

# 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 at <http://www.cs.aub.edu.lb/>.

## Undergraduate Program

### BS Degree in Computer Science

In addition to the general requirements of the Faculty of Arts and Sciences, the department requires the following:

In computer science: CMPS 200, CMPS 212, CMPS 253, CMPS 255, CMPS 256, CMPS 257, CMPS 258, CMPS 272, CMPS 277, CMPS 282, and nine additional credits in computer science courses numbered 220 and above.

In mathematics and statistics: MATH 201, MATH 211 (or CMPS 211), and three additional credits 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.

In sciences: Physics 228, 228L, and six additional credits in courses numbered 200 or above, drawn from biology, chemistry, geology, or physics, and open to science students.

All prospective computer science majors are expected to complete CMPS 200, MATH 201, MATH 211 or CMPS 211, CMPS 212, 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 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.]

## Undergraduate Courses

**CMPS 200 Introduction to Programming 3.3; 4 cr.**  
An introduction to a disciplined approach to computer programming and problem solving, utilizing a block-structured high level language, with an emphasis on procedural abstraction and good programming style. This course covers the basic repetition and selection constructs, procedures and functions, parameter passing, and scope of variables. *Note: If EECE 230 is completed, students can get credit for only one of CMPS 200 or EECE 230. Each semester.*

**CMPS 206 Computers and Programming for the Arts 2.3; 3 cr.**  
An introduction to computers and an illustration of their use. Common applications are considered in word processing, spreadsheets, and database systems. This course also includes an introduction to the Internet and the World Wide Web. This course is meant to be a computer literacy course open to Arts students only. No credit is given to computer science majors. *Students can get credit for only one of CMPS 206, CMPS 209, or EDUC 219. Annually.*

**CMPS 209 Computers and Programming for the Sciences 2.3; 3 cr.**  
A computer literacy course covering all the topics in CMPS 206. Additionally, this course provides an introduction to programming using Visual Basic or a similar language. No credit is given for computer science majors. *Students can get credit for only one of CMPS 206, CMPS 209, or EDUC 219. Each semester.*

**CMPS 211 Discrete Structures 3.1; 3 cr.**  
Logical reasoning, sets, relations and functions; mathematical induction, counting, and simple finite probability theory; molecular arithmetic in different bases; recurrence relations and difference equations; truth tables and switching circuits; graphs and trees; strings and languages. *This course is equivalent to Math 211. Annually.*

**CMPS 212 Intermediate Programming with Data Structures 3.3; 4 cr.**  
A continuation of CMPS 200, this course consolidates algorithm design and programming techniques, emphasizing large programs. This course also provides a detailed study of data structures and data abstraction, and an introduction to complexity considerations and program verification. *Note: If EECE 330 is completed, students can get credit for only one of CMPS 212 or EECE 330. Prerequisite: CMPS 200 or EECE 230. Each semester.*

**CMPS 251 Numerical Computing 3.1; 3 cr.**  
Techniques of numerical analysis: number representations and round-off errors, root finding, approximation of functions, integration, solving initial value problems, Monte-Carlo methods. Implementations and analysis of the algorithms are stressed. Projects using MATLAB or a similar tool are assigned. *Prerequisites: (CMPS 200 or EECE 230) and MATH 201. This course is equivalent to MATH 251. Annually.*

**CMPS 253 Professional Practice 3.0; 3 cr.**

A course that combines the study of basic software engineering techniques with an analysis of the social and professional issues that arise in the practice of computing. The importance of users and their interactions with the software system is studied and considered from a software engineering perspective. This course emphasizes the role people play in the design and implementation of software systems. *Prerequisites: CMPS 212 or EECE 330. Annually.*

**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 corequisite: CMPS 212 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 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 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 or EECE 330. 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 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 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. *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 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: Senior standing. Annually.*

## 41 Credits in Computer Science

Modes of Analysis	English and Arabic (9)	Humanities (12)	Economics and Social Sciences (3)	Sciences, Math, and Technology (36+9+10)
Lecture Courses (9+12+3+39+9+10)	<ol style="list-style-type: none"> <li>Required Arabic course (3): ARAB 201A or B, or any upper level course, as determined by placement</li> <li>Required English courses (usually 6): ENGL 203(3), 204(3), as determined by placement</li> </ol>	Required credits in the humanities: 12, including 6 credits from CVSP (see pp. 150–52)	Required courses (3): ACCT 210 is recommended	<ol style="list-style-type: none"> <li>Required CMPS courses (32): CMPS 200(3+1)<sup>1</sup>, 212(3+1)<sup>1</sup>, 253(3), 255(3), 256(3), 257(3), 258(3), 272(3), 277(3), 282(3)</li> <li>Required CMPS electives (9): to be chosen from CMPS courses above 210</li> <li>Required mathematics courses (6): MATH 201(3), 211(3) (or CMPS 211)</li> <li>Required electives (3): to be chosen from MATH 218(3), STAT 230(3), CMPS 251(3), and MATH 261(3)</li> <li>Required science courses (4): PHYS 228(3), 228L(1)</li> <li>Required natural science<sup>2</sup> electives (6)</li> </ol>
Seminar (0)				
Laboratory (2)				CMPS 200 <sup>1</sup> , 212 <sup>1</sup> (4 hrs/week)
Research Project (0)				CMPS 282 <sup>3</sup>

<sup>1</sup> CMPS 200 and CMPS 212 are 4-credit courses with 3 lecture hours (3 credits), and 3–4 lab hours per week and 1 recitation hour (1 credit).

<sup>2</sup> Science courses numbered 200 and above drawn from biology, chemistry, geology or physics, and open to science students.

<sup>3</sup> CMPS 211 and CMPS 251 are 3-credit courses with 3 lecture hours and 1 recitation hour.