

COURSES FOR COMPUTER SCIENCE

Computer Science Courses

CS100 CS I for Majors

Hours 4

A first course in programming for students majoring in computer science. Language concepts include primitives, variables, sequences, function, selection, iteration and recursion. Software engineering concepts include testing and debugging. System concepts include directories, paths, files, and text editing.

Prerequisite(s): UA Placement Mathematics 440 or UA ACT Subject Math Placement 565 or ACT Mathematics 30 or SAT Mathematics 680 or SAT Mathematics (New) 710 or (Undergraduate level MATH 112 Minimum Grade of C- and Undergraduate level MATH 113 Minimum Grade of C-) or Undergraduate level MATH 115 Minimum Grade of C-

CS101 CS II for Majors

C

Hours 4

A second course in programming for students majoring in computer science. Using a high-level language, students use object-oriented practices to study fundamental data structures and algorithms. Issues such as computability, problem complexity and algorithm analysis, efficient searching and sorting, data structures, and the object-oriented programming paradigm are introduced and explained. Computing proficiency is required for a passing grade in this course.

Prerequisite(s): (CS 100 or CS 110 or RRS 102) and (MATH 125 or MATH 145)

Computer Science

CS102 Computer Applications

C

Hours 3

Familiarization with Windows, fundamental and intermediate word processing commands, spreadsheet applications, and database management. Computing proficiency is required for a passing grade in this course.

Computer Science

CS104 Computer Science Principles

C

Hours 3

An introductory course that overviews the core principles of computer science from a broad spectrum of topics. The course content is focused on computing and its relation to creativity, abstraction, algorithms, programming, Big Data, Internet/networking, and societal impact. Students will work on team-based projects that explore topics in Big Data, investigate the impact of the internet, and create their own games and/or smartphone applications. Students will use the graphical programming language Snap. Computing proficiency is required for a passing grade in this course.

Prerequisite(s) with concurrency: MATH 112 or MATH 115 or MATH 125 or MATH 126 or MATH 145 or MATH 146

Computer Science

CS110 Honors CS I for Majors

UH

Hours 4

This course covers the same material as CS 100 but in a depth appropriate for honors students. It is an honors version of the first course in programming for students majoring in computer science. Prior knowledge of programming is not required, but the course is appropriate for students with prior programming experience. Language concepts include primitives, variables, sequences, function, selection, iteration and recursion. Software engineering concepts include testing and debugging. System concepts include directories, paths, files, and text editing.

Prerequisite(s): UA Placement Mathematics 440 or UA ACT Subject Math Placement 565 or ACT Mathematics 30 or SAT Mathematics 680 or SAT Mathematics (New) 710 or (Undergraduate level MATH 112 Minimum Grade of C- and Undergraduate level MATH 113 Minimum Grade of C-) or Undergraduate level MATH 115 Minimum Grade of C-

University Honors

CS111 Honors CSII for Majors

UH

Hours 4

This course covers the same material as CS 101 but in a depth appropriate for honors students. It is an honors version of the second course in programming for students majoring in computer science. Using a high-level language, students use object-oriented practices to study fundamental data structures and algorithms. Issues such as computability, problem complexity and algorithm analysis, efficient searching and sorting, data structures, and the object-oriented programming paradigm are introduced and explained.

Prerequisite(s): (CS 110 or CS 100 or RRS 102) and (MATH 125 or MATH 145)

University Honors

CS112 Digital Literacy

C

Hours 3

This course is designed to help the students acquire various competencies that will enable them to safely and effectively use and create digital technologies and Internet resources in personal, academic, and professional contexts. Students will demonstrate their learning by creating a digital literacy portfolio. Computing proficiency is required for a passing grade in this course.

Computer Science

CS121 The Discipline of Computing

Hours 1

An introduction to the discipline of computing designed for students who are considering a major in Computer Science, a major in Cyber Security, or a minor in Computer Science.

Prerequisite(s): MATH 112 OR higher OR UA Math Placement Test Score of 370

Prerequisite(s) with concurrency: MATH 112

CS140 Introduction to Cyber Security

Hours 3

This course provides an introduction to cyber security. It covers fundamental concepts necessary to understand the threats to security as well as various defenses against those threats. The material includes an understanding of existing threats, planning for security, technology used to defend a computer system, and implementing security measures and technology.

Prerequisite(s): CS 100

CS200 Software Design and Engineering

C

Hours 4

Introduction to software engineering: the software crisis, program life cycle, software systems analysis techniques, software modeling, theory and practice of design, program testing methodologies, programmer team organization, and program verification and synthesis. Computing proficiency is required for a passing grade in this course.

Prerequisite(s): CS 101 or CS 111

Computer Science

CS201 Data Structures and Algorithms

C

Hours 4

Data structures including balanced search trees, heaps, hash tables, and graphs. Algorithm design techniques including divide-and-conquer, greedy method, and dynamic programming. Emphasis on problem solving, design, analysis, and reasoning about data structures and algorithms. Computing proficiency is required for a passing grade in this course.

Prerequisite(s): (CS 101 or CS 111) and MATH 301

Computer Science

CS202 Web Foundations

C

Hours 3

Introduces the student to the fundamentals of the internet and web page design and development. Students will be shown how to use the internet, text editors, and build basic web pages using HTML coding. This will include, but not be limited to hyperlinks, tables, basic CSS styling, frames and forms. The student will also be given demonstrations and assignments using a WYSIWYG editor. Computing proficiency is required for a passing grade in this course.

Computer Science

CS223 Introduction to Python Programming

C

Hours 3

A course designed to introduce programming and problem solving using Python. Computing proficiency is required for a passing grade in this course.

Prerequisite(s): MATH 112 or currently enrolled in MATH 113 or MATH 115 or higher

Computer Science

CS285 Intro to Spreadsheet Applications

C

Hours 3

Use of spreadsheets and other environments to build business and scientific applications. Course includes development of problem-solving skills and an introduction to the object-oriented paradigm. Computing proficiency is required for a passing grade in this course.

Computer Science

CS300 Operating Systems

Hours 3

Study of basic operating system concepts with an emphasis on memory, processor, device, and information management.

Prerequisite(s): CS 200, CS 201

CS301 Database Management Systems

W

Hours 3

Constituent parts of database management (design, creation, and manipulation of databases), including the conceptual and relational data models, SQL, normalization and security. Writing proficiency is required for a passing grade in this course. A student who does not write with the skill normally required of an upper-division student will not earn a passing grade, no matter how well the student performs in other areas of the course.

Prerequisite(s): CS 200 and CS 201

Writing

CS302 Database Applications

C

Hours 3

An introduction to commercial database packages. Students will gain familiarity with both creating and using standard database software packages to solve real-world problems. Computing proficiency is required for a passing grade in this course.

Computer Science

CS305 Advanced Database Applications and Design

C

Hours 3

This course is a follow-up course to CS 302 for non-majors wishing to learn more about the design and use of database systems. Now that the underpinnings of data, data representation, and data visualization are in place from CS 302, students will undertake an investigation into the uses of data and the construction of and understanding of databases design principles. Computing proficiency is required for a passing grade in this course.

Prerequisite(s): CS 302 with a grade of C- or higher

Computer Science

CS312 Website Design

C

Hours 3

A course designed to teach website design principles and implementation techniques. The course requires prior knowledge of the fundamentals of the internet and web page design and development. This class is not cross-listed as a graduate course. Computing proficiency is required for a passing grade in this course.

Prerequisite(s): CS 202 with a grade of C- or higher

Computer Science

CS323 Intermediate Python Programming

C

Hours 3

A course designed to build upon topics from the Introduction to Python Programming course and introduces advanced programming and problem-solving topics using the Python language. Computing proficiency is required for a passing grade in this course.

Prerequisite(s): CS 223 or CS 322 or CS 100 or by permission of instructor

Computer Science

CS340 Legal & Ethical Issues in Comp

C

Hours 3

By way of case study, the course finds and frames issues related to legal and ethical issues in computing. Topics include privacy, free speech, intellectual property, security, and software reliability and liability issues. Computing proficiency is required for a passing grade in this course.

Computer Science

CS345 Advanced Legal and Ethical Issues in Computing

C

Hours 3

By way of case study and fact pattern analysis, we will find and frame advanced legal and ethical issues presented by past, contemporary and emerging technology. Cases and events will be examined. At the conclusion of the semester, students will be able to identify and discuss legal and ethical issues presented by technology. Students will create a seminal project showcasing their understanding of a chosen issue as well as the student's ability to use computing technology to communicate, share and display their work. Computing proficiency is required for a passing grade in this course.

Prerequisite(s): CS 340 with a grade of C- or higher

Computer Science

CS347 Cyber Law and Ethics

HU

Hours 3

We will analyze advanced legal and ethical issues confronting the usage of new technologies and how these issues impact society. We will examine past, contemporary and emerging cases that have a connection to computing technology. Human values and ethics will be at the forefront of our approach, and we will study the intersection of human values, law and professional ethics.

Prerequisite(s): CS 100 or CS 110 or CS 223 or CS 322

Humanities

CS385 Advanced Spreadsheet Applications

C

Hours 3

Design and construction of standard user interfaces using a visual programming environment. Course includes the prototyping of several standard user interface mechanisms. Computing proficiency is required for a passing grade in this course.

Prerequisite(s): CS 285 with a grade of C- or higher

Computer Science

CS391 Special Topics

SP

Hours 3

Special topics in computing.

Special Topics Course

CS393 Software Practicum

Hours 3

Software development course designed to meet the needs of individual students. This course is specifically for students developing software for an enterprise, such as those at The Edge Incubator and Accelerator.

Prerequisite(s) with concurrency: CS 301

CS403 Programming Languages

Hours 3

Formal study of programming language specification, analysis, implementation, and run-time support structures; organization of programming languages with emphasis on language constructs and mechanisms; and study of non-procedural programming paradigms.

Prerequisite(s): CS 300, CS 301 and ECE 383

CS404 CS Curriculum for Math Educators

Hours 3

Building upon the concepts from CS 104, students will explore in-depth how computer science education is presented in the secondary education setting. Students will get the opportunity to explore current computer science curriculum and develop resources for future teaching, with a specific emphasis on the College Board's AP CS Principles (AP CSP) curriculum.

Prerequisite(s): CS 104

CS407 Software Interface Design

Hours 3

Basic concepts of human-computer interaction, including guidelines for interface design, evaluation of interface designs, virtual environments, menus, forms, natural language interactions, novel interaction devices, information search and information visualization.

Prerequisite(s): CS 300, CS 301 and ECE 383

CS416 Testing and Quality Assurance

Hours 3

Study of verification & validation and related processes. Topics include techniques and tools for software analysis, testing, and quality assurance.

Prerequisite(s): CS 300, CS 301 and ECE 383

CS417 Requirements Engineering

Hours 3

Study of requirements engineering and its phases. Topics include formal, semi-formal, and informal paradigms for elicitation, documentation, and management of software system requirements.

Prerequisite(s): CS 300, CS 301 and ECE 383

CS420 Software Evolution

Hours 3

Study of techniques and tools for design-time and run-time software adaptation, including principles of reflection and metaprogramming, software modularity, metamodeling and software language engineering.

Prerequisite(s): CS 300, CS 301 and ECE 383

CS428 Computer Security

Hours 3

An examination of computer security concepts, such as cryptographic tools, user authentication, access control, database security, intrusion detection, malicious software, denial of service, firewalls and intrusion prevention systems, trusted computing and multilevel security, buffer overflow, software security, physical and infrastructure security, human factors, and security auditing.

Prerequisite(s): CS 300, CS 301 and ECE 383

CS434 Compiler Construction

Hours 3

Syntax and semantics of procedure-oriented languages and translation techniques used in their compilation; includes computer implementation.

Prerequisite(s): CS 300, CS 301, and ECE 383

CS435 Computer Graphics

Hours 3

Fundamentals of interactive 3-D computer graphics, including modeling and transformations, viewing, lighting and shading, mapping methods, graphics pipeline, shading languages, and interaction techniques. Programming projects are required.

Prerequisite(s): CS 300, CS 301 and ECE 383

CS438 Computer Comm & Networks

Hours 3

The study of the issues related to computer communications. Topics include physical topologies, switching, error detection and correction, routing, congestion control, and connection management for global networks (such as the Internet) and local area networks (such as Ethernet). In addition, network programming and applications will be considered.

Prerequisite(s): CS 300, CS 301 and ECE 383

CS442 Cryptography

Hours 3

This course will cover algorithms and concepts in cryptography and data security. We will undertake an examination of algorithms and concepts in cryptography and data security, such as symmetric ciphers, asymmetric ciphers, public-key cryptography, hash functions, message authentication codes, key management and distribution, etc.

Prerequisite(s): CS 300, CS 301 and ECE 383

CS443 Digital Forensics

Hours 3

Digital Forensics is an area of study that is rapidly growing in importance and visibility. It involves preserving, identifying, extracting, documenting and interpreting digital data. Though sometimes misunderstood, digital forensics is like other types of investigation. With the continuous rise of computer-related incidents and crimes, and the increased emphasis on homeland defense in this country, there is a growing need for computer science graduates with the skills to investigate these crimes. This course will introduce the topics of computer crime and digital forensics. Students will be required to learn different aspects of computer crime and ways in which to uncover, protect and exploit digital evidence.

Prerequisite(s): CS 300, CS 301, and ECE 383

CS444 Software Security

Hours 3

This course is an introduction to software security principles and practices. Topics for this course will include but not be limited to security architectures, defensive programming, web security, secure information flow, and common software vulnerabilities.

Prerequisite(s): CS 300, CS 301, and ECE 383

CS445 Software Reverse Engineering

Hours 3

Software Reverse Engineering is an area of study that is rapidly growing in importance and visibility. This course will reveal to students the challenges of monitoring and understanding software systems. During the course students will become familiar with the practice of software reverse engineering files by utilizing static and dynamic techniques, and methods in order to gain an understanding as to what impact a file may have on a computer system.

Prerequisite(s): CS 300, CS 301, and ECE 383

CS448 Network Security

Hours 3

Concepts concerning network security, including an examination of network security concepts, algorithms, and protocols.

Prerequisite(s): CS 300, CS 301 and ECE 383

CS451 Data Science

Hours 3

This course introduces fundamental concepts & techniques in data science as well as develops practical skills for data analysis in real-world applications. Given the multi-disciplinary nature of data science, the course will primarily focus on the advantages and disadvantages of various methods for different data characteristics, but will also provide some coverage on the statistical or mathematical foundations. Topics to cover include data preprocessing, data exploration, relationship mining, prediction, clustering, outlier detection, deep learning, spatial and spatiotemporal data analysis, text data analysis, and big data.

Prerequisite(s): CS 300, CS 301, MATH 237, (MATH 355 or GES 255), ECE 383

CS452 Information Retrieval

Hours 3

This course is an introduction to information retrieval principles and practices. The course will cover several aspects of Information Retrieval including; indexing, processing, querying, and classifying data. Also, retrieval models, algorithms, and implementations will be covered. Though the class will focus primarily on textual data, other media including images/videos, music/audio files, and geospatial information will be addressed. Topics for this course will include but not be limited to: text processing and classification, web search development techniques, and document clustering.

Prerequisite(s): CS 300, CS 301, ECE 383

CS455 Social Media Data Analytics

Hours 3

The world is experiencing rapid growth in the amount of published data which come from different sources, including Social Media platforms. The availability of programming interfaces to these platforms allows for near real-time processing of these data for various purposes. This course will reveal to students the inherent challenges of analyzing Social Media data and introduce tools and techniques that are available to address them.

Prerequisite(s): CS 300, CS 301, and ECE 383

CS460 Intro to Autonomous Robotics

Hours 3

Issues involved with the implementation of robot control software including motion, kinematics, simulation testing, sensor incorporation and unmodeled factors.

Prerequisite(s): CS 300, CS 301 and ECE 383

CS461 Brain Computer Interface

Hours 3

This course involves the exploration of new forms of Human-Computer Interaction (HCI) based on passive measurement of neurophysiological states (cognitive and affective). These include the measurement of cognitive workload and affective engagement.

Prerequisite(s): CS 300, CS 301, and ECE 383 or permission of instructor for non-CS majors

CS465 Artificial Intelligence

Hours 3

The advanced study of topics under the umbrella of artificial intelligence including problem solving, knowledge representation, planning and machine learning.

Prerequisite(s): CS 300, CS 301 and ECE 383

CS470 Computer Algorithms

Hours 3

Construction of efficient algorithms for computer implementation.

Prerequisite(s): CS 300, CS 301 and ECE 383

CS475 Formal Languages & Machines

Hours 3

Regular expressions and finite automata. Context free grammars and pushdown automata. Recursively enumerable languages and the Turing machine. The Chomsky hierarchy.

Prerequisite(s): CS 300, CS 301 and ECE 383

CS480 Computer Simulation

Hours 3

Introduction to simulation and use of computer simulation models; simulation methodology, including generation of random numbers and variants, model design, and analysis of data generated by simulation experiments.

Prerequisite(s): CS 300, CS 301 and ECE 383

CS481 High Performance Computing

Hours 3

This course provides students with knowledge and fundamental concepts of high performance computing as well as hands-on experience of the core technology in the field. The objective of this class is to understand how to achieve high performance on a wide range of computational platforms. Topics include: optimizing the performance of sequential programs based on modern computer memory hierarchies, parallel algorithm design, developing parallel programs using MPI, analyzing the performance of parallel programs.

Prerequisite(s): (CS 300, CS 301 and ECE 383) or permission of instructor.

CS484 Machine Learning and Optimal Control

Hours 3

The design of computational agents based on machine learning and control theories; the interplay of theoretical methods from artificial intelligence and optimal control to form a bridge that benefits the students with interests in either field. These methods are collectively referred to as reinforcement learning, as well as approximate dynamic programming and neuro-dynamic programming. The course will involve applying concepts and methods in the context of psychology and neuroscience.

Prerequisite(s): CS 300 and CS 301 and ECE 383 and (GES 255 or MATH 355)

CS491 Special Topics

SP

Hours 3

Formal courses that cover new and innovative topics in computer science and do not yet have their own course numbers. Specific course titles will be announced from time to time.

Prerequisite(s): CS 300, CS 301 and ECE 383

Special Topics Course

CS492 Special Prob (Area)

SP

Hours 1-3

Reading and research course designed to meet the needs of individual students.

Prerequisite(s): CS 300, CS 301 and ECE 383

Special Topics Course

CS493 Special Problems in Software Engineering

SP

Hours 3

Reading, research, and development course designed to meet the needs of individual students. This course is specifically for students pursuing the Software Engineering Concentration.

Prerequisite(s): CS 300, CS 301 and ECE 383

Special Topics Course

CS494 CyberCorps Scholarship For Service Seminar

Hours 1

The CyberCorps® Scholarship for Service (SFS) Seminar is only for the students in the SFS@Bama program. This course will focus on important information necessary to be successful in a government cyber security career. The CyberCorps® SFS program prepares the next generation of cyber security employees to protect and defend the United States of America's infrastructure from threats, attacks, and potential intrusions. The course will include briefings, presentations, job related tasks, job fairs, and guest speakers.

CS495 Capstone Computing

W

Hours 3

A culminating capstone project course that integrates the skills and abilities throughout the curriculum into a comprehensive design and development experience for computer science majors. Writing proficiency is required for a passing grade in this course. A student who does not write with the skill normally required of an upper-division student will not earn a passing grade, no matter how well the student performs in other areas of the course.

Prerequisite(s): (CS403 or CS470 or CS475) and (CS407 or CS415 or CS416 or CS417 or CS420 or CS428 or CS434 or CS435 or CS438 or CS442 or CS443 or CS444 or CS445 or CS448 or CS451 or CS452 or CS455 or CS460 or CS461 or CS465 or CS480 or CS481) with grade of C- or higher

Writing

CS499 Undergraduate Thesis Research

Hours 3

Independent research and participation within a faculty member's research group. Permission of the supervising faculty member is required.

Prerequisite(s): (CS 403 or CS 470 or CS 475) Minimum Grade of C- AND three additional hours of 400-level CS classes