CSCE - COMPUTER SCI & ENGR (CSCE)

CSCE 110 Programming I

Credits 4. 3 Lecture Hours. 2 Lab Hours. Basic concepts in using computation to enhance problem solving abilities; understanding how people communicate with computers, and how computing affects society; computational thinking; representation of data; analysis of program behavior; methods for identifying and fixing errors in programs; understanding abilities and limitation of programs; development and execution of programs.

CSCE 111 Introduction to Computer Science Concepts and Programming

Credits 4. 3 Lecture Hours. 2 Lab Hours. Computation to enhance problem solving abilities; understanding how people communicate with computers, and how computing affects society; computational thinking; software design principles, including algorithm design, data representation, abstraction, modularity, structured and object oriented programming, documentation, testing, portability, and maintenance; understanding programs' abilities and limitations; development and execution programs.

CSCE 120 Program Design and Concepts

Credits 3. 3 Lecture Hours. 1 Lab Hour. Extension of prior programming knowledge and creation of computer programs that solve problems; application of computational thinking to enhance problem solving; analysis of, design of and implementation of computer programs; use of basic and aggregate data types; encapsulation and abstraction; development of software that uses dynamic memory and avoids memory leaks; study of error handling strategies to develop more secure and robust programs. **Prerequisite:** Grade of C or better in ENGR 102, CSCE 110, CSCE 111, CSCE 206 or PHYS 150.

CSCE 121 Introduction to Program Design and Concepts

Credits 4. 3 Lecture Hours. 2 Lab Hours. Computation to enhance problem solving abilities; computational thinking; understanding how people communicate with computers, how computing affects society; design and implementation of algorithms; data types, program control, iteration, functions, classes, and exceptions; understanding abstraction, modularity, code reuse, debugging, maintenance, and other aspects of software development; development and execution of programs. **Prerequisite:** Programming course (high school or college); also taught at Galveston campus.

CSCE 181 Introduction to Computing

Credit 1. 1 Lecture Hour. Introduction to the broad field of computing; presentations from industry and academia about how computer science concepts are used in research and end products; includes a major writing component.

CSCE 201/CYBR 201 Fundamentals of Cybersecurity

Credits 3. 3 Lecture Hours. Basic terminology, concepts, technology, and trends of cybersecurity; foundations of cybersecurity to include cryptography, public key infrastructure, standards and protocols, physical security, network fundamentals; workings of systems, networks, infrastructure; legal and ethical issues in cybersecurity. **Cross Listing:** CYBR 201/CSCE 201.

CSCE 206 Structured Programming in C

Credits 4. 3 Lecture Hours. 2 Lab Hours. (COSC 1420) Structured Programming in C. Basic concepts, nomenclature and historical perspective of computers and computing; internal representation of data; software design principles and practice; structured and object-oriented programming in C; use of terminals, operation of editors and executions of student-written programs.

CSCE 221 Data Structures and Algorithms

Credits 4. 3 Lecture Hours. 2 Lab Hours. Specification and implementation of basic abstract data types and their associated algorithms including stacks, queues, lists, sorting and selection, searching, graphs and hashing; performance tradeoffs of different implementations and asymptotic analysis of running time and memory usage. **Prerequisites:** Grade C or better in CSCE 120 or CSCE 121; grade of C or better in CSCE 222 or ECEN 222, or concurrent enrollment.

CSCE 222 Discrete Structures for Computing

Credits 3. 3 Lecture Hours. Mathematical foundations from discrete mathematics for analyzing computer algorithms, for both correctness and performance; introduction to models of computation, including finite state machines and Turing machines. **Prerequisite:** Grade of C or better in MATH 142, MATH 147, MATH 151, or MATH 171.

CSCE 231 Computing Ethics

Credit 1. 1 Lecture Hour. Introduction to legal, social and ethical issues in computing and software development; emphasizes ethical decision-making, professional responsibility and communication, with coverage of professional codes, organizational ethics, law and policy, intellectual property, open-source software and variety of contemporary topics. **Prerequisites:** Grade of C or better in CSCE 221; also taught at Galveston campus.

CSCE 285 Directed Studies

Credits 0 to 4. 0 to 4 Lecture Hours. Special project in computer science; project must be approved by the department. **Prerequisite:** Approval of department head; also taught at Galveston campus.

CSCE 289 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. Selected topics in an identified area of computer science. May be repeated for credit. **Prerequisite:** Approval of instructor.

CSCE 291 Research

Credits 0 to 4. 0 to 4 Other Hours. Research conducted under the direction of faculty member in computer science. May be taken three times for credit. **Prerequisites:** Freshman or sophomore classification and approval of instructor.

CSCE 305 Computational Data Science

Credits 3. 3 Lecture Hours. Computational practice of data science through a sequence of interactive modules that provides an integrated hands-on approach to its methods, tools, applications and supporting technologies including high performance and cloud computing platforms. **Prerequisites:** Grade of C or better in ENGR 102, CSCE 110, CSCE 111, or CSCE 206; grade of C or better in MATH 251, MATH 253, or STAT 211; junior or senior classification. **Cross Listing:** ECEN 360 and STAT 315.

CSCE 310 Database Systems

Credits 3. 3 Lecture Hours. File structures and access methods; database modeling, design and user interface; components of database management systems; information storage and retrieval, query languages, high-level language interface with database systems. **Prerequisites:** CSCE 221 with a grade of C or better; junior or senior classification.

CSCE 312 Computer Organization

Credits 4. 3 Lecture Hours. 2 Lab Hours. Computer systems from programmer's perspective including simple logic design, data representation and processor architecture, programming of processors, memory, control flow, input/output, and performance measurements; hands-on lab assignments. **Prerequisite:** Grade of C or better in CSCE 221, or concurrent enrollment.

CSCE 313 Introduction to Computer Systems

Credits 4. 3 Lecture Hours. 2 Lab Hours. Introduction to system support for application programs, both on single node and over network including OS application interface, inter-process communication, introduction to system and network programming, and simple computer security concepts; hands-on lab assignments. **Prerequisite:** CSCE 221 with a grade of C or better; grade of C or better in CSCE 312 or concurrent enrollment in CSCE 350/ECEN 350 or ECEN 350/CSCE 350.

CSCE 314 Programming Languages

Credits 3. 3 Lecture Hours. Exploration of the design space of programming languages via an in-depth study of functional and object-oriented programming concepts, using concrete programming languages as examples. Focuses on idiomatic uses of programming language constructs and on features characteristic for each language. **Prerequisite:** Grade of C or better in CSCE 221, or concurrent enrollment.

CSCE 315 Programming Studio

Credits 3. 2 Lecture Hours. 2 Lab Hours. Intensive programming experience that integrates core concepts in Computer Science and familiarizes with a variety of programming/development tools and techniques; students work on 2 or 3 month-long projects each emphasizing a different specialization within Computer Science; focuses on programming techniques to ease code integration, reusability, and clarity. **Prerequisite:** CSCE 312 and CSCE 314, or CSCE 350/ECEN 350 or ECEN 350/CSCE 350; concurrent enrollment in CSCE 313.

CSCE 320/STAT 335 Principles of Data Science

Credits 3. 3 Lecture Hours. Theoretical foundations, algorithms and methods of deriving valuable insights from data; includes foundations in managing and analyzing data at scale, e.g. big data; data mining techniques and algorithms; exploratory data analysis; statistical methods and models; data visualization. **Prerequisites:** STAT 211 or ECEN 303; STAT 212 or CSCE 222; MATH 304. **Cross Listing:** STAT 335/CSCE 320.

CSCE 325 Foundations of Artificial Intelligence and Machine Learning

Credits 3. 3 Lecture Hours. Foundations of artificial intelligence and machine learning; search, reasoning and knowledge representation; planning, decision making and problem solving; supervised and unsupervised learning; deep learning methods and generative AI; applications across domains such as language, vision and robotics; evaluation of systems; ethical and societal implications. **Prerequisites:** Grade of C or better in CSCE 221 and CSCE 222; grade of C or better in STAT 211 or ECEN 303; also taught at Galveston campus.

CSCE 331 Foundations of Software Engineering

Credits 4. 3 Lecture Hours. 2 Lab Hours. Intensive programming experience and provision of the fundamentals needed for larger-scale software development; integration of concepts in computer science and familiarization with a variety of programming and development tools and techniques; team projects each with an emphasis on a different specialization within computer science; emphasis on programming techniques to ease code integration and clarity; practical exposure to software-engineering processes through large-scale projects and specification and documentation. **Prerequisite:** Grade of C or better in CSCE 314, CSCE 350/ECEN 350, or ECEN 350/CSCE 350; grade of C or better or concurrent enrollment in CSCE 313.

CSCE 350/ECEN 350 Computer Architecture and Design

Credits 4. 3 Lecture Hours. 3 Lab Hours. Computer architecture and design; use of register transfer languages and simulation tools to describe and simulate computer operation; central processing unit organization, input/output and memory system architectures. **Prerequisites:** Grade of C or better in ECEN 248 and CSCE 120; junior or senior classification. **Cross Listing:** ECEN 350/CSCE 350.

CSCE 399 High-Impact Experience

Credits 0. 0 Other Hours. Participation in an approved high-impact learning practice; documentation and self-assessment of learning experience. **Prerequisite:** Junior or senior classification; also taught at Galveston campus.

CSCE 402 Law and Policy in Cybersecurity

Credits 3. 3 Lecture Hours. Examination of law and policy issues related to cybersecurity for the spectrum of cybersecurity jobs; includes procurement, operations and maintenance, governance and oversight, protection and defense, analysis, intelligence collection and operation and investigation cybersecurity jobs. **Prerequisites:** Junior or senior classification; MARA-403 taught at Galveston campus. **Cross Listing:** MARA 403 and CYBR 402.

CSCE 410 Operating Systems

Credits 3. 3 Lecture Hours. Hardware/software evolution leading to contemporary operating systems; basic operating systems concepts; methods of operating systems design and construction including algorithms for CPU scheduling, memory and general resource allocation, process coordination and management; case studies of several operating systems. **Prerequisites:** Grade of C or better in CSCE 313; grade of C or better in CSCE 315 or CSCE 331.

CSCE 411 Design and Analysis of Algorithms

Credits 3. 3 Lecture Hours. Study of computer algorithms for numeric and non-numeric problems; design paradigms; analysis of time and space requirements of algorithms; correctness of algorithms; NP-completeness and undecidability of problems. **Prerequisite:** Grade of C or better in CSCE 221 and CSCE 222; junior or senior classification or approval of instructor.

CSCE 412 Cloud Computing

Credits 3. 3 Lecture Hours. Operating system and distributed systems fields that form the basis of cloud computing such as virtualization, key-value storage solutions, group membership, failure detection, peer to peer systems, datacenter networking, resource management and scalability; popular frameworks such as MapReduce and HDFS and case studies on failure determination. **Prerequisite:** Grade of C or better in CSCE 315 or CSCE 331.

CSCE 413 Software Security

Credits 3. 3 Lecture Hours. Basic principles of design and implementation of defect-free software, code reviews including tool-assisted review by static and dynamic analysis, risk analysis and management and methods for software security testing. **Prerequisites:** Grade of C or better in CSCE 315 or CSCE 331; or approval of instructor.

CSCE 416/ECEN 416 Hardware Design Verification

Credits 3. 3 Lecture Hours. Hardware functional verification; case studies on verification in integrated circuit design; introduction to industry best practices; introduction to logic functional verification. **Prerequisites:** CSCE 312, CSCE 350/ECEN 350, or ECEN 350/CSCE 350, or equivalent in computer architecture; familiarity with C/C++/Verilog/VHDL programming. **Cross Listing:** ECEN 416/CSCE 416.

CSCE 420 Artificial Intelligence

Credits 3. 3 Lecture Hours. Fundamental concepts and techniques of intelligent systems; representation and interpretation of knowledge on a computer; search strategies and control; active research areas and applications such as notational systems, natural language understanding, vision systems, planning algorithms, intelligent agents and expert systems. **Prerequisite:** CSCE 411 or approval of instructor.

CSCE 421 Machine Learning

Credits 3. 3 Lecture Hours. Theoretical foundations of machine learning, pattern recognition and generating predictive models and classifiers from data; includes methods for supervised and unsupervised learning (decision trees, linear discriminants, neural networks, Gaussian models, non-parametric models, clustering, dimensionality reduction, deep learning), optimization procedures and statistical inference. **Prerequisite:** Grade of C or better in MATH 304, MATH 311, or MATH 323; Grade of C or better in STAT 211, and STAT 404 or CSCE 221, or ECEN 303, and CSCE 121 or CSCE 120. **Cross Listing:** ECEN 427 and STAT 421.

CSCE 429 Software Development, Globalization and Culture Abroad

Credits 3. 3 Lecture Hours. Software development cycle; software outsourcing model, execution and practices; software industries on products, services and consultancy; software globalization; and offshore development culture; travel abroad required. **Prerequisite:** CSCE 315 or approval of instructor.

CSCE 430 Problem Solving Programming Strategies

Credits 3. 2 Lecture Hours. 3 Lab Hours. Methods for analyzing fundamental programming problems from a variety of domains and implementing solutions quickly and efficiently; problems based on competitive programming contests to develop skills in problem analysis, coding and testing; solving problems will involve identifying and applying a range of algorithmic solutions; includes dealing with combinatorics, dynamic programming, graphs, numerical calculations, string processing and geometry, along with other specialized algorithms. **Prerequisites:** CSCE 411 or approval of instructor.

CSCE 431 Software Engineering

Credits 3. 2 Lecture Hours. 2 Lab Hours. Application of engineering approach to computer software design and development; life cycle models, software requirements and specification; conceptual model design; detailed design; validation and verification; design quality assurance; software design/development environments and project management. **Prerequisite:** Grade of C or better in CSCE 315 or CSCE 331 or approval of instructor.

CSCE 432 Accessible Computing

Credits 3. 3 Lecture Hours. Exploration of the characteristics of traditionally disenfranchised user populations due to disability including discrimination; universal design concepts; exploration of ethical and legal motivations for creating accessible technology; development, evaluation, design, and implementation of equitable and inclusive software and computer based solutions; study of multiple existing accessibility standards. **Prerequisite:** Grade of C or better in CSCE 315 or CSCE 331.

CSCE 433 Formal Languages and Automata

Credits 3. 3 Lecture Hours. Basic types of abstract languages and their acceptors; the Chomsky hierarchy; solvability and recursive function theory; application of theoretical results to practical problems. **Prerequisite:** CSCE 315 or CSCE 331 or approval of instructor.

CSCE 434 Compiler Design

Credits 3. 3 Lecture Hours. Programming language translation; functions and general organization of compiler design and interpreters; theoretical and implementation aspects of lexical scanners; parsing of context free languages; code generation and optimization; error recovery. **Prerequisite:** Grade of C or better in CSCE 315 or CSCE 331.

CSCE 435 Parallel Computing

Credits 3. 3 Lecture Hours. Overview of parallel computing technology and programming methods; includes multiprocessor architectures, programming tools, parallel performance, parallel algorithms, and applications of parallel computing. **Prerequisite:** Grade of C or better in CSCE 315 or CSCE 331; junior or senior classification or approval of instructor.

CSCE 436 Computer-Human Interaction

Credits 3. 3 Lecture Hours. Comprehensive study of the Computer-Human Interaction (CHI) area; includes history and importance of CHI; CHI design theories; modeling of computer users and interfaces; empirical techniques for task analysis and interface design; styles of interaction and future directions of CHI including hypermedia and computer-supported collaborative work. **Prerequisites:** Grade of C or better in CSCE 315 or CSCE 331 or concurrent enrollment; or approval of instructor.

CSCE 438 Distributed Systems

Credits 3. 3 Lecture Hours. Principles and techniques for engineering distributed systems with topics including communication, concurrency, programming paradigms, naming, managing shared state, caching, synchronization, reaching agreement, fault tolerance, security, middleware and distributed applications; design, implement and debug large software systems. **Prerequisite:** CSCE 313; junior or senior classification, or approval of instructor.

CSCE 439 Data Analytics for Cybersecurity

Credits 3. 3 Lecture Hours. Theoretical foundations, algorithms and methods of data analytics for cybersecurity; study of data analytics including cluster analysis, supervised machine learning, anomaly detection, and visualization applied to cyber attacks, anomaly detection, vulnerability analysis, strategic manipulation, propaganda and other topics. **Prerequisites:** Grade of C or better in CSCE 221; grade of C or better in ECEN 303, STAT 211, STAT 301, STAT 302, or STAT 303.

CSCE 440 Quantum Algorithms

Credits 3. 3 Lecture Hours. Introduction to the design and analysis of quantum algorithms; basic principles of the quantum circuit model; gives a gentle introduction to basic quantum algorithms; reviews recent results in quantum information processing. **Prerequisites:** Grade of C or better in CSCE 315 or CSCE 331 or approval of instructor.

CSCE 441 Computer Graphics

Credits 3. 3 Lecture Hours. Principles of interactive computer graphics; 2-D and 3-D rendering pipelines, including geometric object and view transformations, projections, hidden surface removal, and rasterization; lighting models for local and global illumination; hierarchical models of 3-D objects; systems and libraries supporting display and user interaction. **Prerequisite:** CSCE 221; junior or senior classification or approval of instructor.

CSCE 442 Scientific Programming

Credits 3. 3 Lecture Hours. Introduction to numerical algorithms fundamental to scientific and engineering applications of computers; elementary discussion of error; algorithms, efficiency; polynomial approximations, quadrature and systems of algebraic and differential equations. **Prerequisites:** CSCE 221 with a grade of C or better; MATH 304 or MATH 308 or concurrent enrollment.

CSCE 443/VIST 487 Game Development

Credits 3. 2 Lecture Hours. 2 Lab Hours. Aesthetic and technical aspects of computer game development, including game mechanics, story development, content creation and game programming; includes game design, interface design, 3D modeling and animation, graphics algorithms, shader programming and artificial intelligence; group project includes the design and development of a game from start to finish. **Prerequisites:** Grade of C or better in VIST 386 or CSCE 441, or approval of instructor. **Cross Listing:** VIST 487/CSCE 443.

CSCE 444 Structures of Interactive Information

Credits 3. 2 Lecture Hours. 2 Lab Hours. A systems approach to the programming, design, authoring and theory of hypermedia; object-oriented visual and interactive programming; visual design, including color, space, text and layering; the reference as a metadisciplinary structure; collecting and sampling; ontologies, maps and navigation as means of structuring information; create dynamic hypermedia that is expressive and interpretive. **Prerequisite:** CSCE 315 or approval of instructor.

CSCE 445 Computers and New Media

Credits 3. 3 Lecture Hours. Potential and realized impact of computers in the design of new media; relationship between authors and readers of interactive material; influence of media design on the content expressed. **Prerequisite:** CSCE 221 or approval of instructor.

CSCE 446/VIST 477 Virtual Reality

Credits 3. 2 Lecture Hours. 2 Lab Hours. Theory and practice of virtual reality; interactive 3D virtual environments; input/output devices, 3D interaction techniques, augmented reality, role of realism in VR, navigation techniques, design guidelines and evaluation methods. **Prerequisite:** Grade of C or better in VIST 272, CSCE 221, or CSCE 441. **Cross Listing:** VIST 477/CSCE 446.

CSCE 447/VIST 476 Data Visualization

Credits 3. 3 Lecture Hours. Visual representation and design of data and information; 3D visualization, infographics, data narratives, principles of visual data encoding and interaction techniques. **Prerequisite:** Grade of C or better in VIST 272, or CSCE 221, or CSCE 441. **Cross Listing:** VIST 476/CSCE 447.

CSCE 448 Computational Photography

Credits 3. 3 Lecture Hours. Cameras and the image formation process; basic image and video processing tools like sampling, filtering and pyramids; several image-based algorithms, including panorama creation, lightfields, image retargeting, high dynamic range imaging and texture synthesis. **Prerequisite:** CSCE 315 or CSCE 331; MATH 304 or MATH 311.

CSCE 449 Applied Cryptography

Credits 3. 3 Lecture Hours. A comprehensive overview of the theory and practice of securing systems through cryptography. Topics include foundational security design principles, attacker models, classical ciphers and secure randomness; modern symmetric-key (stream and block) and asymmetric/public-key ciphers; cryptographic primitives including hash functions, digital signatures, message authentication codes and key exchange. Applications are explored, along with emerging trends. Hands-on projects provide practical experience with cryptographic tools. **Prerequisite:** CSCE 221.

CSCE 450 Computer Animation

Credits 3. 3 Lecture Hours. Investigation of computational problems in computer animation; study of the mathematical and algorithmic foundations behind various techniques used for computer animation for real-time and offline use. **Prerequisite:** Grade of C or better in CSCE 315 or CSCE 331; grade of C or better in or concurrent enrollment in CSCE 441.

CSCE 451 Software Reverse Engineering

Credits 3. 2 Lecture Hours. 2 Lab Hours. Overview of the compilation mechanism to generate executable files and raw binary codes from source codes; executable file formats for an operating system to run the binary code; disassembly algorithms and control graph analysis; static and dynamic analyses; case studies on code obfuscation, codebreaking, malware analysis. **Prerequisite:** Grade of C or better in CSCE 313 or approval of instructor.

CSCE 452 Robotics and Spatial Intelligence

Credits 3. 3 Lecture Hours. Algorithms for executing spatial tasks; path planning and obstacle aance in two- and three-dimensional robots--configuration space, potential field, free-space decomposition methods; stable grasping and manipulation; dealing with uncertainty; knowledge representation for planning--geometric and symbolic models of the environment; task-level programming; learning. **Prerequisite:** CSCE 315 or CSCE 331; MATH 304 or MATH 311.

CSCE 462 Microcomputer Systems

Credits 3. 2 Lecture Hours. 1 Lab Hour. Microcomputers as components of systems; VLSI processor and coprocessor architectures, addressing and instruction sets; I/O interfaces and supervisory control; VLSI architectures for signal processing; integrating special purpose processors into a system. **Prerequisite:** CSCE 313.

CSCE 463 Computer Networks

Credits 3. 3 Lecture Hours. Basic hardware/software and architectural components for computer communications; delay, loss, throughput and topology of packet networks; application/transport-layer protocols, network-layer routing, data-link switching; security; socket programming, kernel APIs and multi-threading; case studies of existing networks, protocols and architectures. **Prerequisite:** CSCE 313 or approval of instructor.

CSCE 464 Wireless and Mobile Systems

Credits 3. 3 Lecture Hours. Introduction to wireless and mobile systems; wireless communication fundamentals; wireless medium access control design; transmission scheduling, network and transport protocols over wireless design, simulation and evaluation; wireless capacity; telecommunication systems; vehicular, adhoc, and sensor network systems; wireless security; mobile applications. **Prerequisites:** CSCE 313; junior or senior classification or approval of instructor.

CSCE 465 Computer and Network Security

Credits 3. 3 Lecture Hours. Fundamental concepts and principles of computer security, operating system and network security, secret key and public key cryptographic algorithms, hash functions, authentication, firewalls and intrusion detection systems, IPSec and VPN, wireless and web security. **Prerequisites:** Grade of C or better in CSCE 315 or CSCE 331, and CSCE 313 ; junior or senior classification; approval of instructor.

CSCE 469/ECEN 469 Advanced Computer Architecture

Credits 3. 3 Lecture Hours. Advanced computer architectures including memory designs, pipeline techniques and parallel structures such as out-of-order cores and multiprocessors. **Prerequisite:** Grade of C or better in ECEN 350/CSCE 350 or CSCE 350/ECEN 350; junior or senior classification. **Cross Listing:** ECEN 469/CSCE 469.

CSCE 470 Information Storage and Retrieval

Credits 3. 3 Lecture Hours. Representation of, storage of and access to very large multimedia document collections; fundamental data structures and algorithms of current information storage and retrieval systems and relates various techniques to design and evaluation of complete retrieval systems. **Prerequisite:** Grade of C or better in CSCE 315 or CSCE 331 or approval of instructor.

CSCE 471 Natural Language Processing

Credits 3. 3 Lecture Hours. NLP fundamentals including word semantics, language models, discourse and pragmatics; introduction to various applications including information extraction, sentiment analysis, question and answering, text summarization and machine translation. **Prerequisites:** Grade of C or better in CSCE 331 or approval of instructor; junior or senior classification.

CSCE 477/CYBR 403 Cybersecurity Risk

Credits 3. 3 Lecture Hours. Risks in cybersecurity; avoidance, acceptance, mitigation, or transference strategies; developing reliable cybersecurity risk assessments to include analysis, categorization, and evaluation; cybersecurity risk audit frameworks. **Prerequisite:** Grade of C or better in CYBR 201/CSCE 201, CSCE 201/CYBR 201, or CSCE 221; junior or senior classification. **Cross Listing:** CYBR 403/CSCE 477.

CSCE 481 Seminar

Credit 1. 1 Lecture Hour. Investigation and report by students on topics of current interest in computer science. **Prerequisite:** Junior or senior classification.

CSCE 482 Senior Capstone Design

Credits 3. 1 Lecture Hour. 6 Lab Hours. Development of system integration skills for solving real-world problems in computer science; significant team software project that uses integration of advanced concepts across computer science specializations; projects require design, implementation, documentation and demonstration, as well as design methodology, management process and teamwork. **Prerequisite:** Grade of C or better in CSCE 411, and CSCE 315 or CSCE 331; senior classification; also taught at Galveston campus.

CSCE 483 Computer Systems Design

Credits 3. 1 Lecture Hour. 6 Lab Hours. Engineering design; working as a design-team member, conceptual design methodology, design evaluations, total project planning and management techniques, design optimization, systems manufacturing costs considerations; emphasis placed upon students' activities as design professionals. **Prerequisites:** Grade of C or better in CSCE 315 or CSCE 331, and CSCE 462 or ECEN 449, and ECEN 325; senior classification.

CSCE 485 Directed Studies

Credits 0 to 6. 0 to 6 Other Hours. Permits work on special project in computer science; project must be approved by the department. **Prerequisite:** Senior classification; also taught at Galveston campus.

CSCE 489 Special Topics in...

Credits 1 to 4. 1 to 4 Other Hours. Special topics in computer science that are new or unique that are not covered in existing courses.

CSCE 491 Research

Credits 0 to 4. 0 to 4 Other Hours. Research conducted under the direction of faculty member in computer science. May be taken four times for credit. **Prerequisites:** Junior or senior classification and approval of instructor.