
2. Personal discussion
3. Discussions in small-group tutorials
4. Verbal presentation, e.g. during or after lectures
5. Written class-wide summaries

Feedback on exams is provided in two forms: (i) numerically, as individual interim marks subject to ratification (approval) by the Board of Examiners; and (ii) in written form, as non-individual summary feedback on individual questions. In July you will also receive feedback in the form of provisional marks for taught modules. Further,

selected examination questions are routinely set as formative and/or summative assessments in later years, with model answers provided. 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
One resit is allowed per module, usually in the next instance when that module is examined. Determinations of results and mitigations will follow Imperial's policies and the academic regulations. 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
Personalised hardware/software tools to cater for individual preferences.	Optional	N/A

Important notice: The Programme Specifications are the result of a large curriculum and pedagogy reform implemented by the Department and supported by the Learning and Teaching Strategy of Imperial College London. The modules, structure and assessments presented in this Programme Specification are correct at time of publication but might change as a result of student and staff feedback and the introduction of new or innovative approaches to teaching and learning. You will be consulted and notified in a timely manner of any changes to this document.

Programme Structure[1]					
FHEQ Level 7 **You will study the core module (individual project); one compulsory module and eight electives. At least five of the eight electives must be from Group S, with the remainder (up to three) from Group O.**					
Code	Module Title	Core/ Compulsory/ Elective	Group	Term	Credits
COMP70095	MSc Computing (Specialism) Individual Project	Core	-	Summer	45
COMP70015	Mathematics for Machine Learning	Compulsory	R	Autumn	5
COMP70093	Logic-Based Learning (not running in 2024-25)	Elective	S	Spring	5
COMP70007	Computational Optimisation (not running in 2024-25)	Elective	S	Spring	5
COMP70010	Deep Learning	Elective	S	Spring	5
COMP70014	Machine Learning for Imaging	Elective	S	Spring	5
COMP70016	Natural Language Processing	Elective	S	Spring	5
COMP70019	Probabilistic Inference (not running in 2024-25)	Elective	S	Spring	5
COMP70028	Reinforcement Learning	Elective	S	Autumn	5
COMP70030	Knowledge Representation (not running in 2024-25)	Elective	S	Spring	5
COMP70031	Modal Logic for Strategic Reasoning	Elective	S	Spring	5
COMP70074	Prolog (not running in 2024-25)	Elective	S	Autumn	5
COMP70050	Introduction to Machine Learning	Elective	S	Autumn	5
COMP70110	Computer Vision	Elective	S	Autumn	5
COMP70067	Robot Learning	Elective	S	Spring	5
COMP70100	Computational Neurodynamics	Elective	S	Autumn	5
COMP70105	Deep Graph-Based Learning	Elective	S	Spring	5
COMP70101	Human-Robot Interaction (not running in 2024-25)	Elective	S	Autumn	5
COMP70098	Introduction to Concrete Complexity	Elective	O	Spring	5
COMP70102	Software Engineering for Machine Learning	Elective	S	Spring	5

[1] **Core** modules are those which serve a fundamental role within the curriculum, and for which achievement of the credits for that mod5ule is essential for the achievement of the target award. Core modules must therefore be taken and passed in order to achieve that named a5ward. **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.

	Systems				
COMP70112	Non-Euclidean Methods in Machine Learning	Elective	S	Spring	5
COMP70103	Statistical Information Theory	Elective	S	Autumn	5
COMP70084	Robotics	Elective	S	Autumn	5
COMP70086	Advanced Computer Architecture	Elective	O	Autumn	5
COMP70090	Graphics	Elective	O	Spring	5
COMP70070	Custom Computing	Elective	O	Spring	5
COMP70071	Distributed Algorithms (not running in 24-25)	Elective	O	Spring	5
COMP70082	Network and Web Security	Elective	O	Spring	5
COMP70075	System Performance Engineering	Elective	O	Spring	5
COMP70001	Advanced Computer Graphics	Elective	O	Spring	5
COMP70004	Advanced Computer Security	Elective	O	Spring	5
COMP70005	Complexity	Elective	O	Autumn	5
COMP70006	Computational Finance (not running in 2024-25)	Elective	O	Autumn	5
COMP70009	Cryptography Engineering (not running in 24-25)	Elective	O	Spring	5
COMP70017	Principles of Distributed Ledgers	Elective	O	Autumn	5
COMP70018	Privacy Engineering	Elective	O	Autumn	5
COMP70020	Program Analysis	Elective	O	Autumn	5
COMP70021	Quantum Computing	Elective	O	Autumn	5
COMP70022	Scalable Systems and Data	Elective	O	Autumn	5
COMP70023	Scalable Software Verification	Elective	O	Autumn	5
COMP70024	Software Reliability (not running in 2024-25)	Elective	O	Autumn	5
COMP70072	Independent Study Option	Elective	O	Spring	5
COMP70068	Scheduling and Resource Allocation	Elective	O	Autumn	5
COMP70111	Networked Systems	Elective	O	Autumn	5
				Credit Total	90

Progression and Classification
Award of a Postgraduate Certificate (PG Cert) To qualify for the award of a postgraduate certificate you must have: • accumulated credit to the value of no fewer than 30 ECTS credits at Level 7 or above. **Award of a Postgraduate Diploma (PG Dip)** To qualify for the award of a postgraduate diploma you must have: • accumulated credit to the value of no fewer than 60 ECTS credits at Level 7 or above; • no more than 10 credits as a result of compensated passes. **Award of a Masters Degree** To qualify for the award of a postgraduate degree you must have: • accumulated credit to the value of no fewer than 90 ECTS credits at level 7 or above; • no more than 15 credits as a result of compensated passes; • 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: i Distinction: 70.00% or above. ii Merit: 60.00% or above but less than 70.00%. iii Pass: 50.00% or above but less than 60.00%. For a Masters, your classification will be determined through the Programme Overall Weighted Average and the designated dissertation or final major project module 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
N/A

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.