COMPUTER SCIENCE AND INFORMATION TECHNOLOGY

The computer science field has demonstrated dramatic growth and technological development within the last decade. The 21st century is heralding the emergence of nanotechnology, ubiquitous computing, computer games and wireless networking. The Computer Science and Information Technology (CS/IT) Department is responding to these technological challenges by offering a dynamic course of study that is responsive to the ever-changing field of computer technology.

(CS/IT) curriculum has three tracks: Computer Science, Information Technology and Computer Gaming - Design and Development. The Computer Science track is geared to those students with strong mathematics and the desire to participate in the research and development side of computer science. The Information Technology track is for those students interested in interface, multimedia and system design for various business applications and the Computing Gaming Design and Development track is for students who wish to design and develop games for entertainment, simulation and training.

Faculty

FRANCES GRODZINSKY, PH.D.
Professor

SANDRA HONDA ADAMS, M.S.
Associate Professor

EFIM KINBER, PH.D.
Professor

KERI MATTHEWS, M.S.
Instructor

ROBERT MCCLOUD, ED.D.
Associate Professor

DOMENICK J. PINTO, M.A., M.A., M.S.
Associate Professor, Chair

FRANCESCO SARDO, M.S.
Instructor

Computer Science Facilities

There are three state of the art computing labs dedicated to computer science courses. These contain the latest flat screen Dell Optiplex computers with DVD, CD-R/W drives. In addition the conference room of the CS/IT department serves as a mini-lab used exclusively by CS/IT majors for projects, homework and tutoring and is equipped with the same state of the art equipment. There is also a Networking/Unix lab equipped with 15 Linux machines and a variety of Cisco routers. This closed LAN laboratory is used for networking and Unix shell programming courses and is open 24 hours a day, seven days a week for those students. All labs are on a 3-year replacement cycle.

SOFTWARE AVAILABLE IN THE LABS INCLUDES:

Microsoft Office 2013
Adobe Director 11.5 Flash CS5 Fireworks CS5 Dreamweaver CS5
V.B. Net 2012
Visual C++ 2012
Visual C# 2012
Visual Studio 2012
Borland JBuilder
Sony Sound Forge 10.0 Adobe Photoshop CS5 Visio 2010

Major in Computer Science

The major in Computer Science with a concentration in Computer Science requires the completion of 54 credits for the Computer Science track and 54 credits for the Computer Gaming track. The major in Computer Science with a concentration in
Information Technology requires 52 credits. CS 110 may be required if a student has no previous programming experience.

REQUIRED COURSES FOR COMPUTER SCIENCE, INFORMATION TECHNOLOGY AND COMPUTER GAMING DESIGN AND DEVELOPMENT TRACKS

- **CS 111** Introduction to Structured Programming
- **CS 112** Data Structures
- **CS 113** Discrete Structures
- **CS 215** Computer Systems Organization with Assembler
- **CS 312** Software Engineering
- **CS 318** Project Course
- **CS 319** Computer Ethics

REQUIRED COURSES FOR COMPUTER SCIENCE TRACK

- **CS 241** Advanced Programming Concepts Using “C”
- **CS 272** OOP with C# and Games
- **CS 311** Database Design
- **CS 339** Networking and Data Communication
- **CS 341** Analysis of Algorithms
- **CS 348** Programming in Unix
- **CS 349** Operating Systems
- **CS Elec.** One Computer Science elective

REQUIRED COURSES FOR COMPUTER GAMING TRACK

- **CS 171** Introduction to Computer Gaming
- **CS 271** Advanced Computer Gaming
- **CS 272** OOP with C# and Games
- **CS 341** Analysis of Algorithms
- **CS 349** Operating Systems
- **CS 371** Advanced Game Programming
- **CS 372** Building Computer Games

REQUIRED SUPPORTING COURSES FOR COMPUTER SCIENCE TRACK

- **MA 151** Calculus I (and MA 152 Calculus II should be taken as part of the required Baccalaureate core.)
- **MA 261** Linear Algebra
- **MA 331** Probability and Statistics I

REQUIRED SUPPORTING COURSES FOR COMPUTER GAMING TRACK

- **MA 140** Precalculus
- **MA 151** Calculus I
- **AR 110** Design: Visual Organization
- **AR 114** Digital Design Basics

REQUIRED COURSES FOR INFORMATION TECHNOLOGY TRACK

Math 109 Mathematics for Decision Making and Math 110 Calculus for Decision Making should be taken as part of the required Baccalaureate core.

- **CS 232** Human–Computer Interaction
- **CS 233** Visual Basic
- **CS 311** Database Design
- **CS 331** Multimedia Applications
- **CS 338** Systems Analysis and Design
- **CS 339** Networking and Data Communication
- **CS Elec.** One Computer Science elective

REQUIRED SUPPORTING COURSES FOR INFORMATION TECHNOLOGY TRACK

- **BU 103** Business: Its Nature and Environment
- **BU 201** Organizational Management
- **MA 131** Statistics for Decision Making
Network Security Emphasis for Computer Science

COURSES REQUIRED
CS 111 Introduction to Structured Programming
CS 112 Data Structures
CS 113 Discrete Structures
CS 215 Computer Systems Organization with Assembler
CS 311 Database Design
CS 312 Software Engineering
CS 318 Project Course
CS 319 Computer Ethics
CS 339 Networking and Data Communication

REQUIRED COURSES FOR COMPUTER SCIENCE CONCENTRATION (NETWORK SECURITY EMPHASIS)
CS 241 Advanced Programming Concepts Using “C”
CS 272 OOP with C# and Games
CS 341 Analysis of Algorithms
CS 349 Operating Systems
CS 367 Managing, Securing and Designing Modern Networks
CS 368 Hands-on Network Security

SUPPORTING COURSES FOR COMPUTER SCIENCE CONCENTRATION (NETWORK SECURITY EMPHASIS)
MA 151 Calculus I
MA 152 Calculus II
MA 261 Linear Algebra
MA 331 Probability and Statistics I

Minor in Information Technology

COURSES REQUIRED
CS 111 Introduction to Structured Programming
CS 112 Data Structures
CS 113 Discrete Structures
CS 215 Computer Systems Organization with Assembler
CS 233 Visual Basic
CS 311 Database Design
CS 312 Software Engineering
CS Elec. One Computer Science elective

Associate’s Degree in Computer Science

The Associate of Science degree in Computer Science offers two concentrations: Computer Science and Information Technology. Both concentrations require the completion of 60 credits. The program is designed for high school graduates who intend to make a career in the field of Computer Science and college graduates who want to obtain a sufficient level of computer experience.

The Computer Science concentration is intended for college students majoring in mathematics or the sciences who wish to supplement their major in order to increase their employment opportunities after graduation. The Information Technology
concentration is intended for high school graduates who wish to make a career in information technology and for business students or individuals working with computers who want a formal education in order to advance their careers.

COURSES REQUIRED FOR BOTH CONCENTRATIONS
CS 111 Introduction to Structured Programming
CS 112 Data Structures
CS 113 Discrete Structures
CS 215 Computer Systems Organization with Assembler

REQUIRED CORE COURSES FOR BOTH CONCENTRATIONS
ENG 110 Academic Writing
ENG 111 Effective Speaking Elec.
Elec. Eight Liberal Arts arts electives

REQUIRED COURSES FOR COMPUTER SCIENCE CONCENTRATION
CS 241 Advanced Programming Concepts Using “C”
CS 272 OOP with C# and Games
Elec. One Computer Science and Information Technology elective (not CS 100, 101, 102, 104, 106)

REQUIRED SUPPORTING COURSES FOR COMPUTER SCIENCE CONCENTRATION
MA 151 Calculus I
MA 152 Calculus II
MA 261 Linear Algebra

REQUIRED COURSES FOR INFORMATION TECHNOLOGY CONCENTRATION
CS 232 Human–Computer Interaction
CS 233 Visual Basic
Elec. One Computer Science and Information Technology elective (not CS 100, 101, 102, 104, 106)

REQUIRED SUPPORTING COURSES FOR INFORMATION TECHNOLOGY CONCENTRATION
MA 109 Mathematics for Decision Making
MA 110 Calculus for Decision Making
BU 103 Business: Its Nature and Environment
or
BU 201 Organizational Management

Certificate Program in Computer Science and Information Technology
The Computer Science Certificate program provides a foundation for scientific use of computers and information technology applications. The student can earn a certificate by completing six courses from either the Computer Science or Information Technology options, provided that the prerequisites are met.

REQUIRED COURSES FOR BOTH CERTIFICATES
CS 111 Introduction to Structured Programming
CS 112 Data Structures

COURSES FOR COMPUTER SCIENCE CERTIFICATE
CS 241 Advanced Programming Concepts Using “C”
CS 272 OOP with C# and Games
CS 312 Software Engineering
CS 341 Analysis of Algorithms

REQUIRED COURSES FOR INFORMATION TECHNOLOGY CERTIFICATE
CS 101 Web Design and Visual Tools for Non Majors
CS 102 Multimedia for Non-Majors
CS 232 Human–Computer Interaction
Certificate Program in Computer Gaming Design and Development

The undergraduate certificate in Computer Gaming Design and Development utilizes all existing courses to package a certificate program particularly geared toward the part-time evening student. The certificate also feeds into a possible BS or AS degree in CS in the Computer Science or Computer Gaming track.

REQUIRED COURSES

- CS 111 Introduction to Structured Programming
- CS 112 Data Structures
- CS 171 Introduction to Computer Gaming
- CS 271 Advanced Computer Gaming
- CS 272 OOP with C# and Games

SUGGESTED SUPPORTING COURSES (NOT REQUIRED)

- MA 140 Precalculus
- MA 151 Calculus I

Course Descriptions

†Elective Core Course

†CS 100 Introduction to Information Technology

3 CR

An introduction to computing and data processing for non-computer science majors. This course is half theory and half hands-on application using Microsoft Office. It includes word processing, spreadsheets, databases, presentation software and using the Internet as a research tool effectively. This course provides the knowledge and understanding necessary to communicate effectively in the personal computing environment of business today.

Non-majors only

†CS 101 Web Design and Visual Tools for Non Majors

3 CR

This course aids in the understanding of the design and production of web sites. It presents what design elements go into web page development. Students browse sites and identify good design elements. They construct their own web page early on and allow it to evolve throughout the semester.

Prerequisite: CS 100 or permission of department chair.

CS 102 Multimedia for Non-Majors

3 CR

This course aids the non-programmer in the understanding of multimedia authoring, incorporating text, graphics, sound and video. It discusses design and planning elements that go into multimedia development. Students use Flash and some of the Action scripting language to choreograph media objects onto a stage using a score.

Prerequisite: CS 100 or permission of department chair.

†CS 104 Digital Animation and Gaming for Non Majors

3 CR

The class will create electronic games using digital animation and timeline control. Topics covered include: creating gaming objects with drawing and color tools; timeline-based animation techniques; controlling screen action with buttons; integrating sound into a game; publishing and exporting a game to the web.

†CS 106 Introduction to Information Technology for Business Administration for Non Majors

3 CR

An introduction to computing and data
processing for non-Computer Science majors. This course is half theory and half hands-on application using Microsoft Office. It includes, spreadsheets, databases and presentation software and provides the knowledge and understanding necessary to communicate effectively in the personal computing environment of business today. For Business Administration majors.

†CS 110 Introduction to Computer Science
3 CR
An introduction to programming logic, using a suitable introductory programming language. This course presents an overview of major programming concepts (selection, loops, input-output operations, procedures and functions) and serves as an introduction to the Unix operating system and Unix-based editors. For computer science majors with no previous programming experience
Prerequisite: Computer Science major or permission of department chair

†CS 111 Introduction to Structured Programming
3 CR
A first course in programming using a structured programming language. Topics include iteration, selection, procedures, functions and arrays with the use of flowcharts and modules. Presents applications in both business and scientific areas.
Prerequisite: CS 110 or permission of department chair

†CS 112 Data Structures
3 CR
A continuation of CS 111 using a structured programming language to implement multidimensional arrays, stacks, queues, linked lists and binary trees. Also introduces recursion, pointers and classes.
Prerequisite: CS 111

CS 113 Discrete Structures
3 CR
Presents mathematical concepts for computer science, including sets, relations and functions; partitions; order relations; countability; permutations and combinations; probability; recurrences; big-Oh notation; elements of abstract algebra such as groups, rings and Boolean algebras.
Prerequisite: MA 006

CS 171 Introduction to Computer Gaming
3 CR
Designing the vector gaming environment; Storyboarding; Tween and frame-by-frame animation; Using functions to control animation timelines; Using random number functions to instantiate digital objects; Artifact movement utilizing vector plot points.
Prerequisite or Corequisite: CS 111

CS 215 Computer Systems Organization with Assembler
3 CR
This course presents an overview of computer architecture and computer organization as they relate to computer science. Topics include computer components, interconnection structures, internal memory, instruction sets, number representation in computers, parallel processing and an elementary introduction to assembly programming.
Prerequisite: CS 112

CS 232 Human–Computer Interaction
3 CR
Focuses on how developers and designers of computer systems can produce computers that are beneficial to the user and easy to use. Human-computer interaction is the intersection of human behavior and computer technology. In understanding human behavior, developers can evaluate what makes the computer easy to learn and use. The course examines the ways
people interact with computers and how to incorporate this knowledge into the design and evaluation of new technology.

Prerequisite: CS 100 or CS 112

**CS 233 Visual Basic**

3 CR

Explores the use of controls and tools, forms, menus, frames, file browsers and buttons, creating windows interfaces for databases, linking to Windows and Excel, writing and debugging Visual Basic code. Uses VB.net 2010.

Prerequisite: CS 112

**CS 241 Advanced Programming Concepts Using “C”**

3 CR

Covers advanced programming techniques in “C,” using pointers, data structures and recursion. Emphasis on algorithmic approach and use of mathematical functions.

Prerequisite: CS 112

**CS 261 Programming for the Web**

3 CR

An introduction to Web-enabling technologies, this course addresses web design with HTML code, Cascading Style Sheets and Layers, Photoshop and JavaScript. Problems and trends faced by webmasters today are also discussed.

Prerequisites: CS 111 and Sophomore status

**CS 271 Advanced Computer Gaming**

3 CR

An object-oriented approach to programming digital objects using Flash and Action Script 3.0. These programming techniques will be applied to both arcade and adventure games.

Prerequisite: CS 171; Corequisite or Prerequisite: CS 112

**CS 272 OOP with C# and Games**

3 CR

An object-oriented approach to computer graphics using C#. Topics covered will include: classes, instantiation, event listeners, polymorphism, encapsulation, event handlers, functions and methods and basic game logic.

Prerequisite: CS 271; Corequisite or Prerequisite: CS 112

**CS 299 Special Topics I**

3 CR

Various courses of current interest to the Computer Science major are introduced from time to time.

Prerequisite: Sophomore status

**CS 311 Database Design**

3 CR

Explores fundamentals of database design theory and applications. Includes data models with emphasis on the relational model.

Prerequisites: CS 112 and CS 215

**CS 312 Software Engineering**

3 CR

The study of software development methodology, both procedural and object oriented. This is a team project-based design course where teams develop software projects from requirements analysis through detailed design and testing. Umbrella activities such as configuration management, quality assurance, writing documentation, ethics and costing are covered. Automated software design tools are used and oral and written presentations required.

Prerequisite: CS 311

**CS 318 Project Course**

3 CR

Students sign up for this senior project course one semester before the graduating semester, because of the independent study/
work involved. Students work with a faculty member in the department and a mentor to define and implement an acceptable project. The student is required to assess requirements, design software and write detailed documentation that illustrates and supports design choices. Test plans, usability testing and prototypes are also required. Students present their projects to the department faculty and public as the culmination of this project.

Prerequisites: Senior status and permission from Computer Science Department

**CS 333 Theory of Computer Gaming**

3 CR

Computer Game Studies is an emerging field. This course provides a solid, theoretical background in the field of computer gaming which will assist them in their pursuit of game development throughout their career.

Prerequisite: CS 271

**CS 338 Systems Analysis and Design**

3 CR

An advanced design course that studies the application of computer solutions to business problems. This is a project-based course where teams set milestones and present object-oriented analysis and design of their solutions. Oral and written presentations are required and automated software tools are used.

Prerequisite: CS 312

**CS 339 Networking and Data Communication**

3 CR

The study of networks and data communication concentrating on the Internet model. This is a laboratory-based course that includes projects implemented on both Unix and Windows machines. Topics such as LANs, WANs and MANs; hardware, software, protocols, routing, circuit-switching and packet-switching networks, analog and digital systems, compression and error handling are among those studied. Students use a simulation package to design and simulate networks.

Prerequisites: CS 338 or CS 341 and Senior status

**CS 341 Analysis of Algorithms**

3 CR

Emphasis on theory and techniques underlying the analysis of algorithms including big/little-Oh, graphs and networks, searching, sorting, recursion and classical algorithms.

Prerequisites: CS 112 and MA 151

---

**CS 319 Computer Ethics**

3 CR

This course focuses on the ethical and social issues associated with computer technology such as privacy, theft, intellectual property, accountability, hacking and cracking, codes of ethics and professional responsibility. Students also examine philosophers such as Aristotle, Kant and Mill and use their theories to support ethical debate and dialogue.

This course is a Senior-level capstone course. It emphasizes both oral and written communication as students discuss and examine their own ethical beliefs in relation to society and technology.

Prerequisites: Junior/Senior status, PH 101 or permission of instructor

**CS 331 Multimedia Applications**

3 CR

This course aids in the understanding of multimedia authoring, incorporating text, graphics, sound and video. It discusses design and planning elements that go into multimedia development. Students use Flash and Action scripting to choreograph media objects onto a stage using a score. It is designed for students with programming experience.

Prerequisite: CS 112
CS 348 Programming in Unix
3 CR
Discusses main issues of Unix OS programming and administration. Explores the popular Unix text editor Emacs, Unix file system, process manipulation, regular expressions and their uses, filters and system administration and security.
Prerequisites: CS 241 and CS 341

CS 349 Operating Systems
3 CR
Examines resource management, including memory allocation and management, virtual memory, process scheduling, protection, deadlock and concurrency, case studies and multiprocessing.
Prerequisite: CS 341

CS 367 Managing, Securing and Designing Modern Networks
3 CR
Focuses on wireless and mobile networks, multimedia networking, network management infrastructure, configuration management, network security, cryptography, authentication, access controls, network design (OpNet), designing network performance.
Prerequisite: CS 339

CS 368 Hands-on Network Security
3 CR
Focuses on networking security topics, firewalls (using Linux), packet filters, NAT and PAT, public key infrastructure (using Microsoft Certification Server), encryption algorithms, decrypting passwords, dictionary decryption, brute force decryption, certificate servers, vulnerability assessment, identifying security holes, forensics, Layer 5 vulnerabilities, packet monitoring.
Prerequisite: CS 367

CS 371 Advanced Game Programming
3 CR
A game oriented programming course focusing on advanced graphics techniques using OpenGL and/or DirectX.
Prerequisite: CS 272

CS 372 Building Computer Games
3 CR
In this class we explore how logic and creativity work together in the well designed computer game. Topics include: genres of games; character development and gameplay; new and developing gaming concepts; creation and use of gaming engines; the role of sound and music; teaching a game to think.
Prerequisite: CS 371