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[CompSc]) is a postgraduate degree awarded for the satisfactory completion of a course of study in the Faculty of Engineering. The MSc(CompSc) course is offered in part-time and full-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 Master of Science in Computer Science but has completed 8 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

For the part-time mode of study, the curriculum shall normally take two academic years of study, and the maximum period of study is three years. For the full-time mode of study, the curriculum shall normally take one academic year of study, and the maximum period of study is two 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)   satisfy the examiners in all forms of assessment as may be required in *either*
       (1)   which may include a project report or dissertation of four modules; *or*
       (2)   at least nine modules successfully completed at this University (which may include a project report or dissertation of four modules) and not more than three modules successfully completed at this or another university before admission to the Master of Science in Computer Science and approved by the Faculty Board.

(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.

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.

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

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

MCS 7   Project report or dissertation

(a)   A candidate who is permitted to select a project report or dissertation of 4 modules is required to submit it by a date specified by the Board of Examiners..

(b)   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.

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 January, May or August 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 or merit at the whole examination may be awarded a mark of distinction or credit, as appropriate, and this mark shall be recorded on the candidate's degree diploma.

SYLLABUSES FOR THE DEGREE OF
MASTER OF SCIENCE IN COMPUTER SCIENCE[1]

The curriculum extends over two to three academic years of part-time or one to two academic years of full-time study.

The following is a list of modules offered by the Department of Computer Science.   The list below is not final and some modules may not be offered every year.
Candidates may also in exceptional circumstances select at most 2 modules from the syllabuses for the degree of MSc(Eng) and that for the degree of MSc(ECom&IComp), subject to approval of the Head of the Department or Course Co-ordinator concerned, and in accordance with the provisions of Regulation MCS 6(b).

Candidates who have failed to satisfy the examiners for the Degree of Master of Science in 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

CSIS7102.   Transaction processing

The goal is to study the fundamentals of database transaction processing, with emphasis on advanced transaction processing techniques.   Topics may include serializability theory, concurrency control protocols, database recovery protocols, distributed transaction processing, real-time databases.

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[1]   Subject to University's approval.

CSIS7103. Data mining

Data mining is the automatic discovery of statistically interesting and potentially useful patterns from large amounts of data. The goal of the course is to study the main methods used today for data mining and on-line analytical processing. Topics include Data Mining Architecture; Data Preprocessing; Mining Association Rules; Classification; Clustering; On-Line Analytical Processing (OLAP); Data Mining Systems and Languages; Advanced Data Mining (Web, Spatial, and Temporal data).

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.
Prerequisites: A course in object-oriented programming and 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

Pervasive computing is the trend towards increasingly ubiquitous and connected computing devices in the environment, a trend being brought about by a convergence of advanced sensor technologies, wireless networks, and the Internet. In this course, we will study the following topics: (1) Software infrastructure for pervasive computing, (2) Sensors architecture and embedded OS, (3) Data routing protocols for wireless sensor networks, (4) Context modeling and reasoning techniques for realizing

context-aware applications, (5) Discovery protocols for spontaneous interaction between appliances and services, and (6) Security and privacy to protect access to user context information.

Prerequisites: Students are expected to complete a client/server programming project in a J2ME or Android platform.   Programming experience in Java is required.

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.

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.

CSIS7305.   Cluster and grid computing

Clusters are powerful computers built using commodity components in a local-area network environment; grids connect and aggregate geographically distributed resources across the Internet. They both can serve as a cost-effective computing platform for solving large-scale resource-intensive problems in science, commerce, and industry.   This module offers an overview of current cluster and grid technologies, and discusses various issues in the design and implementation of cluster and grid systems.   Topics include the concept of single system image, low-latency messaging, software distributed shared memory systems, cluster file and I/O system, grid software and tools, resource management and scheduling in grid, grid security, and case studies of cluster and grid systems and applications.

Prerequisites: The students are expected to exercise the systems configuration and administration under a Linux cluster. Basic understanding of Linux operating system and some experiences in system level programming (C/C++ or Java) are required.

CSIS7306.   Web technologies

This course aims to give students the basic understanding of various Web technologies and their industry applications. Fundamental XML concepts and techniques, such as XML Schema, XSLT, SAX, and DOM, will be introduced. Topics related to Web 2.0/3.0, web services, and service oriented architecture will be studied, which cover web technologies such as RSS, ATOM, Ajax, SOAP, WSDL, ebXML.

Prerequisites: basic web programming knowledge, e.g. HTML, JavaScript, and Java.

IV. *Biocomputing*

CSIS7402. **Computer technologies for bioinformatics**

To give an overview of the existing computer technologies used in bioinformatics. Topics include basic knowledge in biochemistry; introduction to computational problems arising from molecular biology; biological databases; well-known software packages and web resources; concepts behind the computer-based solutions.

CSIS7403. **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.

V. *Human-Computer Interaction*

CSIS7502. **Image processing and computer vision**

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

CSIS7503. **Multimedia technologies**

To study selected topics of multimedia technologies in depth. Topics vary, and may include compression algorithms, psychoacoustics, psychovision, storage systems, and media streaming.

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 approximation algorithms.

CSIS7602.   Topics in theoretical computer science

To cover some selected 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

CSIS7702.   4-module project

Candidate will be required to carry out independent work on a major project that will culminate in the writing of a dissertation.

CSIS7703.   2-module project

Candidate will be required to undertake a computing project under the supervision of a teacher.

VIII. Others

CSIS7801.   Topic in computer science

Selected topics that are of current interest will be discussed.

CSIS7802.   Introduction to financial computing

This module introduces the students to various different aspects of financial computing in the investment banking area. The topics include financial modeling, real time risk management, and from Excel to multi-tier financial system. Financial engineering is an area of growing demand. The module is a combination of financial knowledge, mathematics and computational techniques. This module will be suitable for students who want to pursue a career in this fast growing area.

This is a very practical course. There is no assignment and final exam. You will be expected to complete a final project, to be done individually or as a group.

Prerequisites: This module does not require any prior knowledge in the area of finance. Basic calculus and numeric computational techniques are useful. Knowledge in at least one object-oriented programming language/system is required to complete the final project.

CSIS7803.   Advanced financial computing

This is a continuation of "CSIS7802 Introduction to financial computing". Topics that will be covered include: Term structure of interest rate, Value-At-Risk, Market price of volatility and correlation, Pricing of interest rate and exotic options. This is intended to be a practical course.

Apart from covering the theoretical side of the subjects, we will also focus on the area of numerical solution and algorithm design. Real life implementation experience and issues will be shared and discussed. This course should benefit those who are interested in pursuing a career in the area of finance and trading.

Prerequisite: CSIS7802 "Introduction to financial computing"

IX. *Research Oriented Courses*

The exact topics and contents of these modules may vary from year to year. Interested students should refer to the programme's online pages (http://www.cs.hku.hk/msc) for further information.

CSIS8101.   Advanced topics in data engineering

This course will discuss and study research topics and current problems of interest in the field of data engineering.

CSIS8201.   Advanced topics in software engineering

This course will discuss and study research topics and current problems of interest in the field of software engineering.
Prerequisite: A course in object-oriented programming.

CSIS8301.   Advanced topics in computer systems

This course will discuss and study research topics and current problems of interest in the field of computer systems.

CSIS8501.   Advanced topics in computer graphics

This course will discuss and study research topics and current problems of interest in the field of computer graphics. The emphasis is put on geometric modeling and applications of geometry in computer graphics.

CSIS8502.   Advanced topics in pattern recognition

This course will discuss and study research topics and current problems of interest in the field of pattern recognition.

CSIS8601.   Advanced topics in theoretical computer science

This course will discuss and study research topics and current problems of interest in theoretical computer science.

CSIS8801.   Advanced topics in computer forensics and security

This course is concerned with advanced technologies in computer forensics and security. Students will learn about the similarities and differences between computer forensics and computer security; current issues in different security technologies, such as authentication protocols, cryptographic techniques, and key distribution systems; as well as the application of those techniques and others to various kinds of computer forensics problem.
Pre-requisites: (1) CSIS0327 "Computer and network security" or equivalent
                 (2) CSIS0230 "Principles of operating systems" or equivalent