Computer Science, Bachelor of Arts Degree Program

Course Descriptions

Specific Degree Requirements
General Education: 30 credits
Foundations of Written Communication 6 Credits
Foundations of Society and Human Behavior 6 Credits
Foundations of Global Citizenship 6 Credits
Foundations of Humanities 6 Credits
Foundations of Science & Natural World 6 Credits
*For specific details on the Intellectual Foundations Program, visit the General Education Curriculum

Math and Science: 6 credits
Methods of Calculus (MAC 2233) 3 Credits
Prerequisite: MAC 1105
A descriptive and intuitive introduction to the methods and applications of differentiation and integration. Primarily for social science and business administration majors. This is a General Education course.

Introductory Statistics (STA 2023) 3 Credits
Prerequisite: MAT 1033 or MAC 1105 or MGF 1106 or MAC 2233
An introductory course covering descriptive statistics, probability, binomial and normal distributions, sampling distributions and hypothesis tests, and sampling procedures. Laboratory required. This is a General Education course.

Computer Science Core: 39 credits
Computer Programming and Data Literacy for Everyone (COP 1034C) 3 Credits
This course introduces students from outside the College of Engineering and Computer Science to computational thinking and the art of computer programming using Excel and Python. No prior programming background is required. This is a General Education course and an Academic Service Learning (ASL) course.

Foundations of Computing (COT 2004)
Prerequisite: None
This course provides students with basic understanding of foundational aspects of computer science and introduce a set of tools for computer science practice.

Introduction to Programming in Python (COP 2034) 3 Credits
This class is an introduction to programming using the Python language for students who have no prior programming experience. It introduces programming fundamentals, problem-solving methods, algorithm development, unit testing and debugging techniques. The course covers Python data types, control structures, functions, modules, exception handling, input/output, classes and elements of object-oriented programming.
Data Structures and Algorithms with Python (COP 3410) 3 Credits
Prerequisite: COP 2034 with minimum grade of "C"
This course is an advanced programming class that covers data structures and algorithm analysis using the Python programming language. The course covers various data structures (including arrays, linked lists, stacks, queues, trees) and abstract data types in the design and implementation of computer programs.

Introduction to Internet Computing (COP 3813) 3 Credits
Prerequisite: COP 3014
This course teaches students how to design web pages and develop websites at the introductory to intermediate level. The course is project oriented. Students are required to finish several Internet-based projects using the tools introduced in class.

Structured Computer Architecture (CDA 4102) 3 Credits
Prerequisite: CDA 3201C
A multilevel approach to computer architecture: microarchitecture level, instruction set architecture level, and operating system level. Introduction to parallel computer architectures.

Computer Operating Systems (COP 4610) 3 Credits
Prerequisites: CDA 3331C and COP 3530
An introduction to what makes up a digital computer operating system, includes developing an understanding of interrupts, interrupt handling, processes, process management, file and device management, and other features of control programs. A team design project is required.

Introduction to Database Structures (COP 3540) 3 Credits
Prerequisite: COP 3530
An introduction to the design, implementation and use of file managers and relational data base systems. Topics include secondary storage devices, hash and indexed file structures, and the relational data base language SQL. Programming assignments will be done in the C language and in SQL.

Principles of Software Engineering (CEN 4010) 3 Credits
Prerequisite: COP 3530
An introduction to the basic principles and practices of software engineering. Exposes students to a wide range of software engineering concepts and state-of-the-art technologies. Emphasis is placed on learning and practicing software engineering principles through team course project and gaining appreciation of “programming in the large.” Topics include both technical aspects and non-technical aspects of software engineering, such as software life cycle models, specification and design methods, implementation and testing issues, deployment and post maintenance. Students are required to complete a team project involving written and oral presentations and demonstrations.

Python Programming (COP 4045) 3 Credits
Prerequisite: COP 3530 with minimum grade of "C"
This course is an introduction to the Python programming language with applications to practical problem-solving involving data manipulation and analysis. The first part of the course focuses on teaching the basics of the Python language. Topics covered are data structures (lists, arrays, dictionaries, sets, comprehensions), functions, files and object-oriented language elements. In the second part of the course, students learn to apply advanced language features and methodologies in combination with third-party libraries for scientific computation to develop real-world applications.
Object-Oriented Design and Programming (COP 4331) 3 Credits  
Prerequisite: COP 3530  
Introduces the Java programming language and the main phases of the object-oriented development process, including requirements analysis, design and implementation. Focuses on object-oriented design principles and covers topics such as UML, design patterns, reflection, serialization, generic types and multithreading. Students collaborate on a software term project that involves the entire development cycle.

Software Engineering Project (CEN 4910) 3 Credits  
Prerequisite: CEN 4010  
Applies software engineering principles and practices taught in CEN 4010. Students work in teams to develop a software system, following a process similar to industry practices coupled with the software engineering method and theory. Students complete a team project involving written and oral presentation and demonstrations.

Mobile App Project (COP 4655) 3 Credits  
Prerequisites: CDA 3331C or COP 3813 with minimum grade of "C"  
Top-down design methodology for mobile phone-based application development using mobile platform operating system enabled by javascript. Integration of sensors, embedded boards, smart phone, cloud and data analytics. Project focus may vary dependent on student teams.

Applied Database Systems (COP 4703) 3 Credits  
Prerequisite: COP 3540  
Investigation of state-of-the-art facilities provided by object-relational database systems using Oracle as a vehicle. Java and the Java database interface, JDBC, are considered. Also, server-side web programming with dynamic SQL and CGI, PL/SQL, Java servlets, and JavaServer Pages (JSP) are considered. No prior knowledge of Java or web programming is assumed.

Computer Science Technical Electives: 18 credits  
To satisfy the computer science (CS) elective requirement, all students must take 18 credits chosen from Computer Science and Computer Engineering upper-division courses that are not in the above CS core. Certain 5000-level or 6000-level courses may be taken as CS electives. Students must see an advisor for a current list of elective courses. Students seeking a specialty may consider taking electives in an area of study.

Free Electives: 27 credits  
For Computer Science electives, a few suggested areas of concentration follow.

Internet Technology†  
Introduction to Data Communications (CNT 4104) 3 Credits  
Prerequisite: COP 3530 and CDA 3331C  
To develop an understanding of the various aspects of data communications and computer networking systems. Topics include data transmission, multiplexing, switching, Ethernet and WiFi, Internet protocols and architecture, Internetworking, transport and application layer protocols.
Foundations of Cybersecurity (CNT 4403) 3 Credits
Prerequisite: COP 4610
Overview of technical aspects of data security with emphasis on the Internet. Attacks and defenses. The design of secure systems.

Mobile App Projects (COP 4655) 3 Credits
Prerequisites: CDA 3331C or COP 3813 with minimum grade of "C"
Top-down design methodology for mobile phone-based application development using mobile platform operating system enabled by javascript. Integration of sensors, embedded boards, smart phone, cloud and data analytics. Project focus may vary dependent on student teams.

Applied Database Systems (COP 4703) 3 Credits
Prerequisite: COP 3540
Investigation of state-of-the-art facilities provided by object-relational database systems using Oracle as a vehicle. Java and the Java database interface, JDBC, are considered. Also, server-side web programming with dynamic SQL and CGI, PL/SQL, Java servlets, and JavaServer Pages (JSP) are considered. No prior knowledge of Java or web programming is assumed.

Cybersecurity†
Cyber Physical System Security (CIS 4213) 3 Credits
Prerequisite: COP 3530 or permission of instructor
This course exposes students to fundamental aspects of security regarding cyber-physical systems, so they may apply the techniques to tackle a broad scope of current and future security challenges. Students study several tools and techniques commonly used by hackers to compromise a system. Then they learn methods to defend against these attacks.

Operating Systems Security (CIS 4367) 3 Credits
Prerequisite: COP 4610 or permission of instructor
This course is an introduction to the secure design of operating systems. Through hands-on experimentation, students gain an understanding of how hardware and software constructs protect modern operating systems.

Foundations of Cybersecurity (CNT 4403) 3 Credits
Prerequisite: COP 4610
Overview of technical aspects of data security with emphasis on the Internet. Attacks and defenses. The design of secure systems.

Network and Data Security (CNT 4411) 3 Credits
Prerequisites: COP 3530 and COT 4400 or permission of instructor
This course is an introduction to the broad field of computer, data and information security. It covers both computer security (e.g., security policies, access control, viruses, etc.) and network security (e.g., protocols for maintaining confidentiality for email or for secure web transactions), along with relevant background in basic cryptography (e.g., encryption/digital signatures).
Data Science†

Introduction to Deep Learning (CAP 4613) 3 Credits
Prerequisite: COP 3530 with minimum grade of "C"
This course teaches students basic concepts of deep learning. The course covers three major topics, including statistical machine learning, neural network structures and deep neural networks. Detailed topics include introduction to machine learning algorithms, perceptron learning, multi-layer neural networks, and deep neural network structures and learning algorithms. The lectures include practical sessions dedicated to the implementation and programming of deep learning frameworks.

Introduction to Artificial Learning (CAP 4630) 3 Credits
Prerequisite: COP 3530 or ISM 4234
A broad introduction to the core concepts of artificial intelligence, including knowledge representation, search techniques, heuristics and deduction. Programming in Lisp and possibly other software environments.

Introduction to Data Mining and Machine Learning (CAP 4770) 3 Credits
Prerequisites: COP 3530 and (STA 4821 or STA 2023 or equivalent)
This course deals with the principles of data mining. Topics include machine learning methods, knowledge discovery and representation, classification and prediction models.

Introduction to Data Science and Analytics (CAP 4773) 3 Credits
Prerequisites: COP 3530 and STA 4821 with minimum grades of "C" or permission of instructor
This course deals with the principles of data science and analytics. Topics covered include statistical analysis of data, measurement techniques and tools, machine learning methods, knowledge discovery and representation, classification and prediction models.

† Some of the elective courses in the list may need prerequisites that are not part of the program. Students must ensure that they have the prerequisites for the selected courses.

The following courses may be taken as computer science electives:

Topics in Computer Science (COT 4930) 1-3 Credits
Prerequisite: Permission of instructor
Study relating to specialized topics

Topics in Computer Science (COT 5930) 1-3 Credits
Prerequisite: Permission of instructor
Study relating to specialized topics.

Directed Independent Study (COT 4900) 1-3 Credits
Prerequisite: Permission of instructor
Study of topics relating to the special needs and interests of individual students.