

University of Southern California

Center for Software Engineering

Software Engineering Certificate Program

The USC School of Engineering is pleased to offer a certificate program in software engineering through its Department of Computer Science, Center for Software Engineering. This program is designed for practicing software developers, engineers, scientists, and technical managers, who must typically study off campus while working full-time. The Distance Education Network (DEN) of the School of Engineering administers and delivers all courses in the program.

As more systems become software-intensive, knowledge of modern software engineering methods, tools, and techniques is critical for efficient development of systems that meet users' needs. The certificate program prepares software practitioners for lifetime leadership in software-intensive systems.

The courses will be taught by leaders in software engineering, academics and practitioners, whose pioneering contributions include the spiral model of software development, the COCOMO family of software cost and schedule estimation models, the Theory W (stakeholder win-win) approach to software requirements and management, and other major work in the theory and application of software architectures, software reuse, object-oriented analysis and design, software quality engineering, and software risk management.

Curriculum

The certificate program consists of five 3-unit classes, described below, adapted from the graduate Computer Science curriculum to meet the needs of working software practitioners. As a general prerequisite for each of these classes, admission is limited to students in the certificate program, unless by permission of the Program Director. Some classes have specific prerequisites, as noted. Students must complete each course with a minimum grade of B-, and must complete the program with a minimum average of B (3.0 GPA).

❖ **CSCI 510 Software Management and Economics**

In this course the student will learn the theories of management and their application to software projects. They will learn how to perform an economic analysis of software products and processes, and why an economic analysis is as important as the technical analysis; how to estimate software cost and schedule; how to plan, organize, and direct the software development process; how to apply the lessons learned from each project to improve the next project.

❖ **CSCI 591a Software Engineering**

This is the first of two classes on the application of software engineering to the construction of software systems. In this course the students will learn how to apply "win-win" negotiations to define project goals; how to define a software life-cycle and a life-cycle process appropriate to their project; how to plan product definition, development, testing, implementation, and maintenance; how to define software requirements, architecture, and design; how to incorporate "Commercial Off-the-Shelf" (COTS) products into their design; and how to analyze project artifacts.

❖ **CSCI 591b Software Engineering**

This is the second of two classes on the application of software engineering to the construction of software systems. In this course, the students will learn how to design, implement, test, and maintain a software product. They will learn how to apply quality management, configuration management, and transition management to improve both their software process and product. Prerequisite: CS 591a

❖ **CSCI 578 Software Architecture**

Defining a good architecture is crucial to development of a software system that can satisfy current user needs, and evolve as user needs change. Defining the software architecture is the focus of the early effort of current object-oriented development methods. In this class the students will learn architecture styles, including domain-specific software architectures (DSSA) and dynamic architectures. They will learn how to define software architecture by selecting and applying an appropriate style or combination of styles; how to describe their software architecture using

architecture-description languages; and how to build their software architecture using architecture frameworks (CORBA, JavaBeans, .Net).

❖ **CSCI 592 Emerging Best Practices in Software Engineering**

The practice of software engineering is changing rapidly as we identify new uses for software and as we develop a better understanding of the tools and techniques that work. In this class, students will learn new practices that have been demonstrated to work and are gaining acceptance. They will learn when, where, how, and why to apply emerging best practices to a software project. USC faculty and invited speakers will provide perspective and case-study experience on current topics such as integrated maturity models, software for distributed and mobile systems, rapid application development, agile methods and processes, commercial-off-the-shelf (COTS) software assessment and integration, and software-portfolio and product-line management.

Students who do not have the required background (described below) must pass the following deficiency course with a grade of B or better.

❖ **CSCI 455x Introduction to Programming Systems Design**

Intensive introduction to object-oriented design and programming.

This course will not count toward the 15 units required for completion of the program.

Credits from other educational institutions will not be accepted toward requirements for completion of the program.

Admission Requirements

Applicants to the program will be required to have an undergraduate or graduate degree from an accredited university with a minimum grade point average (GPA) of 3.0. If the degree is not in engineering, mathematics, or science, then the applicant must present work experience adequate to satisfy the Program Director that the applicant can successfully complete the course work. General Record Examination (GRE) scores are not required. Applicants should have practical experience developing software or managing software development, and working knowledge of C++, Java, or an equivalent programming language. Those who lack the practical experience, or language familiarity, may apply to take CSCI 455x "Introduction to Programming Systems Design", which must be passed with a grade of B or better.

Enrollment

Students must be formally admitted to the program to receive the USC certificate of software engineering. However, since the admission process may take several months, an applicant may start as a "Limited Student", a USC designation for students who are not admitted to a degree program, but are registered in a graduate level course and receive full USC credit.

Applicants to the program must submit the USC graduate application form and official academic transcripts, undergraduate and graduate (if any), to the USC Office of Admissions (<http://www.usc.edu/students/admission>). Applicants who do not have a technical degree but believe they have adequate background to complete the coursework successfully must also include a letter requesting special consideration, explaining the circumstances in reasonable detail.

To begin as a Limited Student, submit the Distance Education Network enrollment form (available on the DEN website, <http://den.usc.edu>), along with a resume clearly presenting work experience, educational and technical background for evaluation by the Program Director, at least 2 weeks before the start of the semester in which it is desired to attend class. The resume must be in Acrobat, Microsoft Word, or HTML format. The Program Director will review all resumes and notify all applicants whether or not they will be enrolled.

Limited Students may take up to 2 program classes before applying for admission. A maximum of 12 units taken as a Limited Student may be transferred toward the unit requirements of the certificate. *Enrollment as a Limited Student does not guarantee admission to the certificate program.*

The DEN website, <http://den.usc.edu> has information about applying, enrolling, tuition, and fees.

Time to Complete the Certificate

The certificate program can be completed in one calendar year, although most students will probably take longer. All certificate classes are offered on a regular schedule.

CSCI 455x	Fall, Spring and Summer semesters
CSCI 510	Fall
CSCI 591a	Fall
CSCI 591b	Spring
CSCI 578	Spring
CSCI 592	Spring and Summer

The following tables show recommended course plans.

Table 1: Recommended Schedule For Students Meeting All Requirements and Taking 1 Class a Semester

If start in:	Year 1			Year 2			Year 3	
	Fall	Spring	Summer	Fall	Spring	Summer	Fall	Spring
Fall	591a	591b	592	510	578			
Spring		578	592	591a	591b		510	
Summer			592	591a	591b		510	578

Table 2: Recommended Schedule For Students Needing CSCI 455x and Taking 1 Class a Semester

If start in:	Year 1			Year 2			Year 3	
	Fall	Spring	Summer	Fall	Spring	Summer	Fall	Spring
Fall	455x	578	592	591a	591b		510	
Spring		455x	592	591a	591b		510	578
Summer			455x	591a	591b	592	510	578

Table 3: Recommended Schedule For Students Meeting All Requirements and Taking Up To 2 Classes a Semester

If start in:	Year 1			Year 2		
	Fall	Spring	Summer	Fall	Spring	Summer
Fall	591a 510	591b 578	592			
Spring		578	592	591a 510	591b	
Summer			592	591a 510	591b 578	

Table 4: Recommended Schedule For Students Needing CSCI 455x and Taking Up To 2 Classes a Semester

If start in:	Year 1			Year 2		
	Fall	Spring	Summer	Fall	Spring	Summer
Fall	455x	578	592	591a 510	591b	
Spring		455x	592	591a 510	591b 578	
Summer			455x	591a 510	591b 578	592

Teaching Faculty

The USC School of Engineering is ranked 11th in the nation among graduate engineering schools. The following faculty, leaders in the field, will teach the courses. (See <http://sunset.usc.edu/SwE-Cert> for biographies.)

Dr. Barry Boehm, TRW Professor of Computer Science, Director, Center for Software Engineering

Dr. Neno Medvidovic, Assistant Professor of Computer Science

Dr. Dan Port, Research Assistant Professor of Computer Science

Mr. Winsor Brown, Assistant Director, Center for Software Engineering

Mr. Edward Colbert, Lecturer in Computer Science

Mr. Donald Reifer, Principal, Center for Software Engineering

Course Delivery and Administration

The Software Engineering Certificate Program is designed for off campus students who are working full-time. The School of Engineering Distance Education Network (DEN) administers and delivers all courses.

Students can view all courses on the web using Microsoft Media Player or RealPlayer. Students at DEN affiliate companies with the necessary equipment can view courses via microwave or satellite at their company site.

Homework assignments, class lecture notes, and handouts are posted on the web. Students send completed homework assignments by E-mail to DEN, which delivers the homework to the instructor. Graded homework is returned by E-mail to the students.

Students working in the Los Angeles region will come to campus to take exams. Students working outside the Los Angeles region will take exams at specified DEN sites.

For more about the program, please call or write:

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About the USC Center for Software Engineering and Department of Computer Science

The Center was founded in 1993 to provide an environment for research and teaching in the areas of software design and development processes, generic and domain specific software architectures, software engineering tools and environments, collaborative system definition and design, and the management and economics of software engineering.

The Center helps public and private sector organizations apply the Center's research to reducing software cost and cycle time while improving quality. It integrates research and education by applying its Model-Based System Architecting and Software Engineering (MBASE) approach, currently to around 20 projects each year in which students develop software systems that are actually deployed by clients.

For more information about the USC Department of Computer Science, please visit <http://www.cs.usc.edu>; for the Center for Software Engineering, please visit <http://sunset.usc.edu/index.html>.

About the USC School of Engineering Distance Education Network

Established in 1972, the USC Distance Education Network (DEN) is an extensive broadcast and webcast system that enables full-time professional engineers to take USC School of Engineering courses for graduate degree credit from the convenience of their company facilities. For more information, please visit <http://den.usc.edu>.