Software Engineering

Undergraduate Study

For the undergraduate curriculum in Software Engineering (http://www.se.iastate.edu) leading to the degree Bachelor of Science. This curriculum is accredited under the General Criteria and Software Engineering Program Criteria by the Engineering Accreditation Commission of ABET, http://www.abet.org .

This curriculum is jointly administered by the Department of Computer Science and the Department of Electrical and Computer Engineering at Iowa State University. The Software Engineering program provides undergraduate students with the opportunity to learn software engineering fundamentals, to study applications of state-of-the art software technologies and to prepare for the practice of software engineering. The student-faculty interaction necessary to realize this opportunity occurs within an environment motivated by the principle that excellence in undergraduate education is enhanced by an integrated commitment to successful, long-term research and outreach programs.

The software engineering curriculum offers emphasis areas in software engineering principles, process and practice. Students may also take elective courses in computer engineering and computer science.

Program Educational Objectives

Within five years of graduation, the graduates should:

1. attain a **productive career** in Software Engineering or related fields;

2. attain **leadership** roles and become **effective collaborators** to advance professional and organizational goals;

3. engage in **continuous learning** and professional development.

We expect that these objectives will be manifested in our graduates through the following five key attributes: (a) *peer-recognized expertise*, (b) *engagement in professional practice*, (c) *sustained learning*, (d) *leadership* and (e) *teamwork*.

Demonstration of expertise involves applying state-of-the-art practices for solving problems in the design, development, validation, evolution and sustainment of (software) products. Demonstration of professional engagement involves contributing locally and globally to the use of ethical, competent, and creative practices in industry, academia or the public sector. Demonstration of sustained learning involves the ability to adapt to rapid technological, environmental, and organizational changes through self-study and group study and through opportunities of professional development or graduate study. Demonstration of leadership involves the ability to take initiative, and to facilitate the advancements of individuals and the community by influencing others and by having a widespread, positive impact on critical issues and projects. Finally, demonstration of teamwork involves the ability to work with collaborators who have varied expertise, and with diverse cultural and interdisciplinary backgrounds.

As a complement to the instructional activity, the Department of Computer Science and the Department of Electrical and Computer Engineering provide opportunities for each student to have experience with broadening activities. Students have the opportunity to gain practical industry experience in the cooperative education and internship program. Students have the opportunity to participate in advanced research activities. Through international exchange programs, students learn about engineering practices in other parts of the world.

Curriculum in Software Engineering

Administered by the Department of Electrical and Computer Engineering in the College of Engineering and the Department of Computer Science in the College of Liberal Arts and Sciences.

Leading to the degree bachelor of science.

Total credits required: 125 cr. See also Basic Program and Special Programs. Note: Pass/Not Pass credits cannot be used to meet graduation requirements.

International Perspectives: 3 cr. [1]

U.S. Diversity: 3 cr. [1]

Communication Proficiency/Library requirement:

ENGL 150	Critical Thinking and Communication (C or better in this course)	3
ENGL 250	Written, Oral, Visual, and Electronic Composition (C or better in this course)	3
LIB 160	Information Literacy	1
Choose one of the following:		3
ENGL 309	Report and Proposal Writing (C or better in this course)	
ENGL 314	Technical Communication (C or better in this course)	
Total Credits		**10**

General Education Electives: 15 cr. [2]

Choose 1 course from the following:		3
ECON 101	Principles of Microeconomics	
ECON 102	Principles of Macroeconomics	
I E 305	Engineering Economic Analysis	
Arts and Humanities		6
Social Sciences		3
Additional Arts and Humanities or Social Sciences course		3
Total Credits		**15**

Basic Program: 27 cr.

A minimum GPA of 2.00 is required for this set of courses, including any transfer courses. See Requirement for Entry into Professional Program in College of Engineering Overview section.

CHEM 167	General Chemistry for Engineering Students	4
or CHEM 177	General Chemistry I	
ENGL 150	Critical Thinking and Communication	3
ENGL 250	Written, Oral, Visual, and Electronic Composition	3
ENGR 101	Engineering Orientation	R
or S E 101	Software Engineering Orientation	
S E 185	Problem Solving in Software Engineering [3]	3
LIB 160	Information Literacy	1
MATH 165	Calculus I	4
MATH 166	Calculus II	4
PHYS 221	Introduction to Classical Physics I	5
Total Credits		**27**

Math and Physical Science: 11 cr.

COM S 227	Introduction to Object-oriented Programming	4
COM S 228	Introduction to Data Structures	3
MATH 267	Elementary Differential Equations and Laplace Transforms	4
Total Credits		**11**

Software Engineering Core: 34 cr.

A minimum GPA of 2.00 is required for this set of courses, including any transfer courses:

CPR E 281	Digital Logic	4
Choose one of the following:		3
COM S 327	Advanced Programming Techniques	
CPR E 288	Embedded Systems I: Introduction	
Choose one of the following:		3
COM S 321	Introduction to Computer Architecture and Machine-Level Programming	
CPR E 381	Computer Organization and Assembly Level Programming	
Choose one of the following:		3
COM S 352	Introduction to Operating Systems	
CPR E 308	Operating Systems: Principles and Practice	
Choose one of the following:		3
COM S 330	Discrete Computational Structures	
CPR E 310	Theoretical Foundations of Computer Engineering	
COM S 311	Design and Analysis of Algorithms	3
COM S 363	Introduction to Database Management Systems	3
COM S 309	Software Development Practices	3
S E 319	Software Construction and User Interfaces	3
S E 329	Software Project Management	3
S E 339	Software Architecture and Design	3

Note: CPR E 288, CPR E 381 and CPR E 308 are 4-credit courses. The core credit requirement (34 credits) is given in terms of 3-credit courses. If the 4-credit courses are taken instead, then the extra credits will be used as credits for Supplementary Electives.

Total Credits		**34**

Other Remaining Courses: 38 cr.

S E 491	Senior Design Project I and Professionalism	3
S E 492	Senior Design Project II	2
SP CM 212	Fundamentals of Public Speaking	3
One of the following STAT courses		3
STAT 330	Probability and Statistics for Computer Science	
STAT 305	Engineering Statistics	
One of the following ENGL courses (with a C or better in this course)		3
ENGL 309	Report and Proposal Writing	
ENGL 314	Technical Communication	
Math Elective: Choose one from the following list		3
MATH 207	Matrices and Linear Algebra	
MATH 304	Combinatorics	
MATH 314	Graph Theory	
MATH 317	Theory of Linear Algebra	
Software Engineering Elective [2]		6
Technical Elective [2]		3
Supplementary Elective [2]		9
Open Elective [2]		3
Total Credits		**38**

Seminar/Co-op/Internships

S E 166	Careers in Software Engineering	R
S E 494	Software Engineering Portfolio Development	R
Co-op or internship (S E 396, S E 397, S E 398) is optional		

Transfer Credit Requirements

The degree program must include a minimum of 30 credits at the 300-level or above in professional and technical courses earned at ISU in order to receive a B.S. in software engineering. These 30 credits must include S E 492 Senior Design Project II and credits in the core professional curriculum and/or in technical electives. The software engineering degree program requires a grade of C or better for any transfer credit course that is applied to the degree program.

1. These university requirements will add to the minimum credits of the program unless the university-approved courses are also approved by the department to meet other course requirements within the degree program. U.S Diversity and International Perspectives courses may not be taken Pass/Not Pass.

2. Choose from department approved lists. (https://www.se.iastate.edu/academics/resources)

3. See Basic Program for Professional Engineering Curricula for accepted substitutions for curriculum designated courses in the Basic Program.

See also: A 4-year plan of study grid showing course template by semester .

Note: International perspectives and U.S. diversity courses are used to meet the general education electives (http://www.se.iastate.edu/academics/resources/#general) .