Imperial College London

MSc Computing (Visual Computing and Robotics)

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 (Visual Computing and Robotics)
Award(s)	MSc
Programme Code	G5U13
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	1 academic year (12 months), full-time
Cohort Entry Points	Annually in October
Relevant QAA Benchmark Statement(s) and/or other external reference points	Master's Degrees in Computing
Total Credits	ECTS: 90 CATS: 180
FHEQ Level	Level 7
EHEA Level	2nd cycle
External Accreditor(s)	BCS - The Chartered Institute for IT The IET (The Institution of Engineering and Technology)

Specification Details	
Student cohorts covered by specification	2022-23 entry
Person responsible for the specification	Dr Anandha Gopalan, Director of PG Studies
Date of introduction of programme	
Date of programme specification/revision	January 2023

Programme Overview

This specialism focuses on the study of vision, graphics, intelligent behaviour and biomedical image computing.

This taught postgraduate course 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 a particular area of computing, this course will provide a first crucial step towards that goal.

This specialism focuses on the study of vision, graphics, intelligent behaviour and biomedical image computing. We also offer specialisms in:

- Artificial Intelligence and Machine Learning
- Computational Management
- Security and Reliability
- Software Engineering

Each specialism has a flexible mix of breadth and depth, consisting of two or three compulsory modules as well as choices from a selection of core and optional modules.

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:
- Practical programming skills;
- The detail and essential topics relevant to the students' chosen option and project areas, such as Software Engineering;
- Communication skills, including project design, teamwork, written and oral reports and presentations and literature search, both web-based and hard copy;
- Emerging trends in Computing and an awareness of how these techniques can be adapted in industrial applications;
- Practical programming skills in Prolog and Matlab;
- Research skills, including time management, research effectiveness, personal effectiveness, writing skills, presentation and communication skills, technical presentation and critical reading of literature.

Intellectual Skills:
- Match problems to tools and techniques most suitable for solving them;
- Analyse computing and computing related problems and devise solutions to them;
- Develop an understanding and practice of more advanced computing topics, including databases, concurrent programming, artificial intelligence and distributed systems – in particular Architecture; Artificial Intelligence; Biomedical Applications; Computational Management Science; Creative Industries; Distributed Systems; Software Engineering and Visual Information Processing;
- Plan, conduct and write-up a programme of software development conducted in a team;

- Plan, conduct and write-up a programme of original research and software development.

Practical Skills:
- Design and develop programs of varying levels of complexity using Prolog, Matlab and other languages;
- Use computing tools and techniques, for instance software development tools;
- Analyse computing and computing related problems and devise solutions to them;
- Give technical presentations;
- Appreciate the needs of end-users and issues related to design, management and performance of large scale software;
- Prepare technical reports;
- Conduct detailed literature searches;
- Conduct in-depth research on tools and languages available on line.

Transferable Skills:
- Communicate effectively through oral presentations, computer presentations and written reports;
- Program in the major computer programming paradigms;
- 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;
- Transfer techniques and solutions from one area to another;
- Learn independently with open mindedness and critical enquiry;
- Learn effectively for the purpose of continuing professional development.

Entry Requirements	
Academic Requirement	Normally a 2.1 UK Bachelor's Degree with Honours in a science or engineering discipline, including computing (or a comparable qualification recognised by the College).
English Language Requirement	[Standard requirement] IELTS 6.5 with a minimum of 6.0 in each element or equivalent.

Learning & Teaching Strategy	
Scheduled Learning & Teaching Methods	• Lectures • Tutorials • Practical work • Laboratory • Group work
Project and Placement Learning Methods	• Research project

Assessment Strategy	
Assessment Methods	• Written examinations

	- Coursework - Laboratory work - Presentations - Product demonstration - Technical report - Dissertation

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.

Specific information regarding re-sits for Taught Master's degrees 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

In order to PASS the MSc students have to satisfy all of the following requirements:

1. An aggregated mark of at least 50% on 9 components which must be made up as follows:
    a. The assessments of 6 taught courses. The taught courses must be from the specified list for the specialism, and must include all that are compulsory.
    b. The assessments of either a further 3 taught courses freely selected from any of the courses offered to the specialism, or 2 such taught courses and 1 ISO, which can be, but need not be, in the area of the specialism.
2. Normally, a mark of at least 50% on each of the 9 components. No mark below 40% is accepted as a condoned pass mark.
3. A mark of at least 50% on the individual project.

In order to be considered for the MSc with <u>MERIT</u> students have to satisfy all of the following requirements:

1. Pass the MSc, but without DISTINCTION;
2. An aggregated mark of at least 60% on the 9 components;
3. A mark of at least 60% on the individual project.

In order to be considered for the MSc with <u>DISTINCTION</u> students have to satisfy all of the following requirements:

1. Pass the MSc;
2. An aggregated mark of at least 70% on the 9 components;
3. A mark of at least 70% on the individual project.

Code	Title	Core/ Elective	L&T Hours	Ind. Study Hours	Place-ment Hours	Total Hours	FHEQ Level	ECTS
COMP97088	MSc Computing Science (Specialist) Individual Project	CORE	See module leader			1125	7	45
COMP96007	Computer Vision	ELECTIVE (A)	See module leader			125	6	5
COMP96011	Custom Computing	ELECTIVE (A)	See module leader			125	6	5
COMP96017	Advanced Computer Architecture	ELECTIVE (A)	See module leader			125	6	5
COMP96019	Robotics	ELECTIVE (A)	See module leader			125	6	5
COMP97016	Scalable Systems and Data	ELECTIVE (A)	See module leader			125	7	5
COMP97143	Reinforcement Learning	ELECTIVE (A)	See module leader			125	7	5
COMP97111	Deep Learning	ELECTIVE (A)	See module leader			125	7	5
COMP96009	Graphics	ELECTIVE (A)	See module leader			125	6	5
COMP97061	Probabilistic Inference	ELECTIVE (A)	See module leader			125	7	5
COMP97065	Mathematics for Machine Learning	ELECTIVE (A)	See module leader			125	7	5
COMP97151	Introduction to Machine Learning	ELECTIVE (A)	See module leader			125	7	5
TBC	Data Processing Systems	ELECTIVE (A)	See module leader			125	6	5

Indicative Module List

In addition to the core module, you must select 9 elective modules. Between 3 and 7 of these should be from elective group A, between 2 and 3 of these should be from elective group B, and between 0 and 3 should be from elective group C.

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Code	Title	Core/ Elective	L&T Hours	Ind. Study Hours	Place-ment Hours	Total Hours	FHEQ Level	ECTS
COMP97022	Advanced Computer Graphics	ELECTIVE (B)	See module leader			125	7	5
COMP97105	Machine Learning for Imaging	ELECTIVE (B)	See module leader			125	7	5
COMP97157	Robot Learning	ELECTIVE (B)	See module leader			125	7	5
COMP97057	Quantum Computing	ELECTIVE (C)	See module leader			125	7	5
COMP97014	Cryptography Engineering	ELECTIVE (C)	See module leader					
COMP96005	Logic-Based Learning	ELECTIVE (C)	See module leader			125	6	5
COMP96015	Network and Web Security	ELECTIVE (C)	See module leader			125	6	5
COMP97103	System Performance Engineering	ELECTIVE (C)	See module leader			125	7	5
COMP96027	Distributed Algorithms	ELECTIVE (C)	See module leader			125	6	5
COMP96025	Operations Research	ELECTIVE (C)	See module leader			125	6	5
COMP96032	Type Systems for Programming Languages	ELECTIVE (C)	See module leader			125	6	5
COMP97005	Scalable Software Verification	ELECTIVE (C)	See module leader			125	7	5
COMP97012	Privacy Engineering	ELECTIVE (C)	See module leader			125	7	5

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In addition to the core module, you must select 9 elective modules. Between 3 and 7 of these should be from elective group A, between 2 and 3 of these should be from elective group B, and between 0 and 3 should be from elective group C.

Code	Title	Core/ Elective	L&T Hours	Ind. Study Hours	Place- ment Hours	Total Hours	FHEQ Level	ECTS
COMP97025	Computational Finance	ELECTIVE (C)	See module leader			125	7	5
COMP97035	Complexity	ELECTIVE (C)	See module leader			125	7	5
COMP97037	Software Reliability	ELECTIVE (C)	See module leader			125	7	5
COMP97109	Advanced Computer Security	ELECTIVE (C)	See module leader			125	7	5
COMP97045	Principles of Distributed Ledgers	ELECTIVE (C)	See module leader			125	7	5
COMP97146	Program Analysis	ELECTIVE (C)	See module leader			125	7	5
COMP97055	Computational Optimisation	ELECTIVE (C)	See module leader			125	7	5
COMP97115	Natural Language Processing	ELECTIVE (C)	See module leader			125	7	5
COMP97059	Knowledge Representation	ELECTIVE (C)	See module leader			125	7	5
COMP97067	Modal Logic for Strategic Reasoning in AI	ELECTIVE (C)	See module leader			125	7	5
COMP97070	Independent Study Option	ELECTIVE (C)	See module leader			125	7	5
COMP97083	Prolog	ELECTIVE (C)	See module leader			125	7	5
COMP97159	Scheduling and Resource Allocation	ELECTIVE (C)	See module leader			125	7	5

Supporting Information
The Programme Handbook is available at: http://www.imperial.ac.uk/computing/current-students/pg-info/mcs-vcr/
The Module Handbook is available at: http://www.imperial.ac.uk/computing/current-students/pg-info/mcs-vcr/
The College's entry requirements for postgraduate programmes can be found at: www.imperial.ac.uk/study/apply/postgraduate-taught/entry-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://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". http://www.imperial.ac.uk/admin-services/secretariat/college-governance/charters/charter-and-statutes/
Imperial College London is regulated by the Office for Students (OfS) https://www.officeforstudents.org.uk/