

■ Computer Science

Program Advisors: Dr. Paulo Martins, Dr. Donald Moon, Bro. Robert Maruyama

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's Computer Science Program addresses these trends by emphasizing cybersecurity, databases systems and applications, internet computing and laboratory work.

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 central 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, analyse, 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.

Bachelor of Science in Computer Science (CS)

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

Major requirements for Computer Science: CS 250/250L, BU 362, MA 210, MA 308, MA 331, CS 320, CS 330, CS 361, CS 370, CS 410, CS 430, CS 486, CS 496, CS 499, and three CS electives to be selected from CS 420, CS 440, CS 460, CS 470.

Minor in CS

Pre-minor requirements: CS 150, MA 110

Minor requirements for Computer Science: 12 semester hours of upper division CS courses.

Course Descriptions

Computer Science (CS)

CS 103 Computers and Application Software (3)

Introduction to the computer as a productivity tool. Covers basic concepts and uses of internet including email, FTP and WWW; application packages including word processing, spreadsheet, presentation graphics and database systems.

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. Offered every semester.

CS 160 Introduction to Software Design and Implementation (3)

Introduction to the principles and techniques of software design and implementation. Topics include top-down design, algorithm development, simple data structures, and recursion. Study of basic algorithms to manipulate arrays. Offered every semester. Concurrent registration in CS 160L required.

Prerequisite: CS 150.

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. Offered every semester. Concurrent registration in CS 250L required. Prerequisite: CS 160/160L.

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. Offered annually in the fall semester. Prerequisite: CS 250.

CS 330 Computer Architecture (3)

Architecture versus organization; logic modules; CPU, memory and I/O; instruction cycles and the control unit; datapath implementation of the CPU; memory structure and timing; I/O interface, interrupts, programmed I/O and DMA; and assembly language programming. Offered annually in the spring semester. Prerequisite: CS 250.

CS 361 Computer Networks (3)

Basic concepts in data transmission and network systems, including transmission protocols, network configurations, packet switching, and network interconnection. Offered annually in the fall semester. Prerequisite: CS 250.

CS 370 Network Management (3)

Techniques, tools, and systems to manage local and networks. Includes an overview of network management, diagnostic and performance tools, security issues, and requirements for the LAN manager. Offered annually in the spring semester. Prerequisite: CS 250.

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. Offered alternate years in the fall. Prerequisite: CS 250.

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. Offered alternate years in the spring. Prerequisite: CS 250.

CS 410 Operating Systems (3)

Operating system concepts: process management, memory management, file systems, distributed systems, protection and security. Study of operating system types and examples. Offered annually in the fall semester. Prerequisite: CS 250.

CS 420 Advanced Database Systems (3)

Transaction management, concurrency control, query optimization, and recovery and security techniques. Object-oriented database and distributed database models. Topics from emerging trends. Offered in alternate years in the spring semester. Prerequisite: CS 320.

CS 430 Software Engineering (3)

An overview of methodologies for producing software systems, including requirements analysis, tools and techniques, and design principles and implementations. Includes structured and object-oriented approaches. Offered annually in the spring semester. Prerequisite: CS 250.

CS 440 Data Mining (3)

Concepts and techniques in data mining to analyze large volumes of data, to develop practical models for extracting complex patterns and relationships. Case studies from industry examples. Offered alternate years in the spring semester. Prerequisite: CS 320.

CS 460 Advanced Computer Networks (3)

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 network management. Offered alternate years in the spring semester. Prerequisite: CS 361.

CS 470 Network Security (3)

Principles and practices of computer network security. Explores basic security issues and how they are addressed in contemporary systems through hardware and software technologies. Topics include data network management policies, authentication, firewalls, integrity algorithms, and ciphers. Prerequisites CS 250, CS 360.

CS 486 Collaborative Design (3)

Development of a comprehensive computer solution to a problem in a team setting, with emphasis on working with a client. Participation in software development cycle including specification, design, implementation, testing, maintenance, and documentations. Discussion of professional responsibilities, ethics, and communication. Prerequisite: CS 250.

CS 480 Special Topics (1-3)

Lecture or laboratory work on selected topics (e.g. artificial intelligence, parallel processing, and others by arrangement with instructor). Pre-requisites: CS 250.

CS 496 Topics Seminar (1-3)

Individualized in-depth research, readings and discussions on current topics in computer science. Includes intensive library and computer-based searches and several oral reports. Offered annually. *Prerequisites: CS senior standing or approval of program advisor.*

CS 499 Directed Senior Research or Study (1-3)

Individualized study on a topic arranged through the program advisor. Prerequisites: CS 250.