

Programme Information		
Programme Title	Programme Code	HECoS Code
Postgraduate Certificate in Computational Biomedicine (Online)	A1Q1C / A1COC	For Registry Use Only
MSc / Postgraduate Diploma in Computational Biomedicine (Computational Genomics) (Online)	A1CG2 / A1CG A1Q2D / A1CGD	
MSc / Postgraduate Diploma in Computational Biomedicine (Computational Brain Sciences) (Online)	A1CB2 / A1CB / A1Q1D / A1CBD	

Award	Length of Study	Mode of Study	Entry Point(s)	Total Credits	
				ECTS	CATS
MSc (Suspended until January 2028) A1CG / A1CB	24 months	Part-time	Annually in January	90	180
MSc - A1CG2 / A1CB2	28 months	Part-time	Annually in September	90	180
PG Diploma (Suspended until January 2028) - A1CGD / A1CBD	18 months	Part-time	Annually in January	60	120
PG Diploma - A1Q2D / A1Q1D	20 months	Part-time	Annually in September	60	120
PG Certificate (Suspended until January 2028) - A1COC	12 months	Part-time	Annually in January	30	60
PG Certificate - A1Q1C	12 months	Part-time	Annually in September	30	60
PGCert, PGDip and MSc award are available for direct entry.					

Ownership			
Awarding Institution	Imperial College London	Faculty	Faculty of Medicine
Teaching Institution	Imperial College London	Department	Metabolism, Digestion and Reproduction
Associateship	Diploma of Imperial (DIC) (MSc only)	Main Location(s) of Study	Online
External Reference			
Relevant QAA Benchmark Statement(s) and/or other external reference points		N/A	

FHEQ Level		Level 7	
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 date	Agreement expiry date
N/A	N/A	N/A	N/A
Specification Details			
Programme Lead		Dr. Shamith Samarajiwa	
Student cohorts covered by specification		2026-27 entry	
Date of introduction of programme		September 26	
Date of programme specification/revision		August 25	

Programme Overview
Currently, biomedicine is undergoing an explosion in data generation, with large quantities of diverse and heterogenous datasets of varying size and complexity being generated across a range of different biomedical fields such as genomics, immunology and microbiology, neuroscience, oncology, epidemiology, clinical diagnostics and drug discovery. Due to technological advances, genome sequencing and biomedical imaging are a couple of the main contributors to this data tsunami, with different types of multi-omic and imaging data currently contributing exabytes (billion gigabytes) annually and predicted to produce zettabyte (trillion gigabytes) scale datasets in the next decade. This two-year part-time master's programme in computational biomedicine is aimed at producing computational biologists and biomedical data scientists with the capacity to process, integrate, mine, model and analyse complex biomedical datasets, as well as understand and interpret the extracted biological insights. You will apply the computational biology training acquired during this programme to develop new computational tools, methods, algorithms and models to solve scientific problems in the biomedical domain. You will learn Python, R and BASH as the main programming and scripting languages for biomedical data analysis. In addition, you will also be exposed to other scripting (sed, awk) and query languages (Cypher, SQL) for data handling. This unique programme will be a collaboration between several different departments in the Faculty of Medicine (Department of Metabolism, Digestion and Reproduction, National Heart and Lung Institute, Department of Brain Sciences). The module leads, lecturers and teaching fellows involved in programme delivery are all active researchers that are experts in their respective fields. This taught part-time programme will be spread across two years. In the first year, you will study two core modules (each spread across 15 weeks) and a stream specific compulsory module (12 weeks) in the latter part of the first year. The first core module "<i>Data science foundations for biomedical computational biology</i>", will enable development of expertise in data handling, reproducible research skills, Linux usage, and foundations of BASH scripting for bioinformatics. In addition, comprehensive training in R and Python programming languages will be provided. while the second core module, "<i>Introduction to machine learning and biostatistics</i>" will provide foundational skills in biostatistics, and machine and deep learning, necessary for the rest of the course.

The degree is composed of two specialist streams, in either **Computational Genomics**, or **Computational Brain Sciences**. During the latter part of the first year, you will select your first stream specific module (12 weeks). Depending on the stream, you will study “*Computational genomics and epigenome regulation*” providing you with expertise in next generation sequencing and multi-omic data analysis or “*Machine learning for translational neuroscience*” for handling neuroscience data.

In the first half of the second year, you will complete your second stream specific compulsory module (12 weeks), depending on the stream, these will be either “*Single cell omics, network biology and biomedical AI*” module, or the “*Brain imaging and high temporal resolution methods*” module.

Graduates of this programme will be employable in academic research institutes and university research laboratories, government research agencies, clinical informatician in the NHS and will have industry careers opportunities in biomedical start-ups, pharmaceutical or biotechnology, and technology focused companies. This programme will also prepare you for PhD programmes in biomedical data science, biostatistics, computational biology, bioinformatics, systems biology, and artificial intelligence applied to biomedicine.

Learning Outcomes

After completion of the master’s course in computational biomedicine, you will be able to:

1. Formulate a computational biology research proposal through the grant writing exercise.
2. Plan and produce scientific hypotheses and statistically robust experimental designs.
3. Evaluate and select most appropriate computational tools, data science methods and techniques to perform computational biology research.
4. Conduct reproducible and transparent computational research using a variety of technologies.
5. Produce well documented, version controlled reusable scientific code, following best practices of scientific programming.
6. Apply your skills in integrating, mining, modelling, visualisation, and analysis of biomedical data.
7. Apply programming and modelling techniques to produce machine learning/artificial intelligence (machine and deep learning) models applied to biomedical datasets.
8. Utilise specialist skills and domain expertise in analysing datasets and interpreting results from genomics (including omics related to immunology, oncology, rare disease or infectious disease), and brain sciences.
9. Perform high quality research in computational biology: organise and manage datasets, time, and computational resources efficiently while performing research in a scientific environment.
10. Analyse and interpret imaging, genomic, transcriptomic and epigenomic datasets from clinical or biomedical fields such as oncology, immunology, infectious disease, genomics, and neuroscience.
11. Critically evaluate published research in computational biology.
12. Communicate research findings to the scientific community in a variety of formats including poster presentations, oral presentations and written scientific reports.

To achieve a Postgraduate Certificate (PGCert) or Post Graduate Diploma (PGDip) award, you will need to achieve learning outcomes 1 to 7, which will be met by successfully completing the taught modules 1 and 2 (PGCert) or modules 1-4 (PGDip).

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	UG degree Normally a 2:1 UK Bachelor’s Degree or equivalent in a relevant Biological or Biomedical science discipline or in Clinical Medicine (or a comparable qualification recognised by the College).
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	PGT: www.imperial.ac.uk/study/apply/postgraduate-taught/entry-requirements/
Non-academic Requirements	N/A
English Language Requirement	Standard requirement Please check for other Accepted English Qualifications
Admissions Test/Interview	You might be invited to attend a post-application interview (via video conferencing or phone call).

The programme's competency standards documents are available from the department.

Learning & Teaching Approach

This fully online, part-time M.Sc. in Computational Biomedicine is designed for biologists and clinicians who may not have any background in computational and statistical methods used in computational biology or biomedical data science. The course will be delivered online and will use active learning approaches to maximise your participation and encourage productive discussions with your colleagues, lecturers and teaching fellows. Learning will be achieved through a multitude of learning approaches that includes self-learning through online lectures and teaching resources, interactive sessions for practical sessions and workshops, live online tutorials, demonstrations, or problem-solving sessions, small group-based activities enabled via online video conferencing or using innovative virtual reality workspaces. During your research project, you will also be able to experience a stimulating, real-life research environment that will encourage learning through active participation.

Some noteworthy specific aspects of the course include:

- Online study materials will be provided to you ahead of the lectures so that you can come prepared and consolidate your learning through active discussion during the weekly live tutorials and problem-solving sessions.
- Seminars and lectures will be delivered by experts from Imperial College London and other associated research institutions. All lectures will be pre-recorded and available online. Some guest lecturers will be in the live online format, with recordings made available later for students from different time zones or work commitments.
- Online practical sessions will include documentation and/or video instructions, R or Jupyter notebooks containing code and instructions, or links to suitable online resource (i.e. a GitHub code repository) and where possible a virtual environment (such as docker or singularity containers) which you can install locally and run the practical. Live demonstrations and hands-on-sessions will be delivered by Imperial College London researchers and teaching fellows with the help of graduate teaching assistants to maximise interactions. These will be reinforced with online resources.
- Mastering scientific programming and applying statistical analyses requires a great deal of practise. You will be given regular programming and data analysis assignments to complete independently or in groups to practise and develop your computational skills.
- You will work (remotely) for 6 months on a well-defined computational biology research project within a research group at Imperial College London or associated institute. This will include weekly meetings with your research supervisor and participating in journal clubs and other activities.

Overall Workload

The overall workload includes online learning content and pre-recorded video lecture sessions, online pre-recorded practical material, online live synchronous problem-solving sessions, workshops and tutorials and independent learning (actual contact hours may vary between modules). The expected total study time is 1125 hours in each year (2250 hours for the entire 2-year M.Sc. degree). For the post graduate certificate (PG Cert) course, the expected study time is 750 hours, and you are expected to complete the two core taught modules, whereas the total study for the post graduate diploma (PG Dip) is 1500 hours, and you are expected to complete the two core and two specialist compulsory modules from within a single stream.

In the first year of the M.Sc. course, you will spend 100% of your time on the taught components and complete three modules (two core and one stream specific module). In the second year of the M.Sc. course, you will spend approximately 30% of your time on the final stream specific taught module and the other 70% working on a research project.

The taught component will consist of approximately 20-30% online content (lectures, seminars, practical) 5-10% live online session (problem-solving session, workshops, tutorials) and around 60% guided independent learning, which includes online learning material, pre-reading, statistics and programming assignments, and group-based activities. Synchronous online sessions will also be accessible via virtual reality headsets and standard screen-based platforms (MS Teams or Zoom), enabling you to interact and directly engage with both instructors and colleagues in a virtual or screen-based environment.

As this course is purely computational, you do not require wet laboratory access. During the 6 months allocated to the research project, you will spend 80% of your time on the assigned research and the remaining 20% on writing the research report. During this period, whenever possible, you will participate remotely, in joint activities of the research team such as regular group meetings and journal clubs. You will maintain regular contact with your supervisor using electronic means such as e-mail, slack and video conferencing. Research work will be carried out using remote access to various computing resources, local servers, including the Imperial College High Performance Computing cluster and other cloud-based resources.

Assessment Strategy

Assessment Methods

In this program, formative and summative assessments will be held at different points during the progression of the course. Students applying for this program should be aware that the Team Based Learning (TBLs) are essential to the teaching and learning of the modules in which they appear, and that you are expected to participate.

The two core modules (modules one: Data Science Foundations for Biomedical Computational Biology and two: Introduction to Biomedical Machine Learning and Biostatistics) will be assessed by summative TBL examinations, summative programming, problem-solving and data analysis assignments, and a mock research grant proposal at the end of module two.

A formative TBL will be held in module 1 prior to the summative TBL in order for students to familiarize with the TBL format. The module will be assessed by a summative TBL on reproducible research technologies (10%), a Bash scripting assignment (20%), HPC job submission scripting and workflow analysis assignment (20%), and a R/Python programming and data analysis assignment (50% of the total grade). For the summative TBL examinations, students will be split into small groups (4 or 5 students per group assigned based on time zones) and will be given one or two research publications (or other reading or learning material) to revise before the examination. They will then answer a set of multiple-choice questions individually (iRAT) as well as work in teams to provide answers (tRAT) and longer written answers to more detailed questions, forming a team application (tAPP) based on their learning material. These TBLs can be either synchronous or asynchronous and will be time-limited to 2 hours. In both module one and two, coding assignments that allow multiple autograder submissions (within a specific submission deadline) will help improve coding skills and obtain instant feedback.

Both module one and two will have summative data analysis and coding assignment. This will involve obtaining a given (published) dataset from a data repository, cleaning, processing, transforming the data into useful formats and carrying out an analysis. For module one the emphasis will be on demonstrating programming and analysis skills, while for module two emphasis will be on statistical aspects, including the selection and application of appropriate statistical methods or machine learning models. The creativity displayed in problem selection and solving as well as reproducibility of the analysis and data analysis and visualization skills will be assessed based on

the reproducible research documents (either as an R or Jupyter notebook) containing well documented code, results, data visualization /figures and explanations/annotations. Module two will also be assessed by a summative TBL (10%), a data analysis assignment (30%), a machine/deep learning assignment (30%), and a research grant proposal writing exercise worth 30% of the module grade.

Since the two stream-based compulsory modules are very specialised, specific assessment methods will be used to ensure that you gain the maximum benefit from the course. You will be required to be familiar with the principles of programming taught in core module one and statistics and machine learning methods taught in core module two.

The computational genomics compulsory module one (Computational Genomics and Epigenome Regulation) will be assessed by a summative TBL exercise in quality control and pre-processing of sequencing data (10%) and summative assignments on multi-omic data analysis and interpretation (40%), and a reproducible data analysis assignment related to a complex genomic or multi-omic disease dataset where a group of students working together in teams of 3-4 will attempt to reproduce computational analyses and associated figures from relevant sections of a research paper using data analysis and computational methods learnt in the module will form 50% of the grade.

A summative TBL on drug discovery analysis (20%), an assignment on data integration and network biology applications (40%) and an assignment assessing AI based methods used for modelling and analysis of single cell data sets (40%) will form the assessment of genomics compulsory module 2 (Single Cell Omics, Network Biology & Biomedical AI).

The computational Brain Sciences compulsory module one (Machine Learning for translational neuroscience) assessment will have three components. A formative assessment in preparation of code workbooks will be completed prior to the summative assessments. Submission of code workbooks from two of the weekly workshops that includes code, hypothesis and justification of methods, and pipeline specification will be required for the summative assessments. These will be worth 40% of the grade each. These assessments probe your practical performance and understanding of the machine learning topic from the workshops. You will also take part in a problem-solving examination conducted with access to your own code library and will form 20% of the grade.

The assessment of Computational Brain Sciences compulsory module two (Brain Imaging and high temporal resolution methods) will be via two separate in-course assessments. Prior to the summative assessments, a formative assessment in writing workshop reports will be completed. One of the summative assessments will be writing a literature search and review on a specific neuroimaging topic, leading to a 5000-word written critique and summary of the findings. The other will consist of a 4 page (2000 word) write up of results from one of the workshops. Each assessment will contribute to 50% of the grade.

The six-month research project will be assessed through a written thesis (70%) and an oral presentation (30%).

Academic Feedback Policy

Feedback will be provided on both formative and summative assessment within two weeks of completion. Regular feedback will be provided throughout the programme in several formats, including:

1. Oral (during live question answer sessions or tutorials)
2. Personal (discussion with academics during office hours and with personal tutors on a regular basis)
3. Interactive (team-based learning activities, practical sessions and workshops)
4. Peer (after team-based learning sessions)
5. Written (feedback on written work or presentations)

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
Computer PC or laptop capable of running one of Linux, Windows 10/11 with WSL2 or MacOS operating systems	Mandatory	£600
VR headset (Meta Quest 3)	Mandatory	Provided By the programme for PGCert, PGDip and MSc students (£550)
A reliable broadband internet connection	Mandatory	£20 per month

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					
Year 1 – FHEQ Level 7 You will study all core modules if enrolled in the PGCert, all core and compulsory modules specific to your stream (group). Within a stream (group) you must select the two compulsory modules. You must complete all core and compulsory modules specific to your stream (group) if enrolled in the PGDip. In addition, you must complete the research project core module if enrolled the MSc programme.					
Code	Module Title	Core/ Compulsory/ Elective	Group	Term	Credits
META70027	Data Science Foundations for Biomedical Computational Biology	Core	C	Autumn-Spring	15
META70032	Introduction to Biomedical Machine Learning and Biostatistics	Core	C	Summer	15
META70028	Computational Genomics and Epigenome Regulation	Compulsory	CG	Autumn	15
META70033	Machine Learning for Translational Neuroscience	Compulsory	BS	Autumn	15
Credit Total					45
Year 2 - FHEQ Level 7 You must select the two compulsory modules from the same group (stream CG, BS) if enrolled in either the PGDip or MSc and complete the research project if enrolled in the MSc program.					
Code	Module Title	Core/ Compulsory/ Elective	Group	Term	Credits
META70029	Advanced Computational Genomics: Single Cell Omics, Network Biology and Biomedical AI	Compulsory	CG	Spring	15
META70031	Brain Imaging and High Temporal Resolution Methods	Compulsory	BS	Spring	15
META70030	Computational Biomedicine Research Project (six months)	Core	P	Summer	30
Credit Total					45

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.

Students can initially apply for the Postgraduate Certificate (PGCert), Postgraduate Diploma (PGDip) or the M.Sc. programme.

If enrolled in PGCert to progress to the PGDip or M.Sc. programme, you must pass the PGCert programme. You may elect to exit the programme after the first year, having achieved the Postgraduate Certificate. If you choose to continue with the PGDip or M.Sc. programme at this point, you will not receive the Certificate award, as only one certificate is awarded at the conclusion of your period of study on the programme. Application to continue to M.Sc. can occur at the end of the PGCert or the PGDip.

Where you defer entry to the M.Sc., you must have been successful in the Diploma course. The minimum time that you will have to complete your M.Sc. is usually 2 years or 2.5 years. Once you have formally chosen to exit the programme, there is no point of re-entry. However, you may defer entry into the PGDip or M.Sc. (without exiting) for a maximum of ONE year before re-joining - a one-year interruption of studies (IOS) may be applied for in exceptional circumstances but is not guaranteed, however all studies must be completed within a five-year period. Therefore, the longest possible period from entry to Certificate to completion of the M.Sc. (including any interruptions) will be 5 academic years in total.

All modules in the PGCert year are core and must be successfully completed for the award or progression. During the PGDip, you must choose two of the compulsory modules from one of the streams. This will lead to a subspecialty award on successful completion. Currently, a stream consists of 2 stream specific compulsory modules, and they must be completed before progression. During the M.Sc. year, students should complete a research project consistent within their stream of choice.

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 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.

Award of a Masters Degree (including MRes)

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 15 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 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/pg/apply/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/university-governance-structure/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.