- Undergraduate Courses
- Postgraduate Courses

Undergraduate Courses:

COMP 001 Academic and Professional Development I [0 credit]

A compulsory one-year course for Computer Science students. This course is designed to provide academic advising to students and to develop their communication skills in interacting with technical and non-technical audiences. Graded P or F.

COMP 002 Academic and Professional Development II [0 credit]

Continuation of COMP 001. A compulsory, one year course for Computer Science students. Graded P or F.

COMP 003 Academic and Professional Development III [0 credit]

Continuation of COMP 002. A compulsory, one year course for Computer Science students. Graded P or F.

COMP 099 Industrial Training [0 credit]

For Computer Science students only. A practical training course for a period of four to five weeks. Topics may include basic computer architecture and maintenance, UNIX system and network administration, Windows NT system administration, and safety. Graded P or F.

COMP 101 Computing Fundamentals [2-0-2:3]

Introduction to computers and computing tools primarily for non-Engineering students. Computer hardware and software, data communications. Window managers, word processing, electronic mail, spreadsheets, presentation graphics, database management, statistical analysis. *Exclusions:* ISMT 101; any COMP course

COMP 102 Computer and Programming Fundamentals I [3-0-2:3]

Introduction to computers and programming. Computer hardware and software. Problem solving. Program design. Procedural abstraction. Debugging and testing. Simple and structured data types. Recursive programming. Introduction to searching and sorting. *Exclusions:* COMP 104, COMP 105 (prior to 98-99)

COMP 103 Computer and Programming Fundamentals II [2-0-1:2]

Programming techniques and introduction to object-oriented programming. Classes and objects. Data encapsulation and information hiding. Abstract data types. Pointers and linked data structures. Recursive data structures. Searching and sorting. *Exclusions:* COMP 104, ISMT 223 *Prerequisite:* COMP 102 or COMP 105 (prior to 98-99)

COMP 104 Programming Fundamentals and Methodology [3-1-2:5]

Structured programming and introduction to object-oriented programming. Problem solving. Program design. Procedural abstraction. Debugging and testing. Recursive programming. Classes and objects. Abstract data types. Linked data structures. Searching and sorting. *Exclusions:* COMP 102, COMP 103, COMP 105 (prior to 98-99), ISMT 223

COMP 109 Supplementary Programming Laboratory [0-0-2:0]

Supplementary programming laboratory sessions for students in COMP 104 without sufficient prior programming experience. Graded P or F. *Exclusions:* Grade B or above in HKCEE Computer Studies; grade D or above in HKALE Computer Studies *Corequisite:* COMP 104

COMP 111 Software Tools [2-0-2:3]

Using, primarily, the UNIX environment and shell programming techniques as a platform for developing software tools. Laboratory exercises will also give hands-on practice with tools that increase programmer productivity such as document preparation tools, window managers and Internet facilities. *Exclusion:* COMP 211 *Prerequisite:* COMP 102 or COMP 104

COMP 151 Object-Oriented Programming [3-0-2:3]

Object-oriented programming concepts and techniques. Software reuse. Classes, objects, and methods. Abstract data types. Object creation and initialization. Message passing. Class hierarchies and inheritance. Polymorphism. Templates and algorithm abstraction. *Exclusion:* COMP 251 (prior to 1999-2000) *Prerequisite:* COMP 103 or COMP 104

COMP 171 Data Structures and Algorithms [3-2-0:3]

Asymptotic notations. Performance measurement. Sorting and searching: algorithms and lower bound. Abstract data types and classes. Data structures: heaps, search trees, tries, and hashing. Graphs: representation, depth-first-search, and breadth-first-search. *Exclusion:* ISMT 227 (prior to 2000-01) *Prerequisite:* COMP 103 or COMP 104

COMP 180 Computer Organization [3-0-1:3]

Inner workings of modern digital computer systems and tradeoffs at the hardware-software interface. Topics include: instructions set design, memory systems, input-output systems, interrupts and exceptions, pipelining, performance and cost analysis, assembly language programming, and a survey of advanced architectures. *Exclusion:* ELEC 152 *Prerequisite:* COMP 102 or COMP 104

COMP 201 Java Programming [3-0-1:3]

[Previous Course Codes: COMP 300T, COMP 300W] Introduction to Java programming. Fundamentals include language syntax, object-oriented programming, inheritance, polymorphism, exception handling, multithreading. Standard libraries for input/output, graphics programming, built-in data structures. Application programming interface and foundation class library. *Exclusion:* ISMT 232 *Prerequisite:* COMP 151 or COMP 251 (prior to 1999-2000)

COMP 211 Introduction to Software Engineering [3-1-1:3]

Methods and tools for planning, designing, implementing, validating, and maintaining large software systems. Project work to build a software system as a team, using appropriate software engineering tools and techniques. *Exclusion:* ISMT 221 *Prerequisites:* COMP 151 and COMP 171

COMP 221 Fundamentals of Artificial Intelligence [3-1-0:3]

Foundations underlying design of intelligent systems. Relations between logical, statistical, cognitive, biological paradigms; basic techniques for heuristic search, theorem proving, knowledge representation, adaptation; applications in vision, language, planning, expert systems. *Prerequisite*: COMP 171

COMP 231 Database Management Systems [3-1-1:3]

Principles of database systems; conceptual modeling and data models; logical and physical database design; query languages and query processing; database services including concurrency, crash recovery, security and integrity. Hands-on DBMS experience. *Exclusions*: IEEM 230, ISMT 226 *Prerequisite:* COMP 171

COMP 241 Human-Computer Interaction [3-0-1:3]

Humans, computers, and interactions between them; input devices; usability; style; visual and auditory displays; user-centered design; models of the user interface; user testing. *Prerequisite:* COMP 171 or ISMT 227 (prior to 2000-01)

COMP 251 Principles of Programming Languages [3-0-1:3]

Comparative studies of programming languages, programming language concepts and constructs. Non-imperative programming paradigms: object-oriented, functional, logic, concurrent programming. Basic concepts of program translation and interpretation. Storage allocation and run-time organization. *Prerequisites:* COMP 151 and COMP 171

COMP 252 Principles of Systems Software [3-0-2:3]

Principles, purpose and organization of systems software; processes, tasks, scheduling, interprocess communication, synchronization, mutual exclusion; memory management; device management; file systems, security and protection, multi-CPU systems, computer networking and distributed computing. *Prerequisites:* COMP 180/ELEC 152; and one of COMP 102, COMP 103 or COMP 104

COMP 271 Design and Analysis of Algorithms [3-1-0:3]

Time and space complexity analysis of algorithms. Design paradigms: divide-and-conquer, greedy algorithms, dynamic programming. Graph algorithms: searching and backtracking, connectivity, biconnectivity, minimum spanning tree, shortest path. NP-completeness. *Prerequisite:* COMP 171

COMP 272 Theory of Computation [3-1-0:3]

Introduction to automata, formal languages, and computability. Set theory and countability. Finite automata and regular languages. Push-down automata and context-free languages. Turing machines. Church's thesis. Halting problem. Uncomputability. *Prerequisites*: COMP 171, MATH 111/113/152, and MATH 132

COMP 300 Special Topics in Computer Science [1-4 credit(s)]

Selected topics of current interest to the Department not covered by existing courses. Offerings are announced each semester.

COMP 303 Internet Computing [2-0-2:3]

[Previous Course Code: COMP 300X] Technologies and standards for World Wide Web (WWW), user interfaces and Browsers, authoring tools, Internet protocols, Internet servers, database connectivity, Robots, Search engines, server-side programming, client-side programming, security and privacy, recent advances. *Prerequisite*: COMP 251

COMP 322 Intelligent Robotic Systems [3-0-2:3]

Fundamentals in robot configurations; kinematics; robot programming languages; and robot vision. Introduction to the intelligent integration of sensors, robots and systems to achieve specific tasks. *Background*: Basic knowledge in linear algebra

COMP 327 Introduction to Pattern Recognition [3-1-0:3]

Fundamentals of pattern recognition. Bayes decision theory. Parametric and non-parametric classifiers. Feature extraction and selection techniques. Pattern recognition applications. Project work to build a pattern recognition system. *Prerequisites:* COMP 171 and MATH 241/244/246

COMP 332 Principles of Database Design [3-1-0:3]

Data modeling concepts; conceptual, logical and physical design; analyzing, evaluating and improving schemas; schema documentation and maintenance; functional analysis; design tools; schema mappings; database tuning; distributed database design. *Exclusion:* ISMT 226 *Prerequisite*: COMP 231

COMP 334 Distributed Database Systems [3-0-1:3]

Distributed database system concepts: system architectures; database design and administration; query processing and optimization; transaction management; concurrency control; availability; recovery. A course project using a commerical distributed DBMS is required. *Prerequisite*: COMP 231

COMP 336 Information Retrieval [3-0-1:3]

Systems that provide relevance (similarity) based retrieval rather than exact matching. Topics: IR system architecture, IR models, performance, evaluation, relevance feedback, clustering, other reduction indexing approaches, analysis applications, future trends. *Prerequisites*: COMP 251 and COMP 271

COMP 341 Computer Graphics [3-0-1:3]

Input and output, graphics primitives, line drawing, coordinate systems, transformations, synthetic camera, color, curves, shading and rendering. Optional: surfaces, human vision, ray tracing, architectures. *Prerequisite*: COMP 271

COMP 342 Introduction to Computer Music [3-0-1:3]

An introductory course in the technology of computer music. Music representation, music theory, musical acoustics, spectral analysis, sound synthesis techniques, sound modification techniques and effects. No previous musical background required, but helpful. *Prerequisite:* COMP 171 or ISMT 227 (prior to 2000-01)

COMP 343 Fundamentals of Multimedia Computing [3-0-1:3]

Digital media representation; compression techniques and standards; multimedia storage, retrieval and communications; quality of service; multimedia resource management; multimedia database; synchyronization; multimedia document, authoring; multimedia programming; applications. *Exclusion:* ELEC 360 *Prerequisite*: COMP 252
Reference: Ralf Steinmetz and Klara Nahrstedt, *Multimedia: Computing, Communications and Applications,* 1995

COMP 351 Performance Evaluation of Computer Systems [3-1-0:3]

Basic concepts and techniques in modeling complex systems; elements of probability, statistics, Markov processes, queuing theory, operational analysis and simulation. Model parametrization, verification and validation. *Prerequisites:* COMP 252, and MATH 241/244/246

COMP 361 Computer Communication Networks I [3-0-1:3]

Principles of network architectures and communications protocols; switching and multiplexing techniques; the OSI reference model: physical, data link, network and transport layers: LAN protocols and performance; introduction to network programming. *Background:* Probability and statistics *Exclusions:* ELEC 315, ISMT 335 *Prerequisite:* COMP 252
Reference: W. Stallings, *Data and Computer Communications, 5th edition,* 1997

COMP 362 Computer Communication Networks II [3-0-1:3]

Design and implementation of computer communication networks, services and applications; bridging and routing; internetworking; ASN.1; network management. Examples are drawn primarily from TCP/IP protocol suite. *Prerequisite*: COMP 361 or ELEC 315
Reference: Larry L. Peterson & Bruce S. Davie, *Computer Networks: A System Approach*, 1996

COMP 364 Computer and Communication Security [3-0-0:3]

Cryptosystems, symmetric-key and public-key cryptography, cryptanalysis, authentication, message digests, digital signatures, and random number generation. Access controls and firewalls. Applications such as certificate authorities, electronic commerce, smartcards, and digital cash. *Prerequisite:* COMP 271

COMP 381 Design and Analysis of Computer Architectures [3-1-0:3]

Analysis, synthesis and evaluation of different computer architectures. Emphasis on computer design with respect to price/performance and its relation to architectural choices such as pipelining, memory hierarchy, input/output, instruction set design, vector processing, and multiprocessing. *Prerequisite:* COMP 252

COMP 382 Introduction to Parallel Computing [3-0-0:3]

Concept of high-performance computing using parallel and distributed processing. Design, algorithms, applications, and programming of parallel systems such as the Intel Paragon and network of workstations. *Background*: Programming experience and knowledge of computer architecture. *Prerequisites*: COMP 171, and COMP 180/ ELEC 152

COMP 394 Computer Engineering Project I [0-0-6:2]

[Also ELEC 394] Each Computer Engineering student is required to take COMP/ELEC 394, 395 and 396. The project is conducted under the supervision of a Computer Science and/or Electrical and Electronic Engineering faculty member. May be graded PP.

COMP 395 Computer Engineering Project II [0-0-9:3]

[Also ELEC 395] Continuation of COMP 394. May be graded PP. *Prerequisite:* COMP 394

COMP 396 Computer Engineering Project III [0-0-9:3]

[Also ELEC 396] Continuation of COMP 395. *Prerequisite:* COMP 395

COMP 397 Final Year Project I [0-0-9:3]

A project in an area of specialization in Computer Science under the guidance of a faculty member. Objectives are to integrate the classroom material from several courses, and to apply them to solve practical problems. May be graded PP.

COMP 398 Final Year Project II [0-0-12:4]

Continuation of COMP 397.

Postgraduate Courses:

COMP 512 Advanced Distributed Software Development [3-0-0:3]

The course examines the advanced concepts of component-based software development in distributed environments. Topics include models and analysis, security, component concepts, business objects, CORBA beans, objects for e-commerce, object web.

COMP 522 Machine Learning [3-0-0:3]

Introduction to major learning paradigms and techniques. Decision trees, neural networks, conceptual clustering, mixture density estimation, EM algorithm, unsupervised Bayesian Classification, hidden Markov models, reinforcement learning, case-based learning, PAC learning. *Background:* COMP 221

COMP 524 Computer Vision [3-0-0:3]

Introduction to techniques for automatically describing visual data and tools for image analysis; perception of spatial organization; models of general purpose vision systems; computational and psychological models of perception. *Background:* COMP 221; knowledge in linear algebra

COMP 526 Natural Language Processing [3-0-0:3]

Techniques for parsing, interpretation, context modeling, plan recognition, generation. Emphasis on statistical approaches, neuropsychological and linguistic constraints, large text corpora. Applications include machine translation, dialogue systems, cognitive modeling, knowledge acquisition. *Background:* COMP 221

COMP 527 Pattern Recognition [3-0-0:3]

Fundamentals of pattern recognition techniques. Statistical decision theory. Parametric density estimation. Nonparametric density estimation. Discriminant functions. Feedforward neural networks. Feature selection and extraction. Clustering. Mixture density estimation. Hidden Markov models. *Background*: Knowledge of linear algebra and probability.

COMP 530 Database Architecture and Implementation [3-0-0:3]

Systems and architecture concepts in database management systems: advanced storage and access methods; transaction processing; query processing and optimization; implementation of relational operators; memory and storage management; fault tolerance; recovery. *Background:* COMP 231 and COMP 252

COMP 531 Data and Knowledge Base Systems [3-0-0:3]

Advanced course in data- and knowledge-base systems. Data models including object-oriented and logic-based. Architectures; database design and system implementation techniques. Transaction management and recovery; query optimization. Active databases. *Background:* COMP 231

COMP 534 Distributed Data and Knowledge Bases [3-0-0:3]

Advanced topics in distributed data and knowledge base systems: architectures; database design; query processing and optimization; concurrency control; recovery. Techniques for supporting heterogeneous database systems and cooperative information systems.

COMP 537 Knowledge Discovery in Databases [3-0-0:3]

An introduction to knowledge discovery in databases. Different discovery and learning techniques are presented and compared. Automatic generation of query language expressions is discussed in depth. Potential applications are shown. *Background:* COMP 231

COMP 538 Reasoning and Decision under Uncertainty [3-0-0:3]

AI methods of reasoning and decision under uncertainty. Probability theory; Bayesian networks. Bayesian decision theory; influence diagrams. Markov decision processes; planning under uncertainty. Learning with Bayesian networks. Other approaches. Applications. *Background*: Knowledge of probability

COMP 542 Advanced Computer Music [3-0-1:3]

An advanced course in computer music. Course material will include instrument modeling (contribute one instrument to a class orchestra), music theory (melody, harmony, form and composition) and algorithmic composition (in C or C ++, using class orchestra and music theory rules). The course will use Csound and the material will focus on technical and creative aspects of computer music. *Background:* COMP 342

COMP 543 Advanced Computer Graphics Modeling and Rendering [3-0-0:3]

Advanced topics in geometric modeling and rendering for computer graphics applications. Focus on tools and techniques for constructing, manipulating, visualizing and animating three-dimensional models of real or abstract objects. *Background:* COMP 341

COMP 553 Distributed Systems [3-0-0:3]

Distributed processes and threads; scheduling; load sharing and local balancing; interprocess communication; clock synchronization; state detection; mutual exclusion; fault-tolerance; naming and authentication; replication management; distributed file systems; case studies. *Background:* COMP 252

COMP 560 Computer Communication Protocols [3-0-0:3]

Protocol development cycle of design, specification, verification, implementation and testing. Introduction to the use of formal description techniques in protocol engineering. Design philosophy of high performance protocols. *Background:* COMP 361

COMP 570 Algorithm Design and Analysis [3-0-0:3]

Advanced topics in algorithm design and analysis, including probabilistic algorithms, geometric algorithms, parallel algorithms: shared memory and network connected, graph algorithms, and advanced topics in complexity theory.

COMP 573 Computational Geometry [3-0-0:3]

An introductory course in Computational Geometry. Algorithms for manipulating geometric objects. Topics include Convex Hulls, Voronoi Diagrams, Point Location, Triangulations, Randomized Algorithms, Point-Line Duality. *Background:* COMP 271

COMP 587 Parallel Processing: Software [3-0-0:3]

Software aspects of parallel processing systems including parallel programming paradigms, complex problem solving techniques using high performance computing, parallel algorithms, parallelism management, scheduling, mapping, load balancing, parallel languages, and parallelization compilers. *Background:* COMP 252 and COMP 271

COMP 610 Topics in Software Engineering [3-0-0:3]

Selected topics in software engineering of current interest to the Department and not covered by existing courses.

COMP 621 Advanced Topics in Artificial Intelligence [3-0-0:3]

Advanced topics in artificial intelligence including neural networks, natural language processing, logic programming, image understanding, robotics and others. *Background*: an appropriate 500-level course.

COMP 630 Topics in Database Systems [3-0-0:3]

Selected topics in database systems of current interest to the Department and not covered by existing courses.

COMP 631 Topics in Knowledge Base Systems [3-0-0:3]

Selected topics in knowledge base systems of current interest to the Department and not covered by existing courses.

COMP 641 Topics in Graphics [3-0-0:3]

Selected topics in graphics of current interest to the Department and not covered by existing courses.

COMP 651 Topics in Computer Systems Analysis [3-0-0:3]

Advanced topics in computer systems analysis; issues in the development and solution of system models; model parametrization, verification and validation; recent developments in techniques and tools for system evaluation.

COMP 660 Topics in Computer and Communication Networks [3-0-0:3]

Advanced topics in communication networks, including issues in high speed networking, ATM, multimedia communication, network interconnection, network management, and protocol verification and testing.

COMP 670 Topics in Theoretical Computer Science [3-0-0:3]

Selected topics in theoretical computer science not covered by existing courses, including, but not limited to, computational complexities and computability, graph algorithms and combinatorial optimization.

COMP 680 Topics in Computer Engineering [3-0-0:3]

Selected topics in computer engineering of current interest to the Department and not covered by existing courses.

COMP 685 Topics in Applications of Computer Science [3-0-0:3]

Selected topics in applications of computer science not covered by existing course.

COMP 690 Computer Science Seminar I [0-1-0:1]

A regular seminar presenting research problems currently under investigation. Students are expected to attend regularly. Graded P or F.

COMP 691 Computer Science Seminar II [0-1-0:1]

A regular seminar presenting research problems currently under investigation. Students are expected to attend regularly. Graded P or F.

COMP 692 Computer Science Seminar III [0-1-0:1]

A regular seminar presenting research problems currently under investigation. Students are expected to attend regularly. Graded P or F.

COMP 695 Advanced Seminar in Computer Science [0 credit]

An in-depth study of a current topic in computer science. Offerings are announced each semester. Graded P or F.

COMP 697 Independent Studies [1 - 3 credit(s)]

An independent research project carried out under the supervision of a faculty member. (Only one independent studies course may be used to satisfy the course requirements for any postgraduate program.)

COMP 698 MSc Research Project [0-0-12:4]

An independent research project carried out under the supervision of a faculty member. A project report is required and must be approved by two faculty members, one of whom is the supervisor.