Bachelor of Science in Computer Engineering

Computer Engineering with a Major in Modeling & Simulation Engineering (BSCE)

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The computer engineering undergraduate degree program, available in both synchronous online and face-to-face formats, is designed to provide both a broad engineering background and a comprehensive foundation in the technical principles underlying the computer area. Students develop a background through course work in mathematics, the basic sciences, and general engineering. The technical core consists of course work from electrical engineering to address hardware aspects of computer engineering and course work from computer science to address software aspects.

There are two majors available in the Bachelor of Science in Computer Engineering degree: Computer Engineering major and Modeling & Simulation Engineering major. Adequate elective freedom is available to students in each major. The Computer Engineering major has a built-in minor in computer science, and four technical electives allow for specialization in one or more of four additional areas: computer hardware systems, computer networks, cyber security, or data analytics engineering. The Modeling and Simulation major allows students to select three technical elective courses. In addition, course work in General Education Skills and Ways of Knowing is required to assure a well-rounded program of study.

Students pursuing a Bachelor of Science in Computer Engineering degree (BSCE) are intended in their degree until Engineering Fundamental/foundational courses (I.E. Calculus I & II, Calculus-based University Physics I, Programming I, Chemistry I & II, and Engineering introductory courses) are completed.

Computer Engineering Program Educational Objectives

The computer engineering program seeks to prepare graduates who, after the first few years of their professional career, have:

1. established themselves as practicing engineering professionals in industry or government, or engaged in graduate study
2. demonstrated their ability to work successfully as members of a professional team and function effectively as responsible professionals
3. demonstrated their ability to adapt to new technology and career challenges.

Student Outcomes

The computer engineering student outcomes are as follows. Graduates must attain:

1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
3. An ability to communicate effectively with a range of audiences.
4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

Accreditation

The Bachelor of Science in Computer Engineering is accredited by the Engineering Accreditation Commission of ABET, http://www.abet.org. (http://www.abet.org)

Requirements

Lower-Division General Education

Written Communication (http://catalog.odu.edu/undergraduate/requirements-undergraduate-degrees/#written)	6
Oral Communication (http://catalog.odu.edu/undergraduate/requirements-undergraduate-degrees/#oral)	3
Mathematics (http://catalog.odu.edu/undergraduate/requirements-undergraduate-degrees/#math)	3
Language and Culture (http://catalog.odu.edu/undergraduate/requirements-undergraduate-degrees/#language)	0-6
Information Literacy and Research (http://catalog.odu.edu/undergraduate/requirements-undergraduate-degrees/#information)	3
Human Behavior (http://catalog.odu.edu/undergraduate/requirements-undergraduate-degrees/#behavior)	3
Human Creativity (http://catalog.odu.edu/undergraduate/requirements-undergraduate-degrees/#creativity)	3
Interpreting the Past (http://catalog.odu.edu/undergraduate/requirements-undergraduate-degrees/#interpret)	3
Literature (http://catalog.odu.edu/undergraduate/requirements-undergraduate-degrees/#literature)	3
Philosophy and Ethics (http://catalog.odu.edu/undergraduate/requirements-undergraduate-degrees/#philosophy)	3
The Nature of Science (http://catalog.odu.edu/undergraduate/requirements-undergraduate-degrees/#nature)	8
Impact of Technology (http://catalog.odu.edu/undergraduate/requirements-undergraduate-degrees/#impact)	3

The General Education requirements in information literacy and research, impact of technology, and philosophy and ethics are met through the major.

Upper-Division General Education

- Option A. Approved Minor, 12-24 credit hours; also second degree or second major
- Option B. Interdisciplinary Minor; 12 credit hours, (3 credit hours may be in the major area of study)
- Option C. An approved certification program such as teaching licensure (hours vary)
- Option D. Two Upper-Division Courses (6 credit hours) from outside the College of Engineering and Technology and are not required by the major.

Requirements for Graduation

Requirements for graduation include the following:

- Minimum of 120 credit hours.
- Minimum of 30 credit hours overall and 12 credit hours of upper-level courses in the major program from Old Dominion University.

- Minimum overall cumulative grade point average of C (2.00) in all courses taken.
- Minimum overall cumulative grade point average of C (2.00) in all courses taken toward the major.
- Minimum overall cumulative grade point average of C (2.00) in all courses taken toward a minor.
- Completion of ENGL 110C, ENGL 211C or ENGL 231C, and the writing intensive (W) course in the major with a grade of C or better. The W course must be taken at Old Dominion University.
- Completion of Senior Assessment.

Computer Engineering with a Major in Modeling & Simulation Engineering

James Leathrum Jr., Program Advisor and Coordinator

Computer Engineering-Modeling & Simulation Engineering majors must earn a grade of C or better in all 200-level ECE courses and all CS courses prior to taking the next course in the sequence.

Any ECE course registration issues are to be resolved with the ECE Academic Coordinator and Program Manager.

General Education	
Complete lower-division requirements	32-38
Complete upper-division requirements (minimum of 6 credit hours)	6
Modeling & Simulation Engineering Major	
Complete modeling and simulation engineering major requirements as shown on the degree program guide	90
Total Credit Hours	**128-134**

Degree Program Guide

The Degree Program Guide is a suggested curriculum to complete this degree program in four years. It is just one of several plans that will work and is presented only as broad guidance to students. Each student is strongly encouraged to develop a customized plan in consultation with their academic advisor. Additional information can also be found in Degree Works.

Computer Engineering with a Major in Modeling & Simulation Engineering (BSCE)

Course	Title	Credit Hours
Freshman		
Fall		
ENGN 110	Explore Engineering and Technology	2
CHEM 121N	Foundations of Chemistry I Lecture	3
CHEM 122N or CHEM 120	Foundations of Chemistry I Laboratory [**] or Foundations of Chemistry I Laboratory for Online Degree Programs	1
MATH 211	Calculus I	4
ENGL 110C	English Composition (grade of C or better required)	3
COMM 101R	Public Speaking	3
	Credit Hours	**16**
Spring		
ECE 111	Information Literacy and Research for Electrical and Computer Engineering	2
CHEM 123N	Foundations of Chemistry II Lecture	3
MATH 212	Calculus II	4
PHYS 231N	University Physics I	4
ENGN 150	Computer Programming for Engineering Problem Solving	4
	Credit Hours	**17**
Sophomore		
Fall		
MATH 307 or MATH 280	Ordinary Differential Equations (280) or Transfer Credit for Ordinary Differential Equations	3
ECE 201	Circuit Analysis I	3
ECE 241	Fundamentals of Computer Engineering	4
PHYS 232N	University Physics II	4
ENGL 211C or ENGL 231C	Writing, Rhetoric, and Research or Writing, Rhetoric, and Research: Special Topics	3
	Credit Hours	**17**
Spring		
ECE 202	Circuit Analysis II	3
ECE 287	Fundamental Electric Circuit Laboratory	2
CS 250	Programming with C++	4
CS 252	Introduction to Unix for Programmers	1
CS 381	Introduction to Discrete Structures	3
Literature Way of Knowing		3
	Credit Hours	**16**
Junior		
Fall		
ECE 302	Linear System Analysis	3
ECE 313	Electronic Circuits	4
ECE 341	Digital System Design	3
ECE 306	Discrete System Modeling and Simulation	3
ECE 304	Probability, Statistics, and Reliability	3
	Credit Hours	**16**
Spring		
ECE 346	Microcontrollers	3
ECE 348	Simulation Software Design	3
ECE 320	Continuous System Modeling and Simulation	3
ENMA 480	Ethics and Philosophy in Engineering Applications	3
Interpreting the Past Way of Knowing		3
	Credit Hours	**15**
Senior		
Fall		
ECE 406	Computer Graphics and Visualization	3
ECE 484W	Computer Engineering Design I (grade of C or better required)	3
ECE 486	Preparatory ECE Senior Design II	2

Technical Elective ***		3
Human Creativity Way of Knowing		3
Upper-Division General Education course		3
	Credit Hours	**17**
Spring		
ECE 487	ECE Senior Design II	2
Technical Elective ***		3
Technical Elective ***		3
Human Behavior Way of Knowing		3
Upper-Division General Education course		3
	Credit Hours	**14**
	Total Credit Hours	**128**

* Does not include the University's General Education language and culture requirement. Additional hours may be required.

** CHEM 120 is for online program students only.

*** Computer Engineering-Modeling & Simulation Engineering major students need three technical elective courses selected from one of two options: (1) three 400-level ECE technical elective courses; and (2) two 400-level ECE technical elective courses and one 300-level ECE technical elective course or one approved 300- or 400-level CS/MATH/Engineering course.

Electrical Engineering (BSEE) Dual Major/Degree with Modeling & Simulation Engineering Major (BSCE)

Course	Title	Credit Hours
Freshman		
Fall		
ENGN 110	Explore Engineering and Technology	2
CHEM 121N	Foundations of Chemistry I Lecture	3
CHEM 122N or CHEM 120	Foundations of Chemistry I Laboratory ** or Foundations of Chemistry I Laboratory for Online Degree Programs	1
MATH 211	Calculus I	4
ENGL 110C	English Composition	3
COMM 101R	Public Speaking	3
	Credit Hours	**16**
Spring		
ECE 111	Information Literacy and Research for Electrical and Computer Engineering	2
CHEM 123N	Foundations of Chemistry II Lecture	3
MATH 212	Calculus II	4
ENGN 150	Computer Programming for Engineering Problem Solving	4
PHYS 231N	University Physics I	4
	Credit Hours	**17**
Sophomore		
Fall		
MATH 307 or MATH 280	Ordinary Differential Equations or Transfer Credit for Ordinary Differential Equations	3
ECE 201	Circuit Analysis I	3
ENGL 211C or ENGL 231C	Writing, Rhetoric, and Research or Writing, Rhetoric, and Research: Special Topics	3
PHYS 232N	University Physics II	4
CS 381	Introduction to Discrete Structures	3
Human Creativity Way of Knowing		3
	Credit Hours	**19**
Spring		
ECE 202	Circuit Analysis II	3
ECE 287	Fundamental Electric Circuit Laboratory	2
ECE 241	Fundamentals of Computer Engineering	4
CS 250	Programming with C++	4
CS 252	Introduction to Unix for Programmers	1
MATH 312 or MATH 285	Calculus III or Transfer Credit for Calculus III	4
	Credit Hours	**18**
Junior		
Fall		
ECE 302	Linear System Analysis	3
ECE 304	Probability, Statistics, and Reliability	3
ECE 306	Discrete System Modeling and Simulation	3
ECE 313	Electronic Circuits	4
ECE 341	Digital System Design	3
	Credit Hours	**16**
Spring		
ECE 303	Introduction to Electrical Power	3
ECE 320	Continuous System Modeling and Simulation	3
ECE 348	Simulation Software Design	3
ECE 346	Microcontrollers	3
ECE 381	Introduction to Discrete-time Signal Processing	3
Interpreting the Past (http://catalog.odu.edu/undergraduate/requirements-undergraduate-degrees/#interpret)		3
	Credit Hours	**18**
Senior		
Fall		
ECE 323	Electromagnetics	3
ECE 332	Microelectronic Materials and Processes	3
ECE 406	Computer Graphics and Visualization	3

ECE 484W	Computer Engineering Design I	3
ECE 485W	Electrical Engineering Design I	3
ECE 486	Preparatory ECE Senior Design II	2
	Credit Hours	**17**
Spring		
ECE 387	Microelectronics Fabrication Laboratory	3
ECE 487	ECE Senior Design II	2
ENMA 480	Ethics and Philosophy in Engineering Applications	3
Technical Elective ***		3
Literature Way of Knowing		3
Human Behavior Way of Knowing		3
	Credit Hours	**17**
	Total Credit Hours	**138**

* Does not include the University's General Education language and culture requirement. Additional hours may be required.

** CHEM 120 is for online program students only.

*** Electrical & Computer Engineering students pursuing the double major/degree need their final technical elective course to be a 400-level ECE technical elective course.

The General Education requirements in information literacy and research, impact of technology, and philosophy and ethics are met through the major. The upper-division General Education requirement is met through the completion of a second major/degree.

Electrical & Computer engineering majors must earn a grade of C or better in all 200-level ECE courses and all CS courses prior to taking the next course in the sequence.

Any ECE course registration issues are to be resolved with the ECE Academic Coordinator and Program Manager.

The four-year plan is a suggested curriculum to complete this degree program in four years. It is just one of several plans that will work and is presented only as broad guidance to students. Each student is strongly encouraged to develop a customized plan in consultation with their academic advisor. Additional information can also be found in Degree Works.

Students seeking two degrees must complete a minimum of 150 credit hours.

Modeling & Simulation Engineering Major (BSCE) Dual Degree with Computer Science (BSCS)

Course	Title	Credit Hours
Freshman		
Fall		
ENGN 110	Explore Engineering and Technology	2
CHEM 121N	Foundations of Chemistry I Lecture	3
CHEM 122N or CHEM 120	Foundations of Chemistry I Laboratory [1] or Foundations of Chemistry I Laboratory for Online Degree Programs	1
MATH 211	Calculus I	4
ENGL 110C	English Composition (grade of C or better required)	3
Human Creativity Way of Knowing		3
	Credit Hours	**16**
Spring		
ECE 111	Information Literacy and Research for Electrical and Computer Engineering [2]	2
CHEM 123N	Foundations of Chemistry II Lecture	3
MATH 212	Calculus II	4
PHYS 231N	University Physics I	4
ENGN 150	Computer Programming for Engineering Problem Solving [3]	4
	Credit Hours	**17**
Sophomore		
Fall		
MATH 307 or MATH 280	Ordinary Differential Equations (280) or Transfer Credit for Ordinary Differential Equations	3
ECE 201	Circuit Analysis I	3
PHYS 232N	University Physics II	4
COMM 101R	Public Speaking	3
ENGL 211C or ENGL 231C	Writing, Rhetoric, and Research or Writing, Rhetoric, and Research: Special Topics	3
	Credit Hours	**16**
Spring		
ECE 202	Circuit Analysis II	3
ECE 287	Fundamental Electric Circuit Laboratory	2
CS 250	Programming with C++	4
CS 252	Introduction to Unix for Programmers	1
CS 381	Introduction to Discrete Structures	3
Human Behavior Way of Knowing		3
	Credit Hours	**16**
Junior		
Fall		
ECE 241	Fundamentals of Computer Engineering	4
ECE 302	Linear System Analysis	3
CS 330	Object-Oriented Design and Programming	3
CS 390	Introduction to Theoretical Computer Science	3
CS 315	Computer Science Undergraduate Colloquium	1
Literature Way of Knowing		3
	Credit Hours	**17**
Spring		
ECE 313	Electronic Circuits	4
ECE 341	Digital System Design	3
ECE 304	Probability, Statistics, and Reliability [4]	3
CS 361	Data Structures and Algorithms	3

CS 450 or CS 418	Database Concepts or Web Programming	3
	Credit Hours	**16**
Senior		
Fall		
MATH 316	Introductory Linear Algebra	3
ECE 306	Discrete System Modeling and Simulation	3
CS 350	Introduction to Software Engineering	3
ENMA 480	Ethics and Philosophy in Engineering Applications [5]	3
ECE Technical Elective I [6]		3
	Credit Hours	**15**
Spring		
ECE 320	Continuous System Modeling and Simulation	3
ECE 346	Microcontrollers [7]	3
ECE 348	Simulation Software Design	3
CS 417	Computational Methods and Software	3
CS 355	Principles of Programming Languages	3
CS Upper Level Elective I		3
	Credit Hours	**18**
Fifth Year		
Fall		
ECE 406	Computer Graphics and Visualization	3
ECE 443	Computer Architecture [8]	3
ECE 484W	Computer Engineering Design I	3
ECE 486	Preparatory ECE Senior Design II	2
CS 410	Professional Workforce Development I	3
CS Upper Level Elective II		3
	Credit Hours	**17**
Spring		
ECE 487	ECE Senior Design II	2
CS 471	Operating Systems	3
CS 411W	Professional Workforce Development II	3
CS Upper Level Elective III		3
Interpreting the Past Way of Knowing		3
	Credit Hours	**14**
	Total Credit Hours	**162**

* Does not include the University's General Education language and culture requirement. Additional hours may be required.

1 CHEM 120 is for online program students only.

2 ECE 111 and other ECE required courses satisfy the Computer Science Information Literacy & Research requirement of CS 121G.

3 ENGN 150 satisfies the CS 150 requirement in Computer Science curriculum.

4 ECE 304 satisfies the STAT 330 requirement in Computer Science curriculum

5 ENMA 480 satisfies the Computer Science Philosophy & Ethics requirement.

6 Computer Engineering - Modeling & Simulation Engineering Major students pursuing the dual degree with Computer Science have one remaining ECE 400-level Technical Elective course.

7 ECE 346 satisfies the CS 170 requirement in Computer Science curriculum.

8 ECE 443 satisfies the CS 270 requirement in Computer Science curriculum.

The General Education requirements in information literacy and research, impact of technology, and philosophy and ethics are met through the major. The upper-division General Education requirement is met through a built-in minor in computer science and through the completion of a second major/degree.

Modeling & Simulation Engineering and Computer Science majors must earn a grade of C or better in all 200-level ECE courses and all CS courses prior to taking the next course in the sequence.

Any ECE course registration issues are to be resolved with the ECE Academic Coordinator and Program Manager.

The five-year plan is a suggested curriculum to complete this degree program in five years. It is just one of several plans that will work and is presented only as broad guidance to students. Each student is strongly encouraged to develop a customized plan in consultation with their academic advisor. Additional information can also be found in Degree Works.

Linked Bachelor's/Master's Degree Programs

These are designed to allow qualified students to secure a space in a master's program available in the Frank Batten College of Engineering and Technology while they are still pursuing their undergraduate degrees. An eligible student can choose a master's program in the same discipline as his/her bachelor's program or in a complementary discipline. Subject to the approval of the undergraduate and graduate program directors, a student enrolled in a linked program can count up to six credit hours of course work towards both the undergraduate and the graduate degrees. Full-time students may be able to complete the requirements for the bachelor's degree in four years and the master's degree in one additional year. Students in linked programs must earn a minimum of 150 credit hours (120 discrete credit hours for the undergraduate degree and 30 discrete credit hours for the graduate degree).

Students who are matriculated in an undergraduate major in the Frank Batten College of Engineering and Technology with a GPA of at least 3.00 overall and 3.00 in the major are eligible to apply for admission to a linked bachelor's/master's program. Transfer students who desire to be admitted to a linked program at the time they join an undergraduate major at Old Dominion University are eligible to apply if their overall GPA at their previous institution is 3.25 or higher. Prerequisite courses may be required for engineering technology majors to pursue a master's degree in engineering.

Continuance in a linked bachelor's/master's program requires maintenance of a GPA of 3.00 or higher overall and in the major.

Bachelor-to-PhD Programs

For a select number of exceptionally well-qualified students, the college has established a linked doctoral program that enables students to be admitted directly into the PhD program upon completion of the baccalaureate degree. A select number of exceptionally well-qualified students can be admitted to the Bachelor/PhD program in their junior year while they are pursuing one of the undergraduate programs at Old Dominion University. This program

encourages admitted students to work closely with faculty members and pursue a research experience. Just as in the linked Bachelor/MS program, six credit hours of graduate course work may again be counted towards the undergraduate degree and doctoral course work mentioned above for the Bachelor/PhD program. For linked bachelor's to doctoral programs, students must earn a minimum of 198 credit hours (120 discrete credit hours for the undergraduate degree and 78 discrete credit hours for the graduate degree). Students in these programs must maintain a GPA of 3.50 or better throughout their bachelor's and doctoral studies.

The student may opt to obtain the master's degree along the way to the doctorate. To obtain the master's degree, the student must utilize the six graduate credits obtained as part of their undergraduate program, use 18 credits of the graduate course work that is part of the PhD, and also write a master's thesis.