Computer Science/Software Engineering

Richard LeBlanc, PhD, Chair

Objectives

The computer science program seeks to prepare students for careers that require sophisticated programming and computer applications in industrial, scientific, technical or educational settings, and to incorporate into the program the principles and techniques of software engineering. The program provides solid foundations for understanding the changing roles of computers in society and encourages students to apply their knowledge to solving a variety of problems through laboratory and project activities.

Recognizing that different people study computer science for different reasons, the department offers both bachelor of science and bachelor of arts degrees. The bachelor of science in computer science (BSCS) degree program provides a rigorous professional, technical educational background, appropriate for a career in software development or for entry into graduate study in computer science. A general option is available, as well as two specializations, the bachelor of science in computer science with a specialization in mathematics, and the bachelor of science in computer science with specialization in business. These specialized options within the BSCS degree program enable students to develop greater interdisciplinary expertise which will better equip them for jobs demanding such skills in the workplace.

The bachelor of arts (BA) degree program offers a sound foundation in computer science courses, while allowing greater flexibility in determining an area of application of the acquired computing skills. It is an excellent preparation for students interested in professional careers involving computer applications in less technical areas such as business or education.

Both the BSCS and BA degree programs require that all students complete a capstone experience, the year-long senior software engineering project which requires students to work in small groups to complete a substantial software system project, working with a faculty advisor and a sponsoring organization from business or industry. In addition to the bachelor's degree programs, the department offers a computer science minor, as well as computer literacy courses.

Degrees Offered

Bachelor of Arts
Bachelor of Science in Computer Science
Master of Software Engineering—See the *Graduate Bulletin*

Majors Offered

Computer Science
Computer Science with Specialization in Mathematics
Computer Science with Specialization in Business

Minor Offered

Computer Science

Departmental Requirements

A grade of C (2.00) is required in all CSSE courses that are prerequisites to other required CSSE courses. Only courses graded C (2.00) or higher may be transferred to satisfy degree requirements. Transfer credits in the major require departmental approval. The MATH 134, 135, 136 sequence can be fulfilled by any three quarter or two semester calculus sequence from which Seattle University accepts the first course or courses as substitutes for MATH 134 and 135. Both the cumulative grade point average and grade point average for major/department courses completed at Seattle University must be at least 2.50 for graduation.

Bachelor of Arts
Major in Computer Science

The bachelor of arts degree with a major in computer science requires students to complete a minimum of 180 quarter credits with both a cumulative grade point average and a major/department grade point average of 2.50 or better.

I. Core Curriculum Requirements

ENGL 110 College Writing: Inquiry and Argument 5
PHIL 110 Introduction to Philosophy and Critical Thinking. 5

Choose one of the following two courses: 5
HIST 120 Origins of Western Civilization
HIST 121 Studies in Modern Civilization

ENGL 120 Masterpieces of Literature 5
Lab Science 5
Fine Arts (one approved 5 credit course, see course descriptions) 5
PHIL 220 Philosophy of the Human Person 5
Social Science I 5
Social Science II (different discipline from Social Science I) 5
Theology and Religious Studies Phase II (200-299) 5
Ethics (upper division) 5
Theology and Religious Studies Phase III (300-399) 5
Interdisciplinary satisfied by CSSE 481
Senior Synthesis filled by CSSE 486, 488, and 489.

II. Major Requirements

59 credits in computer science, including:
CSSE 151 Fundamentals of Computer Science I 5
CSSE 152 Fundamentals of Computer Science II 5
CSSE 250 Data Structures 5
CSSE 308 Technical Communications 3
CSSE 370 Fundamentals of Databases I 5
CSSE 380 Organization of Programming Languages 5
CSSE 481 The Art of Web Design 5
CSSE XXX CSSE Electives 15
(10 Credits must be 300 level or above, excluding CSSE 482-483, 486-489)
CSSE 486 Software Engineering Project 5
CSSE 488 Software Engineering & Project Development II 3
CSSE 489 Software Engineering & Project Development III 3

III. Other Major Department Requirements

45 credits including:

MATH 134	**Calculus I**	**5**
MATH 135	**Calculus II**	**5**

Choose one of the following two courses: 5

MATH 244	**Probability and Statistics**
MATH 351	**Probability**

***Area of Application 30**

*Bachelor of arts degree students must complete a coordinated group of application area courses. These courses must include at least 30 credits of courses in an area of proposed application of computer science. These 30 credits may be those prescribed for a minor in another department, but may not include any credits already required by the Computer Science Department for the bachelor of arts degree. In areas of application where a minor is not prescribed, the Computer Science Department will define the acceptable application area courses, with the assistance of the appropriate departments.

Bachelor of Science in Computer Science
Major in Computer Science—General Option

The bachelor of science in computer science degree (BSCS) requires students to complete at least 180 quarter credits with both a cumulative grade point average and a major/department grade point average of 2.50 or better.

I. Core Curriculum Requirements

ENGL 110	**College Writing: Inquiry and Argument**	**5**
PHIL 110	**Introduction to Philosophy and Critical Thinking**	**5**

Choose one of the following two courses: 5

HIST 120	**Origins of Western Civilization**
HIST 121	**Studies in Modern Civilization**

ENGL 120	**Introduction to Literature**	**5**
Fine Arts (one approved 5 credit course, see course descriptions)		**5**
PHIL 220	**Philosophy of the Human Person**	**5**
Social Science I		**5**
Social Science II (different discipline from Social Science I)		**5**
Theology and Religious Studies Phase II (200-299)		**5**
Ethics (upper division)		**5**
Theology and Religious Studies Phase III (300-399)		**5**
Interdisciplinary		**3**

Senior Synthesis filled by CSSE 487, 488, 489

II. Major Requirements

84 credits in computer science, including:

CSSE 151	**Fundamentals of Computer Science I**	**5**
CSSE 152	**Fundamentals of Computer Science II**	**5**
CSSE 210	**Foundations of Computer Science**	**5**
CSSE 250	**Data Structures**	**5**
CSSE 251	**Introduction to Computer Organization**	**5**
CSSE 308	**Technical Communications**	**3**

CSSE 310	**Design and Analysis of Algorithms**	**5**
CSSE 320	**Object-Oriented Development**	**5**
CSSE 340	**Operating Systems**	**5**
CSSE 350	**Theoretical Computer Science**	**5**
CSSE 370	**Fundamentals of Databases I**	**5**
CSSE 380	**Organization of Programming Languages**	**5**
CSSE 487	**Software Engineering & Project Development I**	**5**
CSSE 488	**Software Engineering & Project Development II**	**3**
CSSE 489	**Software Engineering & Project Development III**	**3**
CSSE 4XX	**Electives (400-level, excluding 480-483, 486-489)**	**15**

III. Other Major Department Requirements

38 credits in mathematics, physics, and science including:

MATH 134	**Calculus I**	**5**
MATH 135	**Calculus II**	**5**
MATH 136	**Calculus III**	**5**
MATH 233	**Linear Algebra**	**3**
PHYS 121	**Mechanics**	**5**

Choose two of the following six options: 10

PHYS 122	**Electricity and Magnetism**
PHYS 123	**Waves and Optics**
BIOL 161 & 171	**Biology I: Molecular and Cellular Biology and Lab**
BIOL 240	**Genetics**
CHEM 121 & 131	**General Chemistry I and Lab**
CHEM 122 & 132	**General Chemistry II and Lab**

Choose one of the following two courses: 5

MATH 244	**Fundamentals of Probability and Statistics**
MATH 351	**Probability**

Bachelor of Science in Computer Science Major in Computer Science with a Specialization in Business

The specialization in business will prepare students for information management or information technology positions, which are increasingly critical in most companies. In addition to computer science requirements (69 credits), the student will take at least 30 credits of business courses through the Albers School of Business and Economics.

This bachelor of science in computer science degree requires students to complete at least 180 quarter credits with both a cumulative grade point average and a major/specialization/department grade point average of 2.50 or better.

I. Core Curriculum Requirements

ENGL 110	**College Writing: Inquiry and Argument**	**5**
PHIL 110	**Introduction to Philosophy and Critical Thinking**	**5**

Choose one of the following two courses: 5

HIST 120	**Origins of Western Civilization**
HIST 121	**Studies in Modern Civilization**

ENGL 120	**Masterpieces of Literature**	**5**

Lab Science 5
Fine Arts (one approved 5 credit course; see course descriptions) 5
PHIL 220 **Philosophy of the Human Person** 5
Social Science I (not economics) 5
Social Science II filled by ECON 271 5
Theology and Religious Studies Phase II (200-299) 5
Ethics (upper division) 5
Theology and Religious Studies Phase III (300-399) 5
Interdisciplinary satisfied by CSSE 481
Senior Synthesis filled by CSSE 487, 488, 489

II. Major Requirements

69 credits in computer science, including:

CSSE 151 **Fundamentals of Computer Science I** 5
CSSE 152 **Fundamentals of Computer Science II** 5
CSSE 210 **Foundations of Computer Science** 5
CSSE 250 **Data Structures** 5
CSSE 308 **Technical Communications** 3
CSSE 310 **Design and Analysis of Algorithms** 5
CSSE 320 **Object-Oriented Development** 5
CSSE 370 **Fundamentals of Databases I** 5
CSSE 380 **Organization of Programming Languages** 5
CSSE 481 **The Art of Web Design** 5
CSSE 487 **Software Engineering & Project Development I** 5
CSSE 488 **Software Engineering & Project Development II** 3
CSSE 489 **Software Engineering & Project Development III** 3
CSSE 4XX **Electives (400-level, excluding 480-483, 486-489)** 10

III. Business Specialization Requirements

30 credit hours in ASBE satisfying one of the following: 30
Courses required for minor in Accounting or
Courses required for minor in Business Administration or
Courses required for minor in Economics or
Courses required for minor in Entrepreneurship and Innovation or
Courses required for minor in Finance or
Courses required for minor in International Business or
30 Approved credit hours of upper-level ASBE courses

IV. Other Major Department Requirements

15 credits including:

MATH 134 **Calculus I** 5
MATH 135 **Calculus II** 5

Choose one of the following two courses: 5
ECON 260 **Business Statistics**
ECON 310 **Quantitative Methods and Applications**

NOTE: 1. Each student must complete a business specialization in accounting, business administration, economics finance, entrepreneurship and innovation or international business, by completing the courses specified by the ASBE for these minors in the chosen area of specialization. Students should be aware that the ASBE does not allow students completing this program to also minor in business administration.

2. BSCS business specialization students must meet all prerequisites for courses taken and must be at least at junior standing when enrolled in 300/400 level courses from Albers School of Business and Economics. 3. Business courses are subject to the same grade minimums as for business administration majors. 4. The total number of business credits, prerequisite plus required credit hours in business cannot exceed 24 percent of a student's total credit hours (ECON 260, ECON 271, ECON 310 do not count as business hours).

Bachelor of Science in Computer Science Major in Computer Science with a Specialization in Mathematics

This specialization requires students to take 64 credits in computer science and 50 credits in mathematics. The combination of mature skills in applied mathematics and strong computer applications skills is a rare and valuable combination.

This bachelor of science in computer science degree requires students to complete at least 180 quarter credits with both a cumulative grade point average and a major/specialization grade point average of 2.50 or better.

I. Core Curriculum Requirements

ENGL 110 **College Writing: Inquiry and Argument** **5**
PHIL 110 **Introduction to Philosophy and Critical Thinking** **5**
Choose one of the following two courses: 5
HIST 120 **Origins of Western Civilization**
HIST 121 **Studies in Modern Civilization**
ENGL 120 **Masterpieces of Literature** **5**
Fine Arts (one approved 5 credit course; see course descriptions) **5**
PHIL 220 **Philosophy of the Human Person** **5**
PHYS 121 **Mechanics** **5**
Social Science I **5**
Social Science II (different discipline from Social Science I) **5**
Theology and Religious Studies Phase II (200-299) **5**
Ethics (upper-division) **5**
Theology and Religious Studies Phase III (300-399) **5**
Interdisciplinary **3**
Senior Synthesis filled by CSSE 487, 488, 489

II. Major Requirements

64 credits in computer science courses, including:
CSSE 151 **Fundamentals of Computer Science I** **5**
CSSE 152 **Fundamentals of Computer Science II** **5**
CSSE 250 **Data Structures** **5**
CSSE 251 **Introduction to Computer Organization** **5**
CSSE 308 **Technical Communications** **3**
CSSE 310 **Design and Analysis of Algorithms** **5**
CSSE 320 **Object-Oriented Development** **5**
CSSE 340 **Operating Systems** **5**
CSSE 350 **Theoretical Computer Science** **5**
CSSE 370 **Fundamentals of Databases I** **5**
CSSE 380 **Organization of Programming Languages** **5**

CSSE 487 **Software Engineering & Project Development I** **5**
CSSE 488 **Software Engineering & Project Development II**..... **3**
CSSE 489 **Software Engineering & Project Development III** **3**

III. Mathematics Specialization Requirements

50 credits in mathematics courses, including:

MATH 134 **Calculus I**..... **5**
MATH 135 **Calculus II**..... **5**
MATH 136 **Calculus III** **5**
MATH 232 **Multivariable Calculus** **3**
MATH 233 **Linear Algebra**..... **3**
MATH 234 **Differential Equations**..... **4**

Choose one of the following two courses: 5

CSSE 210 **Foundations of Computer Science**
MATH 310 **Introduction to Advanced Mathematics**

Choose one of the following two courses: 5

MATH 244 **Probability and Statistics**
MATH 351 **Probability**

Choose three of the following four courses:..... 15

MATH 331 **Introduction to Complex Variables**
MATH 361 **Applied Mathematics I**
MATH 371 **Introduction to Numerical Methods**
MATH 461 **Applied Mathematics II**

Minor in Computer Science

In order to earn a minor in computer science, students must complete 30 quarter credits in computer science, selected from:

CSSE 151 **Fundamentals of Computer Science I** **5**
CSSE 152 **Fundamentals of Computer Science II** **5**
CSSE 250 **Data Structures**..... **5**

Choose 5 credits from:

CSSE 320 **Object-Oriented Development**..... **5**
CSSE 380 **Organization of Programming Languages** **5**

Choose an additional 10 credits from:

CSSE 310 **Design and Analysis of Algorithms** **5**
CSSE 320 **Object-Oriented Development**..... **5**
CSSE 340 **Operating Systems**..... **5**
CSSE 350 **Theoretical Computer Science** **5**
CSSE 370 **Fundamentals of Databases I** **5**
CSSE 380 **Organization of Programming Languages** **5**
CSSE 422 **Design Patterns**..... **5**
CSSE 434 **Software Testing and Debugging** **5**
CSSE 444 **Concurrent and Distributed Systems**..... **5**
CSSE 460 **Computer Networks**..... **5**
CSSE 465 **Computer Graphics** **5**

CSSE 470 **Artificial Intelligence** **5**
CSSE 471 **Fundamentals of Databases II** **5**
CSSE 481 **The Art of Web Design** **5**
CSSE 485 **Compiler Principles and Techniques** **5**

See policy for minors (84-1) for more information.

Computer Science Courses

CSSE 103 **Introduction to Computers and Applications** **5**
An introduction to computer applications and concepts. Applications include word processing, spreadsheets, databases, electronic mail, and other Internet tools. Also covers historical development of computers. A brief introduction to hardware and software, and other concepts of modern computing. Computer-related social and ethical issues. No prior experience with computers required. (fall, winter, spring)

CSSE 108 **Database Applications** **5**
An introduction to databases for the non-computer science major. Includes relational database modeling (using a DBMS such as Microsoft Access), designing the database, creating the tables, reports, forms and queries. Other topics may include transferring data between spreadsheets and database, automating applications, linking to other databases and database security.

CSSE 151 **Fundamentals of Computer Science I** **5**
Introduction to the fundamentals of computer science, including programming in a modern high-level language with emphasis on programming design and style. Algorithm development, stepwise refinement, control structures, functions, elementary search algorithms, primitive and aggregate data types. Prerequisite: C- or better in MATH 120 or equivalent.

CSSE 152 **Fundamentals of Computer Science II** **5**
Continuation of the introduction to the fundamentals of computer science, including abstract data types (ADTs), recursion, linked lists, stacks, queues, binary trees and function overloading. Prerequisite: C (2.00) or better in CSSE 151.

CSSE 191-193 **Special Topics** ..... **1 to 5**

CSSE 205 **Programming for Web & Business Applications** **5**
An introduction to graphical user interface programming and applications using a simplified programming language (such as Visual Basic). Topics include simple event-driven programming and interface design. Other topics may include web form, working with graphics and an introduction to object-oriented programming.

CSSE 210 **Foundations of Computer Science** **5**
Introduction to logic, digital logic design and other applications of logic to computer science, functions, combinatorics, equivalence relations, methods of proof, induction, recurrence relations and recursion in programming languages, graphs, graph implementations and applications. Prerequisites: MATH 135 and C (2.00) or better in CSSE 152.

CSSE 230 **FORTRAN for Science and Engineering** **3**
Introduction to FORTRAN programming for science and engineering computing. Emphasis on algorithm development and stepwise refinement for solving science and engineering problems. Introduction to numerical techniques. Laboratory programming assignments will be taken primarily from the fields of engineering and science. Credit not granted for both CSSE 230 and CSSE 231. Prerequisites: MEGR 230; plus MATH 232 and 233.

CSSE 231 C Programming for Science and Engineering 3
Introduction to C programming, in a UNIX environment, for science and engineering computing. Emphasis on algorithm development, stepwise refinement for solving science and engineering problems. Programming assignments will be drawn from the fields of engineering and science. Credit not granted for both CSSE 230 and CSSE 231. Prerequisites: MEGR 230; plus MATH 232 and 233.

CSSE 250 Data Structures 5
Abstract data types. Big-Oh notation. Heaps, sorting (Quicksort, Mergesort, Heapsort), binary search trees, tree balancing techniques, and hashing. Additional topics may include B trees. Prerequisite: C (2.00) or better in CSSE 152.

CSSE 251 Introduction to Computer Organization 5
Basic concepts of digital logic design, computer hardware (CPU components, memory hierarchies, I/O, interrupts), data representation (integer and floating point, characters, arrays, and structured data), Instruction Set Architectures (design trade-offs, RISC vs CISC, assembly language and machine language, realizations of high-level language constructs). Implementation via programming in an assembly language. Prerequisite: C (2.00) or better in CSSE 152.

CSSE 291-293 Special Topics ..... 1 to 5

CSSE 296 Directed Study ..... 1 to 5

CSSE 308 Technical Communications 3
Communication skills for computer professionals. Writing, speaking, electronic communication. Structure and content of software documentation. CS Majors are to take this course concurrently with CSSE 487 or 486, the first quarter of the capstone software project course. Prerequisite: ENGL 110 and a C (2.00) or better in CSSE 250.

CSSE 310 Design and Analysis of Algorithms 5
Advanced data structures (e.g. sets, graphs, priority queues) and their application; algorithm analysis and design techniques, such as divide and conquer, greedy methods, branch and bound, etc. Asymptotic analysis of algorithms and introduction to computability theory. Prerequisites: C (2.00) or better in CSSE 250 and either MATH 310 or a C (2.00) or better in CSSE 210.

CSSE 320 Object-Oriented Development 5
Fundamentals and principles of object-oriented development, including classes, containment, inheritance, overloading and polymorphism. Object-oriented analysis, design and programming. Prerequisite: C (2.00) or better in CSSE 250.

CSSE 340 Operating Systems 5
Computer system overview (devices, interrupts, memory hierarchy), and the basic concepts of operating systems from an applications programming perspective. Topics include processes, process scheduling, threads, deadlock, synchronization, memory management, I/O, and networking. Pre-requisites: C (2.00) or better in CSSE 250 and a C (2.00) or better in either CSSE 251 or ECEGR 304.

CSSE 350 Theoretical Computer Science 5
An introduction to the formal mathematical basis of computer science and functional language programming. Topics include regular sets (finite automata, regular expressions, regular grammars, applications), context-free languages (grammars, pushdown automata, normal forms, applications), Turing machines, and functional programming. Prerequisites: C (2.00) or better in CSSE 250 and either MATH 310 or a C (2.00) or better in CSSE 210.

CSSE 370 Fundamentals of Databases I 5

Introduction to database management systems, architecture, architecture, and environment. Relational database design including data modeling and schema design. Coverage of SQL query language for application development. Overview fundamental concepts of transaction management, security and recovery control. Prerequisite: C (2.00) or better in CSSE 250.

CSSE 380 Organization of Programming Languages 5

Overview of common features, organization and tradeoffs of modern programming languages, with an emphasis on scripting languages. Semantics, garbage collection and memory management issues, and type systems. Prerequisite: C (2.00) or better in CSSE 250.

CSSE 391-393 Special Topics ..... 1 to 5

CSSE 396 Directed Study ..... 1 to 5

CSSE 422 Design Patterns 5

Categorization of standard design patterns, their use, expected benefit(s) and associated cost(s). Explication and analysis of creational, interface, structural and behavioral patterns. Prerequisite: C (2.00) or better in CSSE 320.

CSSE 434 Software Testing and Debugging 5

Overview of testing and debugging principles. Topics include program analysis, testing adequacy, functional testing, structural testing, unit testing, integration testing, and systematic debugging. Prerequisites: C (2.00) or better in one 300-level CSSE course and either MATH 222, 310, or a C (2.00) or better in CSSE 210.

CSSE 444 Concurrent and Distributed Systems 5

Parallel computation using multiple interacting systems. Distributed system architectures, cluster computing including Beowulf clusters, peer-to-peer architectures. Adapting algorithms for parallel computation. Fault tolerance, scalability, resource sharing. Prerequisites: C (2.00) or better in CSSE 340 and a C (2.00) or better in CSSE 310.

CSSE 460 Computer Networks 5

The principles of networking with emphasis on the TCP/IP protocol suite upon which the Internet is based. Client-server network programming. Topics include layering of network protocols, application protocols such as HTTP, reliable data transfer, routing, and link layer protocols such as Ethernet. Prerequisite: C (2.00) or better in CSSE 340.

CSSE 465 Computer Graphics 5

Fundamentals of computer graphics. Techniques of computer image synthesis. Line-drawing and color raster graphics. Homogeneous coordinates, hidden line and surface, and smooth shading algorithms. Prerequisite: C (2.00) or better in CSSE 250 and either MATH 310 or a C (2.0) or better in CSSE 210.

CSSE 470 Artificial Intelligence 5

Principal ideas and developments in artificial intelligence, including knowledge representation, goal-directed problem solving, optimal and sub-optimal search, theorem proving, pattern matching. Additional topics may include expert systems, neural nets, simulated annealing, genetic algorithms. Prerequisite: C (2.00) or better in CSSE 310 and CSSE 380.

CSSE 471 Fundamentals of Databases II 5
A continuation of the CSSE 370 Fundamentals of Databases I course. Topics include advanced data models including the enhanced entity relationship model, object-oriented and object-relational data models, physical data storage in database systems, transaction processing, concurrency control, recovery techniques, query processing and optimization, database security and authorization, and more advanced application programming for database systems covered in the 370 course. Prerequisite: C (2.00) or better in CSSE 370.

CSSE 480 Interdisciplinary Core Course ..... 3 to 5
Title and content vary.

CSSE 481 The Art of Web Design 5
An introduction to website design with emphasis on the area of human computer interaction (HCI). Topics include defining the audience, planning the site, prototyping and testing the design. HCI topics include an introduction to cognitive psychology, user-centered design methodology and memory characteristics as pertains to interface design. Technical aspects of creating a site include basic text markup, scripting languages and other web tools. Core interdisciplinary option. Cannot be used as a CSSE 400-level elective. Prerequisite: PHIL 110.

CSSE 482 Computer Games: Design and Effect 3
Examine and create computer games with an emphasis on the perspectives of storytelling and strategic thinking. Evaluate game genres, play and icons with respect to cultural impact and relevance to audience considerations such as age, race, gender and other factors. Fundamental problem-solving techniques explored for implementation via an easy-to-use programming design tool. Cannot be used as a CSSE 400-level elective. Core interdisciplinary option. Pre/Co-requisite: ENGL 120.

CSSE 483 CyberSecruity 3
Overview of computer security issues at both the personal computer, local area network and Internet computing levels. Of interest to students in business, communication, criminal justice, economics, political science, psychology, science and sociology. Topics include attacks and threats on computer systems such as unwanted email, viruses, hackers, spyware and denial of services; identity and monetary theft by discovering banking and credit card information via banks, retail outlets, Internet web sites and other business entities; and countermeasures that one should take such as adding computer firewalls, installing and updating security software, and a plan for backup and disaster recovery. Examples of actual cases are presented and analyzed along with suggestions for improving security on them. Cannot be used as a CSSE 400-level elective. Core interdisciplinary option.

CSSE 485 Compiler Principles and Techniques 5
Lexical analyzers, top and bottom-up parsing and LL(k), LR, etc. grammars, symbol tables, internal forms and intermediate languages, code generation, code optimization, semantic specifications, error detection and recovery, comparison methods. Use of software tools for lexical analysis and parsing. Prerequisites: C (2.00) or better in CSSE 251, CSSE 350 and CSSE 380.

CSSE 486 Software Engineering Project 5
Meets regularly in the fall quarter, to cover the principles of software engineering, and to initiate software project activities. Prerequisite: C (2.00) or better in CSSE 370, CSSE 380, CSSE 481 and a major GPA of 2.50 or higher. Co-requisite: CSSE 308.

CSSE 487 Software Engineering and Project Development I 5
Meets regularly in the fall quarter, to cover the principles of software engineering, and to initiate software project activities. Prerequisite: C (2.00) or better in CSSE 310, CSSE 320, CSSE 370, and CSSE 380 and a major GPA of 2.50 or higher. Co-requisite: CSSE 308.

CSSE 488 Software Engineering and Project Development II 3

Meets as required to continue software project work initiated in the fall quarter. Prerequisite: C (2.00) or better in CSSE 487 or C (2.00) or better in CSSE 486. (winter)

CSSE 489 Software Engineering and Project Development III 3

Meets as required to complete software projects by end of spring quarter. Prerequisite: C (2.00) or better in CSSE 488. (spring)

Principles of software engineering and their application in the planning and execution of a three-quarter-long software development project. Students work in teams to define and carry out software projects from initial requirements statements to final implementation. Activities include project planning and management, as well as analysis, design and implementation of the software project. In CSSE 486 and CSSE 487, projects are defined and requirement specifications developed by the project teams. The required software products are then designed and implemented in CSSE 488 and 489, culminating in a formal presentation of results at the end of the spring quarter. The three courses, CSSE 487 (or CSSE 486 for students pursuing a B.A. degree), 488, and 489, must be taken as a continuous sequence and together, they fulfill the senior synthesis core requirement.

CSSE 491-493 Special Topics ..... 1 to 5

CSSE 496 Independent Study ..... 1 to 5

CSSE 497 Directed Reading ..... 1 to 5

CSSE 498 Directed Research ..... 1 to 5