SYLLABUSES FOR THE DEGREE OF
MASTER OF SCIENCE IN COMPUTER SCIENCE

[This syllabus is applicable to students admitted to the curriculum in the academic year 2025-26 and thereafter.]

Definition and Terminology

Stream of study – a specialisation in the curriculum selected by a candidate which can be General, Cyber Security, Financial Computing and Multimedia Computing.

Discipline course – any course on a list of courses in the discipline of curriculum which a candidate must pass at least a certain number of credits as specified in the Regulations.

Subject group – a subset of courses in the list of discipline courses which have the same specialisation.

Stream specific course – any course in a subject group which corresponds to the specialisation of the stream of study.

Elective course – any Postgraduate level course offered by the Departments of the Faculty of Engineering and the School of Computing and Data Science for the fulfilment of the curriculum requirements of the degree of MSc in Computer Science that are not classified as discipline courses.

Capstone Experience – a 12-credit project or 12-credit computing technology practicum which is a compulsory and integral part of the curriculum.

Curriculum Structure

Candidates are required to complete 72 credits of courses as set out below, normally over one academic year of full-time study or two academic years of part-time study:

	General Stream	Cyber Security / Financial Computing / Multimedia Computing Stream
Course Category	No. of Credits	
Discipline Courses	Not less than 48	Not less than 48 [Include at least 24 credits in Stream Specific Courses in the candidate's corresponding stream of study]
Elective Courses	Not more than 12	
Capstone Experience	12 (Project or Computing technology practicum)	
Total	72	

Course Selection

Candidates shall select courses in accordance with the regulations of the degree. For General Stream, candidate can choose any discipline courses listed below in any subject group, and undertake a COMP7705 Project or COMP7706 Computing technology practicum in any area in computer science. In addition, to qualify as a graduate of Cyber Security, Financial Computing or Multimedia Computing Stream, candidates must pass at least 4 stream specific courses (at least 24 credits in total) in the corresponding subject group, and undertake a COMP7705 Project or COMP7706 Computing technology practicum in the area of the corresponding stream.

A.   Cyber Security
COMP7806.   **Topic in information security**
COMP7901.   **Legal protection of digital property**
COMP7903.   **Digital investigation and forensics**
COMP7904.   **Information security: attacks and defense**
COMP7905.   **Reverse engineering and malware analysis**
COMP7906.   **Introduction to cyber security**
FITE7410.   **Financial fraud analytics**

B.   Financial Computing
COMP7103.   **Data mining**
COMP7408.   **Distributed ledger and blockchain technology**
COMP7409.   **Machine learning in trading and finance**
COMP7412.   **Banking in Web3 – Metaverse, DeFi, NFTs and beyond**
COMP7415.   **Mastering the markets: Financial analytics and algorithmic trading**
COMP7802.   **Introduction to financial computing**
COMP7808.   **Topic in financial computing**
COMP7906.   **Introduction to cyber security**
FITE7405.   **Techniques in computational finance**
FITE7406.   **Software development for quantitative finance**
FITE7407.   **Securities transaction banking**
FITE7410.   **Financial fraud analytics**
FITE7413.   **Smart banking and innovative finance**
FITE7414.   **Generative AI in financial services**

C.   Multimedia Computing
COMP7502.   **Image processing and computer vision**
COMP7503.   **Multimedia technologies**
COMP7504.   **Pattern recognition and applications**
COMP7505.   **User interface design and development**
COMP7506.   **Smart phone apps development**
COMP7507.   **Visualization and visual analytics**
COMP7508.   **Data-driven computer animation**
COMP7604.   **Game design and development**
COMP7807.   **Topic in multimedia computing**

D.   Other discipline courses
COMP7104.   **Advanced database systems**
COMP7105.   **Advanced topics in data science**
COMP7106.   **Big data management**
COMP7107.   **Management of complex data types**
COMP7108.   **Network data analytics**
COMP7201.   **Analysis and design of enterprise applications in UML**

COMP7305.	**Cluster and cloud computing**
COMP7308.	**Introduction to unmanned systems**
COMP7309.	**Quantum computing and artificial intelligence**
COMP7310.	**Artificial intelligence of things**
COMP7311.	**Legal issues in artificial intelligence and data science**
COMP7404.	**Computational intelligence and machine learning**
COMP7416.	**FinTech and digital currencies**
COMP7602.	**Introduction to bioinformatics**
COMP7607.	**Natural language processing**
COMP7608.	**Large language models**
COMP7610.	**Introduction to Web3 and blockchain**
COMP7611.	**Security and privacy in AI systems**
COMP7801.	**Topic in computer science**
COPM7805.	**Topic in computer network and systems**
COMP7809.	**Topic in artificial intelligence**
DASC7606.	**Deep learning**
FITE7411.	**RegTech in finance**

Candidate may select no more than 2 courses (at most 12 credits in total) offered by other postgraduate curricula in the Faculty of Engineering and the School of Computing and Data Science as electives. All course selection will be subject to approval by the Master Programme Director/Course coordinator concerned.

MSc(CompSc) Course descriptions

The following is a list of discipline courses offered by the School of Computing and Data Science for the MSc(CompSc) curriculum. The list below is not final and some courses may not be offered every year.

All courses are assessed through examination and / or coursework assessment, the weightings of which are subject to approval by the Board of Examiners.

COMP7103.   Data mining (6 credits)

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).

COMP7104.   Advanced database systems (6 credits)

The course will study some advanced topics and techniques in database systems, with a focus on the aspects of database systems design & algorithms and big data processing for structured data. Traditional topics include query optimization, physical database design, transaction management, crash recovery, parallel databases. The course will also survey some the recent developments in selected areas such as NoSQL databases and SQL-based big data management systems for relational (structured) data.

Prerequisites: A course of introduction to databases and basic programming skills.

COMP7105.   Advanced topics in data science (6 credits)

This course will introduce selected advanced computational methods and apply them to problems in data analysis and relevant applications.

COMP7106.   Big data management (6 credits)

The course will study some advanced topics and techniques in Big Data. It will also survey the recent development and progress in specific areas in big data management and scalable data science. Topics include but not limited to: large database management techniques, spatial data management and spatial networks, data quality and uncertain databases, top-k queries, graph and text databases, and data analytics.

Mutually exclusive with: COMP7107 Management of complex types

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COMP7107.   Management of complex data types (6 credits)

The course studies the management and analysis of data types which are not simple scalars. Such complex data types include spatial data, multidimensional data, time-series data, temporal and spatio-temporal data, sparse multidimensional vectors, set-valued data, strings and sequences, homogeneous and heterogeneous graphs, knowledge-base graphs, geo-textual and geo-social data. For each of these data types, we will learn popular queries and analysis tasks, as well as storage and indexing methods for main memory and the disk.

Mutually exclusive with: COMP7106 Big data management

COMP7108.   Network data analytics (6 credits)

In the era of data, numerous real-world applications are best represented as networks. This perspective is vital as analyzing these networks can uncover valuable insights, extract interesting information, and make informed decisions. Modern technologies have significantly enhanced our ability to access vast volumes of data, simplifying and reducing the cost of storage. Understanding the importance of data is crucial in addressing diverse challenges, such as traffic congestion, financial network fraud detection, and the spread of misinformation in social networks, to name a few. Consequently, there is an increasing necessity to develop advanced tools that can address these challenges and further understand the importance of data is more necessary than ever. Examples of these technologies can be machine learning techniques (e.g., modeling different problems using GNNs), and natural language processing (NLP) techniques (text preprocessing and sentiment analysis).

Pre-requisites: Very good knowledge of programming (Python recommended) and knowledge of fundamental data science concepts and techniques (e.g. linear algebra)

COMP7201.   Analysis and design of enterprise applications in UML (6 credits)

This course presents an industrial-strength approach to software development based on object-oriented modelling of business entities. Topics include: overview of software engineering and object-oriented concepts; unified process and Unified Modelling Language (UML); use-case modelling and object modelling; dynamic modelling using sequence diagrams and state machines; object-oriented design; modern web design; introducing design patterns and enterprise applications; shortcomings of UML and remedies. 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.

COMP7305.   Cluster and cloud computing (6 credits)

This course offers an overview of current cloud technologies, and discusses various issues in the design and implementation of cloud systems. Topics include cluster systems architecture and example distributed/parallel programming paradigms; cloud delivery models (SaaS, PaaS, IaaS, and Serverless Computing) with examples from popular public cloud platforms; virtualization techniques such as hypervisor, virtual machines, and Docker; container orchestration and management tools, such as Kubernetes; distributed programming models and systems such as MapReduce and Apache Spark; and distributed file systems, such as Hadoop file system. Students will gain experience in setting up a containerised environment using Kubernetes for running distributed applications (e.g., Web applications, Spark applications) on public cloud environments (e.g., Amazon, Microsoft, Google, Alibaba).

Prerequisites: Students are expected to perform installation and administration of various open-source cloud/distributed software on their machines and the cloud. Basic understanding of Linux OS and administration, networking concepts and setup, and programming experiences (C/C++, Java, or Python) in a Linux environment are required.

COMP7308.   Introduction to unmanned systems (6 credits)

To study the theory and algorithms in unmanned systems. Topics include vehicle modelling, vehicle control, state estimation, perception and mapping, motion planning, and deep learning related techniques.

COMP7309.   Quantum computing and artificial intelligence (6 credits)

This course offers a theoretical overview of selected topics from the interdisciplinary fields of quantum computation and quantum AI. The scope of the lectures encompasses an accessible introduction to the fundamental concepts of quantum computation. Importantly, the introduction does not require preliminary knowledge of quantum theory. Detailed comparisons of computational principles and related phenomena in the classical and quantum domain outline the potential and challenges of quantum theory for fundamentally novel algorithms with enhanced processing power. The theoretical capability of quantum computers is illustrated by analyzing a selection of milestone algorithms of quantum computation, and their potential applications to artificial intelligence and optimization.

COMP7310.   Artificial intelligence of things (6 credits)

This course introduces basic concepts, technologies, and applications of the Internet of Things (IoT), with a focus on smart sensing. The course features various topics on sensors and sensing techniques that enable ubiquitous sensing intelligence for IoT devices, and connects them to exciting applications in smart homes, healthcare, security, etc. The lectures introduce topics like localization, mobile sensing, wireless sensing, acoustic sensing and their applications.

COMP7311.   Legal issues in artificial intelligence and data science (6 credits)

This course introduces students to the growing legal, ethical and policy issues associated with artificial intelligence, data science and the related issues security and assurance. In particular, the relationship of AI and data science to personal autonomy, information assurance and privacy are analyzed and legislative responses studied. Class participation, research, writing, and oral/electronic presentations are integral components of the course.

The course contributes to the following goals: written communication and life-long learning. It includes coverage of the following goals: problem analysis, problem solving and teamwork.

COMP7404.   Computational intelligence and machine learning (6 credits)

This course will teach a broad set of principles and tools that will provide the mathematical, algorithmic and philosophical 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. Ethical issues in advanced AI and how to prevent learning algorithms from acquiring morally undesirable biases will be covered.

Topics may include a subset of the following: problem solving by search, heuristic (informed) search, constraint satisfaction, games, knowledge-based agents, supervised learning (e.g., regression and support vector machine), unsupervised learning (e.g., clustering), dimension reduction, learning theory, reinforcement learning, transfer learning, and adaptive control and ethical challenges of AI and ML.

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

COMP7408.   Distributed ledger and blockchain technology (6 credits)

In this course, students will learn the key technical elements behind the blockchain (or in general, the distributed ledger) technology and some advanced features, such as smart contracts, of the technology. Variations, such as permissioned versus permissionless and private blockchains, and the available blockchain platforms will be discussed.

Students will also learn the following issues: the security, efficiency, and the scalability of the technology. Cyber-currency (e.g. Bitcoin) and other typical application examples in areas such as finance will also be introduced.

Prerequisites: COMP7906 Introduction to cyber security or ICOM6045 Fundamentals of e-commerce security and experience in programming is required.

Mutually exclusive with: FITE3011 Distributed Ledger and Blockchain

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COMP7409.   Machine learning in trading and finance (6 credits)

The course introduces our students to the field of Machine Learning, and help them develop skills of applying Machine Learning, or more precisely, applying supervised learning, unsupervised learning and reinforcement learning to solve problems in Trading and Finance.

This course will cover the following topics. (1) Overview of Machine Learning and Artificial Intelligence, (2) Supervised Learning, Unsupervised Learning and Reinforcement Learning, (3) Major algorithms for Supervised Learning and Unsupervised Learning with applications to Trading and Finance, (4) Basic algorithms for Reinforcement Learning with applications to optimal trading, asset management, and portfolio optimization, (5) Advanced methods of Reinforcement Learning with applications to high-frequency trading, cryptocurrency trading and peer-to-peer lending.

COMP7412.   Banking in Web3 – Metaverse, DeFi, NFTs and beyond (6 credits)

The course introduces students to new concepts of Banking with Web3 Technologies. Firstly, it will review the evolution from traditional banking towards decentralized finance and token economies. It will then assess the opportunities for new customer experiences with virtual reality and in the Metaverse as well as examine the opportunities and risks of NFTs (non-fungible tokens). The course will thoroughly examine the different types of Digital Assets, Digital Currencies and special forms like Central Bank Digital Currencies (e-CNY, e-HKD) and Stablecoins. A critical factor in the evolution towards Web3 - Finance are the required regulations, a proper risk management and compliance of products and processes. The course will elaborate on these with the help of case studies and contemporary scenarios at the time of the lecture.

COMP7415.   Mastering the markets: Financial analytics and algorithmic trading (6 credits)

Algorithmic trading is a trending investment approach nowadays that consists of identification of trading opportunities and implementation via computer algorithms. This course will cover emerging trend in the quantitative investment field, and introduce various data analysis techniques and methodologies that are commonly employed in the industry.

The first half of the course focuses on financial data analysis and strategy implementation. The second half of the course discusses practical techniques to manage and deploy algorithmic trading strategies in real financial world.

COMP7416.   FinTech and digital currencies (6 credits)

There are many existing digital currencies in the world. Besides more than 10,000+ cryptocurrencies (as at July 2025, according to a report), we have different types of stablecoins and CBDCs (central bank digital currencies) from different countries are coming. This course will provide an in-depth explanation on these different types of digital currencies together with why they are being created and the reasons behind the rapid development of digital currencies. Also, how these digital currencies affect the eco-system (in particular, the payment system) of finance and the whole world. The interaction of digital currencies, virtual asset, Web3, metaverse, and AI will also be discussed.

COMP7502.   Image processing and computer vision (6 credits)

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 (6 credits)

This course presents fundamental concepts and emerging technologies for multimedia computing. Students are expected to learn how to develop various kinds of media communication, presentation, and manipulation techniques. At the end of course, students should acquire proper skill set to utilize, integrate and synchronize different information and data from media sources for building specific multimedia applications. Topics include media data acquisition methods and techniques; nature of perceptually encoded information; processing and manipulation of media data; multimedia content organization and analysis; trending technologies for future multimedia computing.

COMP7504.   Pattern recognition and applications (6 credits)

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 (6 credits)

For technology products and services, the user experience is a major key to success. With advanced development of processors, sensors, and new algorithms and software tools, more powerful and expressive user interfaces can be implemented to improve human computer interaction and operation. The course will study matching input and output devices with user capabilities, software and hardware considerations, interface design methodologies, and future interface technologies. All of these topics will be supported and demonstrated with current research and actual case studies.

COMP7506.   Smart phone apps development (6 credits)

Smart phones have become an essential part of our everyday lives. The number of smart phone users worldwide today surpasses six billion and is forecast to further grow by more than one billion in the next few years. 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 download their favorite apps remotely from the app stores. There is a great potential for software developer to reach worldwide users.

This course aims at introducing the design and technical issues of smart phone apps. For example, smart phone screens are usually smaller than computer monitors while smart phones usually possess more hardware sensors than conventional computers. We have to pay special attention to these aspects in order to develop attractive and successful apps. Various modern smart phone apps development environments and programming techniques (such as Java for Android phones and Swift for iPhones) will also be introduced to facilitate students to develop their own apps.

Students should have basic programming knowledge.

Mutually exclusive with: COMP3330 Interactive Mobile Application Design and Programming

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COMP7507.   Visualization and visual analytics (6 credits)

This course 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.

COMP7508.   Data-driven computer animation (6 credits)

Basics of character animation, motion capture, inverse kinematics, physically based character animation, Basics of physically-based animation, rigid body dynamics, fluid simulation, hair animation, cloth simulation, facial animation, crowd simulation, kinematography, performance capture, skinning, data-driven character control, data-driven fluid animation, data-driven cloth animation, data-driven facial animation, data-driven kinematography, data-driven skinning, data-driven crowd animation, data-driven rendering, mesh-shape editing, data-driven mesh-shape editing

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COMP7602.   Introduction to bioinformatics (6 credits)

The course will focus primarily on human genomics and medical applications, but the techniques will be broadly applicable across all species. The topics will include 1) bioinformatics big data analytics and algorithms for sequence alignment and sequence assembly, 2) bioinformatics tasks such variant identification and annotation, gene expression and regulation, and 3) real-life bioinformatics applications such as personal genome analysis and cancer genomics.

COMP7604.   Game design and development (6 credits)

The course 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

COMP7607.   Natural language processing (6 credits)

Natural language processing (NLP) is the study of human language from a computational perspective. The course will be focusing on machine learning and corpus-based methods and algorithms. We will cover syntactic, semantic and discourse processing models. We will describe the use of these methods and models in applications including syntactic parsing, information extraction, statistical machine translation, dialogue systems, and summarization. This course starts with language models (LMs), which are both front and center in natural language processing (NLP), and then introduces key machine learning (ML) ideas that students should grasp (e.g. feature-based models, log-linear models and then the neural models). We will land on modern generic meaning representation methods (e.g. BERT/GPT-3) and the idea of pretraining / finetuning.

COMP7608.   Large language models (6 credits)

This course offers an in-depth exploration of Large Language Models (LLMs), covering their architecture, training paradigms, capabilities, and diverse applications. Students will delve into foundational concepts, cutting-edge advancements, and practical implementations, gaining a holistic understanding of the field. The curriculum also examines state-of-the-art innovations of LLMs, including the role of LLMs as intelligent agents capable of leveraging tools, APIs, and autonomous reasoning. Furthermore, the course highlights the integration of multi-modal intelligence, enabling models to seamlessly process and reason across diverse data formats such as text, images, and audio. Ethical considerations, societal impacts, and future trends will also be explored to provide a well-rounded perspective. Through hands-on projects and real-world use cases, students will acquire the skills to design, deploy, and optimize LLM-powered systems for complex, domain-specific challenges.

COMP7610.   Introduction to Web3 and blockchain (6 credits)

This course will provide a comprehensive introduction to Web3, including the motivation for having Web3. Some example applications of Web3 will be discussed. Students will also learn the foundation technological platform for developing Web3 application, i.e., the blockchain platform. The following will be covered in the course for the blockchain technology: basic cryptography, public key cryptosystem, consensus protocols and the relationship between Web3 and blockchain. Also, the security and privacy issues for Web3 and blockchain will also be discussed.

COMP7611.   Security and privacy in AI systems (6 credits)

AI systems have become part of our daily lives. There are many examples, such as chatbot for customer services, face recognition for entrance, and autonomous driving. On the other hand, there is no AI system which is 100% accurate (including ChatGPT-like systems). In this course, we will discuss the security and privacy issues of AI systems and the latest research directions on how to tackle these issues for AI systems and ChatGPT-like systems. Example AI scam cases will also be discussed.

COMP7705.   Project (12 credits)

Candidate will be required to carry out independent work on a major project under the supervision of individual staff member. A written report is required.

Note: Students cannot enrol in COMP7706 Computing technology practicum while taking COMP7705.

COMP7706.   Computing technology practicum (12 credits)

The course offers students the opportunity to gain practical experience by applying academic knowledge in a real-world work environment. This enables students to integrate concepts from various subjects and implement methods, tools, and techniques from computer science and related fields in practical settings.   To satisfy the practicum requirement, students must complete at least 360 hours in a computing-technology-related role, which can be paid or unpaid. Suitable placements include internships, research assistantships, or industry-based projects involving substantive technical work. Assessment is based on the supervisor's evaluation of performance and professionalism, a written report reflecting on technical contributions and learning outcomes, and an oral presentation summarizing the practicum experience and key insights, with grades awarded as Pass, Fail, or Distinction.

Note: Students cannot enrol in COMP7705 Project while taking COMP7706.

COMP7801.   Topic in computer science (6 credits)

Selected topics that are of current interest will be discussed.

COMP7802.   Introduction to financial computing (6 credits)

This course 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 course is a combination of financial product knowledge, financial mathematics and computational techniques. This course will be suitable for students who want to pursue a career in this fast growing area.

Prerequisites: This course 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.

COMP7805.   Topic in computer network and systems (6 credits)

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

COMP7806.   Topic in information security (6 credits)

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

COMP7807.   Topic in multimedia computing (6 credits)

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

COMP7808.   Topic in financial computing (6 credits)

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

COMP7809.   Topic in artificial intelligence (6 credits)

Selected topics in artificial intelligence that are of current interest will be discussed.

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COMP7901.   Legal protection of digital property (6 credits)

This course introduces computer professionals to the various legal means of protecting digital property including computer software, algorithms, 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) Copyright protection of software and websites, 2) Patent protection of software and algorithms, 3) Protection of personal data.

Mutually exclusive with: COMP3311/CSIS0311 Legal aspects of computing and ECOM6004 Legal aspects of IT and e-commerce

COMP7903.   Digital investigation and forensics (6 credits)

This course introduces the fundamental principles of digital investigation and forensics. The course 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 (6 credits)

This is an ethical hacking course. In this course, we will teach students how to conduct ethical hacking so as to better protect a computer system in a company. Topics include physical security, password cracking, network hacking, operating system hacking, and application hacking. The course will also discuss R&D problems related to hacking and defense. The course will try to strike a balance between theory and practice so that students can understand the theories behind the hacking process as well as get enough hands-on exercises to perform ethical hacking and defense.

Prerequisites: Students are expected to have knowledge in university level mathematics and systems plus experience in programming.

COMP7905.   Reverse engineering and malware analysis (6 credits)

This course provides students a foundational knowledge about reverse engineering and malware analysis, through the study of various cases and hand-on analysis of malware samples. It covers fundamental concepts in malware investigations so as to equip the students with enough background knowledge in handling malicious software attacks. Various malware incidents will be covered, such as cases in Ransomware, banking- Trojan, state-sponsored and APT attacks, cases in Stuxnet and malicious software attacks on Industrial Control System and IoT devices. With the experience of studying these cases and analyzing selected samples, the students will be able to understand the global cyber security landscape and its future impact. Hands-on exercises and in-depth discussion will be provided to enable students to acquire the required knowledge and skill set for defending and protecting an enterprise network environment.

Students should have programming/development skills (Assembly, C, C++, Python) and knowledge in Operating System and computer network.

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COMP7906.   Introduction to cyber security (6 credits)

The aim of the course is to introduce different methods of protecting information and data in the cyber world, including the privacy issue. Topics include introduction to security; cyber attacks and threats; cryptographic algorithms and applications; network security and infrastructure.

Mutually exclusive with: ICOM6045 Fundamentals of e-commerce security

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DASC7606.   Deep learning (6 credits)

Machine learning is a fast-growing field in computer science and deep learning is the cutting edge technology that enables machines to learn from large-scale and complex datasets. Ethical implications of deep learning and its applications will be covered and the course will focus on how deep neural networks are applied to solve a wide range of problems in areas such as natural language processing, and image processing. Other applications such as financial predictions, game playing and robotics may also be covered. Topics covered include linear and logistic regression, artificial neural networks and how to train them, recurrent neural networks, convolutional neural networks, generative models, deep reinforcement learning, and unsupervised feature learning.

Prerequisites: Basic programming skills, e.g., Python is required.

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FITE7405.   Techniques in computational finance (6 credits)

This course 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.

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FITE7406.   Software development for quantitative finance (6 credits)

This course introduces the tools and technologies widely used in industry for building applications for Quantitative Finance. From analysis and design to development and implementation, this course 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 course assumes basic understanding of financial concepts covered in COMP7802. Experience in C++/C programming is required.

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FITE7407.   Securities transaction banking (6 credits)

The course 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. It is a crossover between studies of economics, finance and information technology, and features the concepts from basics of the underlying financial products to the latest technology of tokenization of assets on a Blockchain.

FITE7410.   Financial fraud analytics (6 credits)

This course aims at introducing various analytics techniques to fight against financial fraud. These analytics techniques include, descriptive analytics, predictive analytics, and social network learning. Various data set will also be introduced, including labeled or unlabeled data sets, and social network data set. Students learn the fraud patterns through applying the analytics techniques in financial frauds, such as, insurance fraud, credit card fraud, etc.

Key topics include: Handling of raw data sets for fraud detection; Applications of descriptive analytics, predictive analytics and social network analytics to construct fraud detection models; Financial Fraud Analytics challenges and issues when applied in business context.

Required to have basic knowledge about statistics concepts.

FITE7411.   RegTech in finance (6 credits)

The course studies the use of regulatory technology, or RegTech, in the context of regulatory monitoring, reporting and compliance. It demonstrates that the true potential of RegTech lies in its ability to effect a profound transition from a Know Your Customer (KYC) to a Know Your Data (KYD) approach, which relies on efficient processes for the collection, formatting and analysis of reported data. The course covers the RegTech landscape and global challenges, the use of innovative technologies and disruption, RegTech investment, application for authorized institutions and industry adoption, illustrated with initiatives and examples in the Hong Kong context. It also discusses social impact and regulation, and the future development of RegTech.

FITE7413.   Smart banking and innovative finance (6 credits)

This course provides an in-depth exploration of blockchain technology and distributed ledger technology (DLT) and their applications in the context of Smart Banking and Innovative Finance. Students will gain a comprehensive understanding of the underlying principles, functionalities, and potential benefits and challenges of the emerging Financial Technology (FinTech) 3.0.

The course will cover the emerging trend in Smart Banking and Innovative Finance with various disruptive business-IT (DLT and BlockChain) models in the evolving FinTech ecosystem such as decentralized finance (DeFi), central bank digital currencies (CBDC) and Hong Kong SAR Government's w-CBDC and rCBDC projects, eHKD/eCNY use cases, Open Banking and API (Application Programming Interface) ecosystem, Virtual Banks and Stored Valued Facility (SVF), Banking as a Service (BaaS), Banking as a Platform (BaaP), Faster Payment System (FPS) and cross-border payment/forex applications, smart contracts, tokenization and tokenomics, WealthTech, InsurTech, Self-Sovereign Identity (SSI), Zero Knowledge Proof (ZKP), and the related regulatory considerations.

Through lectures, case studies, in-class discussions, group presentations and reflective exercises,

students will develop practical skills in designing, implementing, and managing blockchain and DLT solutions for Smart Banking and Innovative Finance.

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FITE7414.   Generative AI in financial services (6 credits)

The course demonstrates ways of implementing Generative AI in various scenarios in a financial institution. It examines regulatory and ethical requirements as well as the opportunities from harnessing the conversational power of Generative AI for individualized content generation. We will examine how to use GenAI to improve analytics and especially to augment human collaborators. A qualified outlook into the future of the technology and its impact will conclude the course.

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