Department of Computer Science

When introduced in 1983, the main emphasis was to provide a solid foundation in algorithm design and implementation based upon a strong background in mathematics. Since that time we have expanded our offerings to include more theoretical-based computer science courses while retaining the original objective. We also have strengthened the program with “core” courses in computer science that reflect a broader emphasis and a greater variety of electives.

Program Educational Objective (3-5 years after graduation):

• have a diverse group of graduates take on successful leadership roles in Computer Science related fields;
• have graduates remain current in their field through the pursuit of lifelong learning;
• have graduates work effectively with others to make positive contributions to their employers and to society;

Outcomes

Upon graduation, students with a BS majoring in Computer Science will have:

• an ability to apply knowledge of computing and mathematics appropriate to the discipline;
• an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution;
• an ability to design, implement and evaluate a computer-based system, process, component, or program to meet desired needs;
• an ability to function effectively on teams to accomplish a common goal;
• an understanding of professional, ethical, legal, security, and social issues and responsibilities;
• an ability to communicate effectively with a range of audiences;
• an ability to analyze the local and global impact of computing on individuals, organizations, and society;
• recognition of the need for, and an ability to engage in, continuing professional development;
• an ability to use current techniques, skills, and tools necessary for computing practices;
• an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices;
• an ability to apply design and development principles in the construction of software systems of varying complexity.


Computer Science Degrees

• Computer Science M.S. (Online) (http://catalog.georgiasouthern.edu/archive/2016-2017/graduate/allen-e-paulson-engineering-information-technology/computer-science/computer-science-ms-online)

CSCI 5090G Selected Topics in Computer Science
1-3 Credit Hours. 1-3 Lecture Hours. 0 Lab Hours.
Specialized study in a selected area of Computer Science. Graduate students will be given an extra assignment determined by the instructor that undergraduates will not be required to do.
Prerequisite(s): Permission of Instructor.
Cross Listing(s): CSCI 5090.

CSCI 5130G Data Management for Math and the Sciences
3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.
Topics in data management, including operating systems, word processing, spreadsheets, and database management and their applications to mathematics education. Intended primarily for those majoring in Mathematics and Mathematics Education. For those majoring or minoring in Computer Science, this course may not be used as an upper level Computer Science elective. Graduate students will be given an extra assignment determined by the instructor that undergraduates will not be required to do.
Prerequisite(s): CSCI 1230 or Permission of Instructor.
Cross Listing(s): CSCI 5130.

CSCI 5230G Discrete Simulation
3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.
Introduction to discrete simulation models and their implementation on computers. Topics include modeling techniques, experiment design, analysis and validation of results. Students will be exposed to one or more computer simulation languages. Graduate students will be given an extra assignment determined by the instructor that undergraduates will not be required to do.
Prerequisite(s): A minimum grade of "C" in CSCI 3230 and STAT 2231 or Permission of Instructor.
Cross Listing(s): CSCI 5130.

CSCI 5330G Algorithm Design and Analysis
3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.
An in-depth study of the design, implementation, testing, and analysis of algorithms. Graduate students will be given an extra assignment determined by the instructor that undergraduates will not be required to do.
Prerequisite(s): A minimum grade of "C" in CSCI 3236 and MATH 2242.
Cross Listing(s): CSCI 5330, CSCI 5330H.

CSCI 5331G Computer Architecture
3 Credit Hours. 2 Lecture Hours. 2 Lab Hours.
Topics include the study of the Microprocessor Organization and Bus Structures, Complex Instruction Set Computer (CISC) Systems, Reduced Instruction Set Computer (RISC) Systems, Micro-programmed Control and Controller Design, Concepts and Application of Embedded Systems, Pipeline and Vector processing, Input-Output Organization, Memory Organization, and Parallel processor Architecture. Advanced topics related to Hardware-Software Co-design. Graduate students will be given an extra assignment determined by the instructor that undergraduates will not be required to do.
Prerequisite(s): A minimum grade of "C" in CSCI 3231 or Permission of Instructor.
Cross Listing(s): CSCI 5331.

CSCI 5332G Data Communications and Networking
3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.
Fundamental concepts of data communications including architecture models, protocol suites, network programming, signal and data transmissions, error detection, and performance analysis.
Prerequisite(s): A minimum grade of "C" in CSCI 3232 and CSCI 5331 and STAT 2231.
Cross Listing(s): CSCI 5332, CSCI 5332H.
CSCI 5335G Object-Oriented Design
3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.
Introduction to concepts, methods, and current practice of object oriented design and analysis. Topics include the study of the Unified Modeling Language (UML), which has become an industry standard notation. UML topics will include use cases, diagramming notation (class, object, sequence) and object state diagrams. Students will use UML to design and implement individual and small group projects. Additional topics include understanding design patterns in building applications. Graduate students will be given an extra assignment determined by the instructor that undergraduates will not be required to do.
**Prerequisite(s):** A minimum grade of "C" in CSCI 3230.
**Cross Listing(s):** CSCI 5335.

CSCI 5430G Artificial Intelligence
3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.
Introduction to different paradigms for creating software that can reason, access a knowledge base, handle uncertainty, learn, communicate, perceive and act. Graduate students will be given an extra assignment determined by the instructor that undergraduates will not be required to do.
**Prerequisite(s):** A minimum grade of "C" in CSCI 3230 and CSCI 5330 or Permission of Instructor.
**Cross Listing(s):** CSCI 5430.

CSCI 5431G Computer Security
3 Credit Hours. 2 Lecture Hours. 2 Lab Hours.
Computer security theory and practice fundamentals including methods of attack, defending against attacks, privacy vs. security, methods of encryption, authentication, writing secure code, web security, and network security. Graduate students will be given an extra assignment determined by the instructor that undergraduates will not be required to do.
**Prerequisite(s):** A minimum grade of "C" in CSCI 2120 and prior or concurrent enrollment in CSCI 5332.
**Corequisite(s):** CSCI 5320G.
**Cross Listing(s):** CSCI 5431.

CSCI 5436G Distributed Web Systems Design
3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.
This course involves programming methodologies for the World Wide Web. Topics include: Client-side programming, distributed transactions, remote procedure calls, component objects, server-side programming and network load balancing. Graduate students will be given an extra assignment determined by the instructor that undergraduates will not be required to do.
**Prerequisite(s):** A minimum grade of "C" in CSCI 5432.
**Cross Listing(s):** CSCI 5436, CSCI 5436H.

CSCI 5437G Computer Graphics
3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.
Course covers fundamentals of the theory of computer graphics, including raster systems, 3D viewing, illumination, shading and solid modeling. A standard computer graphics language is introduced. Graduate students will be given an extra assignment determined by the instructor that undergraduates will not be required to do.
**Cross Listing(s):** CSCI 5437.

CSCI 5438G Animation
3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.
Course covers mechanism of computer animation and their implementation in OpenGL, together with advanced graph theory. Graduate students will be given an extra assignment determined by the instructor that undergraduates will not be required to do.
**Cross Listing(s):** CSCI 5438.

CSCI 5530G Software Engineering
3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.
This course serves as a major integrative, capstone experience for students and requires teamwork. A study of the development and management of software; strategies and techniques of design, testing, documentation and maintenance. Graduate students will be given an extra assignment determined by the instructor that undergraduates will not be required to do.
**Prerequisite(s):** A minimum grade of "C" in CSCI 5432 and CSCI 5335 and CSCI 5330 or Permission of Instructor.
**Cross Listing(s):** CSCI 5530.

CSCI 5531G Systems and Software Assurance
3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.
This course presents a body of knowledge in systems and software assurance and evaluation including security, safety, and integrity analysis. The core part of the course is software assurance where students are exposed to code and architectural analysis, secure coding practices, standards, and tools. The course also explores standards in modeling internal security at the organizational level and will involve students in risk assessments, comprehensive assurance planning, as well as an array of countermeasure considerations. Graduate students will be required to complete an individual research project not required of undergraduates.
**Prerequisite(s):** A minimum grade of "C" in CSCI 1302 and CSCI 3432 or permission of instructor.
**Cross Listing(s):** CSCI 5531.

CSCI 5532G Network Management Systems
3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.
Theory and practice of network management systems architectures and protocols, including fundamentals of standards models, languages, SNMP, broadband and Web-based tools and applications. Graduate students will be given an extra assignment determined by the instructor that undergraduates will not be required to do.
**Prerequisite(s):** A minimum grade of "C" in CSCI 5332G.
**Cross Listing(s):** CSCI 5532.

CSCI 5538G Wireless and Mobile Systems
3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.
This course deals with the basics of cellular and mobile communication systems, multiple radio access procedures and channel allocation techniques, the architecture and functioning of satellite systems including global positioning system different wireless LAN technologies and personal area networks with an emphasis on Bluetooth networks and mobile application development required for mobile and wireless handheld devices like PDAs and cell phones. Graduate students will be given an extra assignment determined by the instructor that undergraduates will not be required to do.
**Prerequisite(s):** A minimum grade of "C" in CSCI 5332G.
**Cross Listing(s):** CSCI 5538.

CSCI 7090 Selected Topics in Computer Science
1-3 Credit Hours. 1-3 Lecture Hours. 0-2 Lab Hours.
Specialized study in a selected area of Computer Science.
**Prerequisite(s):** Permission of Instructor.

CSCI 7130 Artificial Intelligence - Theory and Application
3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.
Examines the fundamental theory for research, design, and development of artificial intelligence systems. Emphasizes state space search, computer gaming, logic, and knowledge representation. Topics include expert systems, natural language understanding, planning, machine learning and decision making with a view toward applications. Students develop a working system in a realistic application domain.
**Prerequisite(s):** A minimum grade of "B" in CSCI 3230 and CSCI 3232 or Permission of Instructor.
CSCI 7132 Database Systems Design-Theory and Application  
3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.  
Effective design and application of complex Database Systems, involving both traditional relational databases, object-relational databases, advanced rules and constraints, advanced SQL programming, data model validation, ontology based data modeling, contemporary semi-structured data modeling with XML Schema, and advances in SQL, XML, XML Schema, XQuery, and Data Modeling standardization. Review of advances in DB research and DB technology trends. Students will also act as practicing advisors to other students working on DB design projects.  
Prerequisite(s): A minimum grade of "B" in CSCI 3230 and CSCI 3232 or Permission of Instructor.

CSCI 7136 Distributed Web Systems Design - Theory and Application  
3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.  
Client and server side programming, stateless client/server transactions, state maintenance, server side database transactions, Web project design methodologies, database design methodologies for distributed Web projects, testing methodologies, and Web systems project management concepts.  
Prerequisite(s): A minimum grade of "B" in CSCI 7132 or Permission of Instructor.

CSCI 7140 Software Development and Machine Architecture  
4 Credit Hours. 4 Lecture Hours. 0 Lab Hours.  
Software and hardware topics that include an object oriented language, web page construction, electric circuits, architecture, language translation, operating system, and networks. This course is primarily intended for those that are beginning a Masters Degree in Technology. This course cannot be taken for credit by those earning a Masters in Mathematics.  
Prerequisite(s): CSCI 5331 or Permission of Instructor.

CSCI 7230 Advanced Computer Architecture  
3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.  
Comparing different modern computer systems architecture and investigating their performances. Topics include: parallel computer systems, pipelining techniques, vector processor arrays, multiprocessor systems, data flow machines and fault-tolerant computer systems.  
Prerequisite(s): CSCI 5330 or Permission of Instructor.

CSCI 7322 Parallel Algorithms Design and Analysis  
3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.  
A study of parallel constructs for providing experiences in designing and analyzing parallel algorithms.  
Prerequisite(s): A minimum grade of "C" in CSCI 5332 or Permission of Instructor.

CSCI 7334 Unix Network Programming  
3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.  
A study of UNIX interprocess communication protocols and how they can be used in programs.  
Prerequisite(s): A minimum grade of "C" in CSCI 3232 or Permission of Instructor.

CSCI 7336 Broadband Communications  
3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.  
An in-depth study of the structures and principles of broadband networks. Major concepts and principles are explained along with their mathematical analysis.  
Prerequisite(s): A minimum grade of "B" in CSCI 5332 and a minimum grade of "C" in STAT 2231 or Permission of Instructor.

CSCI 7337 Optical Networks  
3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.  
An introduction to optical networks, their principles and systems, understanding of the construction and organization of optical networks along with an in-depth study of the structures and requirements of lightwave-coherent systems. Major concepts and principles are covered along with their mathematical analysis.  
Prerequisite(s): A minimum grade of "B" in CSCI 5332 and a minimum grade of "C" in STAT 2231 or Permission of Instructor.

CSCI 7431 Distributed Database Systems  
3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.  
A study of distributed database architectures and system design, semantic data control, query processing, transaction management, concurrency control, distributed DBMS reliability, parallel DB systems, distributed object DB management systems, and database interoperability.  
Prerequisite(s): A minimum grade of "B" in CSCI 7132 and CSCI 7136 or Permission of Instructor.

CSCI 7432 Algorithm Analysis and Data Structures  
3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.  
Advanced topics in algorithm design and analysis and data structures for implementing these algorithms. Problems considered from areas of information storage and retrieval, graph theory, cryptography and parallel processing.  
Prerequisite(s): A minimum grade of "C" in CSCI 5330 or Permission of Instructor.

CSCI 7433 Data and Database Security  
3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.  
This course covers data protection approaches and mechanisms applicable for digital data in formatted data storage systems including Databases and Data Warehouses. Topics to be covered include: Data Security, View Security, Privacy and Statistical DB Security, DW Security, and Relevant Standards/Guidelines.  
Prerequisite(s): A minimum grade of "B" in CSCI 7132 or permission of instructor.

CSCI 7434 Data Mining  
3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.  
The application of concepts and techniques from information science, statistics, visualization, artificial intelligence, and machine learning for the purpose of extracting, integrating, and visualizing information and knowledge from large databases.  
Prerequisite(s): A minimum grade of "B" in CSCI 7130 and CSCI 7132 or Permission of Instructor.

CSCI 7435 Data Warehousing  
3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.  
Data warehouse design principles and technical problems inherent in complex industrial implementations using commercial software. Possible topics include: an introduction to data warehousing, multidimensional data modeling, data warehouse architectures, data warehouse design and implementations, development of data cube technology, organizing data warehousing projects, from data warehousing to data mining.  
Prerequisite(s): A minimum grade of "B" in CSCI 7132 or Permission of Instructor.

CSCI 7436 Internet Programming  
3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.  
Advanced design and implementations of large-scale Internet applications through the use of high and low level programming constructs. Possible topics include: client-side scripting languages, middle-tier programming languages, middle-tier transaction servers, server-side data access, server-side scripting/programming, integrating applications within a network cluster, internet protocols and socket programming.  
Prerequisite(s): A minimum grade of "C" in CSCI 5332 and CSCI 5432 or Permission of Instructor.
CSCI 7437 Ethics and Research in CS  
3 Credit Hours.  3 Lecture Hours.  0 Lab Hours.  
An overview of the fundamentals of research methods, computer ethics and technical writing as it generally may apply in the Computer Sciences and specifically in broad area of cyber security.

CSCI 7532 Advanced Software Engineering  
3 Credit Hours.  3 Lecture Hours.  0 Lab Hours.  
The focus is the rigorous specification, modeling and prototyping of critical software systems/components. Topics selected from formal specification using Z and VDL, specifications using UML with OCL for real-time systems. Structure, dynamic and constraint modeling, constraint/performance [rate monotonic] analysis, concurrency, re-configuration and distribution, prototyping, reuse and integration issues, and component implementation using advanced tools with implementation styles such as Generic and Meta-Programming.  
Prerequisite(s): A minimum grade of "C" in CSCI 5530.

CSCI 7533 Requirements and Architecture  
3 Credit Hours.  3 Lecture Hours.  0 Lab Hours.  
Software requirements and architecture evaluation using examples of complex software intensive systems. Product-line approach and use of industry standards. Functional and object oriented approaches in complex domains such as avionics, ground vehicles, medical devices, telecommunication. Students are expected to critically evaluate and develop architecture and requirements for sizable systems, functioning as lead architects and requirements managers.  
Prerequisite(s): A minimum grade of "C" in CSCI 5530 or Permission of Instructor.

CSCI 7534 Testing and Measurement  
3 Credit Hours.  3 Lecture Hours.  0 Lab Hours.  
Testing and quantitative evaluation of software products and processes. Topics include: models, methods, standards and tools for testing, measurement and evaluation, test (defect) catalog and coverage testing of units, components, and subsystems. Integration, system and acceptance testing and evaluation, test suites, regression testing and test automation.  
Prerequisite(s): A minimum grade of "C" in CSCI 5530 or Permission of Instructor.

CSCI 7535 Applied Cryptography  
3 Credit Hours.  3 Lecture Hours.  0 Lab Hours.  
A survey of cryptographic techniques and their application. Topics will include stream ciphers, block ciphers, key exchange algorithms, asymmetric ciphers, digital signatures, public key infrastructure, hash functions, elliptic curve ciphers, and techniques of cryptanalysis and applications of cryptography.  
Prerequisite(s): A minimum grade of "B" in CSCI 7536.

CSCI 7536 Network and Computer Security  
3 Credit Hours.  3 Lecture Hours.  0 Lab Hours.  
An overview of the fundamentals of network and computer security and their application. Topics include securing each layer of the OSI model, TCP/IP versions 4 and 6, operating system security, network management systems, secure coding techniques, and the basics of encryption.

CSCI 7610 Graduate Seminar  
1 Credit Hour.  1 Lecture Hour.  0 Lab Hours.  
Students will research topics related to their major/concentration, under supervision of one or more faculty members. Each student will present results on topics of interest to the class on new developments in mathematical sciences, or on his/her research project. Faculty members also may present lectures for the benefit of the students. Course may be repeated up to a maximum of 3 credit hours to be counted toward the M.S. in Mathematics.

CSCI 7890 Directed Study in Computer Science  
1-3 Credit Hours.  1-3 Lecture Hours.  0-2 Lab Hours.  
Directed study under faculty supervision.  
Prerequisite(s): Permission of Instructor and Department Chair.

CSCI 7892 Research Project in CSC  
1-6 Credit Hours.  1-6 Lecture Hours.  0 Lab Hours.  
CSCI 7899 Research Project in Computer Science  
1-6 Credit Hours.  1-6 Lecture Hours.  0-4 Lab Hours.  
Research project addressed toward a real world problem.  
Prerequisite(s): Permission of Project Advisor and Department Chair.

CSCI 7999 Thesis  
1-6 Credit Hours.  0 Lecture Hours.  0 Lab Hours.  
Thesis.