Department of Computer Science

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Professor: Nasri, Ahmad H.
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Senior Lecturer: Jureidini, Wadi’ N.
Lecturer: PLadan, Mohamad I.
Instructors: Mukaddam, Wassim G.; Sidani-Bohsali, Hayat A.

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, and CMPS 212 in the sophomore year. Computer science majors are expected to complete CMPS 253, CMPS 255, CMPS 256, 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. [Note: If ECE 230 (ECE 330) is completed, students can get credit for only one of CMPS 200 (CMPS 212) or ECE 230 (ECE 330)]. A minimum of 9 credits must be taken in the department.

**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 ECE 230 is completed, students can get credit for only one of CMPS 200 or ECE 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 Education 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 Education 219. Each semester.

**CMPS 211  Discrete Structures  3.0; 3 cr.**
Equivalent to MATH 211. Each semester.

**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 ECE 330 is completed, students can get credit for only one of CMPS 212 or ECE 330. Prerequisite: CMPS 200. Each semester.

**CMPS 251  Numerical Computing  3.0; 3 cr.**
Equivalent to MATH 251. Each semester.
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 211 and CMPS 212. 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 co-requisite: CMPS 212. 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. 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 and CMPS 212. 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. 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 and CMPS 256. 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 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. Each semester.

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. 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. Each semester.

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 and consent of instructor. 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. 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. 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 285. 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 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

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<thead>
<tr>
<th>Modes of Analysis</th>
<th>English and Arabic (9)</th>
<th>Humanities (12)</th>
<th>Economics and Social Sciences (3)</th>
<th>Sciences, Math, and Technology (36+9+10)</th>
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<tr>
<td>Lecture Courses</td>
<td>1. Required Arabic course (3): ARAB 201A or B, or any upper level course, as determined by placement &lt;br&gt;2. Required English courses (usually 6): ENGL 203(3), 204(3), as determined by placement</td>
<td>Required credits in the humanities: 12, including 6 credits from CVSP (see pp. 152-54)</td>
<td>Required courses (3): ACCT 210 is recommended</td>
<td>1. Required CMPS courses (30): CMPS 200(3+1)¹, 212(3+1)¹, 253(3), 255(3), 256(3), 257(3), 258(3), 272(3) 277(3), 282(3) &lt;br&gt;2. Required CMPS electives (9): to be chosen from CMPS courses above 210 3. Required mathematics courses (6): MATH 201(3), 211(3) (or CMPS 211) 4. Required electives (3): to be chosen from MATH 218(3), STAT 230(3), CMPS 251(3), and MATH 261(3) 5. Required science courses (4): PHYS 228(3), 228L(1) 6. Required natural science electives (6)</td>
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<td>Seminar</td>
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<td>Laboratory</td>
<td>CMPS 200¹, 212¹</td>
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<td>Research Project</td>
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<td>CMPS 282²</td>
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1. CMPS 200 and CMPS 212 are 4-credit courses with 3 lecture hours (3 credits) and 3–4 lab hours (1 credit) per week.
2. Science courses numbered 200 and above drawn from biology, chemistry, geology or physics, and open to science students.
3. CMPS 282 includes a major project.