



PHOENICIA UNIVERSITY

Innovation . Inspiration . Integrity

College of Arts and Sciences

Suggested Computer Science Degree Plan

2023-2024

College of Arts and Sciences (CAS)

Computer Science

Program Description

The BS degree in Computer Science at Phoenicia University requires students to complete 121 credit hours at the freshman level and 91 credit hours for those joining as sophomores. Of the total credit hours required, 39 credit hours must be completed in major courses, including a one-credit professional internship program, 6 credit hours of elective major courses, and 16 credit hours in required non-major courses, with the remainder allocated to general education.

Graduation Requirements

- Students obtain a minimum “Program GPA” of 2.0; no rounding (e.g., a GPA of 1.99)—whatsoever—will be applied.
- Students obtain a minimum “Cumulative GPA” of 2.0; no rounding (e.g., a GPA of 1.99)—whatsoever—will be applied.
- Students obtain “Graduation Clearance” as detailed in the following section.

University Graduation Requirements (30 credits hours)

To graduate with a Bachelor of Science in Computer Science, students will require 30 credit hours in university general requirements, in addition to the college graduation requirements. The 30 credit hours in general educational requirements for degree programs will include the following:

- 3 credits in Basic Sciences
- 3 credits in Social Sciences
- 6 credits in English (English I and English II)
- 6 credits in Civilization (World Civilization 1 and World Civilization 2)
- 3 credits in Arabic
- 3 credits in Communication (Public Speaking)
- 3 credits in Computing (Elective major course or Web Development)
- 3 credits in Globalization & World Culture

BS Degree in Computer Science Graduation Requirements (61 credit hours)

The College of Arts and Sciences requirements for the BS degree in Computer Science program will include the following additional requirements:

- 39 credits of mandatory core courses (including a 1-credit hour for professional internship)
- 6 credits of elective major courses (2 courses)
- 16 credits of required non-major courses (6 courses)

Required major courses - 39 credits

- CMPS 200: Introduction to Programming plus Lab- 3 cr.
- CMPS 209: Logic Design- 3 cr.
- CMPS 210: Intermediate Programming with Data Structures plus Lab - 3 cr.
- CMPS 220: Low Level Programming - 3 cr.
- CMPS 230: Python Boot Camp (Mandatory Workshop)
- CMPS 240: Algorithms and Data Structures - 3 cr.
- CMPS 242: Computer Architecture - 3 cr.
- CMPS 245: Computer Networks - 3 cr.
- CMPS 250: Mobile Programming - 3 cr.
- CMPS 252: Database Systems - 3 cr.
- CMPS 272: Software Engineering - 3 cr.
- CMPS 282: Operating Systems - 3 cr.
- CMPS 285: Artificial Intelligence - 3 cr.
- CMPS 290: Professional Internship - 1 cr.
- CMPS 295: Senior Project - 2 cr.

Elective major courses - 6 credits

- CMPS 270: Web Development - 3 cr.
- CMPS 223: Theory of Computation - 3 cr.
- CMPS 249: Programming Languages - 3 cr.
- CMPS 247: Computer Graphics - 3 cr.
- CMPS 255: Advanced Object-Oriented Programming - 3 cr.
- CMPS 246: Network Programming - 3 cr.
- CMPS 284: Machine Learning - 3 cr.
- CMPS 286: Special Topic: Image Processing - 3cr.
- CMPS 287: Pattern Recognition - 3cr.
- CMPS 288: Game Development - 3cr.
- CMPS 289: Computational Data Science - 3cr.

Required non-major courses - 16 credits

- MATH 201: Calculus and Analytic Geometry - 3 cr.
- MATH 210: Linear Algebra - 3 cr.
- MATH 211: Discrete Structures - 3 cr.
- MATH 213: Numerical Methods - 3 cr.
- PHYS 210: Electronics - 3 cr.
- PHYS 211: Electronics Lab - 1 cr.

Graduation Clearance

Upon reaching senior-level status, students must fill out the graduation clearance form after completing all their degree requirements. The graduation clearance form should be signed by the following personnel: Departmental Coordinator, Dean of College, IT Director, Library Coordinator, Finance Director, Registrar Director, Career Center Director, Head of the Exit Interview Committee, President, and Chancellor. Failure to do so will delay graduation.

Course Description

CMPS 200. Introduction to Programming plus Lab - 3 cr.

This course is an introductory course in programming. Topics covered include: structure of computers, the computing environment, programming, algorithm development, and a high-level language such as Java. In particular, strategies for problem solving, problem analysis, algorithm representation and algorithm verification are balanced with actual program development using good design and documentation techniques. The course also includes 2.5 teaching hours of weekly lab sessions.

CMPS 202. Introduction to Computing for Arts - 3 cr.

This course offers a broad introduction to the field of computer science, intended for arts students only. Topics include: history of computing, social issues in computing, the Internet and the World Wide Web, and social media. Students also learn common applications such as word processing, spreadsheets, and database systems.

CMPS 209. Logic Design - 3 cr.

This course introduces students to number systems, coding, and binary systems. The course also emphasizes conversion from decimal to other bases (BCD numbers). Topics include: Boolean algebra, logic gates, function minimization, tabular method, Karnaugh mapping, arithmetic functions and circuit design (HA, FA, and ALU). The course also stresses bit manipulation (basic and advanced), combinational functions, circuit design (decoder, encoder, multiplexer and de-multiplexer), sequential circuits components (latches, RS-FF, D-FF, JK-FF, T-FF), RAM structure, and logical functionality.

CMPS 210. Intermediate Programming with Data Structures plus Lab - 3 cr.

This course covers algorithm design, programming techniques, and provides a detailed study of data structures and data abstraction, in addition to complexity considerations and program verification. The course also includes 2.5 teaching hours of weekly lab sessions. **Prerequisite: CMPS 200 or GENG212.**

CMPS 220. Low Level Programming - 3 cr.

This course exposes students to features of the C languages commonly used in systems programming. It covers numerous aspects of the C and C++ programming languages such as: basic syntax, defining structures and classes, I/O, bit-manipulation facilities, pointers and dynamic memory, arrays, memory management, shell script programming, references, the Standard Template Library, inheritance and polymorphism. This course also includes assembly language programming & Linux shell programming.

Prerequisite: CMPS 200; Concurrent Prerequisite: CMPS 209.

CMPS 223. Theory of Computation - 3 cr.

This course exposes students to basic theoretical principles embodied in automata and formal languages. Topics include: introduction to automata and formal languages, regular expressions, finite automata, mathematical induction, correctness proofs for iterative and recursive algorithms, and recurrence equations and their solutions. **Prerequisite: CMPS 210.**

CMPS 230. Python Boot Camp (Mandatory Workshop)

The workshop provides a comprehensive introduction to fundamental programming concepts using Python. It covers essential topics such as strings, lists, loops, conditional statements, dictionaries, and functions. Additionally, students delve into data manipulation within Python, handling formatted datasets, and working with diverse data formats. Object-oriented programming principles, including classes and inheritance, are also explored. The workshop culminates with an overview of the Python Data Analysis Library, pandas, and the Matplotlib library for data visualization. The workshop encompasses a total of 22.5 to 24 teaching hours. **Prerequisites: CMPS 200 and CMPS 210.**

CMPS 240. Algorithms and Data Structures - 3 cr.

This course exposes students to standard computing algorithm design techniques and data structures. Design techniques include: divide-and-conquer, greedy strategies, dynamic programming, linear programming, randomization, and network flows. The course also covers advanced searching, sorting, selection, graph and matrix algorithms. Students will be expected to show good design principles and adequate skills at reasoning about the correctness and complexity of algorithms. **Prerequisite: CMPS 210; Concurrent Prerequisite: MATH 211.**

CMPS 242. Computer Architecture - 3 cr.

This course covers the fundamentals of designing digital computer systems, using modern concepts such as pipeline design, memory hierarchies, IO systems, and parallel processing. Topics include: pipelining and pipelined processors, code scheduling for ILP processors, storage systems and RAID, CPU implementation and virtual machines, memory system organization and architecture, parallel processing,

machine-level representation of data, and assembly-level machine organization, among others.

Prerequisite: CMPS 210; Concurrent Prerequisite: MATH 211.

CMPS 245. Computer Networks - 3 cr.

This course is an introduction to computer networks and systems programming of networks. It covers: basic understanding of computer networks and network protocols, network hardware and software, routing, addressing, congestion control, reliable data transfer, socket programming, and emerging technologies. **Prerequisite: CMPS 242.**

CMPS 246. Network Programming - 3 cr.

This course covers 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. It also covers low-level networking programming and other advanced socket topics. **Prerequisite: CMPS 245.**

CMPS 247. Computer Graphics - 3 cr.

This course stresses the underlying mathematical foundation for and the practice of interactive graphics programming. Topics include basic graphics systems, graphics primitives and attributes, windows and viewports, clipping, geometric transformations, color systems, 2D texture mapping, and 3D graphics. The theory is complemented by a series of programming assignments and projects using C/C++, OpenGL, WebGL and OpenGL ES. **Prerequisites: CMPS 200 and CMPS 220.**

CMPS 249. Programming Languages - 3 cr.

This course presents the development of modern programming languages. It covers: syntax specification, the evolution of programming languages (including abstract data types and object orientation, and contributions of C++ to language design), design and implementation of subprograms, run-time storage management, and programming paradigms: functional programming (illustrated by languages such as Lisp, Scheme, ML or Haskell) and logic programming (illustrated by languages such as Prolog, XSB or Coral). **Prerequisite: CMPS 210.**

CMPS 250. Mobile Programming - 3 cr.

This course covers all aspects of mobile device programming, and emphasizes developing applications that run on current platforms. This course will also help students to write and deploy a content-based application using a mobile computing software framework, as well as design and build a variety of Apps throughout the course to reinforce learning and develop real competency. **Prerequisite: CMPS 220.**

CMPS 252. Database Systems - 3 cr.

This course presents a technical review of the theory and principles of database design and organization. Topics covered include: the concepts and structures necessary to design and implement a database management system, network, hierarchical and relational database models, data normalization, data description languages, query languages, data integrity and security. Students also engage in application programming with SQL. **Prerequisite: CMPS 210.**

CMPS 255. Advanced Object-Oriented Programming - 3 cr.

This course presents advanced object-oriented programming concepts: analysis, design patterns, and techniques using modern programming languages and frameworks. Topics covered include: graphical user interface components, event-based programming, applets, exception handling, files and streams, collections, multimedia, multi-threading, project automation, building and testing with Gradle, accessing databases, and web applications. **Prerequisite: CMPS 210.**

CMPS 270. Web Development - 3 cr.

This course covers front-end and back-end web programming and concentrates on the development of dynamic web pages in a digitally-connected world. Students work on developing dynamic web pages that incorporate both client-side and server-side programming. Topics covered include: web scripting using JavaScript; Web security tools; VBScript; PHP; Java Beans; and server-side components such as CGI, ASP, and PHP, and the installation and configuration of web servers. The course also covers accessing databases through web applications.

CMPS 272. Software Engineering - 3 cr.

This course surveys the fundamentals of software engineering, including the software life-cycle, requirements analysis, design, disciplined implementation and evaluation, software testing, unit, integration, validation and system testing, basic software project management and quality issues, and the documentation and technical writing. Students will work on a software project that employs principles learned in other computer science classes. **Prerequisite: CMPS 210 and CMPS270 or CMPS250.**

CMPS 282. Operating Systems - 3 cr.

This course introduces students to the principles of operating systems, building upon system programming knowledge and considering the operating system as a control program and as a resource allocator. Topics include: processes and threads, synchronization and concurrency control, processor scheduling, virtual memory, memory management, file systems, scheduling and resource management,

distributed systems, security and protection, the Internet, network structures, and Web technologies and operating systems (URL, HTML, HTTP, applets). **Prerequisites: CMPS 220, CMPS 240, and CMPS 242.**

CMPS 284. Machine Learning- 3 cr.

This course provides an introduction to the cross-section of fundamental methods at the core of machine learning. In this course, students discuss and implement real recent applications of machine learning in the fields of image processing, speech recognition, and web data processing. Topics covered include state-of-the-art machine learning algorithms, their theoretical foundations, and the way to apply them to real problems. **Prerequisites: CMPS 200, MATH 201, and MATH 213; Concurrent Prerequisites: CMPS 210 and CMPS 220.**

CMPS 285. Artificial Intelligence - 3 cr.

This course introduces students to the basic knowledge representation, problem-solving, and learning methods of artificial intelligence. Topics include: search methods, game playing and rule-based systems, natural language understanding, knowledge representation, reasoning, planning, vision, robotics, learning and neural networks. Assignments provide practical experience of the topics. **Prerequisites: CMPS 210, MATH 201, and MATH 213.**

CMPS 286. Special Topic: Image Processing- 3cr.

This course introduces students to the fundamentals of digital image processing: Digital image acquisition, formation, and perception, spatial and frequency-based image enhancement, restoration, and compression, morphological image processing, feature extraction and image segmentation, and object recognition. **Prerequisites: CMPS 210, MATH 201, and MATH 213.**

CMPS 287. Pattern Recognition - 3 cr.

This course introduces students to statistical pattern recognition and its applications. Topics include Bayes decision theory, maximum likelihood estimation, discriminant functions, neural networks, and support vector machines. A programming language, such as Matlab/Python, is used for assignments and projects. **Prerequisites: CMPS 210, MATH 201, and MATH 213.**

CMPS 288. Game Development - 3 cr.

This course covers the fundamentals of game design and development. The course covers the different game requirements, including physics, artificial intelligence, pathfinding, and player experience. In this course, students explore player experience in terms of level design, game balance, and difficulty progression. **Prerequisite: CMPS 210.**

CMPS 289. Computational Data Science- 3 cr.

This course introduces the students to the field of data science, covering data visualization, modeling, analysis, prediction, and decision making. In this course, computer science students employ various tools and techniques using modern programming languages (e.g. Python) to advance their data analysis skills.

Prerequisites: CMPS 210, MATH 201, and MATH 213.

CMPS 290. Professional Internship - 1 cr.

This course requires one semester of practical, on-the-job work experience and training (a minimum of 40 hours per week) at select on-campus or off-campus facilities. Students become eligible to register for this course after completing 45 credit hours. **Prerequisites: CMPS 240, CMPS 245, CMPS 250, CMPS 252 and BCOM 300.**

CMPS 295. Senior Project - 2 cr.

This course provides students with the opportunity to integrate knowledge accumulated in different courses while engaging in a significant implementation project in any area of informatics or computer science. The project may be undertaken individually or in small groups under the supervision of a faculty member from the department. In this course, students are required to develop a software product that can be implemented successfully. **Prerequisite: Senior Standing.**

BCOM 300. Workplace Etiquette

This is a mandatory workshop that all students should successfully complete prior to their internships. The course comprises a series of workshops that focus on workplace etiquette and communication in formal and professional settings. In this course, students develop their business etiquette and professional practice skills in addition to their presentation skills so that they are well-equipped for their internships. **Prerequisite: ENGL 201.**

Suggested Degree Plan

(1) Computer Science Graduation Requirements	
Core Computer Science Courses	38 credits
Elective Major Courses	6 credits
Required Non-Major Courses	16 credits
Professional Internship	1 credit
Total Computer Science Courses	61 credits
(2) General Education Courses	
Civilization	6 credits
English	6 credits
Communication	3 credits
Arabic	3 credits
Basic Sciences	3 credits
Social Sciences	3 credits
Globalization & World Culture	3 credits
Computing	3 credits
Total GE Courses	30 credits
Total	91 credits

Suggested Computer Science Degree Plan

First Year					
Fall 1			Spring 1		
Course	Title	Wt.	Course	Title	Wt.
CMPS 200	Introduction to Programming plus Lab	3	CMPS 210	Intermediate Programming with Data Structures plus Lab	3
ENGL 201	English I	3	CMPS 220	Low Level Programming	3
CMPS 209	Logic Design	3	ARAB 201	Arabic	3
MATH 211	Discrete Structures	3	ENGL 202	English II	3
MATH 201	Calculus and Analytic Geometry	3	CIVL 201	World Civilizations 1	3
Total Credits		15	Total Credits		15

Summer I		
Course	Title	Wt.
CMPS 230	Python Boot Camp (Mandatory Workshop)	

Second Year					
Fall 2			Spring 2		
Course	Title	W	Course	Title	Wt.
CMPS 240	Algorithms and Data Structures	3	CMPS 250	Mobile Programming	3
CMPS 242	Computer Architecture	3	CMPS 252	Database Systems	3
XXXX XXX	Computer Science Elective	3	CMPS 245	Computer Networks	3
MATH 213	Numerical Methods	3	COMM 201	Communication Elective- Public Speaking	3
CIVL 202	World Civilizations II	3	PHYS 210	Electronics	3
BCOM 300	Workplace Etiquette (Mandatory Workshop)		PHYS 211	Electronics Lab	1
Total Credits		15	Total Credits		16

Summer II		
Course	Title	Wt.
CMPS 290	Professional Internship	1
Total Credits		1

Third Year					
Fall 3			Spring 3		
Course	Title	Wt.	Course	Title	Wt.
XXXX XXX	Computing/ Computer Science Elective	3	XXXX XXX	Computer Science Elective	3
CMPS 272	Software Engineering	3	CMPS 285	Artificial Intelligence	3
CMPS 282	Operating Systems	3	CMPS 295	Senior Project	2
MATH 210	Linear Algebra	3	XXXX XXX	Social Science Elective	3
SOCL 210	Globalization & World Cultures	3	XXXX XXX	Basic Science Elective (STAT201 or MATH212)	3
Total Credits		15	Total Credits		14



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