Computer Science

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**Major in Computer Science**

**Curriculum**
The computer science curriculum is modeled on recommendations of the Association for Computing Machinery, the world's oldest and largest educational and scientific computing society. The major prepares students for apprentice level positions in system software design, development, implementation and maintenance, as well as for graduate study. The intention is to educate students in principles with a long, useful life rather than to provide vocational training that may be obsolete in less than a decade.

Requirements:

- CSC 141, 142
- CSC 213
- CSC 305, 306
- Two 400-level courses
- Two elective courses from CSC 307, 372, 382, 385 and 391
- Four related mathematics courses: MAT 103, MAT 104, MAT 132 and MAT 320 (Any prerequisites for MAT 320 are waived for computer science majors.)
- MAT 131 should be taken as a general studies quantitative reasoning course.

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**Combined Major in Computer Science**

Requirements:

- CSC 141, 142
- CSC 213
- CSC 305, 306
Combined Major in Information Systems
A student can only do a combined major in information systems; a student cannot major in information systems alone.

Curriculum
There continues to be an increasing demand for college graduates who possess an information systems (IS) degree. Projections are for the need to be further unmet over the next several years as the gap widens for supplying skilled individuals to IS jobs. We are faced with a major shortage, not only with providing players with these needed skills, but also with providing new leadership in burgeoning areas as IS has moved into the mainstream of our economic culture. Globalization of business markets adds the need for communication and project teamwork. To become a part of a graduate’s repertoire. Exhibiting the knowledge and skills that such an IS degree requires, graduates can expect to be in strong positions to compete for managerial and analytical positions in many fields, including software design, database management, network consulting and e-commerce business.

Requirements:
• IST 150
• CSC 141, 142
• CSC 305
• IST 301
• One 300-level IST course
• One 400-level IST course

A student is not allowed to combine information systems with computer science. A student who is interested in this combination would work out a program of study within the Computer Science Department that would result in the student majoring in computer science with some information systems courses being chosen for the student’s departmental elective requirements.

Interdisciplinary Major in Game and Simulation Development
A combined offering from the Computer Science and Digital Media departments
Integrating computer science, digital media, mathematics, music and physics, this interdisciplinary major will teach you how to utilize software engineering principles to implement game and simulation technologies.

Moreover, you’ll benefit from a liberal arts approach to game and simulation development. In addition to studying programming, artificial intelligence, game
engine development, and industry-standard software packages, you'll learn from a curriculum expressly structured to strengthen creative and critical thinking, oral and written communication skills, and personal, social and global awareness. The result is an education that positions you to be competitive in a rapidly expanding field.

Outcomes

- Application of software engineering skills to game and simulation development
- Increased creative and critical thinking skills
- Strengthened oral and written communication abilities
- Heightened personal, social and global awareness

Possible career fields

- Software engineering
- Software development
- Computer science

Program Curriculum

- ART 265 Computer Graphics
- CSC 141 Foundations of Computer Science I
- CSC 305 Data Structures
- CSC 311 Gaming Physics and Math
- CSC 372 Graphics Programming
- CSC 391 Mobile Programming
- CSC 491 Client/Server (Networking for Games) or CSC 491 Artificial Intelligence Programming
- DIG 280 Game History and Development
- DIG 310 Introduction to Game Design
- DIG 311 Experience Design
- DIG 320 Simulation Design
- DIG 380 Visual Programming
- DIG 470 Game Production
- MUS 231 Music and Audio Design for Games

Students interested in this major should contact Professor Dan Falabella.

Wireless Technologies

The Computer Science Department's Personal Digital Assistant (PDA) curriculum is a comprehensive program for higher education students interested in learning wireless technologies.

Today's computing is done on handheld computers. Academically, students need to be educated in the latest technologies that reflect current business and consumer trends. Nationally, there exists a need for IT and IT-related professionals to become proficient in handheld wireless technologies, as it is
one of the fastest growing fields in IT today. The possibilities of these small devices are only limited by the imagination of the user.

To this end, the department has established two wireless research labs. These labs house Sun ULTRA 10 workstations and DELL Pentium computers and are reserved for research and application development for such things as mobile devices, smartphones and Palm OS-based hand-holds.

Facilities

Albright's academic computing facilities include Sun ULTRA 80 file server with Sun ULTRA 10 and ULTRA 5 workstations for student use. These computers may be accessed through the computer science lab located in the Center for Computing and Mathematics. Additional access is provided via internet connections for students living in the residence halls and off-campus. Many language processors, such as C, C++, JAVA, Visual Basic and Python are available on the system for student use.

Courses

CSC 119 Introduction to Programming
This course includes elements of programming in C, C++, JAVA or some other high-level language; practical experience solving problems; coding and executing programs. It does not fulfill the computer science concentration requirements.

Prerequisite: permission required for non-computer science majors

CSC 141 Foundations of Computer Science I
This is an introduction to problem-solving methods and algorithm development using object-oriented methodology and JAVA. The objective is to teach how to design, code, debug and document programs using techniques of good programming style. Three hours lecture and three hours laboratory per week.

CSC 142 Foundations of Computer Science II
This course continues the development of discipline in program design, style and expression. It focuses on debugging and testing; and introduces algorithmic analysis and basic aspects of recursion and simple data structures. Three hours lecture and three hours laboratory per week.

Prerequisite: Successful completion of CSC 141 or permission of the department

CSC 213 Assembly Language and Computer Organization
This course provides basic concepts of computer systems; introduces computer architecture; teaches an assembly language; and introduces the
organization and structuring of the major hardware components of computers. Three hours lecture and three hours laboratory per week.

**Prerequisite: CSC 141**

**CSC 305**  
**Data Structures and Algorithms**  
Analysis of data structures and algorithms for their manipulation are studied, along with comparative efficiency of searching and sorting algorithms. The course applies analysis and design techniques to non-numeric algorithms, which act on data structures. Topics include lists, stacks, queues, recursion, searching and sorting, binary trees, and graphs.  
**Prerequisite: CSC 141**

**CSC 306**  
**Operating Systems**  
Topics in this course include: structure and implementation of multiprogrammed and time-shared computer systems; sequential, interacting and sharing processes; memory management; synchronization; protection; virtual memory; monitors; kernels; and networks of operating systems modules.  
**Prerequisites: CSC 213 and CSC 305**

**CSC 307**  
**Software Engineering**  
This course examines axiomatic bases of program and system design. Students gain laboratory experience designing systems software and are introduced to state-of-the-art software for designing structured systems. Three hours lecture and three hours laboratory per week.  
**Prerequisite: CSC 305 or permission of the department**

**CSC 311**  
**Gaming Physics & Mathematics**  
The objective of this course is to present applications of mathematics and physics in game and simulation programming. The course includes utilization of matrix and vector operations, along with Newtonian principles in games and simulations. Starting with an overview of the rendering pipeline in OpenGL, the student will study vectors, matrices, linear transformations, and geometry for 3D engines. The course will dovetail into a more complete understanding of linear algebra topics that will be covered in the CSC372 Computer Graphics course.  
**Prerequisite: CSC 305 or permission of the department**

**CSC 372**  
**Computer Graphics**  
This course is designed to provide those principles which will enable the student to design, use and understand graphics systems. It is assumed that the student has no prior background in computer graphics, but is familiar with fundamental mathematical concepts which will be necessary for the development of this course. Students should have coding experience in either C, C++, or Java. Topics will include: line drawing algorithms, menus and panel constructions, polygons, two-dimensional transformations, windowing and clipping, three-dimensioning, and, possibly, texture mapping. **Prerequisite:** CSC 305
CSC 382
Computer Science Internship
Students will apply computer science theory in a business, institution or
government agency under the supervision of an on-site staff member and a
faculty sponsor. Reports and computer science projects are required. This
course does not fulfill CSC concentration requirements. Students must obtain
sponsorship and apply to the computer science faculty no later than the first
day of the last month of the semester preceding the expected internship.
Quality/Nonquality only.
Prerequisite: Permission of computer science faculty

CSC 385
Handheld Wireless Technology
This course introduces the underlying concepts of wireless technology
and its particular use with handheld devices. Operating system principles
are discussed in relation to the environment of the Palm PDA. Coding and
application development are essential components of this course. Students
work in the C and JAVA programming environments and learn how to interface
Palm devices with Unix and Windows platforms.

CSC 391
Advanced Topics in Computer Science
A different topic is presented each semester. These topics include mobile
programming, object-oriented methodologies, expert systems, artificial
intelligence, advanced graphics concepts, database management, wireless
research, algorithm analysis. It is designed to provide the serious student
with a challenging course on a topic that might not usually be developed
at the elementary or intermediate levels. The instructor provides a syllabus
discussing the topics to be covered in the semester prior to the actual offering
of the course. Prerequisite: Changes based on topic

CSC 491
Seminar
The seminar includes assigned readings, projects and lectures in areas of
special interest. These areas include: client/server (networking for games),
a rtificial intelligence, automata theory, computability, formal languages,
compiler writing, image processing and advanced UNIX concepts. Material
in these courses should be current and topical. The seminars present a
strong challenge to the student. May be repeated with new topic. Prerequisite:
Changes based on topic

IST 100
Introduction to Computer Concepts
This course provides a personal capability for student use of information
technology. Exposure to a suite of software tools, which are useful for the
IS major, including Internet and electronic mail, spreadsheet processing,
databases, presentation graphics, statistical software and word processing.

IST 150
Fundamentals of Information Systems
This course provides an introduction to systems and development concepts,
information technology and application software. It explains how information is
used in organizations and how IT enables improvement in quality, timeliness and competitive advantage.

**IST 301**  
**Analysis and Logical Design**  
This course provides an understanding of the system development and modification process. It enables students to evaluate and choose a system development methodology. It emphasizes the factors for effective communication and integration with users and user systems.  
*Prerequisite: IST 141 and IST 150*

**IST 391**  
**Advanced Topics in Information Systems**  
A different topic is presented each semester. Currently, these topics include, but are not limited to, applications programming in Visual Basic and Python, operating systems concepts, database management principles, advanced database concepts, data communications, and network security. The course provides the IS student with a challenging, applications-based topic that can be utilized in the business sector. The instructor provides a syllabus discussing the topics to be covered in the semester prior to the actual offering of the course.  
*Prerequisite: IST 150 and IST 301*

**IST 492**  
**Project Management and Practice**  
This course covers the factors necessary for successful management of system development or enhancement projects. Both technical and behavioral aspects of project management are discussed. Project management, management of the IS function and systems integration are components of the project experience.  
*Prerequisite: IST 301 and IST 313*

**IST 499**  
**Information Systems Topics Seminar**  
This course discusses current topics in computing based upon readings in professional literature and individual research projects. It is designed to provide the serious student with a challenging topic, which will allow the individual to draw upon the knowledge that has been gained in previous IS courses.  
*Prerequisite: Senior-level standing or department permission*

**Digital Media Courses**

**ART 265 Computer Graphics Art and Design** Computer Graphics is a combined studio/lecture course providing instruction in the use of industry-standard digital media tools. Students learn from the perspective of an artist and designer the essentials of digital still image creation, graphic design and digital animation. This course not only provides students with a strong technical foundation, but it also introduces students to the concepts intrinsic to art and design in the digital age.
DIG 201 Digital Video This hands-on course introduces students to the concepts and technological knowledge that support the fields of digital video, script writing, lighting and non-linear editing. Students work individually and in groups on a series of short video productions using Premiere Pro, an industry standard editing and special effects software package. Cinematic history, aesthetic philosophy and key applications are taught through class demonstrations, exercises and lectures. Digital skills and a personal vocabulary are developed further through class critiques and individual instruction. Prequisite: ART 265

DIG 230 3D Animation and Special Effects This studio provides instruction in the use of industry-standard digital animation, special effects and conceptualization applications. Students learn from the perspective of a digital media designer/producer/director the essentials of creating virtual environments, characters and special effects. Emphasis is placed on the foundations of modeling and animating in the 3D virtual environment, preparing each designer to tackle more advanced modeling and animation methods known by professional artists. In conjunction with becoming familiar with the foundations of Maya, students develop the critical skills necessary to accurately assess the impact that digital tools have on the ways in which visual messages communicate, influence and inform our cultural and intellectual contemporary landscape. Prequisite: ART 265

DIG 265 Digital Literacy This course introduces students to the concepts and technological news driving digital media. Students investigate the new aesthetic tradition inherent in digital culture, gaming, instant messaging, artificial intelligence, computer graphics, digital design and the Internet. Digital history, aesthetic philosophy, and key applications are examined through class lecture and studio projects. Students are expected to consider these concerns while formulating their work. In-class critiques and individual instruction are used to refine student work. Prequisite: ART 265

DIG 270 Digital Illustration and Design This course will cover the use of art and design as creative tools in mass communications and art media. Through creative design projects and discussions/critiques, students will create raster and vector imagery to populate original print-ready designs. Upon completion of the course students will have technical skills (Adobe Photoshop, InDesign and Illustrator) sufficient to design, illustrate and professionally package press ready projects, as well as understand design, composition and conceptual integration of text and imagery. Prequisite: ART 265

DIG 280 Game History and Development This class will explore the history of digital game design as well as the technologies, culture and social-sphere that surrounds it. The course will cover digital and electronic games and platforms, as well as the tools of development employed in their creation. An exploration of the relationship between these elements and their influence on contemporary game design and culture will be central to the course. Prequisite: ART 265
DIG 300 Digital Media Production  This course provides an intensive hands-on investigation into a wide range of digital production tools. Skills are honed as students develop their creativity within the context of specific software applications. Students create new work for their portfolios with an emphasis on individual objectives and specific areas of interest. In addition to studio work, students examine pertinent readings in digital media and visual communications through papers and classroom discussion. Readings and essays also provide a theoretical framework for effective communication in individualized projects.

DIG 301 Digital Video II  This course is an opportunity for serious video students to hone their skills as an editor, director and cinematographer through the development of ambitious projects. Sound and cinematography are integrated into the concepts inherent in their productions. The screen functions as an immersive, temporal canvas where students in Digital Video II develop their green screening techniques and integrate special effects software into their productions. The primary software in Digital Video II includes the advanced application of Premiere Pro with After Effects. Students are expected to write, storyboard, edit and shoot their productions. Outcomes of the course consist of work to be included in student portfolios for graduate school and potential employment, as well as the ability to critically think about their work in relationship to other artists and in relationship to their own objectives as an artist and filmmaker in the digital age.  *Prerequisite: DIG 201*

DIG 310 Introduction to Game Design  This course will explore the practice and theory that surrounds interactive game design. The course will focus on the principles of game design, the social and cultural context of games, and the application of these concepts. Particular attention will be placed on individual creativity, the collaborative design process, and an understanding of the meaning of "gaming" and "play" in contemporary culture. Basic prototyping and design software will be used as a part of this course.  *Prerequisite: ART 265*

DIG 311 Experience Design and Narrative  This class will introduce students to new ways of thinking about interactivity and storytelling. Students will analyze how the interactive structure of an experience creates narrative. Focus will be placed on non-linear narratives, online interactive storytelling, alternative reality and narrative structures in game systems. Students will research the history that led to these genres and create their own interactive experience as part of the class.  *Prerequisite: DIG 280, DIG 310*

DIG 315 Web Design  This class integrates Macromedia Flash MX with other applications resulting in web-based design and animation for online distribution. This course aids students in the development of their work within a professional standard emphasizing the concept of form and function. Students are taught appropriate history, aesthetic philosophy and key applications through class lecture and studio
projects. They are expected to consider these concerns while formulating their work. In-class critiques and individual instruction are used to refine student work. *Prerequisite: ART 265*

**DIG 320 Simulation Design** The Simulation Design Class will explore how programmers and designers can manage the simulation of small and large-scale systems and environments in both games and applied-simulation fields. A focus will be placed on the frameworks used in these simulations, including design of rule-systems, asset management, and managing out-of-simulation input. *Prerequisite: DIG 280, DIG 310*

**DIG 330 3D Animation II** This studio course is a combination of hands-on exercises and in-class research designed for ambitious animators already familiar with working in the three-dimensional realm in AliasWavefront Maya and/or other 3D applications. This course introduces new methods of creating and manipulating both polygonal and nurb shapes developed by 3D artists who have researched for years to find the best methods of achieving effects and models. Students also learn the native language of Maya, MEL, by hands-on use for specific special effects. By exploring such methods, students are able to choose and acquire their own techniques, and gain control of the 3D world at the professional level. *Prerequisite: DIG 230*

**DIG 370 Game Production Capstone** The Game Production course is designed to give participants an understanding of the digital game production process, from a product's inception to its public release. While learning the methods, tools, and techniques used by game development teams, the class will create a real-world product, test it, market it, and release it to the public. Aspects of design, aesthetic, interface, monetization, and social and cultural context will all be considered. *Prerequisite: DIG 310, 311*

**DIG 380 Visual Programming** This course targets an audience of individuals within the context of the visual arts who are interested in creating interactive and visual work through writing software but who have little or no prior programming experience. Many people think programming is only for people who are good at math and other technical disciplines. In this course, we will be extending the programming space to engage people who think differently, people with visual and spatial minds. The language used is called processing. This language makes it possible to introduce software concepts in the context of the arts and also to open arts concepts to a more technical group. Satisfies the General Studies Foundations Quantitative Reasoning requirement.

**DIG 420 Senior Seminar** This course is meant as a rite of passage from an undergraduate student to a professional working in the field or a scholar and artist pursuing graduate studies. The faculty works closely with students in the creation of a portfolio showcasing each student's work while demonstrating aesthetic and critical thinking. Writing assignments, resume’ construction and art and design coursework augment the senior seminar experience. Students
must utilize all their talents, creative thinking, and honed craft when creating work for group critiques.

**DIG 470 Game Production** This course is designed to give participants an understanding of the digital game production process, from a product’s inception to its public release. While learning the methods, tools, and techniques used by game development teams, the class will create a real-world product, test it, market it, and release it to the public. Aspects of design, aesthetic, interface, monetization, and social and cultural context will all be considered. *Prerequisite: DIG 310, DIG 311*

**MUS 231 Music and Sound Design for Games and Video**
This class will examine the creation and application of music and sound design as used in contemporary games, video, and other digital media. A focus will be placed on the relationship of audio to user experience and as a method of feedback in traditional and non-traditional gaming systems. The student will learn how to mix and synchronize soundtrack elements to video. Both the development process and consideration of final product will be explored. *Prerequisite: ART 265*