

REL 325	Revelation and other Apocalyptic Literature	4 sh
REL 326	Life and Thoughts of Paul	4 sh
REL 329	Jesus and the Gospels	4 sh
REL 355	Philosophy of Religion	4 sh
THE 301	Theatre History and Literature I	4 sh
TOTAL		20 sh

In addition to these catalog courses, occasional courses with special topics in Classical Studies will be offered. Examples include Hebrew 110, 210, 310; HST/REL 371, The Ancient World; FRE 371 and SPN 371, Special Topics, as appropriate.

CLA 110. INTRODUCTION TO CLASSICAL STUDIES 4 sh

This course gives the student a chance to find out more about the Classical elements that have shaped Western civilization. The course looks at the literature, art and architecture of the ancient Greek and Roman worlds. It studies how our Classical heritage has affected later ages and cultures, including our own. Offered in fall semesters.

Communications

See Journalism and Communications

Computing Sciences

Chair: Associate Professor Powell

Associate Professors: Heinrichs, Schuette, B. Taylor

Assistant Professors: Conklin, Hightower, Pollard, Yap

Instructor: Hollingsworth

Lecturer: Kleckner

Adjunct: Bryan

The Department of Computing Sciences at Elon University offers A.B. and B.S. degrees in Computer Science, A.B. and B.S. degrees in Computer Information Systems, and minors in Computer Science and Computer Information Systems. A concentration area in Management Information Systems (for majors in Business Administration) and minors in Multimedia Authoring or Geographical Information Systems are also available options.

The discipline called Computer Science emphasizes problem solving based upon mathematical logic, the analysis of alternative solutions, the use of the scientific method of hypothesis development and testing, and the link between principles, creativity and implementation techniques. The experiences, challenges and discipline of computer science translate well into other areas and interests. The discipline is constantly changing; the student must be able to communicate well and learn new concepts throughout life. The Computer Science program at Elon is a rigorous one emphasizing the application and theory of computation. Students study programming languages, operating systems, algorithm analysis, artificial intelligence, game programming and parallel and distributed problem-solving using computer technology.

The Computer Information Systems discipline centers on the development of systems that will improve the performance of people in organizations. Information systems are vital to problem identification, analysis and decision-making. These skills are integral parts of many fields of study. Students in information systems apply problem-solving techniques and programming skills to the design, implementation and maintenance of these information systems. Computer Information Systems at Elon is a hands-on program that gives the stu-

dent a solid foundation in information systems, including knowledge and skills about networks, Web development, database development, systems analysis, application development and project management.

Computing Sciences students at Elon have excellent access to both faculty and equipment including a wide array of computer hardware and software. The latest versions of over fifty software development tools are updated twice annually. Every computer is replaced every three years. Opportunities for various work and independent learning experiences that complement classroom learning are available. Other opportunities for involvement include the student chapter of the Association for Computing Machinery (ACM), participation in regional and local programming contests and independent study and research. Graduates pursue employment in many areas of industry, business, education and government as well as continuing study at the graduate level.

A Bachelor of Arts degree in Computer Science requires the following courses:

CSC 130	Introduction to Computer Science	4 sh
CSC 230	Algorithm Development	4 sh
CSC 331	Algorithm Analysis	4 sh
CSC 335	Programming Languages	4 sh
CSC 342	Computer Organization and Architecture	4 sh
CSC 351	Theory of Computation	4 sh
CSC 441	Operating Systems and Networking	4 sh
CSC 462	Software Development/Capstone	4 sh
MTH 206	Discrete Structures	4 sh
MTH 221	Calculus and Analytic Geometry II	4 sh
Select one course beyond core math requirement		4 sh

Probability/Statistics: if core math requirement was MTH 121, then MTH 112 General Statistics or a probability and/or statistics course

or

Quantitative Analysis: if core math requirement was MTH 112, then MTH 121 Calculus and Analytic Geometry I

Two courses from the following: 8 sh

CSC 410	Artificial Intelligence
CSC 415	Numerical Analysis
CSC 420	Game Programming and Computer Graphics
CSC 430	Advanced Programming Concepts
CSC 431	Parallel and Distributed Computation
CSC 499	Research
CSC 300-400 level elective	

TOTAL 52 sh

A Bachelor of Science degree in Computer Science requires the following courses:

CSC 130	Introduction to Computer Science	4 sh
CSC 230	Algorithm Development	4 sh
CSC 331	Algorithm Analysis	4 sh
CSC 335	Programming Languages	4 sh
CSC 342	Computer Organization and Architecture	4 sh

CSC 351	Theory of Computation	4 sh
CSC 441	Operating Systems and Networking	4 sh
CSC 462	Software Development/Capstone	4 sh
MTH 206	Discrete Structures	4 sh
MTH 221	Calculus and Analytic Geometry II	4 sh
Select one course beyond core math requirement		4 sh
Probability/Statistics: if core math requirement was MTH 121, then MTH 112 General Statistics or a probability and/or statistics course		
or		
Quantitative Analysis: if core math requirement was MTH 112, then MTH 121 Calculus and Analytic Geometry I		
Three courses from the following:		12 sh
CSC 410	Artificial Intelligence	
CSC 415	Numerical Analysis	
CSC 420	Game Programming and Computer Graphics	
CSC 430	Advanced Programming Concepts	
CSC 431	Parallel and Distributed Computation	
CSC 499	Research	
CSC 300-400 level elective		
Either:		8 sh
CHM 111, 112, 113, 114, or		
PHY 113, 114, 117, 118, or		
BIO 111, 112, 113, 114		
TOTAL		64 sh

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A Bachelor of Arts in Computer Information Systems requires the following courses:

CIS 211	Management Information Systems	4 sh
CIS 216	Programming in a Visual Environment	4 sh
CIS 245	Hardware, Systems Software and Communications	4 sh
CIS 301	Database Management and Analysis	4 sh
CIS 325	Web Development	4 sh
CIS 330	Systems Analysis and Design	4 sh
CIS 345	Networks and Telecommunications	4 sh
CIS 430	Project Implementation and Management	4 sh
CIS 450	Seminar in Information Systems (capstone)	4 sh
PHL 115	Ethical Practice	4 sh
MTH 206	Discrete Structures	4 sh
Select one course beyond core math requirement		4 sh
Probability/Statistics: if core math requirement was MTH 121, then MTH 112 General Statistics or a probability and/or statistics course		
or		
Quantitative Analysis: if core math requirement was MTH 112, then MTH 116 Applied Mathematics with Calculus or MTH 121 Calculus and Analytic Geometry I		
Total		48 sh

A Bachelor of Science in Computer Information Systems requires the following courses:

CIS 211	Management Information Systems	4 sh
CIS 216	Programming in a Visual Environment	4 sh
CIS 245	Hardware, Systems Software and Communications	4 sh
CIS 301	Database Management and Analysis	4 sh
CIS 325	Web Development	4 sh
CIS 330	Systems Analysis and Design	4 sh
CIS 345	Networks and Telecommunications	4 sh
CIS 430	Project Implementation and Management	4 sh
CIS 450	Seminar in Information Systems (capstone)	4 sh
PHL 115	Ethical Practice	4 sh
MTH 206	Discrete Structures	4 sh
Select one course beyond core math requirement		4 sh
Probability/Statistics: if core math requirement was MTH 121 then MTH 112 General Statistics or a probability and/or statistics course		
or		
Quantitative Analysis: if core math requirement was MTH 112 then MTH 116 Applied Mathematics with Calculus or MTH 121 Calculus and Analytic Geometry I		
Choose one of the following Information Systems Environments:		16 sh
<i>Business Option:</i>		
Select any four courses from the Business Administration minor		
or		
<i>Biology Option:</i>		
BIO 111 and BIO 113; BIO 112 and BIO 114		
Select 8 hours taken from BIO 200, 300, or 400 level courses of interest		
or		
<i>Criminal Justice Studies Option:</i>		
Select at least one course from CJS minor core: PSY 357, SOC 355, or HUS 359		
Select 12 hours from remaining CJS minor core or other available electives		
Total		64 sh

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A minor in Computer Science requires the following:

CSC 130	Introduction to Computer Science	4 sh
CSC 230	Algorithm Development	4 sh
Eight semester hours of 300-400 level Computer Science (CSC) courses		8 sh
One additional course from CSC or CIS at the 200 level or above		4 sh
Total		20 sh

A minor in Computer Information Systems requires the following:

CIS 211	Management Information Systems	4 sh
CIS 216	Programming in a Visual Environment	4 sh

CIS 245	Hardware, Systems Software and Communications	4 sh
CIS 301	Database Management and Analysis	4 sh
One course from the following:		4 sh
CIS 325	Web Development	
CIS 330	Systems Analysis and Design	
CIS 345	Networks and Telecommunications	
Total		20 sh

Multimedia Authoring Minor: See Multimedia Authoring

Geographical Information Systems Minor: See Geographical Information Systems

Concentration in Management Information Systems: See Business Administration

Computer Information Systems

CIS 112. PROBLEM SOLVING WITH SPREADSHEET APPLICATIONS 2 sh

This course involves projects requiring quantitative reasoning. Microsoft Excel is used for what-if analysis and graphical presentation of data. Fundamental functions, worksheet database features and the use of Excel to create static and dynamic Web pages are covered. Prerequisite: None. Offered: fall and spring.

CIS 113. INTRODUCTION TO DATABASE SYSTEMS 2 sh

This course uses a personal database system (Microsoft Access) to implement projects requiring the organization, manipulation and retrieval of data. Students learn how to analyze and present their data using forms, reports and views. Basic and advanced techniques for data retrieval using elementary SQL and joining multiple tables are covered. No credit for students with CIS 211. Prerequisite: None. Offered: fall and spring

CIS 114. INTRODUCTION TO WEB SITE DEVELOPMENT 2 sh

This course develops projects which require the organization and presentation of information on Internet Web sites using a high level tool (Microsoft FrontPage). Lower level tools such as HTML, DHTML, cascading style sheets, XML, VB script and active server pages will be introduced. Prerequisite: None. Offered fall and spring.

CIS 211. MANAGEMENT INFORMATION SYSTEMS 4 sh

This course provides an introduction to the fundamentals of Information Systems (IS) in organizations. The course examines the role of IS in managing Customer Relationships (CRM) and introduces the fundamentals of business-process modeling using data flow diagrams and Microsoft Visio. Database Management is introduced using Microsoft Access to implement projects requiring the organization, manipulation and retrieval of data and to design and execute forms, reports and views. Elementary SQL and query construction will be covered. The strategic and global aspects of Information Systems are reviewed. Prerequisite: None. Offered: fall and spring.

CIS 216. PROGRAMMING IN A VISUAL ENVIRONMENT 4 sh

This course utilizes a programming language with a visual development environment to implement computer applications. Common visual and data objects are incorporated into projects. Code is developed to respond to events induced on these objects by users or other code. Students design and present group and individual projects. Prerequisite: Core Math Requirement or permission of the instructor. Offered fall and spring.

CIS 220. COMPUTERS AND TEACHING 3 sh

This course is designed for students who are planning to teach at the elementary, middle or secondary level and provides an introduction to the role of technology in teaching and learning in K-12 schools. The course provides opportunities for students to develop basic skills in using technology and in selecting and applying technology

appropriately to enhance teacher productivity and student learning. Prerequisite: EDU 211. Offered fall and spring.

CIS 245. HARDWARE, SYSTEMS SOFTWARE AND COMMUNICATIONS 4 sh

This course provides the hardware/system software fundamentals for various computer/network architectures used in the design, development and implementation of contemporary information systems. These concepts enable systems development personnel to explain tradeoffs in computer architecture for effective design. Topics include system architecture for single-user, central and networked computing systems and single- and multi-user operating systems. Prerequisite: Core Math Requirement. Offered fall.

CIS 301. DATABASE MANAGEMENT AND ANALYSIS 4 sh

This course focuses on designing, implementing and using database systems with emphasis on relational and object-relational models. Students design and deploy relational database models using Oracle client and server tools. Students will also learn how to integrate various client front-ends and reporting tools with Oracle databases (such as MS Access using ODBC and Crystal Reports). Students will learn SQL and will be able to design complex reports and queries to answer business problems. This course also provides a short introduction to basic concepts of data analysis and data mining using simple descriptive statistics and SQL. Prerequisite: CIS 211 and CIS 216. Offered fall and spring.

CIS 310. INTERACTION DESIGN FOR WEB AND MULTIMEDIA 4 sh

This course provides Multimedia Authoring minors and other non-CSC/CIS majors with a complete overview of Web development, including theories of Information Architecture. Students will develop Web sites of medium complexity after learning the basics of page markup and interactive Web programming. Prerequisite: None. Offered spring.

CIS 320. BUILDING INTERACTIVE WEB SITES 4 sh

This course provides Multimedia Authoring minors and other non-CSC/CIS majors with a knowledge of how to integrate database systems with a Web site. Students will develop Web sites of medium complexity after learning the basics of relational database design and three-tier Web programming. Prerequisite: None. Offered fall.

CIS 325. WEB DEVELOPMENT 4 sh

This course provides a complete overview of the Web site development process. Students will create complex, interactive Web sites using HTML, XHTML, CSS, Javascript, PHP, SQL, Oracle and Apache. Prerequisite: CIS 301. Offered fall.

CIS 330. SYSTEMS ANALYSIS AND DESIGN 4 sh

This in-depth study of standard techniques for analyzing and designing Information Systems (IS) emphasizes effective written and oral communication as students examine a system using a realistic business scenario. Appropriate CASE tools (Visible Analyst and/or Visio) are used during the analysis phase. Visual Basic, Crystal Reports and Access are used during the implementation phase to create a simulated software application. Prerequisite: CIS 216. Offered fall.

CIS 345. NETWORKS AND TELECOMMUNICATIONS 4 sh

This course focuses on concepts and technologies associated with data and voice communications. Students learn about local and wide area networks, telecommunication systems, protocols, transmissions alternatives, network architectures and design. Hardware and software, client-server computing and management issues are covered. Prerequisite: CIS 245. Offered spring.

CIS 371. SPECIAL TOPICS 1-4 sh

Topics such as decision support and expert systems, data communications and networks, and design patterns are offered when demand is sufficient.

CIS 430. PROJECT IMPLEMENTATION AND MANAGEMENT 4 sh

Project teams identify a business situation requiring information systems (IS) improvement. Concepts and tools for analysis and design methodology are applied. The team carries this design through the implementation phase using appropriate CASE tools, Visual Basic, Access and Crystal Reports. This project is more in-depth than the simulation of CIS 330. Project documentation is presented in the form of a user's manual. Several class presentations are required throughout the semester, culminating with the final working software application. Prerequisite: CIS 330. Corequisite: CIS 345. Offered spring.

CIS 450. SEMINAR IN INFORMATION SYSTEMS 4 sh

The capstone experience for senior CIS majors involves a close review of the conceptual and theoretical foundations of the discipline. Contemporary issues, problems and trends in CIS are discussed with special focus on applications in business, biology and criminal justice. Students will complete a major research paper and presentation. Prerequisites: Senior standing and at least one 300-level CIS course. Offered spring.

CIS 465. MIS STRATEGIES FOR E-BUSINESS 4 sh

The MIS capstone course explores tactical and strategic management of information systems (IS) at the business unit and enterprise level. Students examine current IS issues facing specific industries - healthcare, banking and retail and also explore management of IS on a global scale and within various countries/regions. The course involves a project focused on design and development of an e-Business software application. Prerequisite: CIS 325 or CIS 330. Offered spring.

CIS 481. INTERNSHIP IN INFORMATION SYSTEMS 1-4 sh

Advanced work experiences in Computer Information Systems (CIS) are offered on an individual basis when suitable opportunities can be arranged. Prerequisites: CIS 340 and permission of instructor.

CIS 491. INDEPENDENT STUDY 1-4 sh**CIS 499. RESEARCH 1-4 sh**

Students engage in undergraduate research under the direction of a computing sciences faculty member. Maximum of eight semester hours total credit. Prerequisite: Eligibility as determined by the undergraduate research guidelines of Elon University and approval by the department.

*Computer Science***CSC 130. INTRODUCTION TO COMPUTER SCIENCE 4 sh**

This introduction to programming and problem solving emphasizes applications from quantitative disciplines and incorporates weekly group lab experiences. Prerequisite: MTH 100 or its exemption. Offered fall and spring.

CSC 171. SPECIAL TOPICS 1-4 sh

Students study specialized pieces of software and programming languages. Prerequisite: CSC 130.

CSC 230. ALGORITHM DEVELOPMENT 4 sh

This course continues the study of the development of algorithms and provides an introduction to the analysis of time and space complexity. Topics include program correctness, recursion, elementary data structures, modularization and program structure. Prerequisite: CSC 130. Offered fall and spring.

CSC 331. ALGORITHM ANALYSIS 4 sh

Students analyze structures and appropriate algorithms for sorting, merging and searching in the contexts of mass storage devices, internal main memory and Artificial Intelligence (AI) applications. Topics include graph algorithms, dynamic storage allocation and garbage collection. Prerequisites: CSC 230 and MTH 206. Offered spring.

CSC 335. PROGRAMMING LANGUAGES 4 sh

This course provides an introduction to language definition structure, data types and structures, control structures and data flow, run-time characteristics, and lexical analysis and parsing. Programming assignments involve the use of several languages. Prerequisite: CSC 230. Offered fall.

CSC 342. COMPUTER ORGANIZATION AND ARCHITECTURE 4 sh

Topics cover architectural levels, systems organization, digital logic, machine level, instruction formats, representation of data and computer arithmetic, assembly, linking and loading, and architectural alternatives. Prerequisite: CSC 230. Offered fall.

CSC 351. THEORY OF COMPUTATION 4 sh

In this introduction to theoretical computer science and analysis of discrete mathematical structures which find application in computer science, topics may include predicate calculus, groups, coding theory, graphs, trees, formal languages, grammars, finite state automata, Turing machines and complexity theory. CSC 351 is cross-listed with MTH 351. Prerequisites: CSC 130, MTH 121, 206. Corequisite: CSC 230. Offered spring.

CSC 371. SPECIAL TOPICS 1-4 sh

Topics such as genetic programming, grid computing, decision analysis, design of data base management systems, robotics, simulation and high performance computing are offered when demand is sufficient.

CSC 410. ARTIFICIAL INTELLIGENCE 4 sh

This course is an introduction to the area of Artificial Intelligence systems. Students will learn concepts of knowledge representation, reasoning, acting under uncertainty and learning. Applications studied will include game playing, natural language and expert systems. Prerequisite: CSC 230. Offered fall alternating years.

CSC 415. NUMERICAL ANALYSIS 4 sh

(Cross-listed with MTH 415.)

CSC 420. GAME PROGRAMMING AND COMPUTER GRAPHICS 4 sh

A study of two major areas of programming video games: graphics and game theory. Students will learn the fundamentals of three-dimensional graphic programming, including object transformations, ray tracing, collision detection and animation as well as the components of game theory, including intelligent game playing, types of games and creating engaging storylines. Prerequisite: CSC 230. Offered fall alternating years.

CSC 430. ADVANCED PROGRAMMING CONCEPTS 4 sh

This course will focus on advanced programming concepts beyond the core computer science material. The material in the course continually evolves guided by the needs of students, the expertise of faculty members and technology trends. Currently, the course focuses on developing enterprise level, multi-tier distributed applications. The course explores the major technologies used by server side applications. Using a commercial application server, students will design and implement a significant programming project using either Enterprise JavaBeans or WebServices. Prerequisites: CSC 331, CSC 335. Offered spring alternating years.

CSC 431. PARALLEL AND DISTRIBUTED COMPUTATION 4 sh

This course introduces the foundational concepts of parallel and distributed computation. Topics include SIMD (Single Instruction, Multiple Data) and MIMD (Multiple Instruction, Multiple Data) computation, vector processing, shared memory, concurrency issues, message passing, parallel algorithms and the complexity class NC. A large portion of the course will consist of project work, using MPI, PVM and/or Beowulf. Prerequisite: CSC 331, 342. Offered spring alternating years.

CSC 441. OPERATING SYSTEMS AND NETWORKING 4 sh

Students study the fundamental concepts of operating systems and computer networks.

Topics include concurrent programming, process management, memory management, resource allocation, network protocols and stacks and application level protocols.

Prerequisites: CSC 331, 342. Offered spring.

CSC 462. SOFTWARE DEVELOPMENT/CAPSTONE 4 sh

This capstone course combines a range of topics integral to the specification, design, implementation and testing of a medium-scale software system with the practical experience of implementing such a project as a member of a team. In addition to material on software engineering, the course includes material on human computer interaction and on professionalism and ethical responsibilities in software development.

Prerequisites: CSC 331, CSC 335. Offered fall.

CSC 481. INTERNSHIP IN COMPUTER SCIENCE 1-4 sh

Advanced work experiences in Computer Science are offered on an individual basis when suitable opportunities can be arranged. Prerequisites: permission of instructor.

CSC 491. INDEPENDENT STUDY 1-4 sh

CSC 499. RESEARCH 1-4 sh

Students engage in undergraduate research under the direction of a computing sciences faculty member. Maximum of eight semester hours total credit. Prerequisite: Eligibility as determined by the undergraduate research guidelines of Elon University and approval by the department.

this test. Recommended only for juniors and seniors. Offered second half of spring semester.

COE 310. SECURING A JOB 1 sh

This course helps students prepare for internships, co-ops, summer jobs and permanent employment. Students develop strategies to achieve career goals, investigate critical issues in the workplace, develop a resume and a cover letter, learn how to network and interview effectively. Recommended for sophomores, juniors and seniors. Offered fall and spring.

COE 381-386. CO-OP WORK EXPERIENCE 1-16 sh

This series of courses involves careful monitoring of students in either a part-time or full-time work experience. Students apply classroom theory in a job related to their major/minor/career objectives. Prerequisite: admission to the program.

The Cooperative Education Work Experience program enables qualified students to combine classroom theory with professional work experience while completing their degrees. The student may work full time or part time with an employer selected and/or approved by the university. Credit hours are based on the number of hours worked during the term — a maximum of 16 semester hours of internship/cooperative education credits may be applied to the 132 semester hours required for the A.B. and B.S. degrees. Evaluation is based on reported job performance and student reflection on that performance through papers, journals, seminars, class presentations and readings. Contact the Director of Experiential Education for more information.

ELIGIBILITY REQUIREMENTS: Sophomore, junior or senior standing; minimum 2.0 GPA; approval of faculty/Experiential Education Director. COE 310 class recommended.

Cooperative Education

Director of Experiential Education: Assistant Professor P. Brumbaugh
 Assistant Professors: Allison, Donathan, Kosusko, Lipe, Magee, Martin, Olive-Taylor, L. Rich

The Career Center offers courses designed to acquaint Elon students with the career decision-making process, to assist them in career exploration and graduate school test preparation and to prepare them for the job search.

COE 110. EXPLORING CAREERS/MAJORS 1 sh

This class assists students in exploring majors and careers. Topics include personal values and needs assessment, interest and skill inventories, and career decision-making skills. Recommended for freshmen and sophomores. Offered fall and spring in a half-semester format.

COE 218. GRE PREPARATION 2 sh

Students prepare for the test that they will need to take prior to applying to graduate school. In addition to familiarizing students with various types of questions on the test, this course will help students develop reasoning skills that they need to perform well. Students receive instruction on the basic mathematical principles that are included on this test. Recommended only for juniors and seniors. Offered first half of spring semester.

COE 219. LSAT PREPARATION 2 sh

Students prepare for the test that they will need to take prior to applying to law school. In addition to familiarizing students with various types of questions on the test, this course will help students develop reasoning skills that they need to perform well. Students receive instruction on the basic mathematical principles that are included on

Criminal Justice

Coordinator: Associate Professor McClearn

The Criminal Justice program engages students in the interdisciplinary study of crime and criminal justice, primarily within the United States. Students will gain an understanding of the psychological and sociological dimensions of crime as well as insights into the workings of the criminal justice system and its components. Students will study both academic and applied aspects of the field. Ethical implications and critical analysis of issues will be stressed.

A minor in Criminal Justice Studies requires the following:

PSY 357	Criminal Behavior	4 sh
SOC 355	Sociology of Crime	4 sh
HUS 359	Criminal Justice	4 sh
Eight semester hours of electives selected from the following:		8 sh
CJS 371-9	Special Topics in Criminal Justice	
CJS 481	Internship in Criminal Justice	
CJS 491	Independent Study	
PHL 341	Philosophy of Law	
POL 324	Civil Liberties	
SOC 342	Social Deviance	

Other courses as approved by the program coordinator

TOTAL 20 sh