COMPUTER ENGINEERING (BS)

Program Description

The BS in Computer Engineering program at SPU combines selected topics from our Computer Science and Electrical Engineering majors to provide you with skills to work at the interface between computer software and computer hardware.

The BS in Computer Engineering degree is accredited by the Engineering Accreditation Commission of ABET (http://www.abet.org/accreditation/).

Entering and Completing the Major

In order to earn a degree, you must complete at least one academic major. SPU encourages students to explore various academic paths, so if you change your mind about a major, or want to include an additional program, you are able to do so, as outlined below.

Note that the University encourages you to enter your chosen major(s) as soon as you have determined it and are eligible to join it, especially by the start of your junior year. Students who transfer as juniors and seniors should enter a major within their first two quarters at SPU.

- If this is your first quarter at SPU and you identified a major in this department as your first choice on your application for admission to the University, you have gained entry to the major. To change or add a major, follow these instructions (https://spu.atlassian.net/l/cp/a3th1keb/).
- If you are an SPU student with an SPU cumulative GPA of 2.0 or better, follow these instructions (https://spu.atlassian.net/l/cp/a3th1keb/) to enter a major in this department.
- The University requires a grade of C- or better in all classes that apply to a major; however, programs may require higher minimum grades in specific courses. You may repeat an SPU course only once for a higher grade.
- To advance in this program, meet with your faculty advisor regularly to discuss your grades, course progression, and other indicators of satisfactory academic progress. If your grades or other factors indicate that you may not be able to successfully complete the major or minor, your faculty advisor can work with you to explore options, which may include choosing a different major.
- You must complete the major requirements that are in effect in the SPU Undergraduate Catalog for the year you enter the major.

Computer Engineering (BS)

131 Credits Minimum, Including 45 Upper Division (UD)

Code	Title	Credits
Computer Engineering Core		
CPE 3280	Microcontroller System Design	5
or EE 3280	Microcontroller System Design	
CPE 3350	Operating Systems Programming	3
or CSC 3350	Operating Systems Programming	
CPE 3760	Computer Organization and Assembly Language	5
or EE 3760	Computer Organization and Assembly Language	
Section Credits Required		13
Computer Engineering Electives		
Select two of the following, a third can be used as Tech Elective:		10
CPE 4750	Computer Networks	
or CSC 4750	Computer Networks	
CPE 4760	Advanced Computer Architecture	
or CSC 4760	Advanced Computer Architecture	
EE 3722	Electronics II Analog Electronics	
EE 4770	Fundamentals of Advanced Embedded Systems	
Section Credits Required		10
Computer Science Core		
CSC 1230	Problem Solving and Programming	5
CSC 2430	Data Structures I	5
CSC 2431	Data Structures II	5
Section Credits Required		15
Computer Science Electives [1]		
Select four credits of the following:		4
CSC 3150	Systems Design	
CSC 3220	Applications Programming	
CSC 3310	Concepts in Programming Languages	
CSC 3430	Algorithm Design and Analysis	
Section Credits Required		4
Electrical Engineering Requirements		
EE 1210	Introduction to Logic System Design	5
EE 2726	Electric Circuits I	5
EE 2727	Electric Circuits II	4
or EE 2728	Electric Circuits II - Expanded	
EE 3721 & 3721L	Electronics I - Analog Devices and Circuits and Electronics I - Analog Devices and Circuits Lab	6
Section Credits Required		20
Engineering Requirements		
CPE 1502	Electrical and Computer Engineering Fundamentals	1
or EE 1502	Electrical and Computer Engineering Fundamentals	
EGR 3000	Principles of Professional Practice	1
or GS 3001	Internship and Job Search Strategies	
EGR 3810	General Engineering Design	5
CPE 4211	Computer Engineering Senior Design I	3
EGR 4812	Engineering Senior Design II	3
or CPE 4212	Computer Engineering Senior Design II	
EGR 4899	Engineering Capstone and Senior Design	3
or CPE 4899	Computer Engineering Capstone and Senior Design	
EGR 4941	Engineering Professional Experience [3]	1
Section Credits Required		17
Mathematics Requirements		
MAT 1234	Calculus I	5
MAT 1235	Calculus II	5
MAT 1236	Calculus III	5
MAT 1720	Mathematics for Computer Science	5
EGR 2200	Engineering Probability and Statistics	3
or MAT 2200	Engineering Probability and Statistics	
MAT 2401	Linear Algebra	3
MAT 3237	Differential Equations	3
Section Credits Required		29

Math/Science Breadth Requirement

Select three credits of the following:		3
CHM 1211	General Chemistry I	
or CHM 1310	Survey of General Chemistry	
MAT 3238	Vector Calculus	
MAT 3333	Statistical Modeling	
MAT 4830	Mathematical Modeling	
PHY 3315	Electricity and Magnetism I	
or EE 3315	Electricity and Magnetism I	
Section Credits Required		**3**

Science Requirements

PHY 1121	Physics for Science and Engineering	5
PHY 1122	Physics for Science and Engineering	5
PHY 1123	Physics for Science and Engineering	5
Section Credits Required		**15**

Technical Electives [1]

Select five credits of the following:	
BUS 3682	Social Venture Planning
CPE 4350	Advanced Operating Systems
CPE 4900	Independent Study in Computer Engineering
CPE 4960	Senior Project in Computer Engineering
CPE 4970	Directed Research in Computer Engineering
CSC 4210	Theory of Computation and Algorithm
CSC 4220	Cybersecurity Fundamentals
CSC 4310	Compiler Design
CSC 4350	Advanced Operating Systems
CSC 4410	Database Management
CSC 4430	Advanced Programming
CSC 4800	Advanced Issues in Computer Science
CSC 4930	Practicum in Computer Science - University Service
CSC 4931	Computer Science Practicum
CSC 4960	Project in Computer Science
DAT 4380	Introduction to Machine Learning
EE 3315	Electricity and Magnetism I
EE 3410	Signal and System Analysis
EE 3500	Power Systems Fundamentals
EE 3510	Power Electronics Fundamentals
EE 3520	Microgrids
EE 4311	Optics and Lasers
EE 4450	Control System Design
or EGR 4450	Control Systems Design
EE 4950	Topics in Electrical Engineering [2]
EE 4960	Senior Project
EGR 3311	Experimental Methods I
or PHY 3311	Experimental Methods I
EGR 3611	Appropriate and Sustainable Engineering I: Alternative Energy Systems
EGR 3800	Biomedical Engineering I
EGR 4615	Engineering Project Management
EGR 4930	Practicum - Service
EGR 4931	Engineering Practicum

MAT 3380	Introduction to Data Science	
or DAT 3380	Introduction to Data Science	
Section Credits Required		**5**
Total Credits		**131**

1

3000-level CSC courses (other than CSC 3000) not used for Computer Science Elective category can be used as Technical Electives.

2

EE 4950 may be repeated for additional tech elective credit if the topic is different.

3

A tech internship or professional experience must be approved before enrolling in EGR 4941 and must be completed before passing EGR 4941.

Suggested Course Sequences
Four Year Plan Starting with Calculus

Check the quarter, day and time in the current schedule as course offerings may change. Pay close attention to the pre-requisites of the courses.

Course	Title	Credits
Freshman		
Variable		
WRI 1000	Academic Inquiry and Writing Seminar [1]	5
WRI 1100	Disciplinary Research and Writing Seminar [2]	5
UFDN 1000	The Christian Faith	5
	Credits	**15**
Autumn		
CSC 1230	Problem Solving and Programming	5
MAT 1234	Calculus I	5
UCOL 1000	University Colloquium [2]	1
	Credits	**11**
Winter		
CSC 2430	Data Structures I	5
EE 1502	Electrical and Computer Engineering Fundamentals	1
MAT 1235	Calculus II	5
	Credits	**11**
Spring		
CSC 2431	Data Structures II	5
MAT 1236	Calculus III	5
	Credits	**10**
Sophomore		
Variable		
Common Curriculum (https://catalog.spu.edu/undergraduate/degree-requirements/baccalaureate-degree-requirements/common-curriculum/) or Exploratory Curriculum (https://catalog.spu.edu/undergraduate/degree-requirements/baccalaureate-degree-requirements/exploratory-curriculum/) (and CHM 1310 if needed)		5-10
GS 3001	Internship and Job Search Strategies	1
MAT 2401	Linear Algebra	3
	Credits	**9-14**
Autumn		
EE 1210	Introduction to Logic System Design	5
PHY 1121	Physics for Science and Engineering	5
	Credits	**10**
Winter		
CPE 3760	Computer Organization and Assembly Language	5
MAT 3237	Differential Equations	3

Course	Title	Credits
PHY 1122	Physics for Science and Engineering	5
	Credits	**13**
Spring		
CPE 3280	Microcontroller System Design	5
PHY 1123	Physics for Science and Engineering	5
	Credits	**10**
Junior		
Variable		
CSC Elective [3]		5
Technical Electives [3]		8-12
Common Curriculum (https://catalog.spu.edu/undergraduate/degree-requirements/baccalaureate-degree-requirements/common-curriculum/) and Exploratory Curriculum (https://catalog.spu.edu/undergraduate/degree-requirements/baccalaureate-degree-requirements/exploratory-curriculum/)		5-10
CPE electives (EE 4770 or CSC 4750)		5-10
MAT 2200	Engineering Probability and Statistics (or the following year)	3
	Credits	**26-40**
Autumn		
EE 2726	Electric Circuits I	5
GS 3001	Internship and Job Search Strategies (if not already taken)	1
	Credits	**6**
Winter		
EE 2728	Electric Circuits II - Expanded	5
MAT 1720	Mathematics for Computer Science	5
	Credits	**10**
Spring		
EGR 3810 or EE 3730	General Engineering Design or Engineering Design	5
EE 3721	Electronics I - Analog Devices and Circuits	5
EE 3721L	Electronics I - Analog Devices and Circuits Lab	1
	Credits	**11**
Senior		
Variable		
EGR 4941	Engineering Professional Experience [4]	1
Select two of the following:		**10**
CPE 4750	Computer Networks (Spring alt years)	
EE 4770	Fundamentals of Advanced Embedded Systems (Fall alt years)	
EE 3722	Electronics II Analog Electronics (Fall)	
Common Curriculum (https://catalog.spu.edu/undergraduate/degree-requirements/baccalaureate-degree-requirements/common-curriculum/) or Exploratory Curriculum (https://catalog.spu.edu/undergraduate/degree-requirements/baccalaureate-degree-requirements/exploratory-curriculum/) or Tech Electives [5]		25
	Credits	**36**
Autumn		
CPE 4211	Computer Engineering Senior Design I	3
	Credits	**3**
Winter		
EGR 4812 or EE 4212	Engineering Senior Design II or Electrical Engineering Senior Design II	3
	Credits	**3**
Spring		
CPE 4899	Computer Engineering Capstone and Senior Design	3
CPE/CSC 3350	Operating Systems Programming	3
	Credits	**6**
	Total Credits	**190-209**

[1]

WRI 1000 Academic Inquiry and Writing Seminar must be taken before WRI 1100 Disciplinary Research and Writing Seminar.

[2]

Engineering majors should take the section be taught by an engineering faculty member.

[3]

Taken any quarter after satisfying pre-req(s). See link at the bottom of the page for a list.

[4]

Completion of an approved internship or certification is a required pre-req.

[5]

See link at bottom of page for technical elective list.

Four Year Plan Starting with Algebra or Trigonometry

Check the quarter, day and time in the current schedule as course offerings may change. Pay close attention to the pre-requisites of the courses.

Course	Title	Credits
Freshman		
Variable		
WRI 1000	Academic Inquiry and Writing Seminar [1]	5
WRI 1100	Disciplinary Research and Writing Seminar [2]	5
UFDN 1000	The Christian Faith	5
Exploratory Curriculum (https://catalog.spu.edu/undergraduate/degree-requirements/baccalaureate-degree-requirements/exploratory-curriculum/)		5
	Credits	**20**
Autumn		
CSC 1230	Problem Solving and Programming	5
UCOL 1000	University Colloquium [2]	1
MAT 1010	College Algebra (if needed)	3
	Credits	**9**
Winter		
CSC 2430	Data Structures I	5
CPE/EE 1502	Electrical and Computer Engineering Fundamentals	1
MAT 1110	Precalculus	5
	Credits	**11**
Spring		
CSC 2431	Data Structures II	5
MAT 1234	Calculus I	5
	Credits	**10**
Sophomore		
Variable		
Common Curriculum (https://catalog.spu.edu/undergraduate/degree-requirements/baccalaureate-degree-requirements/common-curriculum/) or Exploratory Curriculum (https://catalog.spu.edu/undergraduate/degree-requirements/baccalaureate-degree-requirements/exploratory-curriculum/) (and CHM 1310 if needed)		5
GS 3001	Internship and Job Search Strategies	1
	Credits	**6**
Autumn		
EE 1210	Introduction to Logic System Design	5
PHY 1121	Physics for Science and Engineering	5
MAT 1235	Calculus II	5
	Credits	**15**
Winter		
CPE/EE 3760	Computer Organization and Assembly Language	5
PHY 1122	Physics for Science and Engineering	5
MAT 1236	Calculus III	5
	Credits	**15**
Spring		
CPE 3280	Microcontroller System Design	5

PHY 1123	Physics for Science and Engineering	5
MAT 2401	Linear Algebra	3
	Credits	**13**
Junior		
Variable		
MAT 2200	Engineering Probability and Statistics (or the following year)	3
CPE electives (EE 4770 or CSC 4750)		10
CSC Elective [3]		5
Technical Electives [3]		8-12
Common Curriculum (https://catalog.spu.edu/undergraduate/degree-requirements/baccalaureate-degree-requirements/common-curriculum/) and/or Exploratory Curriculum (https://catalog.spu.edu/undergraduate/degree-requirements/baccalaureate-degree-requirements/exploratory-curriculum/)		5-10
	Credits	**31-40**
Autumn		
EE 2726	Electric Circuits I	5
GS 3001	Internship and Job Search Strategies (if not already taken)	1
	Credits	**6**
Winter		
MAT 1720	Mathematics for Computer Science	5
EE 2728	Electric Circuits II - Expanded	5
MAT 3237	Differential Equations	3
	Credits	**13**
Spring		
EGR 3810 or EE 3730	General Engineering Design or Engineering Design	5
EE 3721	Electronics I - Analog Devices and Circuits	5
EE 3721L	Electronics I - Analog Devices and Circuits Lab	1
	Credits	**11**
Senior		
Variable		
EGR 4941	Engineering Professional Experience [4]	1
Select two of the following:		**10**
CPE 4750	Computer Networks (Spring alt years)	
EE 4770	Fundamentals of Advanced Embedded Systems (Fall alt years)	
EE 3722	Electronics II Analog Electronics (Fall)	
Common Curriculum (https://catalog.spu.edu/undergraduate/degree-requirements/baccalaureate-degree-requirements/common-curriculum/) or Exploratory Curriculum (https://catalog.spu.edu/undergraduate/degree-requirements/baccalaureate-degree-requirements/exploratory-curriculum/) or Tech Electives [3]		
	Credits	**11**
Autumn		
CPE 4211	Computer Engineering Senior Design I	3
	Credits	**3**
Winter		
EGR 4812 or EE 4212	Engineering Senior Design II or Electrical Engineering Senior Design II	3
	Credits	**3**
Spring		
CPE 4899	Computer Engineering Capstone and Senior Design	3
CPE/CSC 3350	Operating Systems Programming	3
	Credits	**6**
	Total Credits	**183-192**

[1]

WRI 1000 Academic Inquiry and Writing Seminar must be taken before WRI 1100 Disciplinary Research and Writing Seminar.

[2]

Engineering majors should take the section be taught by an engineering faculty member.

[3]

See link at bottom of the page for a list.

[4]

Completion of an approved internship or certification is a required pre-req.

Two Year Plan for a Transfer Student with or without a DTA

See below for the pre-requisite courses required to complete the degree in two years. Note also that without a DTA, it will depend on how many of the General Education Courses (Common Curriculum (https://catalog.spu.edu/undergraduate/degree-requirements/baccalaureate-degree-requirements/common-curriculum/), Exploratory Curriculum (https://catalog.spu.edu/undergraduate/degree-requirements/baccalaureate-degree-requirements/exploratory-curriculum/), etc (https://catalog.spu.edu/undergraduate/degree-requirements/baccalaureate-degree-requirements/graduation-requirements-policies/).) are completed before transferring as to whether or not the degree can be completed in two years.

Check the quarter, day and time in the current schedule as course offerings may change. Pay close attention to the pre-requisites of the courses.

Course	Title	Credits
First Year		
Variable		
CSC Breadth Elective and Tech Electives [1]		12-14
Common Curriculum (https://catalog.spu.edu/undergraduate/degree-requirements/baccalaureate-degree-requirements/common-curriculum/) and/or Exploratory Curriculum (https://catalog.spu.edu/undergraduate/degree-requirements/baccalaureate-degree-requirements/exploratory-curriculum/) as needed		
MAT 2200	Engineering Probability and Statistics [2]	3
	Credits	**15-17**
Autumn		
CSC 2330	Data Structures Programming	5
EE 1210	Introduction to Logic System Design	5
EE 2502 or EE 2726	Selected Circuits Topics for Transfer Students or Electric Circuits I	2
GS 3001	Internship and Job Search Strategies	1
	Credits	**13**
Winter		
CPE 3760	Computer Organization and Assembly Language	5
EE 2728	Electric Circuits II - Expanded	5
MAT 1720	Mathematics for Computer Science	5
	Credits	**15**
Spring		
CPE 3280	Microcontroller System Design	5
EGR 3810 or EE 3730	General Engineering Design or Engineering Design	5
EE 3721	Electronics I - Analog Devices and Circuits	5
EE 3721L	Electronics I - Analog Devices and Circuits Lab	1
	Credits	**16**
Second Year		
Variable		
CSC Breadth Elective and Tech Electives [1]		
MAT 2200	Engineering Probability and Statistics (if needed)	3
EGR 4941	Engineering Professional Experience [3]	1

		Credits
Common Curriculum (https://catalog.spu.edu/undergraduate/degree-requirements/baccalaureate-degree-requirements/common-curriculum/) and/or Exploratory Curriculum (https://catalog.spu.edu/undergraduate/degree-requirements/baccalaureate-degree-requirements/exploratory-curriculum/) as needed		
Select two of the following:		10
CPE 4750	Computer Networks (Spring alt years)	
EE 4770	Fundamentals of Advanced Embedded Systems (Fall alt years)	
EE 3722 & 3722L	Electronics II Analog Electronics and Electronics II Analog Electronics Lab (Fall)	
	Credits	**14**
Autumn		
CSC 2431	Data Structures II	5
CPE 4211	Computer Engineering Senior Design I	3
	Credits	**8**
Winter		
EGR 4812 or EE 4212	Engineering Senior Design II or Electrical Engineering Senior Design II	3
	Credits	**3**
Spring		
CPE 3350	Operating Systems Programming	3
CPE 4899	Computer Engineering Capstone and Senior Design	3
	Credits	**6**
	Total Credits	**90-92**

[1]

Pay attention to pre-reqs. Spread between first and second year. See link at the bottom of the page for a list.

[2]

May be taken the first or second year.

[3]

Completed approved internship or certification is a required pre-req.

Prerequisites for the Two Year Plan

The following courses must be completed before coming to SPU in order to finish at SPU in two years.

Code	Title	Credits
Calculus Equivalent to SPU's		
MAT 1234	Calculus I	
MAT 1235	Calculus II	
MAT 1236	Calculus III	
Two Quarters of Programming in the Same Language [1]		
Prog. I		
Prog II Data Structures		
A Circuits I Class with Lab [2]		
Additional Math/Chemistry Equivalents to SPU's		
MAT 2401	Linear Algebra	
MAT 3237	Differential Equations	
MAT 3238 or CHM 1211	Vector Calculus or General Chemistry I	
Physics Equivalent to SPU's		
PHY 1121	Physics for Science and Engineering	
PHY 1122	Physics for Science and Engineering	
PHY 1123	Physics for Science and Engineering	

[1]

The second must include data structures concepts. If in C++, CSC 2330 Data Structures Programming is waived.

[2]

Or take EE 2502 or EE 2726 at SPU in the Fall.

Four Year Plan including Junior Fall Study Abroad

Check the quarter, day and time in the current schedule as course offerings may change. Pay close attention to the pre-requisites of the courses.

Course	Title	Credits
Freshman		
Variable		
WRI 1000	Academic Inquiry and Writing Seminar [1]	5
WRI 1100	Disciplinary Research and Writing Seminar [2]	5
UFDN 1000	The Christian Faith	5
	Credits	**15**
Autumn		
CSC 1230	Problem Solving and Programming	5
MAT 1234	Calculus I	5
UCOL 1000	University Colloquium [2]	1
	Credits	**11**
Winter		
CSC 2430	Data Structures I	5
EE 1502	Electrical and Computer Engineering Fundamentals	1
MAT 1235	Calculus II	5
	Credits	**11**
Spring		
CSC 2431	Data Structures II	5
MAT 1236	Calculus III	5
	Credits	**10**
Sophomore		
Variable		
Common Curriculum (https://catalog.spu.edu/undergraduate/degree-requirements/baccalaureate-degree-requirements/common-curriculum/) and/or Exploratory Curriculum (https://catalog.spu.edu/undergraduate/degree-requirements/baccalaureate-degree-requirements/exploratory-curriculum/) (and CHM 1310 if needed)		5-10
GS 3001	Internship and Job Search Strategies	1
MAT 2401	Linear Algebra	3
	Credits	**9-14**
Autumn		
EE 1210	Introduction to Logic System Design	5
PHY 1121	Physics for Science and Engineering	5
EE 2726	Electric Circuits I	5
	Credits	**15**
Winter		
CPE 3760	Computer Organization and Assembly Language	5
MAT 3237	Differential Equations	3
EE 2728	Electric Circuits II - Expanded	5
PHY 1122	Physics for Science and Engineering	5
	Credits	**18**
Spring		
CPE 3280	Microcontroller System Design	5
PHY 1123	Physics for Science and Engineering	5
	Credits	**10**
Junior		
Variable		
MAT 2200	Engineering Probability and Statistics (or the following year)	3

CPE Electives [3]		10
EE 4770	Fundamentals of Advanced Embedded Systems	
CSC 4750	Computer Networks	
CSC Elective [4]		5
Technical Electives [4]		8-12
Common Curriculum (https://catalog.spu.edu/undergraduate/degree-requirements/baccalaureate-degree-requirements/common-curriculum/) and/or Exploratory Curriculum (https://catalog.spu.edu/undergraduate/degree-requirements/baccalaureate-degree-requirements/exploratory-curriculum/)		5-10
	Credits	**31-40**
Autumn		
Study Abroad Quarter (General Education credits)		15
	Credits	**15**
Winter		
MAT 1720	Mathematics for Computer Science	5
	Credits	**5**
Spring		
EGR 3810 or EE 3730	General Engineering Design or Engineering Design	5
EE 3721	Electronics I - Analog Devices and Circuits	5
EE 3721L	Electronics I - Analog Devices and Circuits Lab	1
	Credits	**11**
Senior		
Variable		
EGR 4941	Engineering Professional Experience [5]	1
Select two of the following (if not already completed):		**10**
CPE 4750	Computer Networks (Spring alt years)	
EE 4770	Fundamentals of Advanced Embedded Systems (Fall alt years)	
EE 3722	Electronics II Analog Electronics (Fall)	
Common Curriculum (https://catalog.spu.edu/undergraduate/degree-requirements/baccalaureate-degree-requirements/common-curriculum/) and/or Exploratory Curriculum (https://catalog.spu.edu/undergraduate/degree-requirements/baccalaureate-degree-requirements/exploratory-curriculum/) or Technical Electives [6]		25
	Credits	**36**
Autumn		
CPE 4211	Computer Engineering Senior Design I	3
	Credits	**3**
Winter		
EGR 4812 or EE 4212	Engineering Senior Design II or Electrical Engineering Senior Design II	3
	Credits	**3**
Spring		
CPE 4899	Computer Engineering Capstone and Senior Design	3
CPE/CSC 3350	Operating Systems Programming	3
	Credits	**6**
	Total Credits	**209-223**

[1]

WRI 1000 Academic Inquiry and Writing Seminar must be taken before WRI 1100 Disciplinary Research and Writing Seminar.

[2]

Engineering majors should take the section be taught by an engineering faculty member.

[3]

To be taken in either junior or senior year.

[4]

Taken any quarter after satisfying pre-req(s). See link at the bottom of the page for a list.

[5]

Completion of an approved internship or certification is a required pre-req.

[6]

See link at the bottom of page for a list.

Technical and Computer Science Electives List

See the Requirements (p. 1) tab for a full list of technical and computer science electives.