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Computer Science

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The Computer Science (CS) program at Chaminade is based on several recent trends in the evolution of the environment of Computer Science. One of these trends is the emergence of the security of computer systems and electronic data as a major concern. A second trend is the pervasive nature of Internet computing, i.e. the rise in the use of the web as one of the most significant phenomena of the 21st century. A third trend is the realization that practical, "hands-on" student experiences are essential in undergraduate computer science. The curriculum for Chaminade Computer Science Program addresses these trends by emphasizing cybersecurity, databases systems and applications, internet computing and laboratory work. Cyberspace is defined as all of the computer networks in the world and everything they connect and control, including Internet and infrastructure networks such as power grids and satellite communication networks. Alarming increase in the cyber-attacks on the various networks led to the United States government joining together with our allies to fight back against hacker attacks.

The revised curriculum model covers the following knowledge areas of Computer Science: Discrete Structures, Programming Fundamentals, Algorithms and Complexity, Architecture and Organization, Operating Systems, Internet Computing, Human Computer Interfaces, Programming Languages, Information Management, Social and Ethical Issues and Software Engineering. The curricular areas are approached in a project-directed learning model where collaborative work and problem solving are emphasized. A research and development based capstone course, as well as opportunities for internships, will provide Computer Science graduates with highly desirable skill sets.

The Computer Science program at Chaminade has a number of features that are congruent with our University's mission. The close student-faculty interactions promote learning in an atmosphere of family spirit and collaboration. There is a strong intellectual focus in the revised Computer Science program in the area of cybersecurity and networking. There is a pressing national and international need for professionals who will be dedicated to maintaining safe and secure social and economic systems and preserving peace. This is an area of service in which Chaminade graduates will live out purpose-driven professional lives, making important contributions to security and prosperity. The curriculum includes learning outcomes that are related to ethics and integrity, and seeks to provide students with skills of adaptation in the use of a project-based learning model.

Program Learning Outcomes in Computer Science

1. The student will demonstrate an integrative understanding of contemporary computer organization and architecture, operating systems, computer networks, internet and web technologies, database systems, software engineering, and programming;

2. The student will demonstrate the ability to specify, design, implement, analyze, test, document and evaluate a reliable and secure computer-based database or network system, in terms of both its processes and components;

3. The student will demonstrate an understanding of the social, economic, defense-related and geopolitical issues that create the need for secure computer networks;

4. The student will demonstrate an understanding of cybersecurity vulnerabilities, the strategic incorporation of cybersecurity strategies in system development, and will demonstrate the ability to implement best practices in maintaining secure systems;

5. The student will demonstrate the ability to establish safeguards for automated information systems, through installation, configuring, and implementation of security software, hardware, and firmware components;

6. The student will demonstrate the ability to perform, and present, independent and team-based project-based assignments, conduct research assignments, and use critical thinking skills to solve problems;

7. The student will demonstrate an understanding of the regulatory and ethical framework in which the Computer Science professional operates.

Pre-major requirements: CS 150, CS 160/160L, MA 110 or higher

Major requirements for Computer Science:
Core Courses: CS 250, CS 320, CS 330, CS 360, CS 370, CS 410, CS 430, CS 486
Other Required Courses: MA 210, MA 308, MA 331, BU 362
CS electives: three (3) are required; to be selected for the Database Concentration or the Networks Security Concentration from the following list of courses: CS 420, CS 440, CS 450, CS 470, CS 480, CS 499, CS 372, CS 374. Please contact advisor for details.

Minor in CS

Pre-minor requirements: CS 150, MA 110 or higher

Minor requirements for Computer Science: 12 semester hours of upper division CS courses. Please contact advisor for details.

Course Descriptions

Computer Science (CS)

CS 103 Computers and Application Software (3)
Computers have become an essential part of our life. It is difficult to find a business or profession that does not rely on computers. Hence, it is imperative to learn basic computing skills and gain knowledge to become computer fluent. This course focuses on basic computer concepts: operating systems, MS Office Fundamentals such as Word, Power Point (presentation graphics, audio and video) and Excel. The course includes Access relational database as a major departmental computing tool in the organization. No prerequisites. Offered every semester.

CS 150 Introduction to Computer Science (3)
Combines an overview of the discipline of computer science with an introduction to programming. Discussion topics include data representation, computer architecture, software development, operating systems, networks, computer security, and computer ethics. Programming concepts and practices include basic data types and control structures, accompanied by lab exercises. No prerequisites. Offered in fall semester.

CS 160 Introduction to Software Design and Implementation (3)
Introduction to the principles and techniques of software design and implementation. Topics include to-down design, algorithm development, simple data structures, and recursion. Study of basic algorithms to manipulate arrays. Concurrent registration in CS 160L required. Prerequisite: CS 150. Offered in spring semester.

CS 160L Introduction to Software Design and Implementation Laboratory (1)
One-hour laboratory period to accompany CS 160. Concurrent registration in CS 160 required.

CS 250 Data Structures (3)
Representation of information in computers including process and data abstraction techniques; static and dynamic storage methods, lists, stacks, queues, and binary trees; recursion, analysis of algorithms, and searching and sorting. Concurrent registration in CS 250L required. Prerequisite: CS 160/CS 160L. Offered in fall semester.

CS 250L Data Structures Laboratory (1)
One-hour laboratory period to accompany CS 250. Concurrent registration in CS 250 required.

English 102 and COM 101 are prerequisites for all upper division courses.

CS 320 Database Systems (3)
Introduction to principles and techniques of database design. Relational database, entity-relationship model, normal forms, data manipulation language to query and modify database, and Web applications. Prerequisite: CS 250. Offered in spring semester.

CS 330 Computer Architecture (3)
The course covers the following fundamentals: CPU, main memory, I/O devices and system interconnections. It defines the concept of computer architecture versus computer organization. It presents four basic functions of the computer: data processing, data storage, data movement and control. Designing computers for performance leads to discussing various modern architectures and techniques such as chip architecture and parallelism. Prerequisite: CS 250. Offered in spring semester.

CS 361 Computer Networks (3)
Basic concepts in data transmission and network systems, including transmission protocols, network configurations, packet switching, and network interconnection. Prerequisite: CS 250. Offered in fall semester.

CS 370 Network Management (3)
Network management focuses on the deployment, integration, and coordination of hardware, software, and human elements to monitor, configure, analyze, evaluate, and control the networks in real-time. Operational performance and Quality of Service requirements at a reasonable cost are the top priorities of network management. The course presents techniques and tools to manage local and wide area networks. Prerequisite: CS 250. Offered in spring semester.

CS 372 Algorithm Analysis (3)
Study of computational algorithms in terms of their performance using, as an example, the order of growth concept. Consideration of algorithm development and operational speed, the Turing machine, and unsolvable problems in computing. Prerequisite: CS 250. Offered in fall semester.

CS 374 Human-Computer Interaction (3)
Human Factors issues in the development of software, and the design of interfaces for interactive systems. Theories, models, usability studies and software engineering with user interface development environments. Issues include: command languages, menus, forms and direct manipulation, graphical user interfaces, computer supported cooperative work, information search and visualization, input/output devices. Prerequisite: CS 250. Offered in the spring.

CS 410 Operating Systems (3)
Operating systems are a vital part of every computer system. Therefore a course on operating systems is an essential part of any computer science program. Throughout the years, operating systems transformed and emerged in unexpected applications such as domestic appliances, games, and portable electronics. The objective of this course is to present the nature and characteristics of modern computer systems. The course provides a clear and broad description of the concepts that emphasize operating systems. The major components of an operating system are presented and their role discussed in the overall system context. Prerequisite: CS 250. Offered in fall semester.

CS 420 Advanced Database Systems (3)
Course covers transaction management, concurrency control, query optimization, recovery and security techniques. Students learn about object-oriented database and distributed database models. Topics from emerging trends will be discussed. Prerequisite: CS 320. Offered in spring semester.

CS 430 Software Engineering (3)
This course is about developing software. A successful software development process performs flawlessly and meets users' expectations. The objective of this course is to provide a guide to students who would like to have a successful career in software engineering and applications development. The course emphasizes the software engineering process and its best practices. Students learn about software development process methodology, software design methods, managing software development process, and how to improve the software development process. An overview of methodologies for producing software systems, include requirements analysis, tools and techniques, and design principles and implementations. Prerequisite: CS 250. Offered in spring semester.

CS 440 Data Mining (3)
Course presents concepts and techniques in data mining to analyze large volumes of data, to develop practical models for extracting complex patterns and relationships. Acquired knowledge is reinforced by using the Case Studies from industry examples. Prerequisite: CS 320. Offered in spring semester.

CS 450 Advanced Computer Networks (3)
Course presents advanced topics in computer networking including multimedia network applications, audio and video data streaming, network interactive applications and other emerging technologies. Additional topics include principles of cryptography and modern network management techniques. Prerequisite: CS 360. Offered in spring semester.

CS 470 Network Security (3)
The objective of this course is to provide an up-to-date overview of the principles and best practices in computer network security. It explores ever changing security issues of protecting computer assets against unauthorized access and alterations. The key security concepts: confidentiality, integrity, availability, authenticity and accountability are discussed. Students learn about cryptographic algorithms. Prerequisite: CS 480. Offered in fall semester.

CS 480 Special Topics (1-3)
This course addresses a hot and current computer science topics or upcoming new technology trends that have a profound influence on technology or computing. It can be combination of lecture or laboratory work. Examples: cyberspace and cybersecurity essentials, cloud computing, social networking, artificial intelligence in service of the people, speeding to computer performance through parallel processing, etc… This course can be taken by any Chaminade student who is interested in the presented subject. Pre-requisites: NONE. Offered in fall or spring.

CS 486 Collaborative Design (3)
This course allows students to select, develop and implement a comprehensive computer solution to a computing problem. A Collaborative Design course focuses on working together in the team setting environment. Problem solving techniques and software development process are discussed. Prerequisite: CS 250 or CS 430 depending on the subject but NOT both. Please consult instructor. Offered in spring semester.

CS 499 Directed Senior Research or Study (1-3)
Individualized study on a topic arranged through the program advisor for one or more students. Prerequisites: NONE. Offered in fall semester.