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

Applicable to students admitted in the academic years 2014-2015 and 2015-2016.

(See also General Regulations)

The degree of Master of Science in Computer Science (MSc[CompSc]) is a postgraduate degree awarded for the satisfactory completion of a curriculum in the Faculty of Engineering. The MSc(CompSc) curriculum is offered in part-time and full-time modes.

MCS1   Admission requirements

To be eligible for admission to the curriculum leading to the degree of Master of Science in Computer Science, a candidate shall
  (a)   comply with the General Regulations;
  (b)   hold (1)   a Bachelor's degree of this University in a relevant field; *or*
              (2)   any other relevant qualification of equivalent standard from this University or from another university or comparable institution accepted for this purpose; and
  (c)   satisfy the examiners in a qualifying examination if required.

MCS2   Qualifying examination

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

MCS3   Award of degree

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

MCS4   Length of curriculum

For the part-time mode of study, the curriculum shall extend over not less than two and not more than three academic years of study. For the full-time mode of study, the curriculum shall extend over not less than one and not more than two academic years of study. In both cases, a minimum of 300 hours of prescribed work are required.

MCS5   Completion of curriculum

To complete the curriculum a candidate shall, within the prescribed maximum period of study stipulated in Regulation MCS4 above:
- (a)   follow courses of instruction and complete satisfactorily all prescribed practical / laboratory work; and
- (b)   satisfy the examiners in all forms of assessment as may be required in either
  - (1)   twelve modules which may include a dissertation of four modules; *or*
  - (2)   at least nine modules successfully completed at this University (which may include a 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.

MCS6   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)   A candidate shall select modules according to the guidelines stipulated in the syllabus for the degree of MSc(CompSc).
- (c)   Subject to the approval of the Committee on Taught Postgraduate Curricula on the recommendation of the Head of the Department of Computer Science, a candidate may be permitted to select additional module(s).

MCS7   Dissertation

- (a)   A candidate who is permitted to select a dissertation is required to submit it by a date specified by the Board of Examiners.
- (b)   All candidates shall submit a statement that the dissertation represents his/her own work undertaken after registration as a candidate for the degree.

MCS8   Assessment and discontinuation

- (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 is unable to complete the requirements within the prescribed maximum period of study specified in Regulation MCS4 because of illness or circumstances beyond his/her control, may apply for permission to extend his/her period of studies. Any such application shall be made within two weeks of the day of examination for the paper in question.
- (c)   A candidate who has failed to satisfy the examiners in a module or modules may be permitted to present him/herself 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. 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 G12.
- (d)   A candidate who has failed to satisfy the examiners in his/her dissertation may be required to submit or resubmit a dissertation on the same subject within a period specified by the Board of Examiners.

(e)   A candidate who has failed to satisfy the examiners at a second attempt in his/her dissertation within the specified period shall be recommended for discontinuation of studies under the provisions of General Regulation G12.

(f)   A candidate who has failed to fulfill the requirements within the prescribed maximum period of study specified in Regulation MCS4, including any extension, shall be recommended for discontinuation of studies under the provisions of General Regulation G12.

MCS9   Assessment results

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

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

(Applicable to students admitted in the academic year 2015-2016)

The curriculum has four different streams: General Stream, Information Security, Multimedia Computing, and Financial Computing. Each candidate is required to follow a prescribed course of study comprising 12 modules, out of which the candidate has to pass at least 10 modules selected from the modules listed below. To qualify as a graduate of Information Security, Multimedia Computing, or Financial Computing Stream, the candidate must pass at least 4 modules in the corresponding subject group, and undertake a dissertation (COMP7704) in the area of the corresponding stream. For General Stream, the candidate can freely choose from the four subject groups below, and undertake a dissertation (COMP7704) in any area in computer science.

All modules are assessed through examination (0%-100%) and/or coursework assessment (0%-100%)

Subject Groups

**A.	General**
COMP7102	Transaction processing
COMP7103	Data mining
COMP7201	Analysis and design of enterprise applications in UML
COMP7202	Software quality assurance
COMP7203	Modern software design
COMP7204	Project management
COMP7205	Enterprise architecture
COMP7302	Pervasive and mobile computing
COMP7303	High-performance computing
COMP7304	The wireless Internet and mobile network
COMP7305	Cluster and cloud computing
COMP7306	Web technologies
COMP7307	Advanced real-time embedded systems and applications
COMP7403	Computational molecular biology
COMP7404	Computational intelligence and machine learning
COMP7506	Smart phone apps development
COMP7603	Software for robotics and mechatronics
COMP7604	Game design and development
COMP7801	Topic in computer science
COMP7805	Topic in computer network and systems

**B.	Information Security**
COMP7301	Computer and network security
COMP7804	E-commerce security cases and technologies
COMP7806	Topic in information security
COMP7901	Legal protection of digital property
COMP7902	Wireless network security
COMP7903	Digital investigation and forensics
COMP7904	Information security: attacks and defense

**C.	Multimedia Computing**
COMP7502	Image processing and computer vision
COMP7503	Multimedia technologies

COMP7504	Pattern recognition and applications
COMP7505	User interface design and development
COMP7507	Visualization and visual analytics
COMP7605	Advanced multimedia data analysis and applications
COMP7807	Topic in multimedia computing

D.   Financial Computing

COMP7405	Techniques in computational finance
COMP7406	Software development for quantitative finance
COMP7407	Securities transaction banking
COMP7802	Introduction to financial computing
COMP7808	Topic in financial computing

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

COMP7102   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.

COMP7103   Data mining

Data mining is the automatic discovery of statistically interesting and potentially useful patterns from large amounts of data. The goal of the module 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).

COMP7201   Analysis and design of enterprise applications in UML

This module 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.

COMP7202   Software quality assurance

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

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

COMP7203   Modern software design

The practice of software design has changed markedly in recent years as new approaches to design have gained broad acceptance and several have progressed to become mainstream techniques themselves. This module introduces the principles and practical application of these modern approaches. It first reviews the goals of software design and the qualities that differentiate good designs from bad ones. From this foundation it teaches elemental design patterns, classic design patterns and anti-patterns, refactoring, refactoring to patterns, test-driven design and design for test. Implementation issues, programming idioms and effective use of the language are introduced and discussed where appropriate.

Prerequisites: A course in software engineering or analysis and design of software systems. The course also requires the ability to program in Java and a basic understanding of the UML class and sequence diagrams.

COMP7204   Project management

A disciplined project management approach is one of the critical success factors to project success. This module provides students with an insight and appreciation of the project management framework as advocated by Project Management Institute (PMI). These industry best practices are being recognized as US national standards by ANSI. The module is intended to offer a combination of lectures on project management concepts / theories, as well as experience sharing by the instructor and guest speakers. Topics include the studies of most of the nine knowledge areas, such as Scope Management, Time Management, Cost Management, Risk Management, Communications Management, Human Resource Management, Project Leadership and PMO. This will enrich students' understanding of the subject matter with the opportunities to participate in an interactive learning environment under a classroom setting.

COMP7205   Enterprise architecture

This module aims to teach students the practical skills in modeling and developing enterprise IT architectures. It covers different enterprise architecture frameworks, methodologies and practices (such as TOGAF and Zachman). Students will also learn common enterprise integration patterns for implementation of complex enterprise applications based on Service-Oriented Architecture (SOA). New architecture trends (e.g., cloud computing, shared-nothing architecture, column-based database) will also be introduced.

COMP7301   Computer and network security

The aim of the module 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.

COMP7302   Pervasive and mobile computing

Pervasive computing, often synonymously called ubiquitous computing, is to create ambient intelligence where network devices embedded in the environment provide unobtrusive connectivity and services all the time. These intelligent devices work cooperatively and autonomously to collect, process and transport information, in order to adapt to the associated context and activity, thus improving human experience and quality of life. In this module, 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) Discovery protocols for spontaneous interaction between appliances and services, (5) Context modeling and reasoning techniques for realizing context-aware applications, and (6) Security and privacy solutions to protect access to user context information. Students are expected to complete a context-aware mobile application in a J2ME or Android platform.

Prerequisites: Students are required to have at least one course in networking and operating systems. Programming experience in Java is required.

COMP7303   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.

COMP7304   The wireless Internet and mobile network

In the recent few years, many new kinds of wireless network such as mobile ad-hoc network and wireless sensor network are under intensive research by researchers worldwide. These networks enhance the quality of human life as they not only facilitate efficient communications among people, they also let people learn more about their surrounding environments. However, have you ever thought of the potential problems induced by these new kinds of networks?

This module aims at introducing to you various kinds of next generation wireless and mobile networks. We will highlight the scenarios, the characteristics and the technologies behind each kind of network. Then based on their design, we will discuss the potential issues that can appear or even be caused by them. Next we will demonstrate how these issues can be resolved by computer science methodologies.

COMP7305   Cluster and cloud computing

This module offers an overview of current cluster and cloud technologies, and discusses various issues in the design and implementation of cluster and cloud systems. Topics include cluster hardware architecture (e.g., multicore, GPU, high-speed network), middleware design for realizing the concept of single system image (e.g., software distributed shared memory, cluster file systems) and virtualization techniques (e.g., Xen, KVM, Hyper-V) used in current data centers. We will also discuss three types of Cloud computing platforms, including SaaS, PaaS, and IaaS, by providing motivating examples from companies such as Google, Amazon, and Microsoft; and introduce Map/Reduce programming paradigm for large-scale data analysis. Students will be organized into groups for their project work and in-class presentations.

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.

COMP7306   Web technologies

This module aims to give students a 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. New technologies related to Web 2.0, web services, service oriented architecture (SOA), and cloud computing will be studied, including RSS, ATOM, Ajax, SOAP, WSDL, ebXML.

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

COMP7307   Advanced real-time embedded systems and applications

This module's objective is to introduce students to the fundamental problems, concepts and approaches in the design and analysis of real-time embedded systems. It covers topics on real-time scheduling algorithms, microcontroller architecture, Digital Signal Processors (DSP) architecture, System-on-Chips (SoC), real-time operating systems, and case studies on real-time applications.

Prerequisites: Students should have basic knowledge about operating systems.

COMP7403   Computational molecular biology

To introduce computational methods and data structures for analyzing biological data (e.g. DNA, RNA and protein sequences). Typical topics include basics of molecular biology; biological sequence analysis; indexing data structures; RNA secondary structure alignment/prediction and phylogeny.

COMP7404   Computational intelligence and machine learning

This module will teach a broad set of principals and tools that will provide the mathematical and algorithmic framework for tackling problems using Artificial Intelligence (AI) and Machine Learning (ML). AI and ML are highly interdisciplinary fields with impact in different applications, such as, biology, robotics, language, economics, and computer science. AI is the science and engineering of making intelligent machines, especially intelligent computer programs, while ML refers to the changes in systems that perform tasks associated with AI.

Topics may include a subset of the following: problem solving by search, heuristic (informed) search, constraint satisfaction, games, knowledge-based agents, supervised learning, unsupervised learning; learning theory, reinforcement learning and adaptive control.

Pre-requisites: Nil, but knowledge of data structures and algorithms, probability, linear algebra, and programming would be an advantage.

COMP7405   Techniques in computational finance

This module introduces the major computation problems in the field of financial derivatives and various computational methods/techniques for solving these problems. The lectures start with a short introduction on various financial derivative products, and then move to the derivation of the mathematical models employed in the valuation of these products, and finally come to the solving techniques for the models.

Pre-requisites: No prior finance knowledge is required. Students are assumed to have basic competence in calculus and probability (up to the level of knowing the concepts of random variables, normal distributions, etc.). Knowledge in at least one programming language is required for the assignments/final project.

COMP7406   Software development for quantitative finance

This module introduces the tools and technologies widely used in industry for building applications for Quantitative Finance. From analysis and design to development and implementation, this module covers: modeling financial data and designing financial application using UML, a de facto industry standard for object oriented design and development; applying design patterns in financial application; basic skills on translating financial mathematics into spreadsheets using Microsoft Excel and VBA; developing Excel C++ add-ins for financial computation.

Pre-requisites: This module assumes basic understanding of financial concepts covered in COMP7802. Experience in C++/C programming is required.

COMP7407   Securities transaction banking

The module introduces the business and technology scenarios in the field of Transaction Banking for financial markets. It balances the economic and financial considerations for products and markets with the organizational and technological requirements to successfully implement a banking function in this scenario and is a crossover between studies of economics, finance and information technology.

COMP7502   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.

COMP7503   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.

COMP7504   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.

COMP7505   User interface design and development

For technology products and services, the user experience is the key to success. With the advanced development of processors, sensors, devices, algorithms and software tools, more possibilities of user interface can be created to improve or solve the human machine interface and operations. The module will study various input and output devices, software and hardware considerations, use case investigations.

COMP7506   Smart phone apps development

Smart phones have become very popular in recent years. For iPhones alone, 50,000,000 pieces were sold worldwide in 2009. In addition to iPhones, there are also Android phones, Symbian phones as well as Windows phones. Smart phones play an important role in mobile communication and applications.

Smart phones are powerful as they support a wide range of applications (called apps). Most of the time, smart phone users just purchase their favorite apps wirelessly from the vendors. There is a great potential for software developer to reach worldwide users.

This module aims at introducing the design issues of smart phone apps. For examples, the smart phone screen is usually much smaller than the computer monitor. We have to pay special attention to this aspect in order to develop attractive and successful apps. Different smart phone apps development environments and programming techniques (such as Java for Android phones and Objective-C for iPhones) will be introduced to facilitate students to develop their own apps.

Prerequisites: Students should have basic programming knowledge, e.g. C++ or Java.

COMP7507   Visualization and visual analytics

This module introduces the basic principles and techniques in visualization and visual analytics, and their applications. Topics include human visual perception; color; visualization techniques for spatial, geospatial and multivariate data, graphs and networks; text and document visualization; scientific visualization; interaction and visual analysis.

COMP7603   Software for robotics and mechatronics

More and more robotics and mechatronic systems are used to produce high-quality, economical products for an ever demanding world, and also help our daily life. The system for interacting with real world is more complex than the virtual world, and need software for communicate with various mechanical, electrical and electronics system. This ensure effective operate and solving problem in this complex environment.

COMP7604   Game design and development

The module studies the basic concepts and techniques for digital game design and development. Topics include: game history and genres, game design process, game production, 2D/3D graphics, physics, audio/visual design, artificial intelligence.

Prerequisites: Basic programming skill, e.g. C++ or Java, is required

COMP7605   Advanced multimedia data analysis and applications

This module's objective is to introduce advanced multimedia data analysis techniques, and the design and implementation of signal processing algorithms. It covers topics on Digital Filter Realization, Recursive and Non-Recursive filters, Frequency Domain Processing, Two-Dimensional Signal Processing, and application of multimedia signal processing to speech production and analysis, image and video processing.

COMP7704   Dissertation (4 modules)

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

COMP7801   Topic in computer science

Selected topics that are of current interest will be discussed.

COMP7802   Introduction to financial computing

This module introduces the students to different aspects of financial computing in the investment banking area. The topics include yield curve construction in practice, financial modelling and modern risk management practice, etc. Financial engineering is an area of growing demand. The module is a combination of financial product knowledge, financial mathematics and computational techniques. This module will be suitable for students who want to pursue a career in this fast growing area.

Prerequisites: This module does not require any prior knowledge in the area of finance. Basic calculus and numeric computational techniques are useful. Knowledge in Excel spreadsheet operations is required to complete the assignments and final project.

COMP7804   E-commerce security cases and technologies

This module provides students knowledge about modern e-commerce security, through the study of various cases. It covers fundamental concepts in security technology so as to equip the students with enough background knowledge in security, and then covers the impact of the modern e-commerce environment to the changing demand of security. After that a bundle of cases will be covered, such as cases in communication security, cases in Internet security, cases in data security including personal data protection in both client-side and server-side, and application security cases. With the experience of studying these cases, the students will be asked to assess or design security solutions to some given e-commerce security problems, so as to acquire the ability to apply the learnt security technology to real-life cases.

COMP7805   Topic in computer network and systems

Selected topics in computer network and systems that are of current interest will be discussed.

COMP7806   Topic in information security

Selected topics in information security that are of current interest will be discussed.

COMP7807   Topic in multimedia computing

Selected topics in multimedia computing that are of current interest will be discussed.

COMP7808   Topic in financial computing

Selected topics in financial computing that are of current interest will be discussed.

COMP7901   Legal protection of digital property

This module introduces computer professionals to the various legal means of protecting digital property including electronic data, computer software, electronic databases, IP addresses in the form of domain names, and any work or innovation in digital form. Focus is on the main issues in protecting digital property arising from developments in information technology, and their legal solutions. Topics covered include, but are not limited to, the following: 1) Software copyright, 2) Copyright protection of electronic databases, 3) Patent protection of software and algorithms, 4) Legal protection of domain names and websites, 5) Legal protection of electronic data and trade secrets.

COMP7902   Wireless network security

The objective of this module is to introduce security technologies commonly used in wireless networks. Topics include basics of security mechanisms, various security technologies used in wireless networks such as Bluetooth, Wi-Fi, mobile cellular networks. Wireless security aspects in the integration of wired and wireless mobile technologies will be discussed.

COMP7903   Digital investigation and forensics

This module introduces the fundamental principles of digital investigation and forensics. The module starts with a brief introduction to common computer crimes and digital evidence, and then moves on to the computer basics and network basics pertaining to digital forensics, and finally comes to the techniques for digital investigation and forensic examination.

COMP7904   Information security: attacks and defense

This is an introductory module for some preliminary techniques in computer security and simple attacks for security protocols and schemes. Both the theoretical (e.g. the mathematics behind an encryption system and the attacks) and the practical (e.g. introduction of password cracking software tools) aspects of these techniques will be covered.

Prerequisites: Students are expected to have university level mathematics background and some programming experience.

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

(Applicable to students admitted in or before the academic year 2014-2015)

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

The following is a list of discipline 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 two Taught Postgraduate level 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.

All modules are assessed through examination (0%-100%) and/or coursework assessment (0%-100%).

COMP7102   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.

COMP7103   Data mining

Data mining is the automatic discovery of statistically interesting and potentially useful patterns from large amounts of data. The goal of the module 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).

COMP7201   Analysis and design of enterprise applications in UML

This module 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.

COMP7202   Software quality assurance

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

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

COMP7203　Modern software design

The practice of software design has changed markedly in recent years as new approaches to design have gained broad acceptance and several have progressed to become mainstream techniques themselves. This module introduces the principles and practical application of these modern approaches. It first reviews the goals of software design and the qualities that differentiate good designs from bad ones. From this foundation it teaches elemental design patterns, classic design patterns and anti-patterns, refactoring, refactoring to patterns, test-driven design and design for test. Implementation issues, programming idioms and effective use of the language are introduced and discussed where appropriate.

Prerequisites: A course in software engineering or analysis and design of software systems. The course also requires the ability to program in Java and a basic understanding of the UML class and sequence diagrams.

COMP7204　Project management

A disciplined project management approach is one of the critical success factors to project success. This module provides students with an insight and appreciation of the project management framework as advocated by Project Management Institute (PMI). These industry best practices are being recognized as US national standards by ANSI. The module is intended to offer a combination of lectures on project management concepts / theories, as well as experience sharing by the instructor and guest speakers. Topics include the studies of most of the nine knowledge areas, such as Scope Management, Time Management, Cost Management, Risk Management, Communications Management, Human Resource Management, Project Leadership and PMO. This will enrich students' understanding of the subject matter with the opportunities to participate in an interactive learning environment under a classroom setting.

COMP7205　Enterprise architecture

This module aims to teach students the practical skills in modeling and developing enterprise IT architectures. It covers different enterprise architecture frameworks, methodologies and practices (such as TOGAF and Zachman). Students will also learn common enterprise integration patterns for implementation of complex enterprise applications based on Service-Oriented Architecture (SOA). New architecture trends (e.g., cloud computing, shared-nothing architecture, column-based database) will also be introduced.

COMP7301　Computer and network security

The aim of the module 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.

COMP7302   Pervasive and mobile computing

Pervasive computing, often synonymously called ubiquitous computing, is to create ambient intelligence where network devices embedded in the environment provide unobtrusive connectivity and services all the time. These intelligent devices work cooperatively and autonomously to collect, process and transport information, in order to adapt to the associated context and activity, thus improving human experience and quality of life. In this module, 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) Discovery protocols for spontaneous interaction between appliances and services, (5) Context modeling and reasoning techniques for realizing context-aware applications, and (6) Security and privacy solutions to protect access to user context information. Students are expected to complete a context-aware mobile application in a J2ME or Android platform.

Prerequisites: Students are required to have at least one course in networking and operating systems. Programming experience in Java is required.

COMP7303   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.

COMP7304   The wireless Internet and mobile network

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.

COMP7305   Cluster and cloud computing

This module offers an overview of current cluster and cloud technologies, and discusses various issues in the design and implementation of cluster and cloud systems. Topics include cluster hardware architecture (e.g., multicore, GPU, high-speed network), middleware design for realizing the concept of single system image (e.g., software distributed shared memory, cluster file systems) and virtualization techniques (e.g., Xen, KVM, Hyper-V) used in current data centers. We will also discuss three types of Cloud computing platforms, including SaaS, PaaS, and IaaS, by providing motivating examples from companies such as Google, Amazon, and Microsoft; and introduce Map/Reduce programming paradigm for large-scale data analysis. Students will be organized into groups for their project work and in-class presentations.

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.

COMP7306   Web technologies

This module aims to give students a 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. New technologies related to Web 2.0, web services, service oriented architecture (SOA), and cloud computing will be studied, including RSS, ATOM, Ajax, SOAP, WSDL, ebXML.

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

COMP7307   Advanced real-time embedded systems and applications

This module's objective is to introduce advanced real-time scheduling techniques, design and implementation considerations for Embedded Systems. It covers topics on real-time scheduling algorithms, microcontroller architecture, Digital Signal Processors (DSP) architecture, System-on-Chips (SoC), real-time operating systems, and case studies on real-time applications.

Prerequisites: Students should have basic knowledge about the operating systems.

COMP7403   Computational molecular biology

To introduce computational methods and data structures for analyzing biological data (e.g. DNA, RNA and protein sequences). Typical topics include basics of molecular biology; biological sequence analysis; indexing data structures; RNA secondary structure alignment/prediction and phylogeny.

COMP7404   Computational intelligence and machine learning

This module will teach a broad set of principals and tools that will provide the mathematical and algorithmic framework for tackling problems using Artificial Intelligence (AI) and Machine Learning (ML). AI and ML are highly interdisciplinary fields with impact in different applications, such as, biology, robotics, language, economics, and computer science. AI is the science and engineering of making intelligent machines, especially intelligent computer programs, while ML refers to the changes in systems that perform tasks associated with AI.

Topics may include a subset of the following: problem solving by search, heuristic (informed) search, constraint satisfaction, games, knowledge-based agents, supervised learning, unsupervised learning; learning theory, reinforcement learning and adaptive control.

Pre-requisites: Nil, but knowledge of data structures and algorithms, probability, linear algebra, and programming would be an advantage.

COMP7405   Techniques in computational finance

This module introduces the major computation problems in the field of financial derivatives and various computational methods/techniques for solving these problems. The lectures start with a short introduction on various financial derivative products, and then move to the derivation of the mathematical models employed in the valuation of these products, and finally come to the solving techniques for the models.

Pre-requisites: No prior finance knowledge is required. Students are assumed to have basic competence in calculus and probability (up to the level of knowing the concepts of random variables, normal distributions, etc.). Knowledge in at least one programming language is required for the assignments/final project.

COMP7406   Software development for quantitative finance

This module introduces the tools and technologies widely used in industry for building applications for Quantitative Finance. From analysis and design to development and implementation, this module covers: modeling financial data and designing financial application using UML, a de facto industry standard for object oriented design and development; applying design patterns in financial application; basic skills on translating financial mathematics into spreadsheets using Microsoft Excel and VBA; developing Excel C++ add-ins for financial computation.

Pre-requisites: This module assumes basic understanding of financial concepts covered in COMP7802 Experience in C++/C programming is required.

COMP7407   Securities transaction banking

The module introduces the business and technology scenarios in the field of Transaction Banking for financial markets. It balances the economic and financial considerations for products and markets with the organizational and technological requirements to successfully implement a banking function in this scenario and is a crossover between studies of economics, finance and information technology.

COMP7502   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.

COMP7503   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.

COMP7504   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.

COMP7505   User interface design and development

For technology products and services, the user experience is the key to success. With the advanced development of processors, sensors, devices, algorithms and software tools, more possibilities of user

interface can be created to improve or solve the human machine interface and operations. The module will study various input and output devices, software and hardware considerations, use case investigations.

COMP7506   Smart phone apps development

Smart phones have become very popular in recent years. For iPhones alone, 50,000,000 pieces were sold worldwide in 2009. In addition to iPhones, there are also Android phones, Symbian phones as well as Windows phones. Smart phones play an important role in mobile communication and applications.

Smart phones are powerful as they support a wide range of applications "apps". Most of the time, smart phone users just purchase their favorite apps wirelessly from the vendors. There is a great potential for software developer to reach worldwide users.

This module aims at introducing the design issues of smart phone apps. For examples, the smart phone screen is usually much smaller than the computer monitor. We have to pay special attention to this aspect in order to develop attractive and successful apps. Different smart phone apps development environments and programming techniques (such as Java for Android phones and Objective-C for iPhones) will be introduced to facilitate students to develop their own apps.

Prerequisites: Students should have basic programming knowledge, e.g. C++ or Java.

COMP7507   Visualization and visual analytics

This module introduces the basic principles and techniques in visualization and visual analytics, and their applications. Topics include human visual perception; color; visualization techniques for spatial, geospatial and multivariate data, graphs and networks; text and document visualization; interaction and visual analysis.

Prerequisites: Students should have basic programming knowledge, e.g. C++ or Java.

COMP7603   Software for robotics and mechatronics

More and more robotics and mechatronic systems are used to produce high-quality, economical products for an ever demanding world, and also help our daily life. The system for interacting with real world is more complex than the virtual world, and need software for communicate with various mechanical, electrical and electronics system. This ensure effective operate and solving problem in this complex environment.

COMP7604   Game design and development

The module will study various topics in game design, for computer, smartphone, mobile device and game console. Topics includes: history and types of game, game platforms, design of game, cross platform consideration, 3D model, project management, AI, sound effects, and networking.

COMP7605   Advanced multimedia data analysis and applications

This module's objective is to introduce advanced multimedia data analysis techniques, and the design

and implementation of signal processing algorithms. It covers topics on digital filter realization, FIR and IIR filters, relation between z-transform and fourier transform, two-dimensional signal processing, and application of multimedia signal processing to speech production and analysis, image and video processing.

COMP7702   Project (4 modules)
(for students admitted in or before the academic year 2013-14)

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

COMP7704   Dissertation (4 modules)
(for students admitted in or after the academic year 2014-15)

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

COMP7801   Topic in computer science

Selected topics that are of current interest will be discussed.

COMP7802   Introduction to financial computing

This module introduces the students to different aspects of financial computing in the investment banking area. The topics include yield curve construction in practice, financial modelling and modern risk management practice, etc. Financial engineering is an area of growing demand. The module is a combination of financial product knowledge, financial mathematics and computational techniques. This module will be suitable for students who want to pursue a career in this fast growing area.

Prerequisites: This module does not require any prior knowledge in the area of finance. Basic calculus and numeric computational techniques are useful. Knowledge in Excel spreadsheet operations is required to complete the assignments and final project.

COMP7804   E-commerce security cases and technologies

This module provides students knowledge about modern e-commerce security, through the study of various cases. It covers fundamental concepts in security technology so as to equip the students with enough background knowledge in security, and then covers the impact of the modern e-commerce environment to the changing demand of security. After that a bundle of cases will be covered, such as cases in communication security, cases in Internet security, cases in data security including personal data protection in both client-side and server-side, and application security cases. With the experience of studying these cases, the students will be asked to assess or design security solutions to some given e-commerce security problems, so as to acquire the ability to apply the learnt security technology to real-life cases.

COMP7805   Topic in computer network and systems

Selected topics in computer network and systems that are of current interest will be discussed.

COMP7806   Topic in computer security

Selected topics in computer security that are of current interest will be discussed.

COMP7901   Legal protection of digital property

This module introduces computer professionals to the various legal means of protecting digital property including electronic data, computer software, electronic databases, IP addresses in the form of domain names, and any work or innovation in digital form. Focus is on the main issues in protecting digital property arising from developments in information technology, and their legal solutions. Topics covered include, but are not limited to, the following: 1) Software copyright, 2) Copyright protection of electronic databases, 3) Patent protection of software and algorithms, 4) Legal protection of domain names and websites, 5) Legal protection of electronic data and trade secrets.

COMP7902   Wireless network security

The objective of this module is to introduce security technologies commonly used in wireless networks. Topics include basics of security mechanisms, various security technologies used in wireless networks such as Bluetooth, Wi-Fi, mobile cellular networks. Wireless security aspects in the integration of wired and wireless mobile technologies will be discussed.

COMP7903   Digital investigation and forensics

This module introduces the fundamental principles of digital investigation and forensics. The module starts with a brief introduction to common computer crimes and digital evidence, and then moves on to the computer basics and network basics pertaining to digital forensics, and finally comes to the techniques for digital investigation and forensic examination.

COMP7904   Information security: attacks and defense

This is an introductory module for some preliminary techniques in computer security and simple attacks for security protocols and schemes. Both the theoretical (e.g. the mathematics behind an encryption system and the attacks) and the practical (e.g. introduction of password cracking software tools) aspects of these techniques will be covered.

Prerequisites: Students are expected to have university level mathematics background and some programming experience.