# REGULATIONS FOR THE DEGREE OF
# MASTER OF SCIENCE IN COMPUTER SCIENCE
# (MSc[CompSc])

*(See also General Regulations)*

Any publication based on work approved for a higher degree should contain a reference to the effect that the work was submitted to the University of Hong Kong for the award of the degree.

The degree of Master of Science in Computer Science (MSc[Computer Science]) is a postgraduate degree awarded for the satisfactory completion of a course of study in the Faculty of Engineering. The MSc(Computer Science) course is offered in part-time mode.

### MCS 1 Admission requirements

To be eligible for admission to the courses leading to the degree of Master of Science in Computer Science a candidate
- (a) shall comply with the General Regulations;
- (b) shall hold
    - (i) a Bachelor's degree in Computer Science; *or*
    - (ii) any relevant qualification of equivalent standard from this University or from another university or comparable institution accepted for this purpose; and
- (c) shall satisfy the examiners in a qualifying examination if required.

### MCS 2 Qualifying examination

- (a) A qualifying examination may be set to test the candidate's formal academic ability or his ability to follow the courses of study prescribed. It shall consist of one or more written papers or their equivalent and may include a project report.
- (b) A candidate who is required to satisfy the examiners in a qualifying examination shall not be permitted to register until he has satisfied the examiners in the examination.

### MCS 3 Award of degree

- (a) To be eligible for the award of the degree of Master of Science in Computer Science a candidate
    - (i) shall comply with the General Regulations; and
    - (ii) shall complete the curriculum and satisfy the examiners in accordance with the regulations set out below.
- (b) A candidate who has not satisfied the examiners for the award of the Degree of M.Sc. in Computer Science but has completed eight modules may be awarded a Postgraduate Diploma in Science (Computer Science) [PDipSc(CS)], subject to approval of the Faculty Board.

### MCS 4 Length of curriculum

The curriculum is in part-time mode and shall normally take two academic years of study. Maximum period of study is three years.

**MCS 5**     **Completion of curriculum**

    (a)    To complete the curriculum a candidate shall, within the prescribed maximum period of study stipulated in Regulation MCS 4 above:

        (i)    follow courses of instruction and complete satisfactorily all prescribed written work;

        (ii)    shall satisfy the examiners in *either*

            (1)    twelve modules at the prescribed written examinations; *or*

            (2)    eight modules and a project report or dissertation on a subject within an approved field of study.

    (b)    A candidate who fails to fulfil the requirements within the period of study specified in Regulation MCS 4 above shall be recommended for discontinuation under the provisions of General Regulation G 12, except that a candidate, who is unable because of illness or circumstances beyond his control to complete the requirements within the prescribed period of study, may apply for permission to extend his period of studies. Any such application shall be made within two weeks of the first day of the examination paper in question.

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**MCS 6**     **Course selection**

    (a)    Selection of study patterns shall be made in consultation with and be subject to the approval of the Head of the Department of Computer Science and Information Systems.

    (b)    A candidate who is permitted to select the study pattern under section (a)(ii)(1) of Regulation MCS 5 shall select twelve modules.

    (c)    A candidate who is permitted to select the study pattern under section (a)(ii)(2) of Regulation MCS 5 shall select eight modules.

    (d)    Subject to the approval of the Head of the Department of Computer Science and Information Systems, a student may select at most two modules from the syllabuses for the degrees of MSc(ECom&IComp) and MSc(Eng).

    (e)    Subject to the approval of the Faculty Higher Degrees Committee on the recommendation of the Head of the Department of Computer Science and Information Systems, a candidate may be permitted to select additional module(s).

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**MCS 7**     **Project report or dissertation**

A candidate who is permitted to select the study pattern under section (a)(ii)(2) of Regulation MCS 5 is required to submit his project report or dissertation by a date specified by the Board of Examiners. The candidate shall submit a statement that the project report or dissertation represents his own work (or in the case of conjoint work, a statement countersigned by his co-worker, which shows his share of the work) undertaken after registration as a candidate for the degree.

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**MCS 8**     **Examinations**

    (a)    The written examination for each module shall be held after the completion of the prescribed course of study for that module, and not later than the January or May immediately following the completion of the course of study for that module.

    (b)    A candidate who has failed to satisfy the examiners in a module or modules may be permitted to present himself either for re-examination in the module or modules of failure or for examination in the same number of new modules when the examination

is next held, but a candidate who has twice failed to satisfy the examiners in the module or modules for the same module shall not be permitted to present himself for examination in the same module or modules for a third time. To proceed to the following year of the curriculum, a candidate must satisfy the examiners in a minimum of two modules in each academic year. A candidate who passes in less than two modules in an academic year may be recommended for discontinuation of studies under the provisions of General Regulations G 12.

(c)    A candidate who has presented an unsatisfactory project report or dissertation may be required to submit a revised project report or dissertation on the same subject within a specified period.

(d)    A candidate who has presented an unsatisfactory project report or dissertation for a second time shall be recommended for discontinuation of studies under the provisions of General Regulation G 12.

(e)    A candidate who has failed to submit a satisfactory project report or dissertation within the prescribed maximum period of study, including any extension, shall be recommended for discontinuation of studies under the provisions of General Regulation G 12.

## MCS 9    Examination results

At the conclusion of the examination and after presentation of the project reports or dissertations, a pass list shall be published. A candidate who has shown exceptional merit at the whole examination may be awarded a mark of distinction, and this mark shall be recorded on the candidate's degree diploma.

# SYLLABUSES FOR THE DEGREE OF
# MASTER OF SCIENCE IN COMPUTER SCIENCE

The curriculum extends over two academic years of part-time study.

The following is a list of modules offered by the Department of Computer Science and Information Systems. The list below is not final and some modules may not be offered every year.

Candidates may select at most 2 modules from the syllabuses for the degrees of MSc(ECom&IComp) and MSc(Eng), subject to approval of the Head of the Department or Programme Director/Course Co-ordinator concerned, and in accordance with the provisions of Regulation MCS 6(d).

Candidates who have failed to satisfy the examiners for the Degree of M.Sc.(Computer Science) may on termination of their study be awarded a Postgraduate Diploma in Science (Computer Science), subject to approval of the Faculty Board.

## I.    *Data Engineering*

### CSIS7101.    Advanced database technologies

The goal is to study some contemporary technologies in the database area that have been adopted in real applications, and to survey products and applications that embody these technologies. Topics include spatial databases; multidimensional indexing; data warehouse and OLAP; data mining, clustering and classification; semi-structured databases and XML data management; survey of products and applications - GIS systems, CRM, data warehousing tools, data mining tools, search engines and web mining tools.

### CSIS7102.    Transaction processing

The goal is to study the fundamentals of database transaction processing, with emphasis on advanced transaction processing techniques including concurrency and recovery. The study will cover distributed databases, real-time databases, mobile databases, and products and applications that have incorporated these advanced techniques. Topics include concurrency control: notions, algorithms, multiversion concurrency, implementation; transaction recovery: notions, crash recovery, algorithms, media and application recovery; distributed transaction: distributed concurrency control, distributed deadlock detection, distributed transaction recovery; mobile databases, real-time databases, temporal databases; survey of products & applications – examples include web services, application integrators, ERP (enterprise resource planning) and workflow engine.

### II.    *Software Engineering*

### CSIS7201.    Analysis and design of enterprise applications in UML

This course presents an industrial-strength approach to software development based on the object-oriented modelling of business entities. Topics include overview of object-oriented concepts; Unified Modelling Language (UML); object modelling using use cases and class diagrams; dynamic modelling using sequence, interaction and state diagrams; mapping object models to implementation models such as relational databases; and current trends in object technologies, such as components, design patterns and XML. Emphasis will be given on hands-on exercises with the use of CASE tools.

Prerequisites: A course in object-oriented programming and a course in software engineering or systems analysis and design.

### CSIS7202.    Software quality assurance

This course presents the current issues and solutions for ensuring the quality of enterprise systems. Topics include software quality concepts; software process improvement; requirements tracking and management; reviews and inspections; software testing; version control and configuration management; formal methods; and software quality metrics and measurement.

Prerequisite: A course in software engineering or systems analysis and design.

### III.    *Computer Systems*

### CSIS7301.    Computer and network security

The aim of the course is to introduce different methods of protecting information and data in computer and information systems from unauthorized disclosure and modification. Topics include introduction to security; cryptographic algorithms; cryptographic infrastructure; internet security; secure applications and electronic commerce.

### CSIS7302.    Embedded system and pervasive computing

The course offers practical knowledge needed in embedded system development. Industry and research projects will be discussed to show how human life can be benefited from pervasive computing. Topics include wearable computer architecture and applications; sensor networks; real-time embedded operating systems; embedded servers; embedded system networking; address-free routing; smart spaces; dynamic service discovery; mobility and case studies.

**CSIS7303.      High-performance computing**

This module offers an overview of state-of-the-art parallel architectures and programming languages. The students will learn the issues related to the performance of parallel algorithms, and how to design efficient parallel algorithms for parallel machines. Topics include milestones in the history of HPC and its applications; high-performance computing architectures; performance law; modern CPU design; interconnection network and routing techniques; memory hierarchy and cache coherence protocol; parallel algorithm design; parallel programming models and case studies of supercomputers.

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**CSIS7304.      The wireless Internet and mobile computing**

This module offers students an opportunity to understand the principles and technologies behind data services in a wireless, mobile environment. It introduces the developing areas of mobile computing technology and applications. Topics include key features of 1G, 2G, and 3G mobile technology; wireless LANs; personal area networks and Bluetooth; ad hoc networks; mobile IP, DHCP, IPv6; TCP over wireless; proxy systems; web surfing and WAP; mobile file systems; privacy, authentication, security; mobility and location-dependent/personalized wireless applications.

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*IV.      Biocomputing*

**CSIS7401.      Computational molecular biology**

To introduce computational methods for analyzing DNA, RNA and protein sequences. Topics include basics of molecular biology; biological sequence analysis; physical mapping; gene finding; gene rearrangement; secondary structure prediction and phylogeny.

Pre-requisites:   CSIS7402, and CSIS7601 *or* CSIS0250 "Design and Analysis of Algorithms"

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**CSIS7402.      Computer technologies for bioinformatics**

To give an overview of the existing computer technologies used in bioinformatics and the trends of these technologies. Topics include basic knowledge in biochemistry; human genome project; computational biology; biological database organization and annotation; representation of biological data; GCG packages and web resources; biological sequence indexing and searching; biostatistical analysis.

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*V.      Human-Computer Interaction*

**CSIS7501.      Advanced computer graphics and virtual reality**

To study techniques and algorithms in geometric modeling, shading, computer animation, and visualization. Topics include real-time rendering; global illumination computation; solid modeling; curves and surfaces; shape deformation; motion design; virtual reality; and 3D visualization of medical and scientific data.

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**CSIS7502.      Image processing and computer vision**

To study the theory and algorithms in image processing and computer vision. Topics include human perception; image enhancement; image analysis; segmentation; mathematical morphology; image compression; scene understanding and motion analysis.

**CSIS7503.      Multimedia technologies**

To study selected topics of multimedia technologies in depth. Topics include compression algorithms, from general unary code to Burrow-Wheeler method; steganography and multimedia; selected topics in multimedia, such as a comparative study of audio technologies or video compression techniques.

**CSIS7504.      Pattern recognition and applications**

To study techniques in pattern recognition. Topics include statistical decision theory; density estimation; dimension reduction; discriminant functions; unsupervised classification and clustering; neural network; hidden Markov model; and selected applications in pattern recognition such as characters and speech recognition.

## VI.      *Foundations of Computer Science*

**CSIS7601.      Algorithms**

To provide students a deep understanding of the techniques for algorithm design and analysis. Typical topics include advanced data structures, design techniques like recursion; dynamic programming and greedy algorithms; correctness and analysis of algorithms; NP-completeness; randomized algorithms; online algorithms and algebraic computing.

**CSIS7602.      Topics in theoretical computer science**

To cover some advanced topics in theoretical computer science. Topics may vary from year to year. Examples are computational complexity; computational geometry; data compression, online algorithms; approximation algorithms; computational learning theory; lower bounds and distributed computing.

## VII.     *Project*

**CSIS7701.      Project (4 modules)**

Students will be required to undertake a computing project which demands substantial work under the supervision of a teacher.