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Seattle Pacific  
UNIVERSITY

College of  
Arts and Sciences  
Division of Science  
and Engineering

Computer Science

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Seattle, WA 98119-1997

Phone: (206) 281-2140

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<http://www.spu.edu/depts/csc/>

Thank you for your interest in the Computer Science program at Seattle Pacific University. SPU offers both a major and a minor 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.

Enclosed is a description of the courses and requirements for the Majors and Minor, effective **Fall Quarter 2002**. 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) degrees within the program. These options and requirements are shown in the Degree Requirement Summary packet. Also enclosed is a copy of the University catalog description for the Computer Science program and a course offerings summary. Our departmental web site has the most up-to-date information (<http://www.spu.edu/depts/csc/>).

We invite you to contact us if you need further information.

Sincerely,

A handwritten signature in cursive script that reads "Michael H. Tindall".

Michael H. Tindall  
Chairman, Computer Science Department  
(206) 281-2945  
E-mail: [mht @ spu.edu](mailto:mht@spu.edu)

## **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 application-oriented 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 256MB memory, a 20.0 GB hard drive, modem and printer. Software should include Windows 2000 or Windows XP, Microsoft Visual C/C++ Version 6 (or later) and a word processor (such as Microsoft Word). 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>	M.S., Ph.D. Computer Science, University of Illinois. CSC Chairman.
<b>Charles Burris</b>	Ph.D. Applied Mathematics, University of New Mexico. M.S. Computer Science, University of Washington.
<b>Phil Prins</b>	Ph.D. Electrical Engineering University of Idaho. M.S. Computer Science, University of Idaho.
<b>Elaine Weltz</b>	M.S.E. Software Engineering, Seattle University.

**FALL 2002**  
**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.

**GPA.** 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.

**REQUIREMENTS for the Computer Science B.S. MAJOR**  
(106 Credits; 45 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; 37-42 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; 40 upper-division)  
Provides a thorough preparation in the topics and applications of computer science.
- **B.A. – Computer and Information Technology Option** (65 Credits, plus specialization; 32 upper-division in core). Combines preparation in the core areas of computer science with an approved CIT specialization. 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 .....	5
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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 (206) 281-2140.

**B.S. in Computer Engineering:** Combines strong bases in computer science, digital electronics and engineering. For more information, contact the Department of Engineering (206) 281-2140.

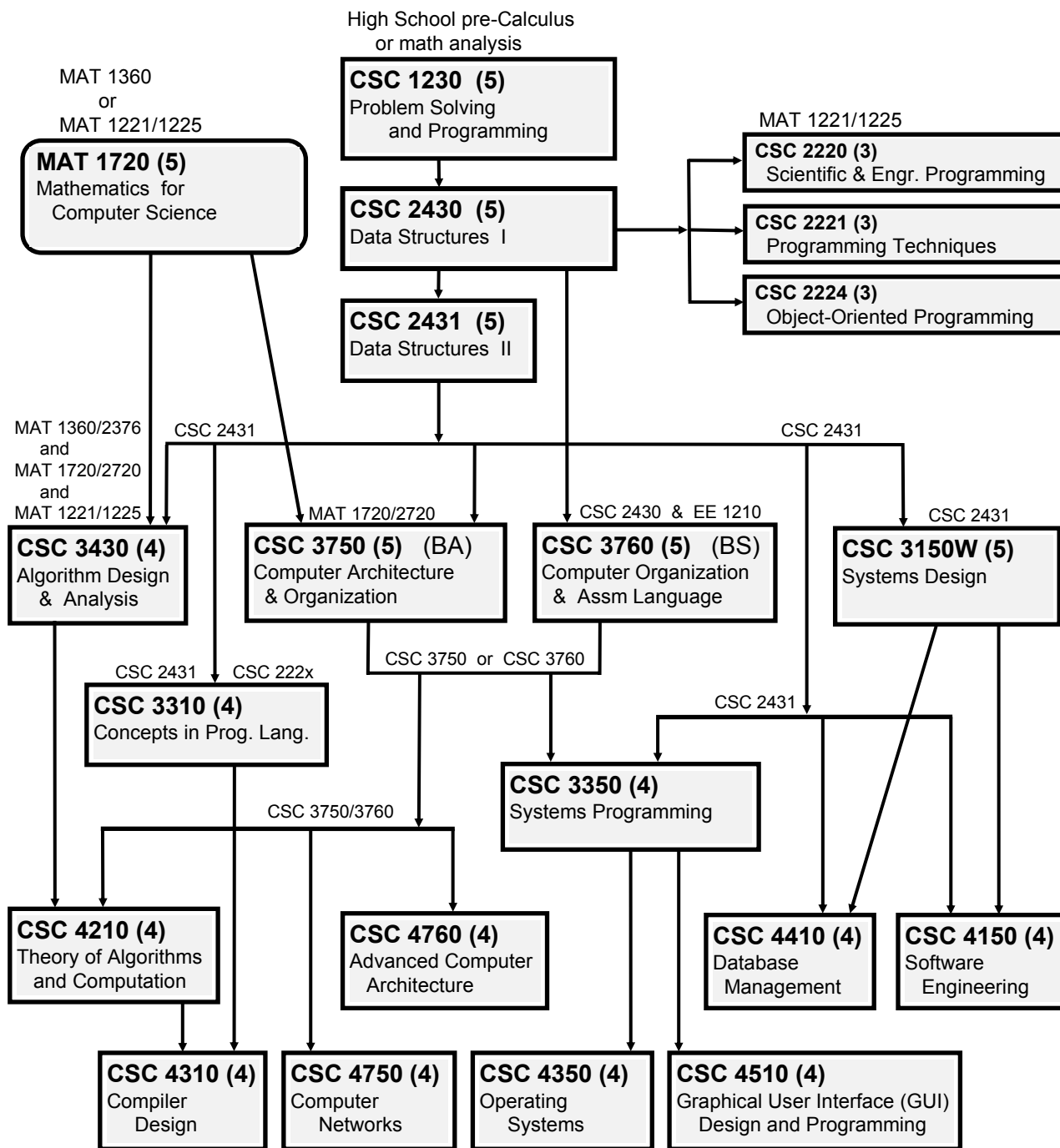
<b>Required Courses for Computer Science Degrees 2002-2003 Catalog</b>	<b>B.S.</b>	<b>B.A. Systems</b>	<b>B.A. Business</b>	<b>Computer &amp; Information Technology B.A. CITech</b>
CSC 1230 Problem Solving & Programming	5	5	5	5
CSC 2221 Programming Techniques			3	
CSC 2220 Scientific & Engr. Programming <i>or</i> CSC 2221 Programming Techniques <i>or</i> CSC 2224 Object Oriented Programming	3	3		3
CSC 2430 Data Structures I	5	5	5	5
CSC 2431 Data Structures II	5	5	5	5
CSC 3150W Systems Design	5	5	5	5
CSC 3310 Concepts in Programming Languages	4	4	4	4
CSC 3350 Systems Programming	4	4	4	4
CSC 3430 Algorithm Design & Analysis	4	4	4	4
CSC 3750 Computer Architecture		5	5	5
CSC 3760 Computer Organization	5			
CSC Electives (CSC 4000 - CSC 4899)	16	16	8	8
CSC 4990 Senior Capstone in Computer Science	2	2	2	2
MAT 1720 Math for Computer Science		5	5	5
MAT 1360 Introduction to Statistics		5	5	5
MAT 1221 Survey of Calculus * <i>or</i> MAT 1225 Calculus *			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	
ACCT 2362 Managerial Accounting <i>or</i> BUS 3250 Business Finance			5	
BUS 3541W Marketing and Society <i>or</i> BUS 3614 Organizational Behavior			5	
Computer and Information Technology Specialization				Varies
<b>Total Upper-division Credits Required</b>	<b>45</b>	<b>40</b>	<b>37-42</b>	<b>32 + specialization</b>
<b>Total Credits Required</b>	<b>106</b>	<b>83</b>	<b>85</b>	<b>65 + specialization</b>

\* This course fulfills a General Education requirement

# Seattle Pacific University

## Computer Science Curriculum PREREQUISITE Diagram

Effective  
FALL  
2002



Jr. or Sr. class standing

**CSC 3899W (3)**  
Ethical and Social Issues in  
Computer Science

Various Prerequisites and Credits

**CSC 4800 (2 - 5)**  
**CSC 4810W (2 - 5)** [ "W" Writing ]  
Advanced Issues in Computer Science

Sr. CSC Major

**CSC 4990 (2)**  
Senior Capstone in  
Computer Science

# COMPUTER SCIENCE MAJOR REQUIREMENTS CHECKLIST

Effective Fall 2002

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).

**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.

34 Credits

- |  |  |
|--|--|
| _____ CSC 1230 Problem Solving and Programming (5) | _____ CSC 3310 Concepts in Programming Languages (4) |
| _____ CSC 2430 Data Structures I (5)               | _____ CSC 3350 Systems Programming (4)               |
| _____ CSC 2431 Data Structures II (5)              | _____ CSC 3430 Algorithm Design and Analysis (4)     |
| _____ CSC 3150W Systems Design (5)                 | _____ CSC 4990 Senior Capstone in Comp.Sci. (2)      |

## B.S. BACHELOR OF SCIENCE REQUIREMENT

**BASE + 72 Credits (Major Total = 106)**

- \_\_\_\_\_ 1 course from the following list:
- \_\_\_\_\_ CSC 2220 Scientific & Engineering Prgmming (3)
  - \_\_\_\_\_ CSC 2221 Programming Techniques (3)
  - \_\_\_\_\_ CSC 2224 Object-Oriented Programming (3)
- \_\_\_\_\_ CSC 3760 Computer Organization & Assembly Lang. (5)
- \_\_\_\_\_ 16 credits (four courses): CSC 4000 - 4899
- \_\_\_\_\_
- \_\_\_\_\_ 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 + 49 Credits (Major Total = 83)**

- \_\_\_\_\_ 1 course from the following list:
- \_\_\_\_\_ CSC 2220 (3); CSC 2221 (3); or CSC 2224 (3)
- \_\_\_\_\_ CSC 3750 Computer Architecture and Organization (5)
- \_\_\_\_\_ 16 credits (four courses): CSC 4000 - 4899
- \_\_\_\_\_
- \_\_\_\_\_ MAT 1720 Mathematics for Computer Science (5)
- \_\_\_\_\_ MAT 1225 Calculus I (5) \*
- \_\_\_\_\_ MAT 1226 Calculus II (5)
- \_\_\_\_\_ MAT 1228 Series and Differential Equations (5)
- \_\_\_\_\_ MAT 1360 Introduction to Statistics (5) \*

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

**BASE + 51 Credits (Major Total = 85)**

- \_\_\_\_\_ CSC 2221 Programming Techniques (3)
- \_\_\_\_\_ CSC 3750 Computer Architecture and Organization (5)
- \_\_\_\_\_ 8 credits (two courses): CSC 4000 - 4899
- \_\_\_\_\_
- \_\_\_\_\_ MAT 1720 Mathematics for Computer Science (5)
- \_\_\_\_\_ 1 course from the following list:
- \_\_\_\_\_ MAT 1221 Survey of Calculus (5) \*
  - \_\_\_\_\_ MAT 1225 Calculus I (5) \*
- \_\_\_\_\_ MAT 1360 Introduction to Statistics (5) \*
- \_\_\_\_\_ ECN 2101 Principles of Micro Economics (5) \*
- \_\_\_\_\_ ACCT 2361 Financial Accounting (5)
- \_\_\_\_\_ 1 course from the following list:
- \_\_\_\_\_ ACCT 2362 Managerial Accounting (5)
  - \_\_\_\_\_ BUS 3250 Business Finance (5)
- \_\_\_\_\_ 1 course from the following list:
- \_\_\_\_\_ BUS 3541W Marketing & Society (5)
  - \_\_\_\_\_ BUS 3614 Organizational Behavior (5)

## BACHELOR OF ARTS REQUIREMENT B.A. - COMPUTER & INFORMATION TECHNOLOGY OPTION

**BASE + 31 Credits (Major Total = 65 + specialization)**

- \_\_\_\_\_ 1 course from the following list:
- \_\_\_\_\_ CSC 2220 (3); CSC 2221 (3); or CSC 2224 (3)
- \_\_\_\_\_ CSC 3750 Computer Architecture and Organization (5)
- \_\_\_\_\_ 8 credits (two courses): CSC 4000 - 4899
- \_\_\_\_\_
- \_\_\_\_\_ MAT 1720 Mathematics for Computer Science (5)
- \_\_\_\_\_ MAT 1221 Survey of Calculus (5) \*
- \_\_\_\_\_ or MAT 1225 Calculus I (5) \*
- \_\_\_\_\_ MAT 1360 Introduction to Statistics (5) \*
- \_\_\_\_\_ Specialization CITech package, as approved by the Computer Science Department (varies).

# The Computer Science Major Academic year 2002-2003

Computer Science Department  
 Miller Science Learning Center  
 (206) 281-2140

Students can choose from B.S. and B.A. programs with Business, Computer Systems, or Computer and Information Technology options. See Catalog.

## Recommended for Freshmen Considering a Major in CSC:

[ USEM (if offered) The Computer: The Machine That Changed the World ]  
 CSC 1230 Problem Solving and Programming (5)

## Courses Students Must Take As Freshmen or Sophomores In Order To Complete Program in Four Years:

B.S.	B.A.-Systems	B.A.-Business	B.A.-CITech Comp & Info Technology
<b>Must Take:</b> (43)	<b>Must Take:</b> (40)	<b>Must Take:</b> (35)	<b>Must Take:</b> (30)
CSC 1230	CSC 1230	CSC 1230	CSC 1230
CSC 2430	CSC 2430	CSC 2430	CSC 2430
CSC 2431	CSC 2431	CSC 2431	CSC 2431
MAT 1225*	MAT 1225*	MAT 1221*	MAT 1221*
MAT 1226	MAT 1226		
MAT 1228	MAT 1228		
MAT 2375	MAT 1720	MAT 1720	MAT 1720
MAT 2376	MAT 1360*	MAT 1360*	MAT 1360*
MAT 2720			
EE 1210		ACCT 2361 or ECN 2101*	(start specialization)
<b>Recommended:</b> (18)	<b>Recommended:</b> (8)	<b>Recommended:</b> (8)	<b>Recommended:</b> (8)
CSC 222x	CSC 222x	CSC 2221	CSC 222x
PHY 1121*	CSC 3750	ACCT 2361	CSC 3750
PHY 1122*		or	
PHY 1123		ECN 2101*	

\* Courses satisfying Exploratory Curriculum or General Education requirements

**Courses Transfer Students Should Take As Soon As Possible:**  
 same as above.

## For More Information Contact:

Elaine Wertz x 3639  
 Mike Tindall x 2945

## **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: CSC 1120 or equivalent experience. 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: CSC 1120, or equivalent. 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: CSC 1120, or equivalent. 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: CSC 1120, or equivalent. 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: CSC 1120, or equivalent. 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: CSC 1120, or equivalent, 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: CSC 1120 or equivalent. 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 2221 PROGRAMMING TECHNIQUES (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 2224 OBJECT ORIENTED PROGRAMMING (3)**

Prerequisite: CSC 2430. Introduces the object oriented programming methodology, languages and systems. Examines encapsulation, classes, inheritance and polymorphism.

### **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 2800 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 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 or Ada. 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 (concurrent registration allowed). 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 3310 CONCEPTS IN PROGRAMMING LANGUAGES (4)**

Prerequisites: CSC 2431, and one of CSC 2220, 2221 or 2224. Explores organization and structure of programming languages; run-time behavior and requirements of programs; and programming language specification.

**CSC 3350 SYSTEMS PROGRAMMING (4)**

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; and translators.

Equivalent: CPE 3350.

**CSC 3430 ALGORITHM DESIGN AND ANALYSIS (4)**

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)**

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 (4)**

Prerequisite: CSC 2431 and 3150. Covers topics in software engineering, including team programming, project planning and management, SDLC (software development life cycle) and software quality assurance. Surveys automated tools for use in software engineering. Course requirements include the design and implementation of a major software project. Equivalent: CPE 4150.

**CSC 4210 THEORY OF COMPUTATION AND ALGORITHMS (4)**

Prerequisites: CSC 3430, CSC 3750 or CSC/CPE/EE 3760. 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 (4)**

Prerequisites: CSC 3310 and CSC 4210. Studies programming language translation and compiler design concepts; language recognition, symbol table management, semantic analysis and code generation.

**CSC 4350 OPERATING SYSTEMS (4)**

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 (4)**

Prerequisites: CSC 2431 and 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 (4)**

Prerequisite: CSC/CPE 3350. Introduction to programming in the Windows GUI environment. Comparison to other GUI environments.

**CSC 4750 COMPUTER NETWORKS (4)**

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 (4)**

Prerequisite: CSC 3750 or CSC/CPE/EE 3760. Recommended: CSC 2431. Studies the architecture of multiprocessor, vector, pipelined and parallel computers. Emphasis placed on principles of parallelism and their application. State-of-the-art super computers are discussed.

**CSC 4800 ADVANCED ISSUES IN COMPUTER SCIENCE (2-5)**

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 (2-5) ("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 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.

**CSC 4990 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.