

COMPUTER AND INFO SCIENCE (CCIS)

CCIS 100 Info. Technology & Comp. App. 3 Credits

A hands-on introduction to personal computer concepts and productivity applications. Computer concepts include basic architecture, the Internet, and operating systems. Productivity applications include word processing, spreadsheets, graphical presentations and relational database usage.

CCIS 100WE Info. Tech. & Computer Applica 3 Credits

A hands-on introduction to personal computer concepts and productivity applications. Computer concepts include basic architecture, the Internet, and windows. Productivity applications include word processing, spreadsheets, presentation, graphics, and relational data base usage.

CCIS 101 Introduction to Computers 3 Credits

An introductory course providing a theoretical overview of the primary topics in Computer Science including hardware concepts, operating systems, programming, data structures, database systems, artificial intelligence, complexity theory, networking security and a discussion of ethics.

CCIS 103 Scientific Comp. for Simu,Ana 3 Credits

An introduction to programming concepts for biology, chemistry, mathematics, and physics majors. The course introduces the scientific programming and analysis tool Matlab. Co-requisite: 103L.

CCIS 103L Scientific Comp. for Simu Lab 1 Credit

A hands-on guided experience in developing Matlab programs. (Must be taken while completing CCIS 103) Corequisite: CCIS 103

CCIS 105 Programming Principles I 3 Credits

An introduction to the fundamental concepts of problem solving focusing on programming oriented solutions and object oriented paradigm. Students are encouraged to be enrolled in or to have already completed CMAT 111, Calculus I. Guided Laboratory is required. Co-requisites: CCIS 101 and CCIS 105L.

CCIS 105L Programming Principles I Lab 1 Credit

A hands-on guided problem-solving experience that supplements CCIS 105. Co-requisite: CCIS 105.

CCIS 106 Programming Principles II 3 Credits

A continuation of CIS 105 utilizing a modern programming language. Guided Laboratory is required. Prerequisite: CCIS 105, Co-requisite: CCIS 106L.

CCIS 106L Programming Principles II Lab 1 Credit

A hands-on guided programming experience in developing programs. Co-requisite: CCIS 106

CCIS 121 Introduction to Computer Sys 3 Credits

Introductory study of logical organization of computer systems. Topics include input-output processing, memory and processor structures and basic logic circuit design. Assembly language programming will be emphasized. Prerequisite: CCIS 101.

CCIS 123 Data Structures 3 Credits

Introductory study of data structures, including record, file, linked structures, lists, stacks, queues, graphs and trees. Guided laboratory is required. Prerequisite: CIS 106. Co-requisite: CCIS 123L.

CCIS 123L Data Structures Lab 0 Credits

A hands-on guided development programming experience using Java to implement aspects of the study of data structures. Co-requisite: CCIS 123.

CCIS 200 Prog.Mobile Devices Non-Majors 3 Credits

A continuation of CCIS 106 emphasizing advanced Java programming concepts and an introduction to procedural concepts utilizing the C ++ language. Guided laboratory. Prerequisite: CCIS 106, Co-requisite: CCIS 200L.

CCIS 200L Advanced Programming Lab 0 Credits

A hands-on guided development programming experience using Java and C++. Co-requisite: CCIS 200.

CCIS 223 Data Structures 3 Credits

Introductory study of data structures, including record, file, linked structures, lists, stacks, queues, graphs and trees. Guided laboratory is required. Prerequisite: CIS 106, Corequisite: CCIS 123L.

CCIS 223L Data Structures Lab 1 Credit

A hands-on guided development programming experience using Java to implement aspects of the study of data structures. Corequisite: CCIS 123.

CCIS 227 Discrete Structures 3 Credits

An introductory study of propositional and predicate systems, including topics such as standard forms, resolution principle and refutation algorithms, computability, Finite State Automata and Turing Machines, with specific reference to applications in Computer Science. Prerequisite: CMAT 311.

CCIS 229 Web Site Design & Development 3 Credits

Introduction to design and development of applications for the World Wide Web. This course will emphasize client-side programming with a brief introduction to server-side applications. This course will provide the student with an introduction to the main concepts of the design and development of web-base applications. The focus will be on learning and understanding the fundamental concepts. Prerequisite: CCIS 101.

CCIS 253 Intro. to Comp. Sim/Analysis 3 Credits

An introduction to programming concepts for biology, chemistry, mathematics, and physics majors. The course introduces the scientific programming and analysis tool Matlab. Co-requisite CCIS 253; pre-requisite CMAT 111 or 107.

CCIS 253L Intro. to Comp. Sim/Analy(Lab) 1 Credit

CCIS 301 Advanced Programming 3 Credits

This course builds on the skills learned in CCIS 105/106 and CCIS 123. This course builds on basic programming constructs discussed in CCIS 105/CCIS 106, i.e., variables, loops, methods, conditional statements, arrays and introductory object oriented concepts. In this course the concentration will be on the following major topics: (1) object-oriented programming, (2) procedural abstraction, (3) data abstraction, and (4) program modularity and state information. Java will be the language to illustrate these topics.

CCIS 321 Software Engineering 3 Credits

Introductory study of large software development issues, including requirements analysis, specification, design, testing and maintenance. Prerequisites: CCIS 123 and CCIS 200. Co-requisite: CCIS 474.

CCIS 329 Rich Internet Applications 3 Credits

Introduction to internet based applications, often called Rich Internet Applications (RIA). Topics include server and client technologies, server side programming. Topics include Common Gateway Interface (CGI), server pages, database access, and AJAX. Prerequisite: CCIS 229 and CCIS 374.

CCIS 371 Computer Algorithms 3 Credits

Introductory study of algorithm design, using appropriate data structures. Topics include algorithms for sorting, searching and graph traversals and complexity issues. Prerequisite: CCIS 223

CCIS 372 Computer Architecture 3 Credits

Study of logical organization of computer hardware and functional components using a simulation programming language. Prerequisite: CCIS 121 and CCIS 223

CCIS 374 Database Systems 3 Credits

Study of basic concepts of databases, including data models, query processing and other topics of interest. Prerequisite: CCIS 223

CCIS 375 Intro to Artificial Intel 3 Credits

Introductory study of intelligent problem solving and search algorithms, inference systems, machine intelligence and knowledge organization. Prerequisite: CCIS 223.

CCIS 400 Fundamen Geographic Inform Sys 3 Credits

This course will provide students with the theoretical concepts and practical experience to the field of Geographical Information Systems. Emphasis will be placed on concepts and spatial reasoning of the analysis techniques. GIS functionality, methodology for implementing the technology, and its potential usefulness in numerous disciplines will be covered in this course. Prerequisites: None.

CCIS 412 Intro Image Proc & Comp Vision 3 Credits

Study of theories of image manipulation and feature extraction. Topics include pixel transformation, filters, edge-detection, color spaces and corrections, and compression. Corequisite: CCIS 412L. Prerequisite: CCIS 472

CCIS 413 Introduction to Robotics 3 Credits

Topics include feature extraction, pattern recognition, spatial recognition, fast color tracking, and stereoscopic vision. Corequisite: CCIS 411L. Prerequisite: CCIS 472

CCIS 416 Intro High-performance Computi 3 Credits

This course provides an introduction to high performance computing as it relates to scientific computing. The course addresses topics related to accessing high performance computing resources, developing applications for those resources, and executing developed applications. The lectures and presentations are designed to provide knowledge and experiences to students that serve as a foundation for continued learning of high performance computing.

CCIS 422 Intro to Computer Forensics 3 Credits

The objective of computer forensics is to pertain legal evidence found in computer files and storage media. Topics include methods and tools to recover deleted or distorted data, encryption, intrusion detection, and analysis of log files.

CCIS 431 Cybersecurity I 3 Credits

Provides a comprehensive overview of the concepts relevant to information security. Concepts include development of security policy, malicious code, general purpose protection of resources, trusted systems, and cryptography. Prerequisite: CCIS 223.

CCIS 432 Cybersecurity II 3 Credits

Every aspect of modern life from business and financial transactions, education and research, medicine, to the utility infrastructure, is predicated on the functioning of the internet and its constituent networks. The power of bad actors to cause harm to computer networks is enormous, and accelerating. The potential for profit through these network crime is estimated to be \$100 billion industry, and the nexus between criminal elements, governments and non-state actors has become another facet of the hyperconnected globe that needs to be combated. The Cybersecurity II class builds on the concepts introduced in Cybersecurity I. It will introduce the underlying principles of building secure and trustworthy computer networks. This course will provide a deep understanding of how modern networks are designed, their weak points, and both traditional and future approaches to make them resilient.

CCIS 433 Graph Theory and Network Analy 3 Credits

The course is an interdisciplinary introduction to the emerging science of networks as complex systems and their applications. Topics to be covered include the mathematics of networks (graph theory); network topology and community structure; data analysis and applications. This course will also introduce students to the area of network analytics, where we will study computational and statistical methods of network science, as well as applications from various disciplines. In this course, students will learn how GPS systems find shortest routes, how engineers design ICs, how biologists assemble genomes, why a political map can always be colored using a few colors. Students will learn about the ongoing research in the field and apply the acquired knowledge to the analysis of real networks. As prerequisites we assume knowledge of college level math, and satisfactory completion of the Data Structures course

CCIS 434 Machine Learning 1 3 Credits

Machine learning is a field in the Computer Sciences utilizing technologies such as statistics, linear algebra, optimization, and Artificial Intelligence. It is used to create automated systems rapidly evaluate large volumes of data quickly to make predictions or decisions without human intervention. ML is becoming pervasive, with applications to the home and for numerous industry segments that span diverse domains including manufacturing, finance, health care etc. This course meets the growing need for a workforce skilled in artificial intelligence, and machine learning. It combines the theory and practice of Machine Learning so that the student has the background knowledge and tools to compete in this rapidly growing field. In this course, algorithms and approaches are presented as building blocks to construct larger systems. Students are expected to have successfully completed CIS 474: Introduction to Databases, and have knowledge of Python.

CCIS 471 Intro. to Computer Algorithms 3 Credits

Introductory study of algorithm design, using appropriate data structures. Topics include algorithms for sorting, searching and graph traversals and complexity issues. Prerequisites: CCIS 123 and CCIS 200.

CCIS 472 Intro to Computer Architecture 3 Credits

Study of logical organization of computer hardware and functional components. Prerequisites: CCIS 223.

CCIS 473 Intro to Operating Systems 3 Credits

Study of basic operating systems concepts, including multiprogramming, resource management and implementation. Prerequisites: CCIS 123 and CCIS 200.

CCIS 474 Intro. to Database Systems 3 Credits

Study of basic concepts of databases, including various models, query processing and other topics of interest. Prerequisites: CCIS 223.

CCIS 475 Intro to Artificial Intell. 3 Credits

Introductory study of intelligent problem solving and search algorithms, inference systems, machine intelligence and knowledge organization. Prerequisites: CCIS 223.

CCIS 476 Programming Langs. & Compilers 3 Credits

An overview of syntactic and semantic aspects of programming languages, including basic concepts of parsing, translation, and execution of procedural languages. Prerequisites: CCIS 123, CCIS 200.

CCIS 482 Intro to Computer Info Systems 3 Credits

Study of methodologies for designing and implementing management information systems with emphasis on system development, implementation and evaluation. Prerequisite: CCIS 123 and CCIS 200.

CCIS 490 Practical Training 3 Credits

Training with industry and government laboratories via internship and cooperative education programs. To receive credit for this course, a student must complete at the equivalent of 6 months of full-time employment with the same employer, receive a satisfactory performance rating from the employer, and write a paper describing in reasonable detail the work environment, activities, responsibilities involved, and knowledge and experience gained from the employment. Prerequisite: Approval of the Department Chair.

CCIS 491 Information Systems Research 3 Credits

Prerequisite: Approval of the Department Chair.

CCIS 493 Senior Design Project 3 Credits

Prerequisite: Approval of the Department Chair.

CCIS 499 Senior Design Project 3 Credits

A one-semester course culminating in a design project acceptable to the department. This course will be managed by a collection of faculty members offering a variety of project environments for the students. Prerequisites: Consent of Advising Professor

CCIS 511 Data Communications 3 Credits

This course examines computer networks and data communication. The topics to be covered (tentatively) include: Network services and applications: DNS, HTTP, SMTP, peer-to-peer systems Network transport architectures, TCP, UDP, TCP congestion control Routing and forwarding, intra-domain and inter-domain routing algorithms Link layers and local area networks, Ethernet, WiFi, and mobility, Multimedia communications and quality of service, Network measurement, inference, and management, Network security, Network experimentation and performance analysis, Protocol verification.

CCIS 513 Local Area Networks 3 Credits**CCIS 516 Data Analytics for Cybersecurity 3 Credits**

Data Analytics for Cybersecurity is an introductory survey of techniques used for the analysis of very large data sets in the cybersecurity domain. Data Analytics can provide insight into the very large data sets being created by the use of computers and networks. Using Data Analytics and the closely related topic of Machine Learning we can develop of computer programs that can learn and change without programmer intervention. This course aims at practical introduction to the topic while introducing the underlying mathematical and statistical techniques that underpin the analysis. Students will gain practical experience applying these techniques across a wide variety of applications in the cybersecurity domain. This course involves a significant level of hands on project work. Students are expected to be able to reason and solve problems themselves.

CCIS 521 Information Systems Design 3 Credits**CCIS 523 Human-Computer Interface 3 Credits****CCIS 529 JAVA Programming 3 Credits**

An introduction to the design, creation, and maintenance of web pages and websites. Students learn how to critically evaluate website quality; learn how to create and maintain quality web pages; learn about web design standards and why they are important and learn to create and manipulate images. Students gain the skills and project-based experience needed for entry into web design and development careers. You will be able to use a variety of strategies and tools to create websites. Students will develop awareness and appreciation of the many ways that people access the web and will be able to create standards-based websites that accessible by the full spectrum of web access technologies.

CCIS 533 Graph Theory and Network Ana 3 Credits

The course is an interdisciplinary introduction to the emerging science of networks as complex systems and their applications. Topics to be covered include the mathematics of networks (graph theory); network topology and community structure; data analysis and applications. This course will also introduce students to the area of Network analytics, where students will study computational and statistical methods of network science, as well as applications from various disciplines. In this course, we will learn how GPS systems find shortest routes, how engineers design ICs, how biologists assemble genomes, why a political map can always be colored using a few colors. Students will learn about the ongoing research in the field and apply the acquired knowledge to the analysis of real networks. As prerequisites we assume knowledge of college level math, and satisfactory completion of the Data Structures course...

CCIS 534 Machine Learning 1 3 Credits

Machine learning is a field in the Computer Sciences utilizing technologies such as statistics, linear algebra, optimization, and Artificial Intelligence. It is used to create automated systems rapidly evaluate large volumes of data quickly to make predictions or decisions without human intervention. ML is becoming pervasive, with applications to the home and for numerous industry segments that span diverse domains including manufacturing, finance, health care etc. This course meets the growing need for a workforce skilled in artificial intelligence, and machine learning. It combines the theory and practice of Machine Learning so that the student has the background knowledge and tools to compete in this rapidly growing field. In this course, algorithms and approaches are presented as building blocks to construct larger systems. Students are expected to have successfully completed CIS 474: Introduction to Databases, and have knowledge of Python.

CCIS 571 Intro. to Algorithms 3 Credits

Study of algorithm design, using appropriate data structures. Topics include algorithms for sorting, searching and graph traversal and complexity issues. Prerequisite: CCIS 271, or approval of department.

CCIS 572 Intro.to Computer Architecture 3 Credits

Study of logical organization of computer hardware and functional components. Prerequisites: CCIS 105, CCIS 106, CCIS 121, CCIS 200, CCIS 271.

CCIS 574 Intro. to Database Systems 3 Credits**CCIS 671 Algorithm Design & Analysis 3 Credits**

Study of algorithm design and analysis techniques. Topics include designing algorithms for sorting, order statistics, set manipulation, graphs, fast Fourier transforms and mathematical manipulations. An introduction to NP completeness theory. Prerequisites: CCIS 371, CCIS 571.

CCIS 672 Computer Organization 3 Credits

Advanced study of logical organization of functional components of computers, including processors, control units and memory. Topics also include interconnection networks, memory hierarchies, array and pipeline machines. Prerequisites: CCIS 372, CCIS 572.

CCIS 673 Operating Systems Design 3 Credits

Advanced study of major issues in operating systems including resource management, concurrent programs and duality of operating systems. Prerequisites: CCIS 373, CCIS 573.

CCIS 674 Database Design 3 Credits

Advanced study of database design including data models, relational interfaces, relational database design, query optimization, crash recovery and concurrency control. Concepts are reinforced via design projects. Prerequisites: CCIS 374 or CCIS 574.

CCIS 675 Artificial Intelligence 3 Credits

Advanced study of problem solving, theorem proving, knowledge representation, expert systems, learning and natural language processing. Prerequisite: CCIS 375 or CCIS 575.

CCIS 687 Intelligent Machines/Robotics 3 Credits

CCIS 691 Software Engineering I 3 Credits
Study of the concept of software process as a framework for developing software systems with emphasis on various management issues. Topics in alternative models for the software process. Prerequisite: CCIS 321 or graduate standing.

CCIS 702 VLSI Design 3 Credits

Study of VLSI systems design, emphasizing quantitative characterization, analysis and computer techniques. Prerequisite: CCIS 701.

CCIS 709 Digital Signal Processing 3 Credits

Study of signals in a digital representation and the processing methods of these signals. Topics include time-series analysis, transformations, and filters. Co-requisite: CCIS 709L

CCIS 721 Data Security 3 Credits

Provides a comprehensive overview of the concepts relevant to information security. Concepts include development of security policy, malicious code, general purpose protection of resources, trusted systems, and cryptography.

CCIS 722 Computer Forensics 3 Credits

The objective of computer forensics is to extract, analyze and report on data found in computer files and storage media. Topics include methods and tools to recover deleted or distorted data, encryption, intrusion detection, and analysis of log files.

CCIS 724 Information Assurance 3 Credits

Study of commercial off-the-shelf and research tools relevant to information assurance. Topics include: Secure Os, Security Protocols, Cryptography, Network Security, Malware Reverse Engineering.

CCIS 801 Topics in Computer Science 3 Credits

Advanced study of a topic of current interest in the department, leading to a publishable technical report. Prerequisite: consent of the department. Note: May be repeated for credit.

CCIS 805 Research/Design Proj.Data Base 3 Credits

Prerequisite: CCIS 674

CCIS 815 Research Design Info. Systems 3 Credits

Prerequisite: CCIS 721.

CCIS 821 Thesis Research 1-3 Credits**CCIS 895 Graduate Seminar 1 Credit**

Graduate Seminar course is intended for the student to explore in research topics in their area of specialization with view towards developing the dissertation topic required for the award of the Ph.D. This one credit hour course is taken every spring, at least three times during the course of study.

CCIS 899 Research in Cybersecurity 1-6 Credits

Research in Cybersecurity course is intended for the students to research advanced topics in Cybersecurity. Students will enroll in this variable 1-6 credit course (hours) to explore the current state of the art topics in cybersecurity with view towards developing the dissertation topic required for the award of the Ph.D. Degree. This course may be taken multiple times during the course of study.

CCIS 900 Research in AI & Robotics 1-6 Credits

Research in AI & Robotics course is intended for the student to research advanced topics in AI and Robotics. Students will enroll in this variable 1-6 credit course (3 hours) to explore the current state of the arts topics in AI & Robotics with view towards developing the dissertation topic required for the award of the Ph.D. Degree. This course may be taken multiple times during the course of study.

CCIS 901 Dissertation Consultation 1 Credit

Dissertation Consultation course is intended for the students in the Ph.D. program. Students will enroll in this one hour course to consult with faculty on the dissertation required for the award of the Ph.D. Degree.

CCIS 902 Dissertation Research 3 Credits

Dissertation Research course is intended for the students in the final semester of the Ph.D program. Students will enroll in this three credit hour course (3 hours) to complete the dissertation required for the award of the Ph.D. Degree.