



SEATTLE PACIFIC  
UNIVERSITY

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COLLEGE OF ARTS AND SCIENCES  
DIVISION OF SCIENCE AND ENGINEERING  
DEPARTMENT OF COMPUTER SCIENCE

3307 Third Avenue West T 206.281.2140  
Seattle, Washington 98119 F 206.378.5400  
<http://www.spu.edu/depts/csc/>

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# Computer Science Department Advising Brochure Effective Fall Quarter 2006

This student academic advising brochure contains information about the degree programs and courses of study that are offered by the Computer Science program at Seattle Pacific University. SPU offers both an undergraduate major and a minor in Computer Science. SPU does not offer a graduate degree in Computer Science.

A major in Computer Science is awarded either the Bachelor of Science degree or the Bachelor of Arts degree from the Division of Science and Engineering in the College of Arts and Sciences. All computer science majors must satisfy a Base Requirement of computer science courses, as well as selecting either the B.S. or the B.A. (with emphasis Option) degree within the program. In addition, all University general education Exploratory Curriculum and Foundation requirements must be met (described fully in the SPU Catalog).

A minor in Computer Science is designed to complement a major course of study in another discipline, providing students with computer programming and software design expertise that can be applied to solve problems relevant to the associated area.

The various degree options and requirements are presented in table and checklist formats, along with several additional diagrams and charts that describe the course sequencing prerequisite structure and recommended 4-year course scheduling plans for completing the degree requirements. Also included is a copy of the University catalog description for the Computer Science program, a brief summary of all CSC course offerings, and other advising information such as a list of courses from the University Exploratory Curriculum that are likely to be particularly relevant for students completing Computer Science degrees.

The CSC departmental web site always has the most up-to-date information about our degree programs and requirements (<http://www.spu.edu/depts/csc/>).

The SPU web site always has the most up-to-date information on Catalog requirements and course Timescheduling (<http://www.spu.edu>).

Please contact a Computer Science faculty advisor if you need further information.

## **Computer Science at Seattle Pacific University**

Departmental Web Page: <http://www.spu.edu/depts/csc/>

Computer science is the discipline which studies the representation, storage, and transformation of information utilizing automatic computing machines. The computer scientist is interested in developing computer software and hardware to analyze data and solve problems. In addition to understanding the organization and operation of modern computer systems, knowledge of the problems and applications in a related discipline is highly recommended.

The Department of Computer Science is dedicated to educating and preparing students for a variety of careers in business, scientific and engineering computing. We seek to provide a broad program of studies in theoretical and applied computer science informed by a Christian world view, graduating students who are equipped for continued professional development and service.

Both bachelor of science (B.S.) and more applied bachelor of arts (B.A.) degree options are available. A variety of computing equipment is available to SPU to support coursework and independent study activities. A fiber-optic Ethernet network links all parts of the campus computing environment. The open student laboratory contains about 30 Pentium/Athlon Windows PC systems, each connected to the Ethernet and with access to printers and appropriate software packages.

It is recommended that students majoring in computer science obtain their own Windows-compatible machine to gain the full experience of configuring and maintaining a computer system. A suitable system would be based on a fast Pentium or Athlon processor with 512MB memory, a 100.0 GB hard drive, Ethernet (or modem) and printer. Software should include Windows XP, Microsoft Visual Studio .NET, Microsoft Word, and Adobe Acrobat Reader. Some courses may require other software which will be available in the student laboratory or for separate purchase. Most recommended software is available with educational pricing through the Computer & Information Systems department, or at the SPU Bookstore.

### **Faculty**

<b>Michael Tindall</b> mht@spu.edu	M.S., Ph.D. Computer Science, University of Illinois, 1975. CSC Chair.
<b>Phil Prins</b> pprins@spu.edu	Ph.D. Electrical Engineering, University of Idaho, 1993. M.S. Computer Science, University of Idaho, 1984.
<b>Elaine Weltz</b> eweltz@spu.edu	M.S.E. Software Engineering, Seattle University, 1989. M.Mus. University of Southern California, 1978.
<b>Creed Jones III</b> creedj@spu.edu	Ph.D. Computer Engineering, Virginia Tech, 2005. M.S. Electrical Engineering, Oakland University, 1982.

## Computer Science Department – Goals and Learning Objectives

The Computer Science department has identified several goals for students enrolled in our programs.

### **Goal 1: Help students develop problem-solving skills, especially those required to analyze, design and implement solutions involving the use of a computer.**

- Objective 1: Successful students will acquire the up-to-date technical knowledge and develop the skills needed for a successful start to careers in the computing industry.
- Objective 2: Successful students will be able to develop solutions to problems that are new to them, and implement these solutions efficiently.
- Objective 3: Successful students will be able to implement solutions utilizing different computer platforms and programming languages.
- Objective 4: Successful students will develop the skills needed to work in small groups on medium to large scale projects.
- Objective 5: Successful students will develop the ability to write technical documents that include specification, design, and implementation of major projects.
- Objective 6: Successful students will be able to effectively disseminate information and results using both oral and written communication.

### **Goal 2: Provide a background in modern computing systems and the theoretical aspects of computer science.**

- Objective 1: Successful students will acquire the computer science knowledge required for graduate studies.
- Objective 2: Successful students will understand the architecture, organization and programming of modern computing systems.
- Objective 3: Successful students will understand the mathematical foundations of computer science, algorithm efficiency and computational complexity.

### **Goal 3: Challenge students to consider the ethical and social impacts of technology, enabling them to take responsible action informed by a Christian world view.**

- Objective 1: Successful students will be aware of ethical and social issues related to technology and recognize their impact.
- Objective 2: Successful students will be able to evaluate potential ethical dilemmas and apply decision-making techniques to resolve them.

### **Goal 4: Prepare students for continued learning in a rapidly changing discipline.**

- Objective 1: Successful students will be aware of the rapid rate of change of technology and methodologies in computer science.
- Objective 2: Successful students will be familiar with ways to gain knowledge and understanding of new developments in computer science and technology.
- Objective 3: Successful students will be aware of alternatives for continuing education in computer science.

*“As a community of learners, Seattle Pacific University seeks to educate and prepare students for service and leadership. We are committed to evangelical Christian faith and values, and to excellence in teaching and scholarship for the intellectual, personal and spiritual growth of students.”* – Mission Statement of Seattle Pacific University

*“The Department of Computer Science is dedicated to educating and preparing students for a variety of careers in business, scientific and engineering computing. We seek to provide a broad program of studies in theoretical and applied computer science informed by a Christian world view, graduating students who are equipped for continued professional development and service.”* – Mission of CSC Dept.

**FALL 2006**  
**COMPUTER SCIENCE DEGREE REQUIREMENTS**

A computer science major requires satisfying the BASE core requirement and the requirements for either the B.S. degree or one of the approved B.A. option tracks (business, computer systems, or computer and information technology).

**Preliminary Prerequisites.** High School Pre-Calculus or Math Analysis is required.

**Admission and GPA Requirement.** A minimum 2.5 GPA (cumulative in all courses required for the major taken at SPU) is required for admission to the major. Additionally, a minimum 2.0 ("C" grade) must be earned in CSC 2430, and a minimum 1.7 ("C-" grade) must be earned in each other course required for the major. An admission form and information is available from <http://www.spu.edu/depts/csc>.

**REQUIREMENTS for the Computer Science B.S. MAJOR**  
(106 Credits; 48 upper-division)

The B.S. major is the traditional degree in computer science. It provides preparation for graduate studies or professional careers in computer science, emphasizing scientific and engineering foundations.

**REQUIREMENTS for the Computer Science B.A. MAJOR**

The B.A. major is an applications-oriented degree in computer science. Each option provides preparation for professional careers in computing, with a specific emphasis on an area of applications.

- **B.A. - Business Option** (85 Credits; 45 upper-division)  
Combines preparation in the core areas of computer science with additional emphasis on business organizations, accounting, finance and marketing.
- **B.A. - Computer Systems Option** (83 Credits; 43 upper-division)  
Provides a thorough preparation in the topics and applications of computer science.
- **B.A. - Computer and Information Technology Degree Completion Option**  
(65 Credits, plus specialization; 35 upper-division in core).  
Combines preparation in the core areas of computer science with an approved CIT specialization. Designed for transfer students who have already completed appropriate computer-related technical certifications or associates degrees. See computer science advisor for details.

**REQUIREMENTS for the Computer Science MINOR**  
(35 Credits; 15 upper-division)

**Core Courses**

CSC 1230 Problem Solving and Programming.....	5
CSC 2430 Data Structures I .....	5
CSC 2431 Data Structures II .....	5

**Electives**

CSC 3000 - CSC 4999.....	15
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**Mathematics**

Select one of: MAT 1221 or MAT 1225 or MAT 1360 or BUS 2700 .....	<u>5</u>
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<b>Total</b> .....	<b>35</b>
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**Related Degree Programs**

**B.S. in Computational Mathematics:** Combines computational and applied mathematics with a strong base in computer science. For more information, contact the Department of Mathematics.

**B.S. in Computer Engineering:** Combines strong bases in computer science, digital electronics and engineering. For more information, contact the Department of Engineering.

<b>Computer Science Degrees Required Courses for 2006-2007 Catalog</b>	<b>B.S.</b>	<b>B.A. Systems</b>	<b>B.A. Business</b>
CSC 1230 Problem Solving & Programming	5	5	5
CSC 2430 Data Structures I	5	5	5
CSC 2431 Data Structures II	5	5	5
CSC 3150W Systems Design	5	5	5
CSC 3220 Applications Programming	3	3	3
CSC 3221 Netcentric Computing	3	3	3
CSC 3310 Concepts in Programming Languages	3	3	3
CSC 3350 Operating Systems Programming	3	3	3
CSC 3430 Algorithm Design & Analysis	3	3	3
CSC 3750 Computer Architecture		5	5
CSC 3760 Computer Organization	5		
CSC Project Course (CSC 4150, 4760, or 4820)	5		
CSC Electives (CSC 4000 - CSC 4850)	11	16	8
CSC 4898 Senior Capstone in Computer Science	2	2	2
<b>Total Computer Science Credits Required</b>	<b>58</b>	<b>58</b>	<b>50</b>
MAT 1221 Survey of Calculus * <i>or</i> MAT 1225 Calculus *			5
MAT 1720 Math for Computer Science		5	5
MAT 1360 Introduction to Statistics *		5	5
MAT 1225 Calculus *	5	5	
MAT 1226 Calculus	5	5	
MAT 1228 Series and Differential Equations	5	5	
MAT 2375 Probability Theory	2		
MAT 2376 Applied Statistics	3		
MAT 2720 Discrete Mathematics	3		
PHY 1121, 1122, 1123 Physics *	15		
EE 1210 Logic System Design	5		
EE 3280 Microcontroller System Design	5		
ECN 2101 Microeconomics *			5
ACCT 2361 Financial Accounting			5
<b>BUS/ECN Electives – 10 credits chosen from list:</b> BUS 3250 Business Finance (5) BUS 3541W Marketing and Society (5) BUS 3614 Organizational Behavior for Managers (5) BUS 3631 Entrepreneurship (5) BUS 3657 Human Resource Management (5) BUS 3670 Management in the Nonprofit Sector (3) BUS 4625 The Organization's Presence on the Net (5) BUS 4644 Operations Management (5) BUS 4660 Managing Systems (5) ECN 3231 Urban Economics (5) ECN 3640 Growth of American Economic Sys. (3)			10
<b>Total Supporting-Discipline Credits Required</b>	<b>48</b>	<b>25</b>	<b>35</b>
<b>Total Credits Required</b>	<b>106</b>	<b>83</b>	<b>85</b>
<b>Total Upper-division Credits Required</b>	<b>48</b>	<b>43</b>	<b>45</b>

\* This course fulfills a General Education requirement



# COMPUTER SCIENCE MAJOR REQUIREMENTS CHECKLIST

Effective Fall 2006

A Computer Science major requires satisfying the BASE requirement, plus the requirements for the Bachelor of Science B.S. degree or one of the three Bachelor of Arts options (B.A.-Business; B.A.-Computer Systems; or B.A.-Computer and Information Technology).

**Major Admission GPA.** A minimum 2.5 GPA (cumulative in all courses required for the major) is required for admission to the major. Additionally, a minimum 2.0 ("C" grade) must be earned in CSC 2430, and a minimum 1.7 ("C-" grade) must be earned in each other course required for the major.

[ Note: Courses marked with \* may fulfill a general education requirement. ]

## BASE REQUIREMENT -- B.S. OR B.A.

37 Credits

- |  |  |
|--|--|
| _____ CSC 1230 Problem Solving and Programming (5) | _____ CSC 3221 Netcentric Computing (3)                |
| _____ CSC 2430 Data Structures I (5)               | _____ CSC 3310 Concepts in Programming Languages (3)   |
| _____ CSC 2431 Data Structures II (5)              | _____ CSC 3350 Operating Systems Programming (3)       |
| _____ CSC 3150W Systems Design (5)                 | _____ CSC 3430 Algorithm Design and Analysis (3)       |
| _____ CSC 3220 Applications Programming (3)        | _____ CSC 4898 Senior Capstone in Computer Science (2) |

### B.S. BACHELOR OF SCIENCE REQUIREMENT

BASE + 69 Credits (Major Total = 106)

- \_\_\_\_\_ CSC 3760 Computer Organization & Assembly Lang. (5)  
\_\_\_\_\_ 1 Project course from the following list  
    CSC 4150 Software Engineering (5)  
    CSC 4760 Adv. Computer Architecture (5)  
    CSC 4820 Adv. Issues – Project course (5)  
\_\_\_\_\_ 11 credits: CSC 4000 - 4850
- \_\_\_\_\_ MAT 1225 Calculus I (5) \*  
\_\_\_\_\_ MAT 1226 Calculus II (5)  
\_\_\_\_\_ MAT 1228 Series and Differential Equations (5)  
\_\_\_\_\_ MAT 2375 Probability Theory (2)  
\_\_\_\_\_ MAT 2376 Applied Statistics (3)  
\_\_\_\_\_ MAT 2720 Discrete Mathematics (3)  
\_\_\_\_\_ PHY 1121 Physics for Science and Engineering (5) \*  
\_\_\_\_\_ PHY 1122 Physics for Science and Engineering (5) \*  
\_\_\_\_\_ PHY 1123 Physics for Science and Engineering (5) \*  
\_\_\_\_\_ EE 1210 Introduction to Logic System Design (5)  
\_\_\_\_\_ EE 3280 Microcontroller System Design (5)

### BACHELOR OF ARTS REQUIREMENT B.A. - COMPUTER SYSTEMS OPTION

BASE + 46 Credits (Major Total = 83)

- \_\_\_\_\_ CSC 3750 Computer Architecture and Organization (5)  
\_\_\_\_\_ 16 credits: CSC 4000 - 4850
- \_\_\_\_\_ MAT 1225 Calculus I (5) \*  
\_\_\_\_\_ MAT 1226 Calculus II (5)  
\_\_\_\_\_ MAT 1228 Series and Differential Equations (5)  
\_\_\_\_\_ MAT 1720 Mathematics for Computer Science (5)  
\_\_\_\_\_ MAT 1360 Introduction to Statistics (5) \*

### BACHELOR OF ARTS REQUIREMENT B.A. - BUSINESS OPTION

BASE + 48 Credits (Major Total = 85)

- \_\_\_\_\_ CSC 3750 Computer Architecture and Organization (5)  
\_\_\_\_\_ 8 credits: CSC 4000 - 4850
- \_\_\_\_\_ 1 course from the following list:  
    MAT 1221 Survey of Calculus (5) \*  
    MAT 1225 Calculus I (5) \*  
\_\_\_\_\_ MAT 1720 Mathematics for Computer Science (5)  
\_\_\_\_\_ MAT 1360 Introduction to Statistics (5) \*
- \_\_\_\_\_ ECN 2101 Principles of Micro Economics (5) \*  
\_\_\_\_\_ ACCT 2361 Financial Accounting (5)  
\_\_\_\_\_ 10 credits: chosen from BUS/ECN Elective List

### BACHELOR OF ARTS REQUIREMENT B.A. – COMPUTER & INFORMATION TECHNOLOGY Transfer DEGREE COMPLETION OPTION

BASE + 28 Credits (Major Total = 65 + specialization)

- \_\_\_\_\_ CSC 3750 Computer Architecture and Organization (5)  
\_\_\_\_\_ 8 credits: CSC 4000 – 4850
- \_\_\_\_\_ 1 course from the following list:  
    MAT 1221 Survey of Calculus (5) \*  
    MAT 1225 Calculus I (5) \*  
\_\_\_\_\_ MAT 1720 Mathematics for Computer Science (5)  
\_\_\_\_\_ MAT 1360 Introduction to Statistics (5) \*  
\_\_\_\_\_ Specialization CITech package, as approved by the Computer Science Department (varies).

# The Computer Science Major

Academic year 2006-2007

Computer Science Department Otto Miller Hall (206) 281-2140  
 For more information, contact: Mike Tindall, Chair (206) 281-2945

Recommended scheduling plans for students choosing B.S. degree or B.A. degree with Computer Systems or Business options.

## Recommended Course Sequence for CSC - BS

Year	Core	Expl/Other	Major		
FR	USEM UCOR 1000 UFDN 1000	3 <sup>rd</sup> quarter Foreign Lang. or 5 cr. Expl.	MAT 1225 (5)* MAT 1226 (5) MAT 1228 (5)	CSC 1230 (5) CSC 2430 (5) CSC 2431 (5)	
SO	UCOR 2000 UFDN 2000	Exploratory Curriculum 10 credits	MAT 2375 (2) MAT 2376 (3) MAT 2720 (3)	CSC 3220 (3) CSC 3221 (3) CSC 3760 (5)	EE 1210 (5)
JR	UCOR 3000 UFDN 3100	10 credits		CSC 3150 (5) CSC 3310 (3) CSC 3350 (3) CSC 3430 (3)	PHY 1121 (5)* PHY 1122 (5)* PHY 1123 (5)*
SR	CSC 4898 (2)	Any remaining Exploratory or elective credits		CSC Proj. (5) CSC 4xxx (11)	EE 3280 (5)

\* This course fulfills a General Education requirement

## Recommended Course Sequence for CSC – BA Computer Systems Option

Year	Core	Expl/Other	Major		
FR	USEM UCOR 1000 UFDN 1000	3 <sup>rd</sup> quarter Foreign Lang. or 5 cr. Expl.	MAT 1225 (5)* MAT 1226 (5) MAT 1228 (5)	CSC 1230 (5) CSC 2430 (5) CSC 2431 (5)	
SO	UCOR 2000 UFDN 2000	Exploratory Curriculum 14 credits	MAT 1360 (5)* MAT 1720 (5)	CSC 3220 (3) CSC 3221 (3) CSC 3750 (5)	
JR	UCOR 3000 UFDN 3100	18 credits		CSC 3150 (5) CSC 3310 (3) CSC 3350 (3) CSC 3430 (3)	
SR	CSC 4898 (2)	Any remaining Exploratory or elective credits		CSC 4xxx (16)	

\* This course fulfills a General Education requirement

## Recommended Course Sequence for CSC – BA Business Option

Year	Core	Expl/Other	Major		
FR	USEM UCOR 1000 UFDN 1000	3 <sup>rd</sup> quarter Foreign Lang. or 5 cr. Expl.	MAT 1221 (5)* or MAT 1225 (5)*	CSC 1230 (5) CSC 2430 (5) CSC 2431 (5)	ECN 2101 (5)*
SO	UCOR 2000 UFDN 2000	Exploratory Curriculum 9 credits	MAT 1360 (5)* MAT 1720 (5)	CSC 3220 (3) CSC 3221 (3) CSC 3750 (5)	ACCT 2361 (5)
JR	UCOR 3000 UFDN 3100	16 credits		CSC 3150 (5) CSC 3310 (3) CSC 3350 (3) CSC 3430 (3)	5 credits from CSC major BUS/ECN list
SR	CSC 4898 (2)	Any remaining Exploratory or elective credits		CSC 4xxx (8)	5 credits from CSC major BUS/ECN list

\* This course fulfills a General Education requirement

# Exploratory Curriculum Advising Suggestions for Computer Science Majors

All students completing degrees at SPU must satisfy several University requirements, in addition to the specific degree requirements for their chosen major. The **Exploratory Curriculum** is designed to introduce students to fundamental concepts across the breadth of the liberal arts disciplines, and includes a large variety of alternatives. Students are encouraged to follow their interests within the different categories and to use their choices to maximize their learning in ways most relevant to them personally.

Some thoughts about Computer Science Computer Science is a technical scientific discipline that frequently also involves graphical design and language components. Problem solving skills with mathematical and logical reasoning ability are mandatory. Computer scientists are often called upon for oral and written presentations or client interactions, and effective communication skills are highly prized. The fields of computing and technology are expanding throughout the world, making it commonplace for careers in computing to involve interactions with the business and political environments of multiple cultures.

With these themes in mind, the following is a list of courses from the Exploratory Curriculum that often are particularly helpful for students majoring in Computer Science.

## Exploratory Curriculum: Arts and Humanities

### A. Arts

ART	1180 (5)	The Visual Arts
FCS	1710 (5)	Design Fundamentals
MUS	23xx/43xx	Performing Ensembles
TRE	1310 (5)	The Actor's Art

### B. Humanities

COM	1101 (5)	Introduction to Interpersonal Communication
COM	1321 (5)	Public Speaking
HUM	3000 (5)	Other Peoples, Other Faiths
LIN	2100 (5)	Foundations of Language Study
PHI	1001 (5)	Power of Logic
PHI	2500 (3)	Philosophy of Science

## Exploratory Curriculum: Social Sciences

### A. Anthropology, Psychology, Sociology

ANT	2250 (5)	Cultural Anthropology
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### B. Economics, Geography, History, Political Science

ECN	1100 (5)	Fundamentals of Economics
ECN	2101 (5)	Microeconomics
GEO	1110 (5)	World Regional Geography
GEO	3170 (5)	Geopolitics
POL	2330 (5)	International Relations

## Exploratory Curriculum: Natural Sciences

### A. Biological Science

BIO	1100 (5)	Blakely or other field experience course
BIO	2101 (5)	General Biology

### B. Physical Science

PHY	1101 (5)	General Physics
PHY	1121 (5)	Physics for Science and Engineering

## Exploratory Curriculum: Mathematics

Follow CSC degree requirements, which satisfy the general mathematics requirements.

## **COURSE LISTINGS**

### **CSC 1120 INTRODUCTION TO THE COMPUTER (1)**

Explores how to use a (windows-based) computer; Description of computer hardware components; Basics of the windowing environment, including the file system, running applications, editing messages and documents, and printing; and the effects of computers in society.

### **CSC 1121 INTERNET AND EMAIL (1)**

Prerequisite: Introductory computer concepts. Explores the following topics: Networks, electronic mail, and the Internet; How to get an email account; Logging onto and off of a computer; Using the full capabilities of email; Participating in newsgroups; Downloading files using FTP; and using the World Wide Web and the Internet.

### **CSC 1122 WORDPROCESSING (1)**

Prerequisite: Introductory computer concepts. What is "Word Processing"? Creating, modifying, saving and printing documents. Formatting and enhancing a document. Using columns, tables, footnotes, pictures, and drawings. Using document "proofing" tools, such as spelling and grammar checkers and a thesaurus.

### **CSC 1123 SPREADSHEETS (1)**

Prerequisite: Introductory computer concepts. What is a "Spreadsheet"? This course covers creating, modifying, saving and printing spreadsheet documents; Entering and using formulas and calculations; Editing and importing data; Incorporating graphs; and formatting and enhancing the appearance of a spreadsheet document.

### **CSC 1124 DATABASES (1)**

Prerequisite: Introductory computer concepts. What is a "Database" and a relational database management system? Designing a database. Defining tables. Defining and editing fields. Entering and editing data. Creating and using queries using one or more tables. Creating, formatting, and enhancing forms and reports.

### **CSC 1126 PRESENTATION MANAGERS (1)**

Prerequisite: Introductory computer concepts. What is a "Presentation Manager"? Covers designing an effective presentation; Creating and editing slides, Incorporating pictures, drawings and "graphics"; Rearranging topics and slides; Formatting and enhancing the look of a presentation; Estimating the timing and sequencing of a presentation; Printing notes and handouts.

### **CSC 1130 BEGINNING PROGRAMMING (5)**

Prerequisite: Introductory computer concepts, two years of high school algebra. Covers designing a computerized solution to a problem, the software development lifecycle, and structured programming concepts and skills. Provides an introduction to a modern programming language.

### **CSC 1230 PROBLEM SOLVING AND PROGRAMMING (5)**

Prerequisites: High School pre-Calculus or math analysis, or equivalent; demonstrable computer literacy. Introduction to computer science. Covers problem solving methods and algorithm development; modern programming methodologies; and fundamentals of a high-level block structured language. (Currently uses the C++ programming language.)

### **CSC 1800 SPECIAL TOPICS IN COMPUTER USAGE (1 - 3)**

Prerequisite: Introductory computer concepts. Presentation of a topic of current interest in computer usage. Topics may vary between offerings. May be repeated for credit up to 5 credits.

### **CSC 2220 SCIENTIFIC AND ENGINEERING PROGRAMMING (3)**

Prerequisites: MAT 1221 or MAT 1225, CSC 2430. Explores fundamentals of computer programming and problem solving for engineering and science students.

### **CSC 2222 PROGRAMMING TECHNIQUES (3)**

Prerequisites: CSC 2430. Intermediate programming and problem solving techniques that will introduce a different programming language than used in CSC 2430.

### **CSC 2430 DATA STRUCTURES I (5)**

Prerequisite: CSC 1230 or equivalent. Develops discipline in program design, style, debugging, testing. Introduces object-oriented design, with Classes, Methods and encapsulation. Introduces dynamic storage allocation and pointers. Examines arrays, linked linear data structures, and recursion. (Currently uses the C++ programming language.)

### **CSC 2431 DATA STRUCTURES II (5)**

Prerequisite: Continuation of CSC 2430. Linked data structures, including trees and other non-linear representations. Introduction to graphs and networks. Explores external data structures and techniques necessary for implementing different file organizations. Covers methods of organizing and accessing data on secondary storage devices (indexing, trees and hashing).

### **CSC 2950 SPECIAL TOPICS IN COMPUTER SCIENCE (1-5)**

Prerequisite: Permission of the instructor. An introductory course studying a special interest topic in computer science. Topics and credits may vary between offerings. May be repeated for an unlimited number of credits.

### **CSC 2951 INDEPENDENT STUDY - C++ PROGRAMMING (2)**

Prerequisite: Previous problem solving and programming course in Pascal, Modula, Ada or Java. Fundamentals of the C/C++ programming language. Offered as a directed-study, instructor-arranged course.

**CSC 3150W SYSTEMS DESIGN (5) (“W” Writing Course)**

Prerequisite: CSC 2431 and CSC 3220. CSC 2431 may be taken concurrently. Surveys issues and tools used in the analysis and design of software systems. Topics include requirements gathering; feasibility, process and data analysis; architecture, user-interface and program design. Measures for the evaluation of specifications and designs.

**CSC 3220 APPLICATIONS PROGRAMMING (3)**

Prerequisite: CSC 2430. An implementation-oriented look at software development techniques used to create interactive applications, focusing on the use of object-oriented libraries to create user interfaces. Topics include event-driven programming, human-computer interaction (HCI), graphical user interfaces (GUI), database interfaces, and tools for interface prototyping.

**CSC 3221 NETCENTRIC COMPUTING (3)**

Prerequisites: CSC 3220. Introduction to networking and the internet. Topics studied include network architectures, network security, communication and networking layer protocols, and the web as an example of client-server computing. In addition, students will practice building web applications.

**CSC 3310 CONCEPTS IN PROGRAMMING LANGUAGES (3)**

Prerequisites: CSC 2431. Explores organization and structure of programming languages; run-time behavior and requirements of programs; and programming language specification.

**CSC 3350 OPERATING SYSTEMS PROGRAMMING (3)**

Prerequisites: CSC 2431 and CSC 3750 or CSC/CPE/EE3760. Introduction to operating systems and systems programming. Surveys systems software; operating system interface and functions; utilities and shell programming; linkers and loaders; translators; and processes, concurrency and concurrent programming.

Equivalent: CPE 3350.

**CSC 3430 ALGORITHM DESIGN AND ANALYSIS (3)**

Prerequisites: CSC 2431 and MAT 1360/2376 and MAT 1720/2720 and MAT 1221/1225. Covers the design and analysis of algorithms for searching, sorting, string processing, table management and graphs. Includes principles of computational complexity and analysis.

**CSC 3750 COMPUTER ARCHITECTURE AND ORGANIZATION (5)**

Prerequisite: CSC 2431 (concurrent registration allowed) and MAT 1720/2720. Digital logic, computer structure, machine language, addressing, use and operation of assemblers, microarchitectures, instruction formats, and the memory hierarchy.

**CSC 3760 COMPUTER ORGANIZATION AND ASSEMBLY LANGUAGE (5)**

Prerequisite: CSC 2430 and EE 1210. Recommended: CSC 2431. Studies organization and structuring of the major hardware and software components of computers; mechanics of information transfer and control within a digital computer system; networks and communication systems; microprogramming; machine instruction sets; and assembly language programming. Equivalent: CPE 3760 and EE 3760.

**CSC 3899W ETHICAL AND SOCIAL ISSUES IN COMPUTER SCIENCE (3) (“W” Writing Course)**

Prerequisite: Junior/Senior class standing. Covers ethical, social and societal impact issues with which computer professionals must deal. Topics include such areas as invasion of privacy, computer crime, intellectual property, software theft, computer security, ethics in the workplace and artificial intelligence. Class format is a combination of lecture and discussion.

**CSC 3900 INDEPENDENT STUDY IN COMPUTER SCIENCE (1-5)**

Prerequisite: Permission of the instructor and Independent Study Agreement. Independent study and research in an advanced computer science topic. May be repeated for credit up to 10 credits.

**CSC 3930 PRACTICUM IN COMPUTER SCIENCE (1-5)**

Prerequisite: Permission of the instructor. Studies applied computer science. Typically involves academic systems programming, teaching, grading, lab preparation of tutoring responsibilities. Includes an assessment of Christian service issues or experiences. May be repeated for credit up to 10 credits.

**CSC 3940 INTERNSHIP IN COMPUTER SCIENCE (1-5)**

Prerequisite: Permission of the instructor and Intern Learning Contract. Provides a significant learning experience to be obtained in a supervised work-study environment. Typically involves work in systems analysis and design, advanced applications or systems programming. Includes an assessment of Christian service issues or experiences. May be repeated for credit up to 10 credits.

**CSC 3950 TOPICS IN COMPUTER SCIENCE (1-5)**

Prerequisite: Permission of the instructor. Advanced or special interest topics in computer science. May be repeated for credit up to 10 credits.

**CSC 3960 PROJECT IN COMPUTER SCIENCE (1-5)**

Prerequisite: Permission of the instructor. Independent work on a significant project in computer science. May be repeated for credit up to 10 credits.

**CSC 4150 SOFTWARE ENGINEERING (5) (Team-Project Course)**

Prerequisite: CSC 3150, and Senior class standing. Covers topics in software engineering, including team programming, project planning and management, SDLC (software development life cycle) and software quality assurance. Course requirements include the design and implementation of a team software project. Equivalent: CPE 4150.

**CSC 4210 THEORY OF COMPUTATION AND ALGORITHMS (3)**

Prerequisites: CSC 3430. Introduction to theoretical topics in computer science. Includes formal languages, automata and parsing; computational complexity, analysis of algorithms; computability; and program correctness and verification.

**CSC 4310 COMPILER DESIGN (3)**

Prerequisites: CSC 3310 and CSC 3750 or CSC/CPE/EE3760. Studies programming language translation and compiler design concepts; language recognition, symbol table management, semantic analysis and code generation.

**CSC 4350 ADVANCED OPERATING SYSTEMS (3)**

Prerequisite: CSC/CPE 3350. Introduces the major functions of operating systems. Covers processes and concurrency; concurrent programming; resource allocation, contention and control; scheduling, memory management and device management. Equivalent: CPE 4350.

**CSC 4410 DATABASE MANAGEMENT (5)**

Prerequisites: CSC 3150. Introduces database concepts: data models; data description and data manipulation languages: query facilities; data security, integrity and reliability. Primary emphasis on relational data model; includes the design and implementation of database applications using a relational DBMS.

**CSC 4510 GRAPHICAL USER INTERFACE DESIGN AND PROGRAMMING (3)**

Prerequisite: CSC 3221. Introduction to programming in the Windows GUI environment. Comparison to other GUI environments.

**CSC 4750 COMPUTER NETWORKS (5)**

Prerequisite: CSC 3750 or CSC/CPE/EE 3760. Recommended: CSC 2431. Studies concepts and terminology of computer networks, equipment and protocols. Emphasis is on local area networks. A laboratory project is required.

**CSC 4760 ADVANCED COMPUTER ARCHITECTURE (5) (Team-Project Course)**

Prerequisite: CSC 3750 or CSC/CPE/EE 3760. Recommended: CSC 2431. Studies the architecture of multiprocessor, vector, pipelined and parallel computers. Emphasis is placed on principles of parallelism and the architecture of state-of-the-art super computers. A team project is required. Equivalent: CPE 4760.

**CSC 4800 ADVANCED ISSUES IN COMPUTER SCIENCE (3-5)**

Prerequisite: Permission of the instructor. An advanced course studying a special interest topic in computer science. Topics and credits may vary between offerings. Computer science minors may take this course with instructor approval. May be repeated for an unlimited number of credits. Open to: Computer Science majors.

**CSC 4810W ADVANCED ISSUES IN COMPUTER SCIENCE (3-5) ("W" Writing Course)**

Prerequisite: Permission of the instructor. An advanced course studying a special interest topic in computer science. Topics and credits may vary between offerings. Computer science minors may take this course with instructor approval. May be repeated for an unlimited number of credits. Open to: Computer Science majors.

**CSC 4820 ADVANCED ISSUES IN COMPUTER SCIENCE: PROJECT (5) (Team-Project Course)**

Prerequisite: Permission of the instructor. An advanced course studying a special interest topic in computer science. A team project is required. Topics may vary between offerings. Open to: Computer Science majors.

**CSC 4898 SENIOR CAPSTONE IN COMPUTER SCIENCE (2)**

Prerequisite: Senior CSC Major who has completed the CSC Base requirements. This senior capstone course will explore topics and frontiers in computer science. Students will write a significant paper or design and implement an experimental project that investigates a current topic within the computer science discipline.

**CSC 4900 INDEPENDENT STUDY IN COMPUTER SCIENCE (1-5)**

Prerequisite: Permission of the instructor and Independent Study Agreement. Independent study and research in an advanced computer science topic. May be repeated for credit up to 8 credits.

**CSC 4930 PRACTICUM IN COMPUTER SCIENCE (1-5)**

Prerequisite: Permission of the instructor. Studies applied computer science. Typically involves academic systems programming, teaching, grading, lab preparation or tutoring responsibilities. Includes an assessment of Christian service issues or experiences. May be repeated for credit up to 8 credits.

**CSC 4940 INTERNSHIP IN COMPUTER SCIENCE (1-5)**

Prerequisite: Permission of the instructor and Intern Learning Contract. Provides a significant learning experience to be obtained in a supervised work-study environment. Typically involves work in systems analysis and design, advanced applications or systems programming. Includes an assessment of Christian service issues or experiences. May be repeated for credit up to 8 credits.

**CSC 4950 TOPICS IN COMPUTER SCIENCE (1-5)**

Prerequisite: Permission of the instructor, Computer Science majors, Junior/Senior class standing.. An advanced course studying a special interest topic in computer science. Topics and credits may vary between offerings. Registration Approval: Instructor. May be repeated for credit up to 5 credits.

**CSC 4960 PROJECT IN COMPUTER SCIENCE (1-5)**

Prerequisite: Permission of the instructor. Independent work on a significant project in computer science. May be repeated for credit up to 8 credits.