BEng Computing

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 intended as a reference point for prospective students, current students, external examiners and academic and support staff involved in delivering the programme and enabling student development and achievement.

Programme Information				
Programme Title	Computing			
Award(s)	BEng			
Programme Code	G400			
Awarding Institution	Imperial College London			
Teaching Institution	Imperial College London			
Faculty	Faculty of Engineering			
Department	Department of Computing			
Main Location of Study	South Kensington Campus			
Mode and Period of Study	3 academic years, full-time			
Cohort Entry Points	Annually in October			
Relevant QAA Benchmark Statement(s) and/or other external reference points	Computing			
Total Credits	ECTS:	180-182	CATS:	360-364
FHEQ Level	Level 6			
EHEA Level	1st cycle			
External Accreditor(s)	BCS – The Chartered Institute for IT The Institution of Engineering and Technology (IET)			
Specification Details				
Student cohorts covered by specification	2018/19 and previous entry cohorts			
Person responsible for the specification	Dr Tony Field			
Date of introduction of programme	-			
Date of programme specification/revision	October 2019			

Programme Overview

Computing is a creative and wide-ranging subject that focuses on using sound underlying principles and logical thinking to design and build systems that really work.

You will learn how modern computer and communications systems function, and how they can be used and adapted to build the next generation of computing applications.

All of our Computing courses follow broadly the same structure for the first two years. Core modules give you an understanding of the basic concepts and principles of computing. We also provide a solid background in discrete mathematics (logic, sets, relations and grammars), which is the basic mathematics of computing, and classical mathematics and statistics relevant to applications engineering and management.

The central core of our courses has been designed to give you an overview of computing, an understanding of the basic concepts and principles, the ability to appreciate and to adapt to changes in technology, and practical experience in applied computing.

We place special emphasis on the fundamental principles underlying computing and on the engineering considerations involved in computing system design, implementation and usage. We will also introduce you to computing architecture and hardware, alongside the software that can exploit them.

You will attend laboratory and problem-solving classes, as well as completing project and design work throughout the course.

As the degree progresses you will study advanced techniques and choose from a wide range of optional modules, as well as completing a substantial individual project on a subject of your choice.

Learning Outcomes

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: www.imperial.ac.uk/students/academic-support/graduate-attributes

Knowledge and Understanding of:

- The major paradigms of high-level programming: declarative, imperative and object oriented;
- Fundamental Computing concepts, including computer hardware, computer architecture, operating systems, programming, program design, fundamental algorithms, compilers, databases, networks and communications, human computer interaction, and many application areas such as e-commerce, graphics and artificial intelligence;
- The underlying mathematical foundations of Computing, including logic, discrete mathematics, computability, and complexity;
- Formal aspects of software engineering, including program specification, program reasoning and design methods;
- Continuous mathematics relevant to a wide range of application areas including computer graphics, operations research, optimisation, performance analysis and scientific computing;
- Practical aspects of software engineering and engineering design;
- Communication skills, including project specification, system design, teamwork, written and oral presentation and literature search;

- Moral and ethical issues, including professional conduct, law and plagiarism;
- Understanding of a broad range of research work in Department's major areas of expertise;
- Ability to develop computer systems that use methods developed in research work;

Intellectual Skills:

- Analyse computing system design problems of varying types and specify those problems, and proposed solutions, in a suitable formalism;
- Reason about program correctness and algorithm complexity;
- Construct abstract models of computer and communication systems for the purposes of functional and performance analysis;
- Analyse unseen problems and select tools and techniques most suitable for solving them;
- Design experiments for the purposes of testing and evaluation;
- Perform critical evaluation of alternative designs and solution techniques for a wide range of problems;
- Develop an understanding of the theory, practice and trends of more advanced computing topics;
- Understand current research work;

Practical Skills:

- Design and develop programs of varying levels of complexity using a number of different programming languages and paradigms, for example object oriented programming, logic programming, functional programming and imperative programming;
- Use many computing tools and techniques, such as database, web-based and graphic tools and techniques;
- Analyse computing problems and devise appropriate solutions to them;
- Give technical presentations;
- Prepare technical reports;
- Conduct detailed literature searches;
- Plan, conduct and write up a programme of development conducted in a team;
- Plan, conduct and write-up a programme of research and development conducted as an individual;
- Design high quality user interfaces;
- Apply mathematical knowledge to Computing problems of a numerical nature;

Transferable Skills:

- Communicate effectively through oral presentations, computer presentations and written reports;
- Program in the major computer programming paradigms;
- Use the World Wide Web effectively;
- Integrate and evaluate information from multiple and diverse sources;
- Work within and contribute to a team, apply management skills such as coordination, project design and evaluation and decision processes as applied in software engineering;
- Manage resources and time;
- Learn independently with open-mindedness and critical enquiry;
- Learn effectively for the purpose of continuing professional development;
- Apply research skills to develop a broad understanding of a new or emerging topic

Entry Requirements

Academic Requirement	Grade Requirement	Normally a minimum **A*AA** overall
	Subject Requirements	**A*** in Mathematics **A** in Further Mathematics is highly recommended
	Excluded Subjects	ICT, Business Studies and General Studies and Critical Thinking
International Baccalaureate (IB)	Grade Requirement	Minimum **39** overall
	Subject Requirements	**7** in Mathematics **7** in one further relevant subject (such as Physics, Computer Science, Chemistry, Economics or Biology)
English Language Requirement		Standard requirement IELTS score of 6.5 overall (minimum 6.0 in all elements)
Admissions Tests		An entrance test will be required if the applicant is unable to attend an interview
Interview		Yes
The programme's competency standards document can be found at: http://www.imperial.ac.uk/computing/prospective-students/courses/ug/competence/		
Learning & Teaching Strategy		
Scheduled Learning & Teaching Methods		• Lectures • Seminars • Tutorials • Laboratory work
Project and Placement Learning Methods		• Group project • Individual project
Assessment Strategy		
Assessment Methods		• Reports • Presentations • Demonstrations • Written examinations • Laboratory-based examinations • Coursework • Laboratory work • Programming tests
Academic Feedback Policy		

Feedback will be provided on coursework within two weeks of submission. This will be in the form of, for example:

- Personal discussion
- Discussions in small-group tutorials
- Marked-up coursework, laboratory exercises or tests
- Verbal presentation, e.g. during or after lectures
- Written class-wide summaries
- Interactive problem solving sessions
- Model answers to coursework

In lieu of feedback on examinations, selected examination questions are routinely set as unassessed problems in the following year, with model answers provided.

Re-sit Policy

In line with College policy, students who are unsuccessful in any of their examinations may usually be allowed an opportunity to re-sit at the discretion of the Board of Examiners.

Students in the Faculty of Engineering who have marginally failed a year may be offered the chance to undertake a Supplementary Qualifying Test (SQT) at the discretion of the Board of Examiners in order to progress into the next year.

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

Further information regarding re-sits for BEng, MEng, BSc and MSci degrees in the Faculty of Engineering can be found in the relevant Academic Regulations available at:
https://www.imperial.ac.uk/about/governance/academic-governance/regulations/

Mitigating Circumstances Policy

Students may be eligible to apply for mitigation if they have suffered from serious and unforeseen circumstances during the course of their studies that have adversely affected their ability to complete an assessment task and/or their performance in a piece of assessment.

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

Assessment Structure

Marking Scheme

Year One
In order to pass the first year and qualify to progress to the second year, the candidate must achieve:

- A minimum of 40% in each module;
- A minimum of 40% overall

Year Two
In order to pass the second year and qualify to progress to the third year, the candidate must achieve:

- A minimum of 40% in each module;
- A minimum of 40% overall

Year Three
The marks for the three years are aggregated into an overall mark.
Students must normally achieve at least 40% in the individual project and a minimum of 40% overall in order to pass the degree.

The BEng degree mark is calculated with the year weightings 1:2:3.

Final Degree Classifications

Third – a student must achieve an aggregate mark of 40%
Lower Second – a student must achieve an aggregate mark of 50%
Upper Second – a student must achieve an aggregate mark of 60%
First - a student must achieve an aggregate mark of 70%

Module Weightings		
Year	**Module Title**	**Module Weighting %**
1 (16.7%)	Reasoning About Programs	7.05%
	Databases 1	8.82%
	Architecture	8.82%
	Mathematical Methods	8.82%
	Logic	8.82%
	Programming 1 (Haskell)	10.11%
	Programming 2 (Java)	13.00%
	Discrete Structures	7.05%
	Graphs and Algorithms	7.05%
	Laboratory 1	0.00%
	Computing Topics	4.70%
	Ethics in Computing 1	0.58%
	Presentation Skills	0.58%
	Hardware	8.82%
	Programming 3 (C)	5.77%
	Year 1 Extracurricular	0.00%
2 (33.3%)	Compilers	8.23%
	Software Engineering - Design	8.23%
	Networks and Communications	8.23%
	Operating Systems	8.23%
	Models of Computation	8.23%
	2nd Year Computing Group Project	10.58%
	Probability and Statistics	8.23%
	Laboratory 2	23.52%
	Advanced Laboratory 2	0.00%
	An Introduction to Law for Computer Scientists	0.00%
	Introduction to Prolog	0.00%
	Algorithms 2	8.23%
	Electives (1 module from group A)	8.23%
	Year 2 Extracurricular	0.00%
3 (50.0%)	3rd Year Software Engineering Group Project	17.25%
	BEng Individual Project	33.33%
	Electives (AT LEAST 6 modules from group B and NO MORE THAN 1 module from group C)	7.05% each
	Year 3 Extracurricular	0.00%

Indicative Module List									
Code	Title	Core/ Elective	Year	L&T Hours	Ind. Study Hours	Place-ment Hours	Total Hours	FHEQ Level	ECTS
CO112	Hardware	Core	1	27	73	0	100	4	4
CO113	Architecture	Core	1	27	73	0	100	4	4
CO120.1	Programming 1 (Haskell)	Core	1	31	169	0	200	4	8
CO120.2	Programming 2 (Java)	Core	1	13.5	186.5	0	200	4	8
CO120.3	Programming 3 (C)	Core	1	52	148	0	200	4	8
CO130	Databases 1	Core	1	27	73	0	100	4	4
CO140	Logic	Core	1	27	85.5	0	112.5	4	4.5
CO141	Reasoning About Programs	Core	1	27	85.5	0	112.5	4	4.5
CO142	Discrete Structures	Core	1	49.5	50.5	0	100	4	4
CO145	Mathematical Methods	Core	1	32	68	0	100	4	4
CO150	Graphs and Algorithms	Core	1	See module leader			100	4	4
CO161	Laboratory 1	Core	1	176	0	0	N/A	4	0
CO163	Computing Topics	Core	1	11	64	0	75	4	3
CO164	Ethics in Computing 1	Core	1	4	0	0	N/A	4	0

Indicative Module List									
Code	Title	Core/ Elective	Year	L&T Hours	Ind. Study Hours	Place-ment Hours	Total Hours	FHEQ Level	ECTS
CO165	Presentation Skills	Core	1	6	0	0	N/A	4	0
CO191	Advanced Programming	EX1	1	18	0	0	N/A	4	0
CO701	Programming Competition Training	EX1	1	N/A				4	0
CO211	Operating Systems	Core	2	See module leader			100	5	4
CO212	Networks and Communications	Core	2	See module leader			100	5	4
CO220	Software Engineering - Design	Core	2	See module leader			100	5	4
CO221	Compilers	Core	2	See module leader			100	5	4
CO240	Models of Computation	Core	2	See module leader			100	5	4
CO245	Probability and Statistics	Core	2	See module leader			100	5	4
CO261	Laboratory 2	Core	2	See module leader			525	5	21
CO261C	Advanced Laboratory 2	Core	2	See module leader			N/A	5	0
CO271	2nd Year Computing Group Project	Core	2	See module leader			175	5	7
CO273	An Introduction to Law for Computer Scientists	Core	2	See module leader			N/A	5	0
CO276	Introduction to Prolog	Core	2	See module leader			N/A	5	0

Indicative Module List									
Code	Title	Core/ Elective	Year	L&T Hours	Ind. Study Hours	Place-ment Hours	Total Hours	FHEQ Level	ECTS
CO202	Algorithms 2	Core	2	27	73	0	100	5	4
CO231	Introduction to Model-based Artificial Intelligence	Elective (A)	2	See module leader			100	5	4
CO233	Computational Techniques	Elective (A)	2	See module leader			100	5	4
CO701	Programming Competition Training	EX2	2	N/A				5	0
CO301	BEng Individual Project	Core	3	See module leader			500	6	20
CO362	3rd Year Software Engineering Group Project	Core	3	See module leader			250	6	10
CO303	Systems Verification	Elective (B)	3	See module leader			125	6	5
CO304	Logic-Based Learning	Elective (B)	3	See module leader			125	6	5
CO315	Computer Vision	Elective (B)	3	See module leader			125	6	5
CO317	Graphics	Elective (B)	3	See module leader			125	6	5
CO318	Custom Computing	Elective (B)	3	See module leader			125	6	5
CO322	Communicating Computer Science in Schools	Elective (B)	3	See module leader			125	7	5
CO331	Network and Web Security	Elective (B)	3	See module leader			125	6	5

Indicative Module List									
Code	Title	Core/ Elective	Year	L&T Hours	Ind. Study Hours	Place-ment Hours	Total Hours	FHEQ Level	ECTS
CO332	Advanced Computer Architecture	Elective (B)	3	See module leader			125	6	5
CO333	Robotics	Elective (B)	3	See module leader			125	6	5
CO337	Simulation and Modelling	Elective (B)	3	See module leader			125	6	5
CO338	Pervasive Computing	Elective (B)	3	See module leader			125	6	5
CO339	Performance Engineering	Elective (B)	3	See module leader			125	6	5
CO343	Operations Research	Elective (B)	3	See module leader			125	6	5
CO347	Distributed Algorithms	Elective (B)	3	See module leader			125	6	5
CO382	Type Systems for Programming Languages	Elective (B)	3	See module leader			125	6	5
CO395	Introduction to Machine Learning	Elective (B)	3	See module leader			125	6	5
CO572	Advanced Databases	Elective (B)	3	See module leader			125	6	5
M3N9	Computational Linear Algebra	Elective (C)	3	See module leader			125	6	8
M3S1	Statistical Theory 1	Elective (C)	3	See module leader			125	6	8
M3A50	Methods for Data Science	Elective (C)	3	See module leader			125	6	8
-	Business School Modules	Elective (C)	3	Variable				6	6
-	Horizons Modules	Elective (C)	3	Variable				6	6

Indicative Module List									
Code	Title	Core/ Elective	Year	L&T Hours	Ind. Study Hours	Place-ment Hours	Total Hours	FHEQ Level	ECTS
CO701	Programming Competition Training	EX3	3	Variable				6	0

Supporting Information
The Programme Handbook is available at: http://www.imperial.ac.uk/computing/current-students/computing/ug-handbook/
The Module Handbook is available at: http://www.imperial.ac.uk/computing/current-students/computing/ug-handbook/
The College's entry requirements for undergraduate programmes can be found at: www.imperial.ac.uk/study/ug/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: http://www3.imperial.ac.uk/registry/proceduresandregulations/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". http://www.imperial.ac.uk/admin-services/secretariat/college-governance/charters/charter-and-statutes/
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