

# Computer & Information Technology

---

Smith Computer Center  
Burns North CIT Suite  
(435) 652-7723  
<http://cit.dixie.edu/>

To find faculty & staff phone numbers and email addresses, please consult the University Directory (<http://www.dixie.edu/directory/directory.php>).

## Department Chair

Russ Ross, Ph.D.

## Advisor/Support Coordinator

Nikki Dang, M.Ed.

## Lecturer/Advisor

Carol Stander, MLTID

## Dean

Eric Pedersen, Ph.D.

## Administrative Assistant

Ruth Bruckert

## Program Description

The Computer & Information Technology (CIT) programs at DSU have the latest equipment, the best software, as well as a strong faculty who can teach students to use it well. The CIT programs prepare students for careers in illustration, web development, multimedia, digital video, systems administration, security and networking, software engineering, and computer science.

The department offers students two Bachelor of Science degrees: Computer Science (CS) and Computer & Information Technology (CIT). Within the CIT degree, there is a general program as well as the option to focus on any of four areas: Digital Design, Information Technology, Software Development or Web Design & Development.

CIT also coordinates with the Udvar-Hazy School of Business in offering an emphasis within the Bachelor of Science in Business Administration program: Management Information Systems. Some certificates are also available.

The fields of Computer & Information Technology are diverse, exciting, rapidly changing, and ever expanding. The DSU programs offer students the opportunity to be challenged in small, personalized classes where they can develop your knowledge and skills to be successful.

## What is the Study of CIT?

To compete in a 21st century digital economy, every organization needs knowledgeable, technologically-savvy professionals.

The Dixie State University CIT Department specializes in providing a state-of-the-art education in advanced computer literacy, networking, operating system, software applications, graphic design, programming, Internet and Web publishing, e-commerce, and related technology-oriented training.

The Computer Information Technology (CIT) degree offers an integration of the four areas of emphasis as described below:

**Digital Design (DES):** This emphasis specializes in creating interface designs for websites, preferred user experiences, interactive design, multimedia, and print.

**Information Technology (IT):** This emphasis offers a rigorous preparation in critical technology areas such as software/hardware systems, database structures, security, server configuration, and networking.

**Software Development (mostly CS):** This emphasis offers a wide range of courses which addresses fundamental issues such as algorithm design, languages, graphics, operating systems, object-oriented methods, parallel processing, artificial intelligence, compilers, mobile app programming, and web programming.

**Web Design & Development (WEB):** This emphasis specializes in designing and developing websites, including comprehensive internet development projects.

In addition, the CIT department offers a Bachelor's of Science in Computer Science (CS), which is the study and application of the theories and principles used to create, test, and evaluate the software applications and systems that make computers work. This rapidly evolving field reflects changes in technology as well as the changing practices of employers.

## Course Prefixes

- CIT, CS, DES, IT, WEB

## ACM Club

Dixie State University's Association of Computing Machinery (ACM) Club, also known as the Computer Club, provides computer enthusiasts a place to meet, form friendships, share ideas and play computer games. The club meets every week on Thursday evenings.

Each fall semester members participate in the ACM's international programming contest. During the spring semester the ACM Club sponsors a local programming contest for students from Dixie State University and local high schools. For more information, contact Dr. Bob Nielson, the club's faculty advisor.

## Degrees & Certificates

### Bachelor's Degrees

- Bachelor of Science in Computer Science ([catalog.dixie.edu/programs/computerinformationtechnology/bachelor\\_of\\_science\\_in\\_computer\\_science](http://catalog.dixie.edu/programs/computerinformationtechnology/bachelor_of_science_in_computer_science))
- Bachelor of Science in Computer & Information Technology ([catalog.dixie.edu/programs/computerinformationtechnology/bachelor\\_of\\_science\\_in\\_computer\\_information\\_technology](http://catalog.dixie.edu/programs/computerinformationtechnology/bachelor_of_science_in_computer_information_technology))
- Bachelor of Science in Computer & Information Technology – Digital Design Emphasis ([catalog.dixie.edu/programs/computerinformationtechnology/bachelor\\_of\\_science\\_in\\_computer\\_information\\_technology\\_digital\\_design\\_emphasis](http://catalog.dixie.edu/programs/computerinformationtechnology/bachelor_of_science_in_computer_information_technology_digital_design_emphasis))
- Bachelor of Science in Computer & Information Technology – Information Technology Emphasis ([catalog.dixie.edu/programs/computerinformationtechnology/bachelor\\_of\\_science\\_in\\_computer\\_information\\_technology\\_information\\_technology\\_emphasis](http://catalog.dixie.edu/programs/computerinformationtechnology/bachelor_of_science_in_computer_information_technology_information_technology_emphasis))
- Bachelor of Science in Computer & Information Technology – Software Development Emphasis ([catalog.dixie.edu/programs/computerinformationtechnology/bachelor\\_of\\_science\\_in\\_computer\\_information\\_technology\\_computer\\_science\\_emphasis](http://catalog.dixie.edu/programs/computerinformationtechnology/bachelor_of_science_in_computer_information_technology_computer_science_emphasis))
- Bachelor of Science in Computer & Information Technology – Web Design & Development Emphasis ([catalog.dixie.edu/programs/computerinformationtechnology/bachelor\\_of\\_science\\_in\\_computer\\_information\\_technology\\_web\\_design\\_emphasis](http://catalog.dixie.edu/programs/computerinformationtechnology/bachelor_of_science_in_computer_information_technology_web_design_emphasis))
- Bachelor of Arts/Science in Integrated Studies - Digital Design Emphasis ([catalog.dixie.edu/programs/interdisciplinaryartsandsciences/bachelor\\_of\\_science\\_bachelor\\_of\\_arts\\_in\\_integrated\\_studies\\_digital\\_design](http://catalog.dixie.edu/programs/interdisciplinaryartsandsciences/bachelor_of_science_bachelor_of_arts_in_integrated_studies_digital_design))
- Bachelor of Arts/Science in Integrated Studies - Information Technology Emphasis ([catalog.dixie.edu/programs/interdisciplinaryartsandsciences/bachelor\\_of\\_science\\_bachelor\\_of\\_arts\\_in\\_integrated\\_studies\\_information\\_technology\\_emphasis](http://catalog.dixie.edu/programs/interdisciplinaryartsandsciences/bachelor_of_science_bachelor_of_arts_in_integrated_studies_information_technology_emphasis))
- Bachelor of Arts/Science in Integrated Studies - Software Development Emphasis ([catalog.dixie.edu/programs/interdisciplinaryartsandsciences/bachelor\\_of\\_science\\_bachelor\\_of\\_arts\\_in\\_integrated\\_studies\\_computer\\_science\\_emphasis](http://catalog.dixie.edu/programs/interdisciplinaryartsandsciences/bachelor_of_science_bachelor_of_arts_in_integrated_studies_computer_science_emphasis))
- Bachelor of Arts/Science in Integrated Studies - Web Design & Development Emphasis ([catalog.dixie.edu/programs/interdisciplinaryartsandsciences/bachelor\\_of\\_science\\_bachelor\\_of\\_arts\\_in\\_integrated\\_studies\\_web\\_design\\_development](http://catalog.dixie.edu/programs/interdisciplinaryartsandsciences/bachelor_of_science_bachelor_of_arts_in_integrated_studies_web_design_development))

### Minors

- Minor in Computer Science ([catalog.dixie.edu/programs/minor\\_in\\_computer\\_science](http://catalog.dixie.edu/programs/minor_in_computer_science))
- Minor in Digital Design ([catalog.dixie.edu/programs/minor\\_in\\_digital\\_design](http://catalog.dixie.edu/programs/minor_in_digital_design))
- Minor in Information Technology ([catalog.dixie.edu/programs/minor\\_in\\_information\\_technology](http://catalog.dixie.edu/programs/minor_in_information_technology))
- Minor in Web Design & Development ([catalog.dixie.edu/programs/minor\\_in\\_web\\_design\\_development](http://catalog.dixie.edu/programs/minor_in_web_design_development))

### Certificates

- Visual Technologies Certificate ([catalog.dixie.edu/programs/computerinformationtechnology/visual\\_technologies\\_certificate](http://catalog.dixie.edu/programs/computerinformationtechnology/visual_technologies_certificate))

## Admission Requirements

Incoming students will be placed in pre-program designations CIT-P or CS-P until they have completed the requirements below with a 2.5 or higher GPA. When students have completed the program admission requirements, they will meet with a CIT advisor to be officially accepted into the program.

### Bachelor of Science in Computer & Information Technology (no emphasis)

CS 1400	Fundamentals of Programming	3
CS 1410	Object Oriented Programming	3
DES 1300	Design I	3
IT 1100	Introduction to Unix/Linux	3
MATH 1050	College Algebra / Pre-Calculus (or higher GE MATH course)	4
WEB 1400	Web Design I: Fundamentals	3

### Bachelor of Science in Computer & Information Technology - Digital Design Emphasis

DES 1300	Design I	3
CS 1400	Fundamentals of Programming	3
DES 2300	Design II	3
DES 2600	Creative Imaging	3

DES 2800	Digital Publishing	3
WEB 1400	Web Design I: Fundamentals	3
<b>Bachelor of Science in Computer &amp; Information Technology - Information Technology Emphasis</b>		
CS 1400	Fundamentals of Programming	3
CS 1410	Object Oriented Programming	3
or MATH 1100	Business Calculus	
IT 1100	Introduction to Unix/Linux	3
IT 1200	A+ Computer Hardware/Windows OS	3
IT 2400	Intro to Networking	3
WEB 1400	Web Design I: Fundamentals	3
<b>Bachelor of Science in Computer &amp; Information Technology - Software Development Emphasis</b>		
CS 1400	Fundamentals of Programming	3
CS 1410	Object Oriented Programming	3
CS 2420	Introduction to Algorithms and Data Structures	3
IT 1100	Introduction to Unix/Linux	3
MATH 1060	Trigonometry (or higher GE MATH course)	3
WEB 1400	Web Design I: Fundamentals	3
<b>Bachelor of Science in Computer &amp; Information Technology - Web Design &amp; Development Emphasis</b>		
CS 1400	Fundamentals of Programming	3
DES 1300	Design I	3
IT 1100	Introduction to Unix/Linux	3
WEB 1400	Web Design I: Fundamentals	3
<b>Bachelor of Science in Computer Science</b>		
CS 1400	Fundamentals of Programming	3
CS 1410	Object Oriented Programming	3
CS 2420	Introduction to Algorithms and Data Structures	3
MATH 1210	Calculus I (or higher GE MATH course)	4

1. Analyze a problem, and identify and define the technological requirements appropriate to its solution.

*Mapped to Core Theme 1.3, 2.3, 3.3*

Students will demonstrate the ability to identify a problem, then analyze and prepare a solution essential to successful problem solving. Students will exhibit the ability to synthesize multiple sources of information to solve problems, and use one's experiences and other sources of information to create new insights and generate better problem solving approaches.

2. Design, implement, or evaluate a system, process, component, or program to meet desired needs.

*Mapped to Core Theme 1.3, 1.4, 2.3, 3.3*

Students will demonstrate the ability to specify, design, and implement software and/or hardware-software systems to meet project requirements. Students will have the ability to employ modern computer languages, environments, and platforms in such tasks; and the ability to apply appropriate design principles for effective print, online, or UI/UX delivery.

3. Use current techniques, skills, and tools necessary for professional practice.

*Mapped to Core Theme 1.3, 2.3, 3.3*

Technology is always changing and improving. It is important to stay current with best practices in this field. Students will demonstrate life-long learning skills, which will allow successful adaptation to the changing environment and evolving technologies throughout their professional career. Students will facilitate this process by fostering intellectual curiosity and the ability to access information from diverse sources as well as relating knowledge to daily life and defining issues within larger contexts.

4. Explain professional, ethical, legal, security and social issues and responsibilities.

*Mapped to Core Theme 1.4, 2.1, 2.2, 3.2*

Students will demonstrate an awareness and an understanding of these issues as they apply to digital content. Students will be able to articulate and integrate relevant ethical, legal, social, and security concerns into their projects. Students will exhibit openness to ideas different from or in conflict with one's own, including those rooted in different cultures, and awareness of societal and institutional factors influencing assumptions, prejudices, and privileges.

5. Function effectively in teams.

*Mapped to Core Theme 1.3, 1.4, 2.1, 2.3, 3.1*

Students will demonstrate the ability to function effectively in teams to accomplish stated goals. Students will manifest advanced skills in problem solving, positive work ethic, effective use of technology, and understanding team-centric workplace culture. Students will exhibit improved social behavior and competent professional skills to obtain and maintain successful employment within an organization, business, or other entity.

6. Communicate effectively visually, orally and in writing.

*Mapped to Core Theme 1.1, 1.2, 1.4, 2.3, 3.1, 3.2*

Students will demonstrate convincing technical communication skills, both orally and in writing. Students will exhibit the ability to be useful team members, capable of working in groups on strategic problems.

7. Employment.

*Mapped to Core Theme 1.3, 1.4, 2.3, 3.1, 3.3*

The best outcome is a career in a student's chosen field of interest, using their chosen degree. Students will prepare to effectively engage in the professional world. Students will demonstrate ability to apply acquired knowledge to practical employment skills that contribute to the success of organizations and businesses. Students will identify meaningful career options and different professional roles, and to build the skills, abilities and knowledge required to flourish in a changing job market.

## CIT Career Information

### Career Strategies

In addition to the required coursework in CIT, students can do the following to enhance their career opportunities:

- Develop strong interpersonal, communication and teamwork skills
- Patience and perseverance are essential for computer science professionals
- Obtain an internship; related experience is valuable
- Expect to work extended and/or irregular hours at times
- Prepare to learn new information on a regular basis through online discussions, classes, conferences, periodicals, and update your skills accordingly
- Obtain vendor-specific or networking certifications to gain a competitive edge for some positions

### Career Opportunities \*

Careers will vary according to the course of study but can include:

- Network Engineers
- Database Administrators
- Computer Security Specialists
- Web Developers
- Software Engineers
- Computer Security Specialists
- Graphic Designers
- Multimedia Artists
- Animators
- Software Developers

### Job Outlook \*

The overall employment projections from 2014 to 2024 show CIT will increase by 12%, a significantly faster pace than the average for all occupations.

### Salary Range \*

The median wage for computer and information technology occupations was \$81,430 in May 2015.

## Computer Science Career Information

### Career Strategies

In addition to the required coursework in computer science, students can do the following to enhance their career opportunities:

- Develop strong interpersonal, communication and teamwork skills.
- Develop patience and perseverance
- Obtain an internship. Related experience is helpful.
- Prepare to learn new information on a regular basis through online discussions, classes, conferences, periodicals, etc.

## Career Opportunities \*

The Computer Science degree at Dixie State University is designed to meet the national Accreditation Board for Engineering and Technology (ABET) accreditation standards. The CS degree will also prepare students for advanced degrees.

Demand for computer software engineers will increase as computer networking continues to grow. For example, expanding internet technologies have spurred demand for computer software engineers who can develop Internet, intranet, and World Wide Web applications. Likewise, electronic data-processing systems in business, telecommunications, healthcare, government, and other settings continue to become more sophisticated and complex. Implementing, safeguarding, and updating computer systems and resolving problems will fuel the demand for growing numbers of systems software engineers.

Some of the jobs in this area include:

- Computer Scientists
- Software Engineers
- Computer Programmers
- Computer Security Specialists
- Web Developers
- Software Developers

## Job Outlook \*

Employment of software developers is projected to grow much faster than the average for all occupations, increasing by 17% from 2014 to 2024. Job prospects will be best for applicants with a bachelor's or higher degree and relevant experience.

## Salary Range \*

As of May 2015, the median wage for software developers is \$100,690, and that of computer programmers is \$79,530.

\* Derived from the Occupational Outlook Handbook, 2015.

## Computer Information Tech Courses

### **CIT 1001. FYE: Computer & Information Technology. 1 Hour.**

First Year Experience seminar course designed to help freshman students interested in computing adapt to college life and become integrated into Dixie State University and the Computer and Information Technology department. Students will refine academic skills, create and foster social networks, learn about college resources, explore the different options available within the CIT department, and learn about career opportunities in Computing. Multiple listed with all other sections of First Year Experience (all 1001 courses, ENGR 1000). Students may only take one FYE course for credit. FA, SP.

## Computer Science Courses

### **CS 1030. Problem Solving with Computers. 3 Hours.**

For any student interested in how computers are used to solve problems. This course will introduce the use of computers in problem solving including problem decomposition and algorithm construction. Students will be required to complete simple programming projects. Offered based upon sufficient student need. Course fee required. FA, SP.

### **CS 1400. Fundamentals of Programming. 3 Hours.**

Required of all students pursuing Computer and Information Technology degrees. Open to all students with a general interest in computer programming. Covers structured programming techniques and the syntax of a high level programming language through completion of programming projects of increasing difficulty. Course fee required. FA, SP, SU.

### **CS 1410. Object Oriented Programming. 3 Hours.**

Required of all students pursuing Computer and Information Technology degrees, open to all students with a general interest in computer programming. Introduces object oriented programming techniques through completion of programming projects of increasing difficulty. Course fee required. Prerequisite: CS 1400 (Grade C- or higher). FA, SP.

### **CS 2420. Introduction to Algorithms and Data Structures. 3 Hours.**

Required of students pursuing a Computer Science or Information Technology degree or emphasis, open to any student with a strong interest in computer programming. Covers the design and use of common data structures, lists, stacks, queues, trees, hash tables, and graphs through completion of several challenging programming projects. Introduces computational complexity and algorithm analysis. Course fee required. Prerequisite: CS 1410 (Grade C- or higher). FA, SP.

### **CS 2450. Software Engineering. 3 Hours.**

Required of students pursuing a Computer Science degree or emphasis, open to any student with a strong interest in computer programming. Covers current software engineering theory and practice through completion of a challenging team project. Dual listed with MIS 4450 and WEB 3450 (students may take only one course for credit). Course fee required. Prerequisite: CS 2420 (Grade C- or higher). FA, SP.

**CS 2810. Computer Organization and Architecture. 3 Hours.**

Required of students pursuing a Computer Science degree or emphasis, open to any student with a strong interest in computer programming. Covers digital hardware design and systems programming, including numeric representations, digital logic, processor architecture, instruction sets, assembly language, and other low-level programming topics. Course fee required. Prerequisite: CS 1410 (Grade C- or higher). FA, SP.

**CS 3005. Programming in C++. 3 Hours.**

For student pursuing degrees in Computer Science and Computer and Information Technologies, or any student with a strong interest in computer programming. Covers syntax and semantics of C++ programming language through completion of hands-on projects. The student must already be fluent in some other programming language. Course fee required. Prerequisite: CS 1410 (Grade C- or higher). FA, SP.

**CS 3010. Mobile Application Development for Android. 3 Hours.**

For students pursuing degrees in Computer Science, or other students interested in writing applications for modern mobile devices using Google's Android operating system. Prerequisites: CS 2420 (Grade C- or higher) AND CS 3005 (Grade C- or higher). SP.

**CS 3020. Mobile Application Development: iOS. 3 Hours.**

For students pursuing degrees in Computer Science, or other students interested in writing applications for modern mobile devices using Apple's iOS operating system. Prerequisites: CS 2420 (Grade C- or higher); AND CS 3005 (Grade C- or higher). FA.

**CS 3200. Web Application Development I. 3 Hours.**

For students pursuing a degree in Computer Science or an emphasis in Software Development, or other students interested in writing applications for the modern web. Covers the fundamentals of three-tier web applications, including client-side code for modern browsers, server code using representative languages, and integration with database systems; also covers the protocols that connect these components and the environments in which they run. Prerequisites: CS 1410 (Grade C- or higher) AND WEB 1400 (Grade C- or higher); OR CS 2810 (Grade C- or higher). FA, SP.

**CS 3310. Discrete Mathematics. 3 Hours.**

For students pursuing degrees in Computer Science, or other students interested in counting theory and applications. Covers mathematical reasoning, combinatorial analysis, sets, permutations, relations, computational complexity, and Boolean logic through homework and programming assignments. Course fee required. Prerequisite: MATH 1210 (Grade C- or higher); AND CS 1410 (Grade C- or higher). FA.

**CS 3400. Operating Systems. 3 Hours.**

Can be used to fulfill a requirement for students pursuing a degree or emphasis in Computer Science, and open to other students. Covers operating systems design and implementation, including processes and threads, synchronization, virtual memory, and file systems. Course taught by arrangement. Course fee required. Prerequisites: CS 2420 (Grade C- or higher); AND CS 2810 (Grade C- or higher); AND CS 3005 (Grade C- or higher).

**CS 3410. Distributed Systems. 3 Hours.**

Can be used to fulfill a requirement for students pursuing a degree or emphasis in Computer Science, and open to other students. Covers design and implementation of network applications, including message passing, concurrency, synchronization, scalability, and partial failure. Course fee required. Prerequisites: CS 2420 (Grade C- or higher); AND CS 2810 (Grade C- or higher). SP.

**CS 3440. Software Practices. 3 Hours.**

For students pursuing degrees in Computer Science, or other students interested in gaining experience in software development practices. Covers practical usage of software development tools, source code control, software debugging, third party libraries and frameworks, and effective team work. Course fee required. Prerequisite: CS 3005 (Grade C- or higher).

**CS 3500. Application Development. 3 Hours.**

For students pursuing degrees in Computer Science or Computer Information Technology, or others with an interest in graphical interface design and implementation. Covers the theory and practice of constructing easy to use interfaces through programming graphical environment projects in a variety of languages and platforms. Course taught by arrangement. Prerequisite: CS 3005 (Grade C- or higher).

**CS 3510. Advanced Algorithms/Data Structures. 3 Hours.**

Required of students pursuing a Computer Science degree or emphasis. Covers the analysis and design of algorithms and data structures, including graphs, greedy algorithms, divide and conquer algorithms, and dynamic programming. Course fee required. Prerequisites: CS 2420 (Grade C- or higher); AND CS 2810 (Grade C- or higher); AND CS 3310 (Grade C- or higher). SP.

**CS 3520. Programming Languages. 3 Hours.**

Required of students pursuing a Computer Science degree or emphasis. Covers the principles and concepts that characterize high-level computer programming languages, including function and data abstraction, and imperative, functional, logic and object-oriented programming techniques. Course fee required. Prerequisites: CS 2420 (Grade C- or higher); AND CS 2810 (Grade C- or higher). FA.

**CS 3530. Computational Theory. 3 Hours.**

Required of students pursuing a Computer Science degree or emphasis. Covers the theory of computation, including finite-state automata, pushdown automata, Turing machines, and equivalent formalisms. Also introduces complexity theory. Course fee required. Prerequisites: CS 2420 (Grade C- or higher); AND CS 2810 (Grade C- or higher); and CS 3310 (can be concurrently enrolled). FA.

**CS 3600. Graphics Programming. 3 Hours.**

Required of students pursuing a Computer Science degree or emphasis, and open to other interested students. Covers 2-D and 3-D model creation, transformation, and various rendering techniques through completion of programming assignments. Course fee required. Prerequisites: CS 2420 (Grade C- or higher); AND CS 3005 (Grade C- or higher). SP.

**CS 4200. Web Application Development II. 3 Hours.**

For students interested in writing applications for the modern web. Covers advanced concepts and topics in client-side and server-side web application development. Students will be introduced to a variety of modern software frameworks, languages, architectural patterns, and techniques in order to create interactive, data-centric web applications. Course is dual listed with WEB 4200. Students may only take one course for credit. Prerequisite: CS 3200 (Grade C- or higher). SP.

**CS 4300. Artificial Intelligence. 3 Hours.**

Required of students pursuing a Computer Science degree or emphasis. Introduces the broad field of artificial intelligence in computer software followed by specific applications in computer gaming strategies. Students will complete programming assignments. Course fee required. Prerequisites: CS 2420 (Grade C- or higher); AND CS 2810 (Grade C- or higher); AND CS 3005 (Grade C- or higher). FA.

**CS 4307. Database Design & Management. 3 Hours.**

Required of students pursuing a Computer Science degree or emphasis. Covers administration of database management systems, logical database design, implementation of database designs, and application development using a DBMS. Students will design, manage, and implement databases and applications that use databases. Dual listed with IT 4300 (students may take only one course for credit). Course fee required. Prerequisite: CS 1410 (can be concurrently enrolled). FA, SP.

**CS 4310. Database Administration. 3 Hours.**

This course covers the database architecture and environment. Students will be able to manage user access control. Students will be able to perform backup, restore, and recovery operations. Students will be able control performance and optimization issues. It covers updating and upgrading of a database system. Students will be able to perform the importing and exporting of data to/from a database. Dual listed with IT 4310 (only one course may be taken for credit). Course fee required. Prerequisite: CS 4307 (Grade C- or higher). FA.

**CS 4550. Compilers. 3 Hours.**

Required of students pursuing a Computer Science degree or emphasis. Covers compiler design and implementation, including lexical analysis, parsing, symbol table management, and generating code through challenging programming assignments. Course fee required. Prerequisites: CS 2420 (Grade C- or higher); AND CS 2810 (Grade C- or higher); AND CS 3005 (Grade C- or higher). SP.

**CS 4600. Senior Project. 3 Hours.**

Required of students pursuing a Computer Science degree or emphasis. Students will complete an aggressive programming project of software engineering. Course fee required. Prerequisite: Senior status. SP.

**CS 4920R. Internship. 1-3 Hours.**

Internship course in Computer Science and Software Development. Course fee required. Variable credit 1.0 - 3.0. Repeatable up to 3 credits subject to graduation restrictions. Prerequisite: Instructor permission. Offered by arrangement.

**CS 4990. Sem in Computer Science. 3 Hours.**

For students wishing instruction that is not available through other regularly scheduled courses in this discipline. Occasionally, either students need some type of non-traditional instruction, or an unanticipated opportunity for instruction presents itself. This course may include standard lectures, travel and field trips, guest speakers, laboratory exercises, or other nontraditional instruction methods. Repeatable for credit as topics vary, up to 6 credits. Course fee required. Prerequisite: Advanced standing. Offered by arrangement.

**CS 4991R. Competitive Programming. 0.5 Hours.**

For students interested in competing in programming contests. Covers problem analysis and classification, and efficient implementation of solutions. Repeatable up to 6 times for 3 credits. Prerequisite: CS 1400 (Grade C- or higher). FA, SP.

**CS 4992. Seminar in Computer Science. 0.5-3 Hours.**

For students wishing instruction that is not available through other regularly scheduled courses in this discipline. Occasionally, either students request some type of non-traditional instruction, or an unanticipated opportunity for instruction presents itself. This seminar course provides a variable credit context for these purposes. As requirements, this seminar course must first be pre-approved by the department chair; second, it must provide at least nine contact hours of lab or lecture for each credit offered; and third, it must include some academic project or paper (i.e., credit is not given for attendance alone). This course may include standard lectures, travel and field trips, guest speakers, laboratory exercises, or other nontraditional instruction methods. Note that this course is an elective and does not fulfill general education or program requirements. Fees may be required for some seminar courses and instructor permission will be optional at the request of the instructor.

## Digital Design Courses

**DES 1100. Intro to Digital Design. 3 Hours.**

Introduces software and principles related to digital design and visual communications, and the creation and reproduction of art. Teaches how to create and modify digital images, illustration, and page layout using current design software and printing techniques. FA, SP.

**DES 1300. Design I. 3 Hours.**

For students pursuing a degree in Computer and Information Technology. Explores the elements of design from which advertising, computer graphics, and graphic arts are structured by building awareness and skill in creating designs, using the concepts of composition, proportion, alignment, contrasts, white space, typography, eye movement, and element control, emphasizing the value of these concepts to communicate ideas. Course fee required. FA, SP.

**DES 1610. Screen Printing. 3 Hours.**

For students interested in the screen printing industry on the commercial level. Includes hands-on experiences for printing on various substrates using photographically/mechanically generated stencils, reproducing images with computers for positive reproduction, and multi-color screen printing on fabric. Instruction includes the use of vector image editing software. Offered based upon sufficient student need.

**DES 2100. Design Thinking. 3 Hours.**

An introduction to design thinking, an empathy-based, human-centered, and rapid prototype-driven methodology for innovation. Students will explore challenges such as the creation of new products, technological innovation, services, business models, experiences, processes and/or systems through the design thinking process. FA, SP.

**DES 2300. Design II. 3 Hours.**

An intermediate level course that expands the skills and knowledge acquired in Design I. The course emphasizes practical assignments that examine applied problem solving and professional solutions for graphic designers. Specific themes/topics for the course include visual grouping and hierarchy, visual identity development and application of Gestalt theory. Prerequisites: DES 1100 and DES 1300 (both Grade C- or higher). Course fee required. FA, SP.

**DES 2600. Creative Imaging. 3 Hours.**

For students pursuing a degree in Computer and Information Technology. Hands-on introduction to computer photo-manipulation and designing graphics on the computer, emphasizing tools and techniques used for editing and retouching photographs and creating original images with photo-like qualities for use in advertising, web publishing, and interactive multimedia projects. Assignments require access to specific programs on either Macintosh or Windows platforms. FA, SP.

**DES 2710. Typography I. 3 Hours.**

Study of basic layout, lettering, type design, identification of styles, and typographic history. Students learn how to use type as a basic element of graphic communication, how the use of different typefaces visually communicate a desired effect, and fundamental terminology of type specification. Consists of lectures, quizzes, and ongoing typographically-related projects intended to be of portfolio-quality. Dual listed with ART 2710 (students may take only one course for credit). Course fee required. Prerequisite: DES 1300 (Grade C- or higher). FA, SP.

**DES 2800. Digital Publishing. 3 Hours.**

For students pursuing a degree in Computer and Information Technology. A hands-on introduction to page-layout software and publishing for print and multi-media. Students will learn to create multi-page documents including text and images, edit those documents and prepare them for publication. Course fee required. Prerequisite: DES 1300 (Grade C- or higher). FA, SP.

**DES 3100. Interaction Design. 3 Hours.**

For students pursuing an emphasis in Digital Design or Web Design and Development, or other students interested in interaction design and user interface design. Covers interaction design, with an emphasis on user interface and experience (UI/UX) design as a design process. Students will learn how to perform user research, develop user stories, and implement user testing. Students will also learn the process of user interface design, including crafting user flows, site mapping, sketching, wire-framing, prototyping, and creating mock-ups. Students will design user interfaces for web and mobile applications, and learn the specific principles and techniques used for each. Dual listed with WEB 3100 (students may take only one course for credit). Prerequisites: DES 2600 (Grade C- or higher); AND DES 2710 (Grade C- or higher); AND WEB 3400 (Grade C- or higher). FA.

**DES 3300. Intro to Digital Video Editing. 3 Hours.**

For students pursuing a degree in Computer and Information Technology. Introduces essentials of editing video and audio with computers, including TV/video production applications, multimedia authoring, and/or Internet video streaming. Also includes digitizing video and audio from analogue or digital sources, selecting footage from source clips, constructing transitions, titling, creating and using alpha channel or other matte techniques, plus other special effects. Course fee required. Prerequisites: DES 2300 (Grade C- or higher); AND DES 2600 (Grade C- or higher). SP.

**DES 3400. Information Design. 3 Hours.**

Introduction to the field of information design, data visualization, infographics and instructional materials. Students will explore information design problems in both stand-alone and system applications; digital (interaction) media, print, and environmental communication. Prerequisites: DES 2710 OR ART 2710 (Grade C or higher). SP.

**DES 3600. 3-D Visualization. 3 Hours.**

For students pursuing an emphasis in Visual Technologies; also open to other interested students. Introduces three-dimensional modeling and rendering techniques on the computer, including various modeling processes, defining and applying textures, assembling scenes, and rendering images, which are applicable to realistic package and product designs, as well as exciting graphics for desktop or Internet publishing projects. Assignments require access to specific programs on either Macintosh or Windows platforms. Course fee required. Prerequisites: DES 2300 (Grade C- or higher); AND DES 2600 (Grade C- or higher). FA.

**DES 3650. 3-D Animation. 3 Hours.**

For students pursuing a degree in Computer and Information Technology. Companion course to DES 3600, covers aspects of 3D animation design, story boarding, character development, and animation rendering of 3D models suitable for broadcast or composite video use. Maya 3D software will be used to create multiple short animation projects individually and in teams. Includes rigid/soft body animation solvers, dynamic particles, deformation and effects fields, IK/FK rigging, and multi-frame rendering output, use of key frames, ease in/ease out controls, the timeline, realistic modeling techniques, set lighting, shadows, multi-layer surfacing, photorealistic rendering, and video formats for final output. Dual listed with ART 3650 (students may only take one course for credit). Prerequisites: DES 3600 or ART 3610 (Grade C- or higher). SP.

**DES 3710. Typography II. 3 Hours.**

Covers typography as a functional and experimental medium and typeface design. Students develop typographic solutions that explore verbal/visual messages in designs for publication through design problem-solving for a diverse range of specifications, including audience, client needs, and budget constraints, using traditional and digital tools. Dual listed with ART 3710. Student may only take one course for credit. Course fee required. Prerequisite: DES 2710 or ART 2710 (Grade C- or higher). FA.

**DES 3780. Prepress & Print Production. 3 Hours.**

Overview of desktop publishing and digital imaging on the prepress industry. Topics include input and output, correct creation of digital files, data storage, proofing methods, and relevant terminology/communication with prepress and printing professionals. Also acquaints students with the variety of jobs offered in the field, file evaluation, and much more. Field trips to printers and other prepress service providers reinforce lectures/projects. Course fee required. Dual listed with ART 3780 (students may take only one course for credit). Prerequisite: DES 2300 (Grade C- or higher) and DES 2600 (Grade C- or higher). SP.

**DES 3800. Branding. 3 Hours.**

Explores the history, psychology and purpose of corporate identity programs and the role of communication design in the current corporate environment by analyzing, investigating, and reporting on current company corporate objectives and target markets and then designing a sound multifaceted identity program. Prerequisite: DES 2300 (Grade C- or higher) AND DES 2710 (Grade C- or higher). Course fee required. FA.

**DES 4600. Senior Project. 3 Hours.**

For students pursuing a degree in Computer and Information Technology. Emphasizes application of skills to commercial projects through design of or contribution to various private sector or university internet projects, print, and multimedia projects. Includes portfolio development. Course fee required. Prerequisite: Senior standing. SP.

**DES 4650. Publication Design. 3 Hours.**

For students pursuing a degree in Computer and Information Technology. Explores creative, functional, and aesthetic aspects of editorial design with emphasis on page layout. Students will focus on the significance of consistency and thematic continuity, developing aesthetic awareness, and integrating design principles. Students will refine and further develop visual judgment in the arrangement of type and images to effectively convey visual messages. Dual listed with ART 4650. Students may only take one course for credit. Course fee required. Prerequisites: DES 2600 AND DES 2800 (Grade C- or higher) AND DES 2710 OR ART 2710 (Grade C- or higher). SP.

**DES 4900R. Independent Research. 1-3 Hours.**

For students pursuing an emphasis in Digital Design with advanced standing who wish to pursue a specific focus of study related to their degree emphasis and/or research interest not otherwise available in the current Digital Design curriculum. Students are closely supervised by appropriate faculty in the design and successful completion of the course. The course is dependent upon a formal contractual arrangement with the faculty member that is submitted at the beginning of the semester in which coursework is undertaken, and is contingent upon the department chair's approval. Students meet with the faculty mentor each week and provide progress reports for feedback. Students are required to meet the university requirement of 45 hours of work per credit. Variable credit 1.0 - 3.0. Repeatable up to 3 credits subject to graduation restrictions. Course fee required. Prerequisite: Instructor permission. Offered by arrangement.

**DES 4920. Internship. 3 Hours.**

For students pursuing a degree in Computer and Information Technology. Designed to integrate Digital Design students into working environments that increase aptitude, skills, and networking. The internship setting will nurture a mentor learning relationship with the student, and assist them in preparation for after graduation. Prerequisite: Instructor permission. FA, SP, SU.

**DES 4990. Seminar in Digital Design. 3 Hours.**

For students wishing instruction that is not available through other regularly scheduled courses in this discipline. Occasionally, either students need some type of non-traditional instruction, or an unanticipated opportunity for instruction presents itself. This course may include standard lectures, travel and field trips, guest speakers, laboratory exercises, or other nontraditional instruction methods. Repeatable for credit as topics vary, up to 6 credits. Course fee required. Prerequisite: Advanced standing. Offered by arrangement.

## Information Technology Courses

**IT 1100. Introduction to Unix/Linux. 3 Hours.**

Required of all Computer and Information Technology majors, and open to students with a general interest in computer operating systems. Introduces operating system concepts, including file systems, process management, user management, and security. Students will install and configure LINUX and MAC OSX. Course fee required. FA, SP.

**IT 1200. A+ Computer Hardware/Windows OS. 3 Hours.**

This course covers installation, repair and maintenance of computer hardware. It also discusses installation, repair and maintenance of the Microsoft Windows operating system. This course prepares the student to take the CompTIA A+ certification exams. Dual listed with CJ 2500 (students may take only one course for credit). Course fee required. FA, SP.

**IT 2400. Intro to Networking. 3 Hours.**

Required of all Computer Science and Computer and Information Technology majors, and open to students with a general interest in computer networking. Introduces fundamental concepts of computer networks, including physical, transport, and application layers through completion of assignments predicting and measuring the behavior of computer networks under various conditions. Course fee required. Prerequisite: IT 1100 (Grade C- or higher). FA, SP.

**IT 3100. Systems Design and Administration I. 3 Hours.**

Required of Computer and Information Technology majors and students with an emphasis in Information Technology. Covers system administration topics for managing Internet facing services, including DNS, SMTP, and HTTP. Students will install, configure, and test services in a server environment. Course fee required. Prerequisites: CS 1400 (Grade C- or higher); AND IT 2400 (Grade C- or higher). FA.

**IT 3110. Systems Design and Administration II. 3 Hours.**

Required of students pursuing an emphasis in Information Technology, and open to Computer & Information Technology and Computer Science students. A continuation of IT 3100, course covers administration topics for managing local network services, including file sharing and user profile sharing in heterogeneous computer networks. Students will install, configure, and test services in a server environment. Course fee required. Prerequisite: IT 3100 (Grade C- or higher). SP.

**IT 3150. Windows Servers. 3 Hours.**

Students will learn Windows server management techniques to support a small to medium-sized business. Topics covered will include DHCP, DNS, IT, Windows Roles, Workgroups, Active Directory, and Domain Management. File and printer sharing will also be discussed. Course fee required. Prerequisites: IT 1200 and IT 2400 (both Grade C- or higher). SP.

**IT 3300. Virtualization. 3 Hours.**

Full Operating System virtualization as well as container or application virtualization topics will be covered. Automated deployment using configuration files. Management topics such as load-balancing, auto-failover, and high availability will also be discussed. Prerequisite: IT 2400 (Grade C- or higher). FA.

**IT 4100. Files Systems and Storage Technologies. 3 Hours.**

Classic, virtualized, and cloud storage will be covered. Topics such as RAID, NAS, SAN will be covered. Business continuity for backup and replication of storage. Local vs. Remote file systems. We will explore older and newer OS filesystems and compare them (such as fat32, ntfs, ext3, ext4, btrfs). Prerequisite: IT 3100 (Grade C- or higher). SP (even).

**IT 4200. Advanced Web Delivery. 3 Hours.**

Required of students pursuing an Information Technology emphasis, and open to other interested students. Covers advanced web server configuration, management, and optimization necessary to provide web application delivery environments. Course fee required. Prerequisite: IT 3100 (Grade C- or higher). FA.

**IT 4300. Database Design & Management. 3 Hours.**

Required of students pursuing an Information Technology emphasis. Covers administration of database management systems, logical database design, implementation of database designs, and application development using a DBMS. Students will design, manage, and implement databases and applications that use databases. Dual listed with CS 4307 (students may take only one course for credit). Course fee required. Prerequisites: CS 1400 (Grade C- or higher); AND IT 1100 (Grade C- or higher). FA.

**IT 4310. Database Administration. 3 Hours.**

This course covers the database architecture and environment. Students will be able to manage user access control. Students will be able to perform backup, restore, and recovery operations. Students will be able control performance and optimization issues. It covers updating and upgrading of a database system. Students will be able to perform the importing and exporting of data to/from a database. Dual listed with CS 4310 (only one course may be taken for credit). Prerequisites: IT 4300 (Grade C- or higher). FA.

**IT 4400. Network Design & Management. 3 Hours.**

Required of students pursuing an Information Technology emphasis. Covers the design, management, and monitoring of a network. Hands-on configuration experience of layers 1, 2, and 3 will be given on both LAN and WAN levels. The successful student will be prepared to successfully complete the CCNA exam. Course fee required. Prerequisite: IT 2400 (Grade C- or higher). FA.

**IT 4500. Information Security. 3 Hours.**

Required of students pursuing an Information Technology emphasis. Reviews current security exploits, vulnerabilities, and counter measures. Covers general security models and architectures, encryption and forensics. Course fee required. Prerequisites: CS 1400 (Grade C- or higher); AND IT 3100 (Grade C- or higher). SP.

**IT 4600. Senior Project. 3 Hours.**

Required of students pursuing an Information Technology emphasis. Students will complete an aggressive information technology project. Course fee required. Prerequisite: Senior status. SP.

**IT 4920R. Internship. 1-3 Hours.**

Internship course in Information Technology. Course fee required. Variable credit 1.0 - 3.0. Repeatable up to 3 credits subject to graduation restrictions. Prerequisite: Instructor permission. Offered by arrangement.

**IT 4990. Seminar in Inform Technology. 3 Hours.**

For students wishing instruction that is not available through other regularly scheduled courses in this discipline. Occasionally, either students need some type of non-traditional instruction, or an unanticipated opportunity for instruction presents itself. This course may include standard lectures, travel and field trips, guest speakers, laboratory exercises, or other nontraditional instruction methods. Repeatable for credit as topics vary, up to 12 credits. Course fee required. Prerequisite: Advanced standing. Offered by arrangement.

**IT 4991. Seminar in Information Technology. 0.5-3 Hours.**

For students wishing instruction that is not available through other regularly scheduled courses in this discipline. Occasionally, either students request some type of non-traditional instruction, or an unanticipated opportunity for instruction presents itself. This seminar course provides a variable credit context for these purposes. As requirements, this seminar course must first be pre-approved by the department chair; second, it must provide at least nine contact hours of lab or lecture for each credit offered; and third, it must include some academic project or paper (i.e., credit is not given for attendance alone). This course may include standard lectures, travel and field trips, guest speakers, laboratory exercises, or other nontraditional instruction methods. Note that this course in an elective and does not fulfill general education or program requirements. Fees may be required for some seminar courses and instructor permission will be optional at the request of the instructor.

## Web Design Development Courses

**WEB 1400. Web Design I: Fundamentals. 3 Hours.**

For students pursuing a degree in Computer and Information Technology. Covers fundamental principles of front-end web design, including beginner's hands-on experience with HTML and CSS in planning, organizing, analysis, and designing websites. Introduces key foundation concepts such as Internet infrastructure, web page creation and publishing, wire framing, layout techniques, multimedia, content, color, typography, and accessibility. FA, SP.

**WEB 3100. Interaction Design. 3 Hours.**

For students pursuing an emphasis in Digital Design or Web Design and Development, or other students interested in interaction design and user interface design. Covers interaction design, with an emphasis on user interface and experience (UI/UX) design as a design process. Students will learn how to perform user research, develop user stories, and implement user testing. Students will also learn the process of user interface design, including crafting user flows, site mapping, sketching, wireframing, prototyping, and creating mockups. Students will design user interfaces for web and mobile applications, and learn the specific principles and techniques used for each. Dual listed with DES 3100 (students may take only one course for credit). Course fee required. Prerequisites: DES 2600 (Grade C- or higher); AND DES 2710 (Grade C- or higher); AND WEB 3400 (Grade C- or higher). FA.

**WEB 3200. Web Application Development I. 3 Hours.**

For students pursuing an emphasis in Web Design & Development, or other students interested in writing applications for the modern web. Covers the fundamentals of three-tier web applications, including client-side code for modern browsers, server code using representative languages, and integration with database systems; also covers the protocols that connect these components and the environments in which they run. Dual listed with CS 3200 (students may only take one course for credit). Course fee required. Prerequisites: CS 1410 (Grade C- or higher); AND WEB 1400 (Grade C- or higher). FA, SP.

**WEB 3400. Web Design II: Essentials. 3 Hours.**

For students pursuing a degree in Computer and Information Technology. Covers intermediate concepts of front-end web design and development, including essential hands-on experience with HTML, CSS, JavaScript, and other web publishing tools. Essential concepts such as domain and hosting infrastructure, modern web design frameworks & libraries, user interface and experience, e-commerce, web promotion, legal models, development environments, and interactivity are all examined. Course fee required. Prerequisites: DES 1300 (Grade C- or higher); AND WEB 1400 (Grade C- or higher). FA, SP.

**WEB 3450. Software Engineering. 3 Hours.**

Students will take on a challenging team project. Students will also learn about the software lifecycle and its phases. Dual listed with MIS 4450 & CS 2450 (students may take only one course for credit). Course fee required. Prerequisites: WEB 3200 (Grade C- or higher); AND WEB 3400 (Grade C- or higher). FA, SP.

**WEB 3500. Electronic Commerce. 3 Hours.**

For students pursuing a Computer & Information Technology degree. Also open to other interested students. Covers concepts and principles of electronic commerce from an interdisciplinary approach, including computer sciences, marketing, consumer behavior, finance, economics, and information systems. Specifics include electronic commerce process steps, Internet infrastructure, demographics, marketing and market research, advertising, promotion, strategy development, financing, competitive analysis, technical development, Web site review, launch, and on-going innovation. Course fee required. FA, SP.

**WEB 3550. Internet & eCommerce Marketing. 3 Hours.**

For students pursuing a Computer & Information Technology degree. Also open to interested students. Covers impact of new technologies and Internet expansion on marketing and advertising information intensive products and services on the Internet, particularly targeting and reaching customers. Course fee required. FA, SP.

**WEB 4200. Web Application Development II. 3 Hours.**

For students pursuing an emphasis in Web Design & Development, or other students interested in writing applications for the modern web. Covers advanced concepts and topics in client-side and server-side web application development. Students will be introduced to a variety of modern software frameworks, languages, architectural patterns, and techniques in order to create interactive, data-centric web applications. Dual listed with CS 4200 (students may only take one course for credit). Course fee required. Prerequisite: WEB 3200 (Grade C- or higher). SP.

**WEB 4400. Web Design III: Advanced Techniques. 3 Hours.**

For students pursuing a degree in Computer and Information Technology. Covers mastery-level web design and development practices. Hands-on experience developed using advanced technologies such as HTML, CSS, JavaScript, content management systems, advanced web frameworks & libraries, and other advanced front-end technologies. In-depth web topics are covered including: advanced design techniques, user interface and experience, interactivity, animation, and other web related concepts are covered. Course fee required. Prerequisites: DES 2300 (Grade C- or higher); AND DES 2600 (Grade C- or higher); AND DES 2710 (Grade C- or higher); AND WEB 3400 (Grade C- or higher). FA.

**WEB 4600. Senior Project. 3 Hours.**

For students pursuing a degree in Computer and Information Technology. Emphasizes application of skills to commercial projects through design of or contribution to various private sector or university internet projects, print, and multimedia projects. Includes portfolio development. Course fee required. Prerequisite: Senior standing. SP.

**WEB 4900R. Independent Research. 1-3 Hours.**

For students pursuing an emphasis in Web Design and Development with advanced standing who wish to pursue a specific focus of study related to their degree emphasis and/or research interest not otherwise available in the current Web Design and Development curriculum. Students are closely supervised by appropriate faculty in the design and successful completion of the course. The course is dependent upon a formal contractual arrangement with the faculty member that is submitted at the beginning of the semester in which coursework is undertaken, and is contingent upon the department chair's approval. Students meet with the faculty mentor each week and provide progress reports for feedback. Students are required to meet the university requirement of 45 hours of work per credit. Variable credit 1.0 - 3.0. Repeatable up to 3 credits subject to graduation restrictions. Offered by arrangement. Course fee required. Prerequisite: Instructor permission.

**WEB 4920. Internship. 3 Hours.**

For students pursuing a degree in Computer and Information Technology. Designed to integrate Web Design & Development students into working environments that increase aptitude, skills, and networking. The internship setting will nurture a mentor learning relationship with the student, and assist them in preparation for after graduation. Course fee required. Prerequisite: Instructor permission. FA, SP, SU.

**WEB 4990. Seminar in Web Development. 3 Hours.**

For students wishing instruction that is not available through other regularly scheduled courses in this discipline. Occasionally, either students need some type of non-traditional instruction, or an unanticipated opportunity for instruction presents itself. This course may include standard lectures, travel and field trips, guest speakers, laboratory exercises, or other nontraditional instruction methods. Repeatable for credit as topics vary, up to 6 credits. Course fee required. Prerequisite: Advanced standing. Offered by arrangement.