COMPUTING TECHNOLOGY & INFORMATION SYSTEMS (CTIS)

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The Bachelor of Science in Computing Technology & Information Systems prepares students for professions in computing and informatics and is an excellent second major for students who wish to develop connections between current information technology and their other disciplinary work. The two introductory courses, Introduction to Computer Programming and

Management Information Systems, provide a foundation in computer science concepts with applications in programming and the application of information technology concepts and practices to problems faced by business and organizations.

In the 300 level courses, students will develop working knowledge of operating systems, networking, and database concepts as well as the ability to analyze and design solutions for larger problems that can be addressed by information technology. Elective courses allow students to explore other advanced topics and the use of information technology in other disciplines. All students take a capstone course to develop a team-based project that incorporates all components of learning in the program.

The Bachelor of Science in Cyber and Network Security provides students with both the fundamentals of cyber security theory and practice in conjunction with core information technology concepts in networking, operating systems, and computer forensics. Students select electives that allow exploration of additional cyber and network security topics or connections to topics in criminal justice or philosophy.

The required internship is an important component of both the majors in Computing Technology and Information Systems and in Cyber and Network Security. Through the internship and large-scale projects in many courses (semester-long in the case of the CTIS Capstone course), students take ownership of how they apply their learning to develop a portfolio of experience valued by employers and graduate schools.

Degrees Offered

The Bachelor of Science is offered in computing technology and information systems and cyber and network security.

- Computing Technology and Information Systems Major (https://catalog.guilford.edu/catalog/academic-departments-majors/computing-technology-information-systems/computing-technology-information-systems/)
- Cyber and Network Security Major (https://catalog.guilford.edu/catalog/academic-departments-majors/computing-technology-information-systems/cyber-network-security/)

- Computing Technology & Information Systems (https://catalog.guilford.edu/catalog/academic-departments-majors/computing-technology-information-systems/computing-technology-information-systems-minor/)

- Cyber and Network Security (https://catalog.guilford.edu/catalog/academic-departments-majors/computing-technology-information-systems/cyber-network-security-minor/)

CTIS 104. Elementary Electronics (PHYS 104). 4.
Introduces students to the behavior of the fundamental building blocks of modern electronic devices and the underlying scientific principles that make these devices work. Topics will be derived from analog and digital electronics and include resistance, capacitance, diodes, signal filtering, positive and negative feedback, operational amplifiers, Boolean logic, logic gates, and digital to analog conversion. This course is designed for the general student population (but not physics majors and physics minors) who are interested in exploring the fundamentals of electronics. Prerequisite: Successful completion of the quantitative literacy requirement. Spring. Fulfills natural science/mathematics requirement (1998 2019). Offered in alternate years.

CTIS 150. Special Topics. 1-8.

CTIS 210. Introduction to Computer Programming. 4.
Exploration of computer programming with emphasis on scientific, educational and entertainment applications. Topics include programming fundamentals, user interaction, graphics display, data processing, problem solving and artificial intelligence. Prior programming experience not required.
Prerequisite: Background in using computers at the level of an introduction to computers course or equivalent experience, and mathematics background at the level of college algebra. Fullfills numeric/symbolic engagement (2019).

CTIS 221. Fundamentals of Cyber Security (JPS 221). 4.
The percentage of crimes which utilize computers and networks has been increasing over the past 20 years. This course introduces students to the collection, preservation, presentation and preparation of computer- and network-based evidence for the purpose of corporate investigation and criminal law enforcement, activities that define the central roles of computer and network forensic practitioners. Students will be introduced to cybercrime and the tools available to them to be able to appropriately investigate cybercrime. Network intrusions, foot printing, computer numbering, financial crimes and malware are among the topics to be discussed.

CTIS 230. Web Design and Development. 4.
This course introduces students to the designing and development of web pages using a variety of front-end web technology. Students will learn how to organize information on web pages using Hypertext Markup Language (HTML); create web designs using Cascading Style Sheets (CSS); and create dynamic behaviors using JavaScript. Web design concepts will be employed to create web pages that are aesthetically pleasing and user friendly. Students will learn how to use modern web development tools to efficiently create, test and validate web pages across multiple browser environments. Students will apply web design techniques and web development technologies in creating a small, dynamic website.

CTIS 243. Management Information Systems (BUS 243). 4.
Introduction to the management of computing and information resources in organizations. Course topics include computer hardware and software, telecommunications, database management, electronic commerce and business intelligence. Students explore information technology and business problems and use spreadsheet and database applications to create effective solutions.
Prerequisite: Background in using computers at the level of an introduction to computers course or equivalent experience. Fulfills business and policy studies requirement (1998). Social/ behavioral science requirement (2019).

CTIS 250. Special Topics. 1-8.

CTIS 260. Independent Study. 1-8.

CTIS 274. Digital Graphic Design (THEA274). 4.
Introduction to basic principles and elements of graphic design, form/symbol development, color theory and typography. Provides practical experience in essential software processes and procedures including Adobe Illustrator, Photoshop and InDesign. Create digital designs while engaging in critiques and group discussions. Fulfills arts requirement (1998). Arts/humanities requirement (2019).

CTIS 290. Internship. 1-8.

CTIS 310. Advanced Computer Programming. 4.
A continuation of the study of program development begun in CTIS 210. The main areas of study are advanced programming features such as recursion and dynamic memory; a further investigation into object-oriented principles such as object-oriented design, inheritance and polymorphism; an introduction to simple data structures ? lists, queues, stacks and binary trees; and an introduction to algorithm analysis using searching and sorting algorithms.
Prerequisite: CTIS 210.

CTIS 320. Seminar in Cyber Security. 3.
This course focuses on ethical issues faced by security professionals, including those related to networks, intellectual property, privacy, security, reliability, liability, data collection and storage, and relevant current laws. This seminar examines the ethics of cyber security technologies and relevant current laws, in terms of the often-competing priorities of governments, corporations and citizens. This seminar also covers the professionalism for cyber and network security administrators such as job searching, interviewing skills and resume building. These topics are covered through readings, video/ multimedia, writings, discussions and presentations.
Prerequisite: CTIS/JPS 221.

CTIS 321. Operating Systems. 4.
Evaluation of computer operating systems and their basic organization. Includes concurrent programming and synchronization techniques such as locks, barriers, semaphores and monitors. Addresses message passing, memory management, interrupts and file systems. Students will examine the coding used to implement the algorithms and learn to modify these structures to satisfy the specific requirements of a project.
Prerequisite: CTIS 210 or CTIS 221.

CTIS 322. Networking Computers. 4.
In-depth exposure to the terms, concepts and configurations that have historically been, are currently being, and may in the future be used to accomplish inter-computer communication. Lab exercises focus on the installation of operating systems and configuration of their networking components, design and construction of examples of computer networks, and experimentation with performance and configuration of those networks.
Prerequisite: CTIS 321.

CTIS 331. Information Design. 4.
Theory and application of human-computer interaction, information architecture, usability and markup languages. Examination of communication and information transfer from the perspectives of both the provider and the consumer. Role of test, video, interactivity and other methods of providing information in computer and network-based settings.

CTIS 342. Database Systems. 4.
Introduction to theory and practice of enterprise-level relational database systems. Using a database engine, students will learn the principles of entity relationship modeling and normalization. By modifying a database in a project, students will learn how to create queries using SQL, triggers, stored procedures, cursors, forms and reports.
Prerequisite: CTIS 210 and BUS 243 or CTIS 243.

CTIS 345. Systems Analysis and Design. 4.
This course will provide a prospective systems analyst or system architect the techniques used in the analysis, design and implementation of computer-based information systems. The course will enable students to study user requirements, create requests for proposals, prepare project plans, address systems project scope, conduct feasibility studies by providing an understanding of the systems study, project evaluation, planning and systems design phases of the system life cycle.
Prerequisite: CTIS 210 and CTIS 243.

CTIS 350. Special Topics. 1-8.

CTIS 360. Independent Study. 1-8.

CTIS 370. Cyber and Network Security. 4.
The objective of this course is to build on the fundamental concepts of cyber and network security. Students will experience multiple cyber security technologies, processes, and procedures; learn how to analyze the threats, vulnerabilities and risks present in these environments; and develop appropriate strategies to mitigate potential cyber security problems. Topics include security risk assessment and management; policies, procedures and guidelines for information security plans; IT security controls and technologies, security standards, compliance, and cyber laws; IT auditing; cyber insurance strategies; and emerging trends.
Prerequisite: CTIS/JPS 221.

CTIS 371. Computer Forensics. 4.
This course introduces students to the techniques and tools of computer forensics investigations specifically designed for analyzing the Windows operating system. Students will receive step-by-step explanations on how to use a wide variety of forensic tools. Topics include registry analysis, file analysis, internet artifact analysis, volatile evidence collection, live incident response and metadata.
Prerequisite: CTIS/JPS 221.

CTIS 390. Internship. 1-8.

CTIS 440. CTIS Capstone. 4.
Project management in the context of the skills and knowledge developed in CTIS courses. Team approach and solution-oriented. Fulfills the Senior Seminar requirements for the Integrative Experience.
Prerequisite: CTIS 321, CTIS 342 and one of the following: CTIS 310, CTIS 322, CTIS 345 or instructor permission.

CTIS 450. Special Topics. 1-8.

CTIS 460. Independent Study. 1-8.

CTIS 470. Senior Thesis. 1-8.

CTIS 471. Advanced Cyber and Network Security. 4.
This course will cover advanced network and cyber security issues and solutions. It takes an operational approach to implementing and managing effective cyber security policies in complex networked enterprises. Topics include an evaluation of security management models, security program development, risk assessment and mitigation, threat/vulnerability analysis and risk remediation, and cyber security operations. Students also will learn incident handling, business continuity planning and disaster recovery, security policy formulation and implementation (security management cycle), in addition to information-sharing, and privacy, legal, compliance, and ethical issues.
Prerequisite: CTIS 370.

CTIS 490. Departmental Honors. 1-8.