Computing Majors

Computer Science – Software focused, primarily theory-based, lots of programming, housed in CCSE
Software Engineering – Software focused, mixture of theory and practicality, lots of programming, housed in CCSE
Computer Game Design & Development – Software focused, theory & practice centering around game development, lots of programming, housed in CCSE
Information Technology – User/software focused, primarily practicality-based, moderate amount of programming, housed in CCSE
Data Science & Analytics – Data/math focused, theory and practice based, moderate amounts of programming, housed in CCSE
Cybersecurity – Software/user focused, primarily practicality based centering around security, very small amount of programming, housed in Coles
Computer Engineering- Hardware focused, primarily theory-based, small amount of programming, housed in SPCEET
Information Systems – User/organization focused, no programming, housed in Coles
Information Security & Assurance – User/organization security concepts & practices focused, no programming, housed in Coles
Digital Animation – Art/software focused, design/theory based, no programming, housed in College of the Arts
Interactive Design – Design focused, user interaction/user interface/information visualization, a very small bit of programming, housed in Radow CHSS

Undergraduate Computing Areas of Focus

Program	Domain	Hardware	Software	Meeting technology needs of Business	Management of People using Technology
Computer Engineering	Engineering	High focus	Medium-low focus	Low focus	No focus
Computer Science	Computing	Low focus	High focus	Medium focus	Low focus
Information Technology	Computing	Low focus	High focus	High focus	Medium-low focus
Software Engineering	Computing	Low focus	High focus	Medium-low focus	Low focus
Computer Game Design & Development	Computing	Medium focus	High focus	Low focus	Low focus
Data Science & Analytics	Computing	Low focus	High focus	High focus	Low focus
Information Systems	Business	Low focus	Low focus	Medium focus	High focus
Information Security & Assurance	Business	Low focus	Medium-low focus	Medium focus	High focus
Cybersecurity	Computing & Business	Low focus	Medium focus	High focus	High focus

Computing-related Programs

Program	**Computer Science**	**Information Technology**	**Software Engineering**	**Computer Game Design & Development**	**Computer Engineering**
Focus	Study of theoretical principles of computer systems architecture, software, and data communications	Strategy, development and administration of integrated computing management and IT systems.	Engineer software systems that meet specific requirements and built within critical quality levels, cost, and schedule requirements.	Apply computing & software engineering techniques to the design and production of digital media (games) for entertainment, research, and education.	Study of electrical & electronics engineering as it applies to hardware-software integration in computing technology.
Knowledge/skills	Logic & Algorithms Programming concepts/skills using modern languages Creativity Math – statistics, algebra & calculus Complex problem solving Develop/code computer programs for any business/industry	Excellent written/verbal communication skills Logic Complex problem solving Project management Teamwork Administration & operations of computing systems Information security principles	Logic & Algorithms Programming using modern languages Math – statistics, algebra & calculus Teamwork Written/verbal communication skills Design, build & implement software systems Best practices in software development processes	Programming using modern languages Theory of gaming Creativity Complex problem solving Software development process Teamwork Creation of engaging & immersive digital media & multimedia systems	Advanced math Logic & Algorithms Design & creation of electronic components Creativity Engineering principles Complex problem solving
Jobs/careers	Java/C#/C++/etc developer Computer system analyst Artificial intelligence engineer/developer Back-end engineer Full-stack developer	Computer technician System administrator Network administrator Business Intelligence developer Information Security Analyst/developer	Software Engineer Software Architect Java/C#/C++/etc developer Cloud Engineer	Game programmer/developer Video game tester Software developer User interface engineer/designer	Computer hardware engineer Embedded systems developer Network and systems engineer
Related tasks	-Uses new theories to create cutting edge software. -Focuses on the theoretical aspects of technology. -Utilizes theory to research and design software solutions.	-Advocates for user needs in design & functionality -Troubleshoots and designs practical technical applications. -Applies technology to solve practical problems. -Applies technical knowledge for product support.	-Focuses on large-scale systems development. -Assesses requirements for large-scale technological projects. -Designs testing procedures for large-scale systems. -Manages large-scale technological projects.	-Designs and develops software used for educational, simulation, and recreational digital games. -Studies how users interact with game software and designs efficient and engaging interaction experiences. -Designs and develops processes to test the usability and functionality of digital game software.	-Designs and creates embedded computing systems that integrate sensors, actuators, and communications technologies -Utilizes theory to research, design and build computing system components -Maximize hardware-software integration
Video	What is CS?	What is IT?	What is Software Eng.?	What is Game Design/Dev.?	What is Computer Eng.?
College offering major	College of Computing & Software Engineering	College of Computing & Software Engineering	College of Computing & Software Engineering	College of Computing & Software Engineering	Southern Polytechnic College of Engineering & Engineering Technology

Program	**Data Science & Analytics**
Focus	Use mathematical and statistical skills with computational knowledge to analyze & extract information from large sets of data to inform actions.
Knowledge/skills	Statistics Math Programming Data visualization Data mining Data science communication Ethics in statistical studies Application of algorithms to data sets
Jobs/careers	Data Scientist Data Developer Data Engineer Product Analyst Business Analyst Decision Analyst
Related tasks	- Collecting, analyzing & interpreting large sets of complex data. -Use statistical and machine learning techniques to identify patterns & trends in data. - Make predictions to inform business decisions. - Use data visualization software to present data in a way that is easy for non-technical people to understand.
Video	What is Data Science?

Theory vs Application of Technology in Undergraduate Disciplines

Level of Emphasis ◆ = lowest, ◆◆◆◆◆ = highest

Program	Theorical Principles	Application of Theory	Application of Technology in Industry
Computer Engineering	◆◆◆◆	◆◆◆	◆◆
Computer Science	◆◆◆◆◆	◆◆◆	◆◆
Information Technology	◆◆◆	◆◆◆◆	◆◆◆◆◆
Software Engineering	◆◆◆◆	◆◆◆◆	◆◆
Computer Game Design & Development	◆◆	◆◆◆◆	◆◆◆
Data Science & Analytics	◆◆◆	◆◆◆◆◆	◆◆◆
Information Systems	◆	◆◆	◆◆◆◆◆
Information Security & Assurance	◆◆	◆◆◆	◆◆◆◆◆
Cybersecurity	◆◆	◆◆◆◆	◆◆◆◆◆

CCSE Majors

Computer Science

Description

Computer Science involves design and innovation developed from computing principles. This four-year curriculum focuses on the theoretical foundations of computing, algorithms, and programming techniques, as applied to operating systems, artificial intelligence, informatics and the like. Upon graduation, students initiating careers as computer scientists should be prepared to work in a broad range of positions involving tasks from theoretical work to software development.

Keywords

Broad, theory, programming, algorithms, artificial intelligence, data mining

Focus

The study of computer systems architecture, software development, and data communications (how networks like Wifi and ethernet functionally work). Core technology areas include software development, computer architecture, operating systems, data communication, database systems, and software engineering.

Knowledge/Skills

- Logic & Algorithmic thinking
- Programming principles – applicable to object oriented languages, such as Java, C#, C++, and Python
- Creativity
- Math – specifically statistics, algebra and calculus
- Developing computer programs
- Complex problem solving
- Artificial Intelligence methods
    - **Machine learning** - involves the use of Artificial Intelligence to enable machines to learn a task from experience without programming them specifically about that task.
    - **Deep learning** - is a subset of Machine Learning that learns by imitating the inner working of the human brain in order to process data and implement decisions based on that data. Basically, Deep Learning uses artificial neural networks to implement machine learning.
    - **Computer vision** - Computer Vision uses Artificial Intelligence to extract information from images. This information can be object detection in the image, identification of image content to group various

images together, etc. An application of computer vision is navigation for autonomous vehicles by analyzing images of surroundings.
    - **Reinforcement Learning** - part of Artificial Intelligence in which the machine learns something in a way that is similar to how humans learn. As an example, assume that the machine is a student. Here the hypothetical student learns from its own mistakes over time. So the Reinforcement Machine Learning Algorithms learn optimal actions through trial and error.
    - **Robotics** - a field that deals with creating humanoid machines that can behave like humans and perform some actions like human beings.
    - **Natural Language Processing** - machines analyze and understand language and speech as it is spoken. Examples are speech recognition, natural language translation, and chatbots.
    - **Recommender Systems** – like what Netflix, Hulu, or YouTube show you as recommended for you. These systems are based on content or collaborative filtering. Content-based recommendations use various methods to analyze the content of all the items – for instance, a book recommendation is made by using natural language processing. Collaborative filtering is done by analyzing past behavior and recommending things based on that.
    - **Internet of Things** - a network of various devices that are connected over the internet and they can collect and exchange data with each other. Examples include smart refrigerators, smartwatches, smart door locks, medical sensors, fitness trackers, smart security systems, Ring doorbells, Amazon Echo voice controller/Google Home voice controller, and motion detectors.

Sample Jobs

- Developer - Developers, also known as software developers or computer programmers, are responsible for developing, coding, installing, and maintaining software systems. Developers form a key part of the IT team and may be required to modify existing software products or develop entirely new resources.
- Systems analyst - A System Analyst is a skilled professional that works to enhance user experience with software programs. They advise employers and clients on which software program they may need, implement the software and communicate with users to ensure the programs work well.
- Artificial Intelligence engineer - The Artificial Intelligence Engineer is an IT expert whose mission is to develop intelligent algorithms capable of learning, analysing and predicting future events. Their role is to create machines capable of reasoning like the human brain.
- Back-end engineer - A backend engineer is responsible for designing, building, and maintaining the server side of web applications. In other words, a backend engineer's primary responsibility is to build the structure of a software application. They set the software team's foundations of what they need to do to achieve the main goals.
- Full stack developer - A Full-Stack developer is a professional responsible for working on both front-end and back-end development processes. They design, develop, and maintain fully-fledged and functioning platforms with databases or servers.
- Database Administrator - Database Administrators ensure that the databases run efficiently and securely. For example, they create or organize systems to store different data types, such as financial information and customer shipping records. They also make sure authorized users can access this information when needed.
- Mobile application designer/developer - A mobile app developer uses programming languages and development skills to create, test, and develop applications on mobile devices. They work in popular operating system environments like iOS and Android and often take into account UI and UX principles when creating applications.
- Web developer - A Web Developer is a professional who is responsible for the design and construction of websites. They ensure that sites meet user expectations by ensuring they look good, run smoothly and offer easy access points with no loading issues between pages or error messages.

Related Daily Tasks

- Uses new theories to create cutting edge software.

- Focuses on theoretical aspects of technology.
- Utilizes theory to research and design software solutions.

Information Technology

Description

Information Technology involves the design, implementation and maintenance of technology solutions and support for users of such systems. This four-year curriculum focuses on crafting hardware and software solutions as applied to networks, security, client-server and mobile computing, web applications, multimedia resources, communications systems, and the planning and management of the technology lifecycle. Upon graduation, students initiating careers as information technology professionals should be able to work effectively at planning, implementation, configuration, and maintenance of an organization's computing infrastructure.

Keywords

User, communication, interpretation, application, troubleshooting/problem-solving, systems administration

Focus

Primary objective of meeting the high demand for professional degrees in the strategy, development and administration of integrated computing, management, and information technology systems.

Knowledge/Skills

- Communication
- Logic
- Problem Solving
- Troubleshooting
- Project Management
- Teamwork
- Running computing systems
- Database administration
- Network configuration
- Security concepts
- **Internet of Things** – a network of various devices that are connected over the internet and they can collect and exchange data with each other. Examples include smart refrigerators, smartwatches, smart door locks, medical sensors, fitness trackers, smart security systems, Ring doorbells, Amazon Echo voice controller/Google Home voice controller, and motion detectors.

Sample Jobs

- Computer Technician - A Computer Technician is a professional who is tasked with maintaining computer systems, troubleshooting errors, and repairing the organization's hardware. These professionals use their knowledge in networking and software applications to provide technical support for both employees and customers onsite or remotely.
- System Administrator - A system administrator's job description might include: Managing Windows, Linux, or Mac systems. Upgrading, installing, and configuring application software and computer hardware. Troubleshooting and providing technical support to employees.
- Network Administrator - The Network Administrator's role is to ensure the stable operation of the computer networks. This includes planning, developing, installing, configuring, maintaining, supporting, and optimizing all network hardware, software, and communication links.
- IT Specialist - IT specialists support an organization by ensuring users can access and use computer networks throughout the workday. These specialists work in a variety of industries but they all need to have a deep understanding of hardware and software technology so that they can troubleshoot issues that arise.

- Business Intelligence Developer - The main role of a BI developer is to develop, deploy, and maintain BI tools and interfaces. They are also responsible for simplifying highly technical language and complex information into layman's terms for everyone else in the company to understand.
- Data Analyst - A Data Analyst's responsibilities include the deep analysis of data and then determining the best way to represent it visually to managers and stakeholders. They also ensure quality assurance and process documentation and define Key Performance Indicators (KPIs)
- Information Security Analyst - Information security analysts typically do the following: Monitor their organization's networks for security breaches and investigate when one occurs. Use and maintain software, such as firewalls and data encryption programs, to protect sensitive information. Check for vulnerabilities in computer and network systems.

Related Daily Tasks

- Troubleshoots and designs practical technical applications.
- Applies technology to solve practical problems.
- Applies technical knowledge for product support.
- Assist non-technical users in understanding the how and why of technology.

Software Engineering

Description

Software Engineering involves the design, development and testing of large, complex, and safety-critical software applications. This four-year curriculum focuses on the integration of computer science principles with engineering practices as applied to constructing software systems for avionics, healthcare applications, cryptography, traffic control, meteorological systems and the like. Upon graduation, students initiating careers as software engineers should be able to properly perform and manage activities at every stage of the life cycle of large-scale software systems.

Keywords

Software, Development, SDLC, Quality Assurance, Software Testing, Industry Standards, Documentation

Focus

Solve problems and issues in the development of mission-critical software to meet the needs of business and industry. Focused on engineering software systems that meet specified requirements, built within mission critical quality levels, and are within cost and schedule requirements.

Knowledge/Skills

- Logic
- Algorithmic thinking
- Programming
- Math
- Software development process
- Teamwork
- Communication
- Building, designing and implementation of hardware and software programs

Sample Jobs

- Software Engineer - A Software Engineer is an IT professional who designs, develops and maintains computer software at a company. They use their creativity and technical skills and apply the principles of software engineering to help solve new and ongoing problems for an organization.
- Cloud Engineer - A Cloud Engineer deploys, debugs, and executes initiatives related to cloud computing. They design, develop, and maintain cloud-based systems, ensuring efficient data storage and adherence to security

policies. They also interact with clients, provide cloud support, and make recommendations based on client needs.

- Software Architect - A Software Architect is a skilled professional who designs high-level concepts and user interface (UI) layouts for software applications. They collaborate with other architects and software engineers to ensure that the final product meets all requirements outlined in the original designs.

Related Daily Tasks

- Focuses on large-scale systems development.
- Assesses requirements for large-scale technological projects.
- Designs testing procedures for large-scale systems.
- Manages large-scale technological projects

Computer Game Design & Development

Description

The Bachelor of Science in Computer Game Design and Development equips students and graduates with the skills and knowledge to apply computing and software engineering techniques to the design and production of digital media for entertainment, research, and education. As a specialization within the field of computing, game design and development builds on and applies expertise in computing hardware and software to create engaging and immersive multimedia systems.

Keywords

Gaming, User Interaction, Software Development

Focus

The skills and knowledge to apply computing and software engineering techniques to the design and production of digital media for entertainment, research, and education. Builds on and applies expertise in computing hardware and software to create engaging and immersive multimedia systems.

Knowledge/Skills

- Programming
- Creativity
- Problem solving
- Software Development process
- Teamwork
- Written Communication
- Theory of Gaming

Sample Jobs

- Game Programmer/Developer - Game developers turn concepts, stories, and designs into playable video games. Using various programming languages, specialized software applications, and a series of test runs, they breathe life into characters and simulate plots and storylines, creating an immersive and user-friendly electronic gaming experience.
- Video Game Tester - A video game tester is someone who plays video games, tests their features, and identifies glitches and bugs before game release. Game testers often work for video game companies and collaborate with game developers and programmers to improve games and ensure they're ready for users.
- Software Developer - A Software Developer is a professional who is charged with designing and coding software for businesses and consumers alike. They work closely with clients to determine what they need, then use programming languages like Java or C++ to create programs. They must have critical thinking skills, as well as strong problem-solving abilities.

- User Interface Engineer/Designer - A UI engineer, also known as a "user interface developer," is an IT professional who designs websites and applications with the end-user in mind. They're responsible for looking at a website or application from the perspective of the user and making changes so that it's attractive, user-friendly and functional.

Related Daily Tasks

- Designs and develops software used for educational, simulation and recreational digital games.
- Studies how user interact with game software and designs efficient and engaging interaction experiences.
- Designs and develops processes to test the usability and functionality of digital game software.

Data Science & Analytics

Description

The Bachelor of Science with a major in Data Science and Analytics will provide a student with foundational mathematical, statistical, and computational knowledge, skills, and methodologies within the context of the ethical and professional standards of Data Science. A student will also complete at least 16 hours of courses in either a domain of expertise in data science and analytics or a minor to provide them a context in which to apply their data science abilities. Thus, the degree will enable the student to either begin a career in industry, government, or community and non-profit organizations in a range of domains or pursue graduate study.

Students will begin the program by building a foundation in mathematics, statistics, computer programming, and algorithmic techniques. They will then take 38 credit hours of data science core courses covering the fundamentals of data science, programming, machine learning, data mining, data science ethics, and communication. After completing the core, students will complete 6 credit hours of elective courses in data science and statistical learning. Students will also be required to take at least 16 hours in a suitable domain knowledge concentration to begin exploring an expert area of application. The program will conclude with a required data science capstone course, in which the student will demonstrate overall knowledge of the discipline by completing a data science project, incorporating all the knowledge learned in the courses.

Keywords

Data, Analytics, Business Intelligence, BI, Statistics, Visualization

Focus

Math, statistics, analytics and computing knowledge applied towards large sets of data collected in any domain or industry to produce information and visualizations to assist those in leadership positions with decisions regarding anything from research to logistics to marketing strategies.

Knowledge/Skills

- Statistics
- Mathematics
- Programming
- Teamwork Skills
- Algorithmic Thinking
- Abstract thinking
- Databases
- Communication
- Visualization/Data Modeling

Sample Jobs

- Data Scientist - A Data Scientist is a proficient specialist who applies mathematical, problem-solving, and coding skills to manage big data, extracting valuable insights. They design tailor-made solutions from this data, aiding organizations in achieving their unique objectives and goals.
- Data Developer – Data developers are responsible for developing, testing, improving and maintaining new and existing databases to help users retrieve data effectively. Works closely with developers and other members of the IT unit to ensure system consistency.
- Data Engineer - Data engineers implement methods to improve data reliability and quality. They combine raw information from different sources to create consistent and machine-readable formats. They also develop and test architectures that enable data extraction and transformation for predictive or prescriptive modeling.
- Product Analyst – Product analysts monitor the performance of products over their lifecycle. They identify patterns and trends that indicate how well a product performs on the market, and subsequently monitor sales numbers and gather customer feedback data to gauge performance.
- Business Analyst - A Business Analyst is a professional who works closely with stakeholders to identify goals, develop best practices for data collection, and analyze current processes to determine what can be improved to achieve their desired outcome.
- Decision Scientist - They compile and analyze statistical data and use that information to support recommendations for certain actions and decisions. Using their scientific insight and expertise, they drive strategic planning from a fact-based approach.

Related Daily Tasks

- Utilize mathematic and statistical knowledge to work with large sets of data stored in databases and data warehouses to identify meaningful information.
- Participate in team projects focusing on things like data requirement gathering, data processing, modeling, and recommendations.
- Communicate insights and recommendations to leadership to influence strategic decision making.