

Department of Computer Science

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The Department of Computer Science offers a program leading to the degree of Bachelor of Science (BS) in Computer Science. It also offers a program leading to the degree of Master of Science (MS) in Computer Science. For more information about the department visit its webpage: <http://www.cs.aub.edu.lb/>.

Undergraduate Program

BS in Computer Science

Mission Statement

In addition to the university requirements for graduate study in the Faculty of Arts and Sciences, the faculty is committed to cultivating lifelong learning that empowers the student to pursue continuous self-renewal through replenishing her/his knowledge base in an information technology driven age. The faculty offers excellent undergraduate programs leading to bachelor's degrees as well as graduate education leading to master's degrees in most fields. It expects to offer PhD degrees in selected fields in the future. The faculty builds its choices on areas of excellence as it develops its resources. The faculty considers research to be an essential element of faculty activity. Quality research is encouraged and supported to maintain the highest standard of education and to attract

outstanding faculty and students. The faculty also emphasizes the importance of high-quality teaching and continuously monitors teaching effectiveness. Student advising, another important faculty duty, is crucial to the proper running of its liberal arts program. To achieve excellence in education, the faculty continuously revises its curricula, enhances its different academic units by assessing their needs for equipment and research facilities, and concentrates on recruiting and maintaining prominent faculty in all professorial ranks. The active engagement of all its academic units in achieving its goals is vital for the lasting success of its three major areas of study: the humanities, the social sciences, and the basic sciences.

BS Degree in Computer Science

To graduate with a B.S. in computer science a student must finish:

University Requirements

- University language requirements (English 6 credits, Arabic 3 credits)
- University General Education requirements (Humanities 12 credits, Social Sciences 6 credits, Natural Sciences 6 credits, Quantitative Thought 3 credits).

Major Requirements

- Computer science: CMPS 200, CMPS 200L, CMPS 212, CMPS 212L, CMPS 253, CMPS 255, CMPS 256, CMPS 257, CMPS 258, CMPS 272, CMPS 277, CMPS 299, and nine additional credits in computer science courses numbered 220 and above
- Mathematics: MATH 201, MATH 211 (or CMPS 211), and one Math course to be chosen from MATH 218, MATH 219, STAT 230, STAT 233, and MATH 261.
- Sciences: Physics 228, 228L
- Free elective: one course numbered 200 and above from outside the department.

All prospective computer science majors are expected to complete CMPS 200, MATH 201, MATH 211 or CMPS 211, CMPS 212, CMPS 212L, and CMPS 255 in the sophomore year. Computer science majors are expected to complete CMPS 253, CMPS 256, CMPS 257, and CMPS 258 in the junior year, and maintain an average grade of at least 70 in computer science courses. Finally, students are encouraged to take ACCT 210 and PHIL 211 among their general/Free elective courses.

A minor in computer science requires 18 credits: CMPS 200, CMPS 212, CMPS 255, and nine additional credits in computer science courses (CMPS) numbered 211 or above. A minimum of 9 credits must be taken in the department. [Note: This minor is not open to EECE students.]

A concentration in a specific area in computer science consists of 12 credits: 9 credits in computer science to be chosen from the list of the corresponding area, and CMPS 299 (which is to be carried out in the same area.) The first concentration that will be introduced is in Graphics and Multimedia. The list of courses in this area includes: CMPS 220, CMPS 259, CMPS 285, CMPS 286, CMPS 289, CMPS 290, CMPS 388, CMPS 385, CMPS 387, CMPS 396 and CMPS 395.

- CMPS 255 Computer Architecture 3.0; 3 cr.**
A structured overview of the fundamentals of designing digital computer systems. Topics covered include digital logic and systems, machine level representation of data, assembly level machine organization, memory system organization and architecture, CPU implementation and virtual machines, and exposure to one or more micro/mini architectures. *Prerequisite or co-requisite: CMPS 212 and 212L or EECE 330. Annually.*
- CMPS 256 Advanced Algorithms and Data Structures 3.0; 3 cr.**
A systematic study of algorithms and their complexity. Topics include techniques for designing efficient computer algorithms, proving their correctness, and analyzing their complexity; as well as advanced searching, sorting, selection, graph and matrix algorithms. *Prerequisite: CMPS 212 and 212L or EECE 330. Annually.*
- CMPS 257 Theory of Computation 3.0; 3 cr.**
A course that covers basic theoretical principles embodied in automata and grammars. Topics include regular expressions, finite automata, context-free grammars and parsing, pushdown automata, closure properties, Turing machines, Church's thesis, reductions and decidability. This course also provides a quick introduction to complexity theory. *Prerequisites: (MATH 211 or CMPS 211) and (CMPS 212 and 212L or EECE 330). Annually.*
- CMPS 258 Programming Languages 3.0; 3 cr.**
A course on the principles and programming styles that govern the design and implementation of contemporary programming languages, a history and overview of programming languages, fundamental issues in language design, and an introduction to language translation. This course focuses on design issues in imperative, object-oriented, functional, and rule-based paradigms. This last paradigm will be used to introduce intelligent systems issues. Languages such as C, C++, Haskell, and Prolog are used to illustrate key concepts. *Prerequisite: CMPS 212 and 212L or EECE 330. Annually.*
- CMPS 259 Multimedia Programming 3.0; 3 cr.**
This course introduces how to design databases and to use authoring tools' built-in scripting languages to reduce the overhead for a multimedia product. Topics include: application of the scripting language to accomplish other sophisticated effects, and the use the scripting languages built into authoring tools to extend their ability to create multimedia products with increased efficiency and capabilities. *Prerequisites: CMPS 212, 212L and CMPS 220. Annually.*
- CMPS 272 Operating Systems 3.0; 3 cr.**
An overview of operating systems and net-centric computing. Topics include operating system principles, scheduling and resource management, virtual memory, file systems, concurrent processing and synchronization, security and protections, the Internet, network structures, distributed operating systems, and Web technologies and operating systems (URL, HTML, HTTP, applets). A case study of a contemporary operating system like UNIX accompanies the course. *Prerequisites: (CMPS 255 or EECE 321) and (CMPS 256 or EECE 330). Each semester.*
- CMPS 273 Network Programming 3.0; 3 cr.**
This course focuses on the programming aspects of networking protocols. Topics include: designing and building programming applications that use computer networks, fundamental concepts required to build iterative and concurrent client/server networking applications using sockets. Then it moves to explain low level networking programming and other advanced socket topics. The course also presents the emerging peer-to-peer computing along with some tools needed to develop P2P applications. *Prerequisites: 272 or consent of instructor. Annually.*

CMPS 274 Compiler Construction 3.0; 3 cr.

A course that covers syntax specifications of programming languages, parsing theory, top-down and bottom-up parsing, parser generators, syntax-directed code generation, symbol table organization and management, dynamic storage allocation, code optimization, dataflow analysis, and register allocation. *Prerequisites: CMPS 255, CMPS 258 and CMPS 257. Biennially.*

CMPS 277 Database Systems 3.0; 3 cr.

An overview of the nature and purposes of database systems and an introduction to data modeling: entity relationship model, relational model with relational algebra, relational calculus and SQL; integrity constraints; file organization and index files; normalization. *Prerequisite: CMPS 256 or EECE 330. Annually.*

CMPS 278 Web Programming and Design 3.0; 3 cr.

This course introduces the exciting world of WWW, the fundamentals needed to program on the Internet, and the state of the art technologies used in designing and developing rich multi-tiered web based applications. It presents the basics of client-side/server-side web programming and all the skills and tools needed to create dynamic Web-based applications. It provides in-depth coverage of various markup languages (XHTML, Dynamic HTML and XML) and their associated cascading style sheets, several client side and server side scripting languages (JavaScript, PHP) in addition to AJAX-enabled rich Internet applications, client-side technologies, web services, Web Servers, and multi-tiered applications using relational database systems. *Prerequisites: CMPS 277 or consent of instructor. Annually*

CMPS 281 Numerical Linear Algebra 3.0; 3 cr.

A course on direct and interactive methods for solving general and special systems of linear equations, covering LU decomposition, Choleski decomposition, nested dissection, marching algorithms; Jacobi, Gauss-Seidel, successive over-relaxation, alternating directions, and conjugate gradient iterative methods. *This course is equivalent to MATH 281. Prerequisites: (MATH 218 or 219) and (MATH 251 or CMPS 211). Annually.*

CMPS 282 Software Engineering 3.0; 3 cr.

A course on software engineering dealing with large systems, including use of APIs, management of software teams, and software testing and validation; data flow concepts and decision tables; conditions and decision variables; design of output and input forms; files and database development; on-line and distributed environments; system documentation; and system implementation. Students are expected to complete a project in which they integrate their knowledge of the undergraduate computer science curriculum by implementing a significant software system in team work. *Restricted to students who joined the program before October 2010. Prerequisite: CMPS 253. Annually*

CMPS 283 The Logic of Programming 3.0; 3 cr.

A course on computer programming as a rigorous mathematical discipline. Topics include sentential logic, predicate logic, expressions and commands, pre/post-conditions, assignment, repetition, invariant predicates, function predicates, modules, data structures, and concurrency. *Prerequisites: (CMPS 212 or EECE 330) and CMPS 211. Biennially.*

CMPS 284 Computer Networks 3.0; 3 cr.

An introduction to basic data communication, network architecture, protocols, local area networks, and wide area networks. Special emphasis is placed on the TCP/IP protocol suite. The BSD socket library is presented. *Prerequisite: CMPS 255 or EECE 321. Annually.*

- CMPS 285 Computer Graphics 3.0; 3 cr.**
A course that covers the practice of, and underlying mathematical foundation for, interactive graphics programming. Topics include basic graphics systems, graphics primitives and attributes, windows and viewports, clipping, geometric transformations, color systems, 2D texture mapping, and introduction to 3D graphics. Programming in OpenGL will be used. *Prerequisite: CMPS 212 or EECE 330. Annually.*
- CMPS 286 Computer-Aided Geometric Design 3.0; 3 cr.**
A course that discusses the representation of free-form curves and surfaces in modeling objects by computers, including curve approximation and interpolation, spline curves (Bezier and B-splines), visual smoothness of curves, geometric continuity, parameterization of curves, introduction to surface interpolation and approximation, and spline surfaces (Bezier and B-splines). *Prerequisite: CMPS 212 or EECE 330. Biennially.*
- CMPS 287 Artificial Intelligence 3.0; 3 cr.**
An introduction to the principles and techniques that enable computers to behave intelligently. This course covers basic problem solving methods, knowledge representation, reasoning methods, learning from samples and from experience, expert systems and knowledge acquisition, machine learning, and neural networks. Several projects are given, some of which are in Prolog. *Prerequisites: CMPS 256 and 258. Annually.*
- CMPS 288 Internals of Database Management Systems 3.0; 3 cr.**
A course on the internals of database management systems, especially relational DBMS. Topics include query processing and optimization, transaction processing, concurrency control, recovery, distributed transactions, database security, client-server, multi-tier architectures, and web deployed database systems. *Prerequisite: CMPS 277. Annually.*
- CMPS 289 Human Computer Interaction 3.0; 3 cr.**
This course describes the psychological principles of human-computer interaction. Evaluation of user interfaces. Usability engineering. Task analysis, user-centered design, and prototyping. Conceptual models and metaphors. Software design rationale. Design of windows, menus, and commands. Voice and natural language I/O. Response time and feedback. Color, icons, and sound. Internationalization and localization. User interface architectures and APIs. Case studies and project. *Prerequisites: CMPS 253, CMPS 258. Annually.*
- CMPS 290 Multimedia Design 3.0; 3 cr.**
This course introduces the theoretical and practical aspects of the principles governing the design in multimedia, computer-enhanced and computer generated environments. In particular, it covers the design process for multimedia products, including the development life cycle and basic interface design issues. Each student will design a significant multimedia product and use a typical authoring environment to create a working prototype. *Prerequisite CMPS 259. Annually.*
- CMPS 296 Computer Science Tutorial 1–3 cr.**
Prerequisite: Senior standing.
- CMPS 297 Special Topics in Computer Science 1–3 cr.**
A course on selected topics which change according to the interests of the instructors and/or students. Topics are chosen from state-of-the-art innovations in software and computer information systems. *Prerequisite: Consent of instructor. Annually.*

CMPS 299 Graduation Project in Computer Science**3 cr.**

A course to enhance students' skills with practical experience giving them the opportunity to integrate knowledge accumulated in different courses. In this course, students must deliver products, in their area of emphasis/concentration, which pass through the design, analysis, implementation, testing, and evaluation stages. *Prerequisite: Senior standing. Annually.*

41 Credits in Computer Science

Modes of Analysis	English and Arabic (9)	Humanities (12)	Social Sciences (6)	Natural Sciences (10)	Quantitative Thought (32+9+9+3)
Lecture Courses (9+12+6+10+53)	<ol style="list-style-type: none"> Required Arabic courses (3): ARAB 201 A or B, or any upper level course (3), as determined by placement Required English courses (usually 6): ENGL 203(3), 204(3), as determined by placement 	Required credits in the humanities: 12 credits including 6 credits from CVSP (see pp. 158-63)	Required Courses (6)	Required natural ¹ science courses (6) Required physics courses (4): PHYS 228(3), 228L(1)	<ol style="list-style-type: none"> Required CMPS courses (32): CMPS 200(3)+200L(1),² 212(3)+212L(1),² 253(3), 255(3), 256(3), 257(3), 258(3), 272(3) 277(3), 299(3) Required CMPS electives (9)³: to be chosen from CMPS courses above 220 Required mathematics courses (9) ³: MATH 201(3), 211(3) (or CMPS 211) and one Math course to be chosen from MATH 218, MATH 219, STAT 230, STAT 233, and MATH 261. Note: since MATH 251 is equivalent to CMPS 251, it cannot count as both a computer science elective and mathematics elective One free elective (3) numbered 200 and above from outside the department
Seminar (0)					
Laboratory (3)				PHYS 228L	CMPS 2001, 2122 (4 hrs/week)
Research Project (0)					

¹ Natural science courses are numbered 200 and above and drawn from biology, chemistry, geology or physics, open to science students

² CMPS 200L and CMPS 212L are each a 1-credit course with 1 recitation hour, and 3 lab hours per week.

³ CMPS 211 and CMPS 251 are 3-credit courses with 3 lecture hours and 1 recitation hour