

CSCE 1013 Explorations in Computing (Fa) An introduction to computers and computing through interactive programming. This course will provide students with the opportunity to explore programming through interactive applications such as robotics, Web applications, and multimedia. Students will learn the basics of programming, i.e., loops, conditionals, and functions, and learn about how computers work by developing their own multimedia programs, controlling their own robots, and/or creating their own interactive Web pages.

CSCE 2004 Programming Foundations I (Sp, Fa) Introductory programming course for students majoring in computer science or computer engineering. Software development process: problem specification, program design, implementation, testing and documentation. Programming topics: data representation, conditional and iterative statements, functions, arrays and records. Using C++ in a UNIX environment.

CSCE 2004H Honors Programming Foundations I (Sp, Fa) Introductory programming course for students majoring in computer science or computer engineering. Software development process: problem specification, program design, implementation, testing and documentation. Programming topics: data representation, conditional and iterative statements, functions, arrays and records. Using C++ in a UNIX environment.

CSCE 2014 Programming Foundations II (Sp, Fa) This course continues developing problem solving techniques by focusing on fundamental data structures and associated algorithms. Topics include: abstract data types, introduction to object-oriented programming, linked lists, stacks, queues, hash tables, binary trees, graphs, recursion, and searching and sorting algorithms. Using C++ in a UNIX environment. Prerequisite: CSCE 2004.

CSCE 2014H Honors Programming Foundations II (Irregular) This course continues developing problem solving techniques by focusing on fundamental data structures and associated algorithms. Topics include: abstract data types, introduction to object-oriented programming, linked lists, stacks, queues, hash tables, binary trees, graphs, recursion, and searching and sorting algorithms. Using C++ in a UNIX environment. Prerequisite: CSCE 2004.

CSCE 2114 Digital Design (Fa) Introduction to the hardware aspects of digital computers, logic gates, flip-flops, reduction, finite state machines, sequential logic design, digital systems, software design tools, hardware description language (VHDL), and implementation technologies. (Same as ELEG 2904)

CSCE 2214 Computer Organization (Fa) Presents the relationship between computing hardware and software with a focus on the concepts for current computers. CPU design topics are covered including various techniques for microprocessor design and performance evaluation. Prerequisite: CSCE 2114.

CSCE 2813 Introduction to Internet/World Wide Web (Irregular) Introduction to Internet and World Wide Web tools and resources, including Web browsers, robots and search engines, multimedia authoring systems, electronic publishing systems, virtual reality systems, network compatible CD-ROMs, network telecommunication and security systems, digital watermarking, Web censors, internet authoring and programming languages.

CSCE 3143 Data Structures (Fa) Applications of the elements of data structures, arrays, linked lists, trees, stacks, and search techniques. Prerequisite: MATH 2103 and CSCE 2013.

CSCE 3143H Honors Data Structures (Irregular) Applications of the elements of data structures, arrays, linked lists, trees, stacks, and search techniques. Prerequisites: MATH 2103 and CSCE 2013.

CSCE 3193 Programming Paradigms (Fa) Programming in different paradigms with emphasis on object oriented programming, network programming and functional programming. Survey of programming languages, event driven programming, concurrency, software validation. Prerequisite: CSCE 2014.

CSCE 3313 Algorithms (Sp) Provides an introduction to formal techniques for analyzing the complexity of algorithms. The course surveys important classes of algorithms used in computer science and engineering. Prerequisite: CSCE 2014 and MATH 2103.

CSCE 3413 Internet Programming (Irregular) HTML authoring to W3C standards, use of environment and SSI variables, programming concepts with both scripting languages and interpreted and compiled languages, creating web documents, applications, advanced form applications, search/index utilities, and Web databases. Course presumes some introduction to scripting or programming. Prerequisite: CSCE 2813.

CSCE 3513 Software Engineering (Sp) A modern approach to the current techniques used in software design and development. This course emphasizes the use of modern software development tools, multi-module programming, and team design and engineering. Prerequisite: CSCE 3143.

CSCE 3613 Operating Systems (Sp) An introduction to operating systems including topics in system structures, process management, storage management, files, distributed systems, and case studies. Prerequisite: CSCE 2213 and CSCE 3143.

CSCE 3943 Unix Programming I (Irregular) Structure of UNIX file system, use of exec and fork, interprocess communication and record locking. Prerequisite: CSCE 3143.

CSCE 3953 System Synthesis and Modeling (Fa) This course instructs the students in the use of modern synthesis and modeling languages and approaches for design automation. This course will teach students the use of HDLs and modeling languages for representing and implementing digital computer systems. Prerequisite: CSCE 2124.

CSCE 3963 Perl Programming (Irregular) In-depth coverage of the methods and techniques of object-oriented design and its applications to database and artificial intelligence. Prerequisite: CSCE 3943.

CSCE 3973 UNIX Programming II (Irregular) Structure, implementation, and application of minicomputer systems, microcomputer hardware, microprogramming, minicomputer software technology, and design and evaluation of minicomputer systems. Prerequisite: CSCE 3943.

CSCE 4013 Special Topics (Irregular) Consideration of computer science topics not covered in other courses. May be repeated for up to 3 hours of degree credit.

CSCE 4023H Honors Special Topics (Irregular) Consideration of current computer engineering honors topics not covered in other courses. Prerequisite: Honors standing.

CSCE 4114 Embedded Systems (Fa) The architecture, software, and hardware of embedded systems. Involves a mixture of hardware and software for the control of a system (including electrical, electro-mechanical, and electro-chemical systems). They are found in a variety of products including cars, VCRs, HDTVs, cell phones, pacemakers, spacecraft, missile systems, and robots for factory automation. Prerequisite: CSCE 2214.

CSCE 4114H Honors Embedded Systems (Fa) The architecture, software, and hardware of embedded systems. Involves a mixture of hardware and software for the control of a system (including electrical, electro-mechanical, and electro-chemical systems). They are found in a variety of products including cars, VCRs, HDTVs, cell phones, pacemakers, spacecraft, missile systems, and robots for factory automation. Prerequisite: CSCE 2214.

CSCE 4213 Computer Architecture (Sp) The architecture of modern scalar and parallel computing systems. Techniques for dynamic instruction scheduling, branch prediction, instruction level parallelism, shared and distributed memory multiprocessor systems, array processors, and memory hierarchies. Prerequisite: CSCE 2214. (Same as ELEG 4983)

CSCE 4213H Honors Computer Architecture (Sp) The architecture of modern scalar and parallel computing systems. Techniques for dynamic instruction scheduling, branch prediction, instruction level parallelism, shared and distributed memory multiprocessor systems, array processors, and memory hierarchies. Prerequisite: CSCE 2214. (Same as CSCE 4213, ELEG 4983)

CSCE 4233 Low Power Digital Systems (Irregular) The reduction of power consumption is rapidly becoming one of the key issues in digital system design. Traditionally, digital system design has mainly focused on performance and area trade-offs. This course will provide a thorough introduction to digital design for lower consumption at the circuit, logic, and architectural level. Prerequisite: CSCE 2123.

CSCE 4253 Concurrent Computing (Irregular) Programming concurrent processes; computer interconnection network topologies; loosely coupled and tightly coupled paralleled computer architectures; designing algorithms for concurrency; distributed computer architectures. Prerequisite: senior standing in computer science or engineering.

CSCE 4313 Programming Languages (Irregular) Comparison of imperative, object-oriented, and functional styles of languages; language extensibility, design of language interpreters, lexical analysis, grammars/parsing, and evaluation strategies. Prerequisite: CSCE 3143.

CSCE 4323 Formal Languages and Computability (Sp) Finite Automata and regular languages, regular expressions, context-free languages and pushdown automata,

nondeterminism, grammars, and Turing machines. Church's thesis, halting problem, and undecidability. Prerequisite: CSCE 3313.

CSCE 4333 Introduction to Integrated Circuit Design (Irregular) Design and layout of large scale digital integrated circuits using CMOS technology. Topics include MOS devices and basic circuits, integrated circuit layout and fabrication, dynamic logic, circuit design and layout strategies for large scale CMOS circuits, estimation and optimization of logic speed. Prerequisite: ELEG 3933. (Same as ELEG 4233)

CSCE 4353 CPLD/FPGA-Based System Design (Irregular) Field Programmable Logic devices (FPGAs/CPLDs) have become extremely popular as basic building blocks for digital systems. They offer a general architecture that users can customize by inducing permanent or reversible physical changes. This course will deal with the implementation of logic options using these devices. Prerequisite: CSCE 2123. (Same as ELEG 4963)

CSCE 4353H Honors CPLD/FPGA-Based System Design (Irregular) Field Programmable Logic devices (FPGAs/CPLDs) have become extremely popular as basic building blocks for digital systems. They offer a general architecture that users can customize by inducing permanent or reversible physical changes. This course will deal with the implementation of logic options using these devices. Prerequisite: CSCE 2123 and Honors standing.

CSCE 4423 Computer Systems Modeling (Irregular) Basic concepts of problem analysis, model design, and simulation experiments. A simulation will be introduced and used in this course. Prerequisite: INEG 3313 or STAT 3013 and proficiency in a programming language.

CSCE 4523 Database Management Systems (Fa) Introduction to database management systems, architecture, storage structures, indexing, relational data model, E-R diagrams, query languages, SQL, ODBC, transaction management, integrity, and security. Prerequisite: CSCE 3143.

CSCE 4543 Software Architecture (Irregular) A study of software architecture through the use of case studies drawn from real systems designed to solve real problems from technical as well as managerial perspectives. Techniques for designing, building, and evaluating software architectures. Prerequisite: CSCE 3313 and CSCE 4513.

CSCE 4561 Capstone I (Sp, Fa) CSCE students complete a comprehensive software capstone project during their final year of undergraduate studies. The project is done over 2 semesters in phases: concept, formal proposal, implementation, and presentation. The projects include and may require the integration of software and human factors and hardware elements and are developed to software engineering methodologies.

CSCE 4613 Artificial Intelligence (Irregular) Introduction to intelligent agents, AI languages, search, first order logic, knowledge representation, ontologies, problem solving, natural language processing, machine vision, machine learning, and robotics. Prerequisite: CSCE 3143.

CSCE 4753 Computer Networks (Sp) This course is an introductory course on computer networks. Using the Internet as a vehicle, this course introduces underlying concepts and principles of modern computer networks, with emphasis on protocols, architectures, and implementation issues. Prerequisite: INEG 3313 or STAT 3013.

CSCE 4813 Computer Graphics (Irregular) Introduction to the theory and algorithms used in computer graphics systems and applications. Topics include: 2D and 3D geometric models (points, lines, polygons, surfaces), affine transformations (rotation, translation, scaling), viewpoint calculation (clipping, projection), lighting models (light-material interactions, illumination and shadow calculation). Students will implement their own graphics pipeline to demonstrate many of these techniques. Higher level computer graphics applications will be created using OpenGL. Prerequisite: CSCE 3143.

CSCE 490V Individual Study (Irregular) (1-3) Individual study directed by faculty in current research topics, state of the art, or advanced methodology in one of the major computer science or computer engineering areas.

CSCE 4912H Honors Thesis (Sp, Fa) To provide honors students with experience in presenting their research accomplishments to their peers and faculty. Prerequisite: Honors standing. May be repeated for up to 4 hours of degree credit.

CSCE 4914 Advanced Digital Design (Sp) To master advanced logic design concepts, including the design and testing of synchronous and asynchronous combinational and sequential circuits using state of the art CAD tools. Prerequisite: CSCE 2114 or ELEG 2904. (Same as ELEG 4914)

CSCE 4963 Capstone II (Sp, Fa) CSCE students complete a comprehensive capstone project during their final year of undergraduate studies. The project is done over 2 semesters in phases: concepts, formal proposal, implementation, and presentation. The projects include and may require the integration of software and human factor, hardware elements and are developed to software engineering methodologies. Prerequisite: CSCE 4561.

CSCE 5003 Advanced Programming Languages (Irregular) Abstraction, proof of correctness, functional languages, concurrent programming, exception handling, dataflow and object oriented programming, denotational semantics. Prerequisite: Graduate standing.

CSCE 5013 Advanced Special Topics in Computer Science (Irregular) Consideration of current computer engineering topics not covered in other courses. May be repeated for up to 3 hours of degree credit.

CSCE 5033 Advanced Algorithms (Irregular) Design of computer algorithms, with primary emphasis on the development of efficient implementation.

CSCE 5043 Advanced Artificial Intelligence (Irregular) In-depth introduction to AI. Topics include: philosophical foundations, cognition, intelligent agents, AI languages, search, genetic algorithms, first order and modal logic, inference, resolution, knowledge representation,

ontologies, problem solving, planning, expert systems, uncertainty, probabilistic reasoning, fuzzy logic, machine learning, natural language processing, machine vision, and robotics. Prerequisite: Graduate standing.

CSCE 5093 Fault-Tolerant System Design (Irregular) Fault-tolerance is concerned with making or recovering from the effects of faults in a digital system, once they have been detected. On-line fault detection is often required before the fault recovery process. This course will familiarize students with currently available techniques for self-checking and fault-tolerant digital system design.

CSCE 5203 Advanced Database Systems (Irregular) Topics include: object databases, distributed databases, XML query, data warehouses, network as database systems, peer-peer data sharing architectures, data grids, data mining, logic foundations, semantic databases, spatial and temporal databases, and knowledge bases. Prerequisite: CSCE 5123 and graduate standing.

CSCE 5213 Bioinformatics (Irregular) Application of algorithmic techniques to the analysis and solution of biological problems. Topics include an introduction to molecular biology and recombinant DNA technology, biological sequence comparison, and phylogenetics, as well as topics of current interest. Prerequisite: Instructor consent. (Same as BENG 5213)

CSCE 5243 Advanced Formal Languages (Irregular) An advanced continuation of CSCE 4323. Prerequisite: CSCE 4323 and graduate standing.

CSCE 5253L Integrated Circuit Design Laboratory I (Irregular) Design and layout of large scale digital integrated circuits. Students design, check and simulate digital integrated circuits which will be fabricated, and tested in I.C. Design Laboratory II. Topics include computer aided design, circuit timing, and wire delay. Prerequisite: CSCE 4333.

CSCE 5263 Computational Complexity (Irregular) Turing machines, recursion theory and computability, complexity measures, NP-completeness, analysis on NP-complete problems, pseudo-polynomial and approximation. Prerequisite: Graduate standing.

CSCE 5283 Graph and Combinatorial Algorithms (Irregular) A study of algorithms for graphs and combinatorics with special attention to computer implementation and runtime efficiency. Prerequisites: Graduate standing or instructor consent.

CSCE 5313 Advanced Operating Systems (Irregular) Concurrent processes and process communication; mutual exclusion and synchronization principles; kernel philosophy; resource allocation and deadlock; and case studies of specific operating systems. Prerequisite: CSCE 4413 or equivalent and graduate standing.

CSCE 5323 Computer Security (Irregular) Study of a broad selection of contemporary issues in computer security. Topics include access control, security policies, authentication methods, secure system design, and information assurance. Prerequisite: CSCE 4413.

CSCE 5333 Computer Forensics (Irregular) Various methods for identification, preservation, and extraction of electronic evidence at a computer crime scene. Specific topics include auditing and investigation of network and host intrusions, computer forensics tools, resources for system administrators and information security officers, legal issues related to computer and network forensics. Prerequisite: CSCE 5323.

CSCE 5363L Integrated Circuit Design Laboratory II (Irregular) Students test the I.C. chips they designed in I.C. Design Laboratory I, and propose design corrections where needed. Topics include bipolar chip design, gate arrays, BICMOS, memory design, design for testability, and dynamic & domino logic. Prerequisite: CSCE 5253.

CSCE 5613 Telecommunications (Irregular) Overview of public and private telecommunication systems, traffic engineering, communications systems basics, information technology, electromagnetics, and data transmission. (Same as ELEG 5613)

CSCE 5633 Network Performance Evaluation (Irregular) A study of performance modeling tools for telecommunication networks, computer networks, and wireless networks. Prerequisite: STAT 3013.

CSCE 5643 Computer Communications Networks (Irregular) A study of computer communication networks, including the data link layer, routing, flow-control, local area networks, TCP/IP, ATM, B-ISDN, queueing analysis, and recent developments in computer communications.

CSCE 5653 Network Security (Irregular) This course introduces security and secrecy in a networked environment. It is intended to familiarize students with the elements of secure communication, and how they inter-relate to provide secure networks in public and private settings.

CSCE 5683 Digital Image Processing (Irregular) Introduction to digital image processing with an emphasis on practical implementation techniques. Applications include: image acquisition and sampling, image enhancement, noise removal, image restoration, image compression, and object detection. Fundamental methods include: point operations, geometric transformations, linear image processing in the spatial and frequency domains, and non-linear image processing techniques. Basic techniques of linear system theory such as convolution and Fourier transforms will be introduced as necessary to support these topics.

CSCE 5723 Client-Server Computing (Irregular) Advanced Object Oriented methods for designing software systems for network applications. Topics include implementations of distributed object models, remote database connectivity. Server side programming, and reusable components. Prerequisite: CSCE 5743 and graduate standing.

CSCE 581V Master's Project (Sp, Su, Fa) (1-6) Required course for report option. Prerequisite: Graduate standing.

CSCE 590V Advanced Individual Study (Irregular) (1-3) Advanced graduate level individual study directed by faculty in current research topics, state of the art, or advanced methodology in one of the major computer science or computer engineering areas.

CSCE 5943 Computer Arithmetic Circuits (Irregular) Examination of fundamental principles of algorithms for performing arithmetic operations in computers. This course provides sufficient theoretical and practical information to prepare the digital design engineer with an awareness of basic techniques for the realization of arithmetic circuits. Pre- or Corequisite: Graduate standing.

CSCE 5983 Application Specific Integrated Circuit Design (Irregular) ASIC design is taught with emphasis on industrial preparation. Topics include ASIC technologies, design entry, simulation, and synthesis. Advanced design methods and techniques are studied for cell based and gate array ASICs. Prerequisite: CSCE 4213 or ELEG 4943.

CSCE 610V Master's Thesis (Sp, Fa) (1-6)

CSCE 620V Post-Master's Research (Sp, Fa) (1-18)

CSCE 700V Doctoral Dissertation (Sp, Su, Fa) (1-18) May be repeated for up to 5 hours of degree credit.