Washington University in St. Louis

Bachelor of Science in Computer Engineering

Computer engineering encompasses studies of hardware, software, and systems issues that arise in the design, development, and application of computer systems. Computer engineers are particularly well suited to address the particular challenges that exist as computing systems interact with the real, physical world. This includes sensing, actuation, timing, security, and computing systems with widely varying form factors, ranging from servers to mobile devices to the "internet of things." The degree requires 120 units including core courses, technical electives, a capstone course, and common studies.

The Bachelor of Science in Computer Engineering degree is jointly administered by the Department of Computer Science and Engineering and the Department of Electrical and Systems Engineering.

Students working toward a Bachelor of Science in Computer Engineering degree must meet all requirements for an engineering degree from the McKelvey School of Engineering. Required courses and technical electives cannot be taken on a pass/fail basis.

- **Core Requirements*:**

The following courses are required of all computer engineering students:

Code	Title	Units
CSE 131	Introduction to Computer Science	3
CSE 132	Introduction to Computer Engineering	3
CSE 247	Data Structures and Algorithms	3
CSE 260M	Introduction to Digital Logic and Computer Design	3
or ESE 260	Introduction to Digital Logic and Computer Design	
CSE 361S	Introduction to Systems Software	3
CSE 362M	Computer Architecture	3
ESE 105	Introduction to Electrical and Systems Engineering	4
ESE 230	Introduction to Electrical and Electronic Circuits	4
ESE 232	Introduction to Electronic Circuits	3
ESE 326	Probability and Statistics for Engineering	3
Total Units		**32**

* Each of these core courses must be passed with a grade of C- or better.

- **Technical Elective Requirements:**

21 units of technical electives that fulfill the following requirements:

1. At least two courses from the following list (the "hardware" list):

Code	Title	Units
ESE 330	Engineering Electromagnetics Principles	3
ESE 331	Electronics Laboratory	3
ESE 3301	Electromagnetics Laboratory: Spectrum from Radio to Photonics	3
ESE 351	Signals and Systems	3
ESE 433	Radio Frequency and Microwave Technology for Wireless Systems	3
ESE 436	Semiconductor Devices	3
ESE 4301	Quantum Mechanics for Engineers	3
ESE 431	Introduction to Quantum Electronics	3
ESE 441	Control Systems	3
ESE 444	Sensors and Actuators	3
ESE 446	Robotics: Dynamics and Control	3
ESE 4480	Control Systems Design Laboratory	3
ESE 4481	Autonomous Aerial Vehicle Control Laboratory	3
ESE 463	Digital Integrated Circuit Design and Architecture	3
ESE 465	Digital Systems Laboratory	3
ESE 471	Communications Theory and Systems	3
ESE 482	Digital Signal Processing	3

2. At least two courses from the following list (the "software" list):

Code	Title	Units
CSE 231S	Introduction to Parallel and Concurrent Programming	3
CSE 332S	Object-Oriented Software Development Laboratory	3
CSE 365S	Elements of Computing Systems	3
CSE 422S	Operating Systems Organization	3
CSE 425S	Programming Systems and Languages	3
CSE 431S	Translation of Computer Languages	3
CSE 433S	Introduction to Computer Security	3
CSE 434S	Reverse Engineering and Malware Analysis	3
CSE 467S	Embedded Computing Systems	3
CSE 468T	Introduction to Quantum Computing	3
CSE 473S	Introduction to Computer Networks	3

3. The remaining three courses can be any CSE course with an S, M, T, or A suffix; or CSE 347; or any ESE course at the 300 level or higher; or ESE 205, ESE 2180, or ESE 2190. Additional courses (beyond the two required) in the above lists count toward this requirement.

The above can include courses at the graduate level; however, they must still meet one of the two criteria above. Up to 6 units of independent study (CSE 400E, CSE 497-CSE 499, ESE 400, ESE 497) can count toward technical electives. There is no limit as to how many independent study courses can count toward the general 120 units.

- **Capstone Requirement:**

The capstone requirement can be met by taking either CSE 462M or ESE 498.

- **Common Studies Requirements:**

Code	Title	Units
Math 131	Calculus I	3
Math 132	Calculus II	3
Math 217	Differential Equations	3
Math 233	Calculus III	3
Physics 191	Physics I	3
Physics 191F	Physics I - First-Years Only	
Physics 191U	Physics I - Sophomores, Juniors, and Seniors Only	
Physics 191L	Physics I Laboratory	1
Physics 192	Physics II	3
Physics 192L	Physics II Laboratory	1
Natural sciences elective		3
College Writing		3
Engr 310	Technical Writing	3
Humanities and social sciences electives		18
Total Units		**47**

Upon completing a course in the calculus sequence (Math 131-Math 132-Math 233) with a grade of C+ or better, the student may apply to receive credit for the preceding courses in the calculus sequence by following the mathematics department's back credit policy.

The natural sciences requirement is for 3 units designated NSM (Natural Sciences and Mathematics) from any of the following departments: Anthropology, Biology, Chemistry, Earth and Planetary Sciences, Environmental Studies or Physics. These courses must be completed with a grade of C- or better.

The College Writing Program, humanities and social sciences requirements are those required of all students in the McKelvey School of Engineering.