

Programme Information		
Programme Title	Programme Code	HECoS Code
Mathematics and Computer Science	GG14	For Registry Use Only

Award	Length of Study	Mode of Study	Entry Point(s)	Total Credits	
				ECTS	CATS
BEng	3 Academic years	Full-Time	Annually in October	180	360
DipHE	2 Academic Years	Full-Time	None (exit award only)	120	240
CertHE	1 Academic Year	Full-Time	None (exit award only)	60	120

Ownership			
Awarding Institution	Imperial College London	Faculty	Faculty of Engineering Faculty of Natural Sciences
Teaching Institution	Imperial College London	Department	Computing Mathematics
Associateship	City and Guilds of London Institute (ACGI)	Main Location(s) of Study	South Kensington Campus
External Reference			
Relevant QAA Benchmark Statement(s) and/or other external reference points	http://www.qaa.ac.uk/docs/qaa/subject-benchmark-statements/sbs-computing-16.pdf		
FHEQ Level	Level 6		
EHEA Level	1st Cycle		
External Accreditor(s) (if applicable)			
External Accreditor 1:	IET (Institution of Engineering and Technology)		
Accreditation received:	2017	Accreditation renewal:	2021
External Accreditor 2:	BCS (the Chartered Institute for IT)		
Accreditation received:	2017	Accreditation renewal:	2021
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 Herbert Wiklicky		
Student cohorts covered by specification	2019-20 entry		
Date of introduction of programme	September 2019		
Date of programme specification/revision	March 2019		

Programme Overview			
<p>With the spread of computing procedures and mathematical ideas into many areas, there is high demand for professionals who are experts in both. Our Mathematics and Computer Science degrees are mathematical courses orientated towards computing science.</p> <p>Taught jointly by the Departments of Computing and Mathematics, this programme provides:</p> <ul style="list-style-type: none"> • a firm foundation in mathematics, particularly in pure mathematics, numerical analysis and statistics. • covers all the essentials of computer science, with an emphasis on developing software, as well as more theoretical topics. <p>This makes the programme particularly suited to mathematically-able students with interests in both subjects. During the first two years you will take core modules from both departments and complete project work, with the chance to choose from a range of elective modules in the second year¹. In your final year you can choose from a wide variety of elective modules offered by the departments to suit your interests, and you will also complete a substantial individual project in either of the two departments.</p> <p>About the departments</p> <p>In the Department of Computing we place special emphasis on the fundamental principles underlying computing and on understanding the engineering considerations involved in computing system design, implementation and usage.</p> <p>In the Department of Mathematics our teaching programme is strongly influenced by their research expertise which spans Applied Mathematics and Mathematical Physics, Mathematical Finance, Pure Mathematics and Statistics.</p> <p>BEng vs MEng</p> <p>We offer both a three-year BEng programme and four-year integrated Master's MEng programme in Mathematics and Computer Science. Both degree programmes involve substantial group and individual project work. The MEng programme includes an industrial placement and also the opportunity to study more research-focused modules in the fourth year.</p> <p>The BEng programme is professionally accredited by the IET (Institution of Engineering and Technology) and the BCS (the Chartered Institute for IT).</p> <p>Like our MEng degrees, our BEng degree counts towards the educational requirements for becoming a Chartered Engineer (CEng). A CEng is a highly respected qualification earned by professionals working in</p>			

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.

engineering, which can lead to higher earning potential and better career prospects. It also brings international recognition of your qualification, which is particularly useful for students preparing for a career abroad.

While our MEng degrees fully satisfy the educational requirements of this professional qualification, BEng graduates will need to undertake further study on graduation to demonstrate that their knowledge is at Master's degree level.

All applicants for CEng status will also need to demonstrate their ability to meet competences described in the Engineering Council's UK-SPEC.

Learning Outcomes

Upon successful completion of year 1 (equivalent to a Cert HE) you will be able to:

1. Explain the basic operation of a computer.
2. Develop and test software solutions to well-specified problems using a variety of programming paradigms.
3. Describe the key characteristics of information systems and use such systems effectively for data storage and retrieval.
4. Use mathematical methods to specify and analyse the behaviour of simple programs.
5. Appreciate the fundamentals of Mathematics as a living discipline in its own right.
6. Take a structured mathematical-analytical approach to problem solving, including the importance of assumptions made and consequences of their violation.
7. Apply basic research methods and communicate findings orally.
8. Explain the social, ethical and professional principles associated with computer-based technology and act in a manner that respects those principles.

Upon successful completion of year 2 (equivalent to a Dip HE), in addition to the ILOs above you will be able to:

9. Apply software engineering design principles to development of robust software that is easy to understand, test and maintain.
10. Design, implement and deploy web-based applications that meet the needs of their target users.
11. Specify, design and implement programming languages.
12. Explain the key principles underpinning the design of modern computer and communication systems.
13. Apply mathematics as a language to describe and model a wide range of situations relevant to research or industry, choosing appropriate solution methods and interpreting results.
14. Take a structured mathematical-analytical approach to problem solving, including the importance of assumptions made and consequences of their violation.
15. Adhere to relevant laws that impact on the practice of computing.

Upon successful completion of the BEng, in addition to all the ILOs above, you will be able to:

16. Design, engineer and extend complex computer-based systems that are fit for purpose using core Computing knowledge and appropriate state-of-the-art technology, methods and thinking.
17. Develop computer-based systems in a manner that respects relevant legal, social, ethical and other professional practices.
18. Select and apply appropriate methods, techniques and tools to ensure correctness, security, reliability, performance, and maintainability of computer-based systems.
19. Apply mathematical methods and scientific reasoning to novel computing-related problems.
20. Demonstrate effective application of Computing in scientific, engineering and industrial domains, as an individual.
21. Communicate mathematical concepts and understanding concisely and appropriately in varied situations and to diverse audiences.
22. Demonstrate effective teamwork in the management and delivery of complex projects.
23. Communicate effectively, both orally and in writing, as individuals and as part of a team.

The Imperial Graduate Attributes are a set of core competencies which we expect students to achieve through completion of any Imperial College degree programme. The Graduate Attributes are available at:

Entry Requirements

Academic Requirement	<p>Admissions are handled by the Department of Computing.</p> <p>A-levels Our typical A-level offer is A*A*A or A*A*AA including A*s in Maths and Further Maths. Typical offers also require STEP I/II/III. For further recommendations on A-levels, see our website under Qualification Advice for Joint Maths and Computing. We also accept the Edexcel International A levels.</p> <p>International Baccalaureate Our typical IB offer is 42 points overall with a 7 in Maths at higher level and a 7 in one further relevant subject at higher level. Typical offers also require STEP I/II/III.</p> <p>For further information on entry requirements, please go to https://www.imperial.ac.uk/study/ug/apply/requirements/ugacademic/</p>
Non-academic Requirements	N/A
English Language Requirement	<p>Standard requirement Please check for other Accepted English Qualifications</p>
Admissions Test/Interview	<p>All students are required to take an online admissions test that can be sat at various times throughout the admissions cycle. Applicants who are shortlisted will be invited for interview. This will normally be held at Imperial College, although there is provision for interviews to be conducted online.</p>

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

Learning & Teaching Approach

Teaching

You will be taught through a combination of lectures, small-group and class-based tutorials, practical laboratory sessions and personal supervision of project work.

The first two years of the programme is made up of core modules. In year 1 the programming and various mathematics modules are backed up with small group tutorials in groups of approximately eight students. A senior undergraduate student will act an assistant tutor for many of these tutorials.

The third year comprises a mixture of compulsory and elective taught modules. In the third year you will also undertake a group project where you will develop a complex application as part of a team of around six students. The ability to work effectively in teams is an essential skill for any aspiring engineer and Computing is no exception.

There is a spine of professional and transferable skills throughout the three years which includes training in oral and written communication skills and group working, and exposure to important ethical and legal frameworks that will help to govern your activities as a practicing engineer.

The teaching methods will vary from standard classroom teaching to more active learning, where much of what you learn will be by small-group discussions and in-class problem-solving.

Independent learning

You will be expected to spend significant time on independent study outside of face to face contact time. This will typically include reading journal articles and books, undertaking research online and in the library, reviewing lecture notes and watching lecture recordings, working on individual and group projects, working on

coursework assignments and revising for exams. There is also a programme of extra-curricular lectures delivered by guest speakers from industry designed to introduce you to some of the key technical challenges in Computing that are being faced by industry.

Overall Workload

Your overall workload consists of face-to-face sessions and independent learning. In the first two years you will spend approximately 20% of your time in lectures and tutorials and approximately 5% in supervised laboratory sessions. The rest of the time is dedicated to independent study. The nominal total workload amounts to 60 ECTS per year and at Imperial, each [ECTS credit](#) taken equates to an expected total study time of 25 hours, i.e. 1500 hours per year.

Assessment Strategy

Assessment Methods

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

- Programming exercises
- Online programming tests
- Written coursework
- Computer-based coursework
- Written examinations
- Computer-based examinations
- Software demonstrations
- Written reports
- Research summaries
- Oral presentations

Each examinable module comprises coursework that is designed to help you master key elements of the subject and, in part, to help prepare you for the final assessment, which is typically a written or computer-based examination.

In each of the first two years there is a substantial programme of continuous assessment, which is mostly centred around practical laboratory exercises of growing size and complexity. In the first year there are also online programming tests for each of the major programming languages you will study.

You will receive written feedback on all coursework and laboratory exercises, including online programming tests. You will also receive verbal feedback on many other aspects of your study, such as presentation and problem solving skills and your progress in group and individual projects.

Written examinations are held at the beginning of the summer term for first and second year modules and at the end of the Autumn and Spring terms for third modules.

The weighting of coursework varies among modules, with the normal weighting being 15%. The various assessments allow you to demonstrate that you have met the intended learning outcomes for each module and these collectively contribute towards your achievement of the programme learning outcomes, detailed above.

Balance of assessment

The approximate percentages below are based on a typical pathway through the course. Note that laboratory work comprises mostly independent study, although supervised laboratory sessions are also timetabled throughout the year.

	Year 1	Year 2	Year 3
Coursework	10%	10%	83% (total coursework/examination)
Examinations	57%	57%	
Integrated laboratory	33%	33%	0%
Project work	0%	0%	17%

* the specific balance of coursework/examinations will depend on the module choices

Academic Feedback Policy

Feedback may be provided in one of a number of formats, including:

- Written, e.g. in the form of specimen solutions, written and/or verbal comments on individual assignments, class-wide feedback.
- Verbal, e.g. during or after face-to-face discussions with an assessor or in a classroom feedback session.
- Peer-to-peer, e.g. from a senior undergraduate teaching assistant, or peer student
- Personal, e.g. from your personal tutor regarding your overall progress.

You will receive feedback on formative, developmental assessments and on summative coursework assessments. All feedback will be provided in a timely manner that reflects the size and complexity of the assignment and the class size; most feedback will be returned within two weeks of the work being submitted.

The College'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

The College's Policy on Re-sits is available at: www.imperial.ac.uk/student-records-and-data/for-current-students/undergraduate-and-taught-postgraduate/exams-assessments-and-regulations/

Mitigating Circumstances Policy

The College's Policy on Mitigating Circumstances is available at: www.imperial.ac.uk/student-records-and-data/for-current-students/undergraduate-and-taught-postgraduate/exams-assessments-and-regulations/

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					
Year 1 – FHEQ Level 4 Students study all core modules.					
Code	Module Title	Core/ Elective	Group*	Term	Credits
COMP4 0003	Logic	Core		1	5
COMP4 0006	Program Reasoning	Core		2	5
COMP4 0008	Graphs and Algorithms	Core		2	5
COMP4 0010	Computing Practical 1 (for JMC)	Core		1, 2, 3	20
MATH4 0009	Introduction to University Mathematics	Core		1	5
MATH4 0010	Analysis for JMC	Core		1	5
MATH4 0011	Calculus for JMC	Core		1	5
MATH4 0012	Calculus, Algebra and Analysis for JMC	Core		2	10
Credit Total					60
Year 2 - FHEQ Level 5 Students study all core modules (30 ECTS). Conditions to be satisfied for electives: <ul style="list-style-type: none"> • Choose 10 ECTS points from Group A (= CO modules) • Choose 10 ECTS points from Group B (= MA modules) • Choose 10 ECTS points from Group C (= MA modules) • <i>Note: some modules in Groups A and C will also be made available in Year 3 (in Groups D/E)</i> • Students must choose exactly one of the group projects, CO271 (from A) or M2R (from C) 					
Code	Module Title	Core/ Elective	Group	Term	Credits
	Algorithm Design and Analysis	Elective	A, D	1	5
	Operating Systems	Core		1	5
	Software Engineering Design	Core		1	5
	Compilers	Elective	A, D	2	5
	Symbolic Reasoning	Elective	A, D	2	5

	Models of Computation	Elective	A, D	1	5
	Computing Practical 2 (for JMC)	Core		1, 2	10
	Web Application Development	Elective	A	3	5
	Numerical Analysis for JMC	Core		2	5
	Probability and Statistics for JMC	Core		1	5
	Multivariable Calculus and Differential Equations	Elective	B	1, 2	10
	Analysis 2	Elective	B	1, 2	10
	Group Research Project in Mathematics for JMC	Elective	C	3	5
	Groups and Rings	Elective	C, E	1	5
	Lebesgue Measure and Integration	Elective	C, E	2	5
	Network Science	Elective	C, E	1	5
	Partial Differential Equations in Action	Elective	C, E	2	5
	Probability for Statistics	Elective	C, E	1	5
	Statistical Modelling 1	Elective	C, E	2	5
Credit Total					60

Year 3 - FHEQ Level 6

Students study two core/compulsory modules (15 ECTS).

Students must select one individual project from Group H (15 ECTS).

ALL conditions to be satisfied for elective groups D, E, F, G:

- Choose a maximum of 10 ECTS points from Groups D and E (= year 2 modules)
- Choose a minimum of 10 ECTS points from Groups D and F (= CO modules)
- Choose a minimum of 15 ECTS points from Groups E and G (= MA modules)
- Overall choose from DEFG a minimum of 30 and a maximum of 32.5 ECTS points

Code	Module Title	Core/ Elective	Group	Term	Credits
	Group Project	Core		1, 2	10
	I-Explore	Compulsory		1 and/or 2	5 or 7.5
	Algorithm Design and Analysis	Elective	A, D	1	5
	Compilers	Elective	A, D	2	5
	Symbolic Reasoning	Elective	A, D	2	5
	Models of Computation	Elective	A, D	1	5
	Systems Verification	Elective	F	2	5
	Logic-Based Learning	Elective	F	2	5
	Concurrency	Elective	F	1	5

	Computer Vision	Elective	F	1	5
	Computer Graphics	Elective	F	2	5
	Custom Computing	Elective	F	2	5
	Communicating Computer Science in Schools	Elective	F	2	5
	Network and Web Security	Elective	F	2	5
	Advanced Computer Architecture	Elective	F	2	5
	Robotics	Elective	F	1	5
	Simulation and Modelling	Elective	F	1	5
	Pervasive Computing	Elective	F	2	5
	Performance Engineering	Elective	F	2	5
	Operations Research	Elective	F	1	5
	Distributed Algorithms	Elective	F	2	5
	Information and Coding Theory	Elective	F	1	5
	Computer Architecture	Elective	F	1	5
	Type Systems for Programming Languages	Elective	F	1	5
	Introduction to Machine Learning	Elective	F	2	5
	Databases	Elective	F	1	5
	Computer Networks and Distributed Systems	Elective	F	2	5
	Advanced Databases	Elective	F	1	5
	Computing Individual Project (JMC BEng)	Elective	H	1, 2, 3	15
	Maths Individual Project BEng - JMC	Elective	H	2,3	15
	Groups and Rings	Elective	C, E	1	5
	Lebesgue Measure and Integration	Elective	C, E	2	5
	Network Science	Elective	C, E	1	5
	Partial Differential Equations in Action	Elective	C, E	2	5
	Probability for Statistics	Elective	C, E	1	5
	Statistical Modelling 1	Elective	C, E	2	5
	Fluid Dynamics 2	Elective	G	2	7.5
	Fluid Dynamics 1	Elective	G	1	7.5
	Mathematical Physics 1: Quantum Mechanics	Elective	G	1	7.5

	Finite Elements: Numerical Analysis and Implementation	Elective	G	2	7.5
	Methods for Data Science	Elective	G	1	7.5
	Special Relativity and Electromagnetism	Elective	G	1	7.5
	Tensor Calculus and General Relativity	Elective	G	2	7.5
	Mathematical Finance: An Introduction to Option Pricing	Elective	G	1	7.5
	An Introduction to Partial Differential Equations	Elective	G	1	7.5
	Asymptotic Analysis	Elective	G	1	7.5
	Computational Partial Differential Equations 1	Elective	G	2	7.5
	Numerical Solution of Ordinary Differential Equations	Elective	G	1	7.5
	Computational Linear Algebra	Elective	G	1	7.5
	Group Theory	Elective	G	1	7.5
	Galois Theory	Elective	G	2	7.5
	Group Representation Theory	Elective	G	2	7.5
	Number Theory	Elective	G	1	7.5
	Algebraic Number Theory	Elective	G	2	7.5
	Algebraic Combinatorics	Elective	G	1	7.5
	Fourier Analysis and Theory of Distributions	Elective	G	1	7.5
	Measure and Integration	Elective	G	1	7.5
	Geometry 1: Algebraic Curves	Elective	G	1	7.5
	Geometry 2: Algebraic Topology	Elective	G	1	7.5
	Geometry of Curves and Surfaces	Elective	G	1	7.5
	Probability Theory	Elective	G	2	7.5
	Mathematical Logic	Elective	G	1	7.5
	Functional Analysis	Elective	G	2	7.5
	Markov Processes	Elective	G	1	7.5
	Algebra 3	Elective	G	1	7.5
	Dynamical Systems	Elective	G	1	7.5
	Bifurcation Theory	Elective	G	2	7.5
	Statistical Theory 1	Elective	G	2	7.5

	Games, Risks and Decisions	Elective	G	TBC	7.5
	Survival Models and Actuarial Applications	Elective	G	2	7.5
	Credit Scoring 1	Elective	G	1	7.5
	Quantitative Methods in Retail Finance	Elective	G	2	7.5
	Statistical Modelling 2	Elective	G	2	7.5
	Applied Probability	Elective	G	1	7.5
	Time Series	Elective	G	1	7.5
	Stochastic Simulation 1	Elective	G	1	7.5
Credit Total					Min 60 Max 62.5

The above list of elective modules is indicative. In the event that an elective module is suspended or discontinued, we will communicate the changes to you. Further information can be found at: <https://www.imperial.ac.uk/study/ug/apply/our-degrees/potential-course-changes/>

Progression and Classification

Progression

In order to progress to the next level of study, you must have passed all modules (60 ECTS in the first two years and **45 ECTS** in the third year) in the current level of study at first attempt, at resit or by a compensated pass.

In addition you must have achieved at least 50.00% in Computing Practical 1 in order to progress to the second year.

The overall weighted average for each year must be 40.00%, including where a module(s) has been compensated, in order for you to progress to the next year of the programme.

Classification

The marks from modules in each year contribute towards the final degree classification.

In order to be considered for an award, you must have achieved the minimum number of credits at the required levels prescribed for that award and met any programme specific requirements as set out in the Programme Specification.

Your classification will be determined through:

- i) Aggregate Module marks for all modules
- ii) Year Weightings

For this award, Year One is weighted at 7.50%, Year Two at 35.00% and Year Three 57.50%.

The College sets the class of undergraduate degree that may be awarded as follows:

First	70.00% or above for the average weighted module results
Upper Second	60.00% or above for the average weighted module results
Lower Second	50.00% or above for the average weighted module results
Third	40.00% or above for the average weighted module results

Please find the full Academic Regulations at <https://www.imperial.ac.uk/about/governance/academic-governance/regulations/>. Please follow the prompts to find the set of regulations relevant to your programme of study.

Programme Specific Regulations

As an accredited degree, students on the BEng programme are subject to the standards set by the Engineering Council in relation to compensation: a maximum of 15 ECTS credits can be compensated across the entire programme.

Supporting Information

The Programme Handbook is available at: [Computing handbook](#) and [Maths handbook](#)

The Module Handbook is available at: [Computing modules](#) and [Maths modules \(MathsCentral\)](#)

The College's entry requirements for postgraduate programmes can be found at: www.imperial.ac.uk/study/pg/apply/requirements

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

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

Imperial College 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 the College's Centenary, 8th July 2007, established the College 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 a typical student may reasonably be expected to achieve and demonstrate if s/he takes 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.

Modifications

Description	Approved	Date	Paper Reference
N/A	N/A	N/A	N/A