

CYBER SECURITY ENGINEERING

www.ece.iastate.edu (<http://www.ece.iastate.edu/>)

Administered by the Department of Electrical and Computer Engineering

For the undergraduate curriculum in Cyber Security Engineering leading to the degree Bachelor of Science. The Cyber Security Engineering Program is accredited by the Engineering Accreditation Commission of ABET, <https://www.abet.org> (<https://www.abet.org/>), under the commission's General Criteria and Program Criteria for Cybersecurity Engineering and Similarly Named Engineering Programs.

The Department of Electrical and Computer Engineering (ECPE) at Iowa State University provides undergraduate students with the opportunity to learn computer engineering fundamentals, study applications of the most recent advances in state-of-the-art technologies, and to prepare for the practice of cyber security engineering. The student-faculty interaction necessary to realize this opportunity occurs within an environment that is motivated by the principle that excellence in undergraduate education is enhanced by an integrated commitment to successful, long-term research and outreach programs.

Student Learning Outcomes: Graduates of the Cyber Security Engineering curriculum should have, at the time of graduation:

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 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.

Program Educational Objectives:

The program educational objectives for the electrical engineering program describe accomplishments that graduates are expected to attain within five years after graduation. Graduates will have applied their expertise to contemporary problem solving, be engaged professionally, have continued to learn and adapt, and have contributed to their organizations through leadership and teamwork. More specifically, the objectives are **expertise, engagement, learning, leadership and teamwork**.

- Graduates, within five years of graduation, should demonstrate peer-recognized expertise together with the ability to articulate that expertise and use it for contemporary problem solving in the analysis, design, and evaluation of electrical and electronic devices and systems.
- Graduates, within five years of graduation, should demonstrate **engagement** in the engineering profession, locally and globally, by contributing to the ethical, competent, and creative practice of engineering or other professional careers.
- Graduates, within five years of graduation, should demonstrate sustained **learning** and adapting to a constantly changing field through graduate work, professional development, and self-study.
- Graduates, within five years of graduation, should demonstrate **leadership** and initiative to ethically and responsibly advance professional and organizational goals, facilitate the achievements of others, and obtain substantive results.
- Graduates, within five years of graduation, should demonstrate a commitment to **teamwork and communication**.

As a complement to the instructional activity, the ECPE department provides opportunities for each student to have experience with broadening activities. Through the cooperative education and internship program, students have the opportunity to gain practical industry experience. Students have the opportunity to participate in advanced research activities, and through international exchange programs, students learn about engineering practices in other parts of the world. Well-qualified juniors and seniors in cyber security engineering who are interested in graduate study may apply for concurrent enrollment in the Graduate College to simultaneously pursue both the Bachelor of Science and Master of Science.

Curriculum in Cyber Security Engineering

Administered by the Department of Electrical and Computer Engineering.

Leading to the degree Bachelor of Science.

Total credits required: 125

Any transfer credit courses applied to the degree program require a grade of C or better (but will not be calculated into the ISU cumulative GPA, Basic Program GPA or Core GPA). See also Basic Program and Special Programs.

Note: Department does not allow Pass/Not Pass credits to be used to meet graduation requirements.

International Perspectives: 3 cr.¹

U.S. Cultures and Communities: 3 cr.¹

Communication Proficiency/Library requirement:

ENGL 1500	Critical Thinking and Communication (Must have a C or better in this course)	3
ENGL 2500	Written, Oral, Visual, and Electronic Composition (Must have a C or better in this course)	3
LIB 1600	Introduction to College Level Research	1
One of the following:		3
ENGL 3140	Technical Communication (C or better in this course)	
ENGL 3090	Proposal and Report Writing (C or better in this course)	

General Education Electives: 21 cr.³

ENGL 2500	Written, Oral, Visual, and Electronic Composition (Must have a C or better in this course.)	3
ENGL 3140	Technical Communication (Must have a C or better in this course.)	3
or ENGL 3090	Proposal and Report Writing	
Complete minimum of 3 cr. from Approved General Education Component 3000 level and above.		3
Complete additional 12 cr. from Approved General Education Component.		12
Total Credits		21

Basic Program: 24 cr.

A minimum GPA of 2.00 required for this set of courses (please note that transfer course grades will not be calculated into the Basic Program GPA). See Requirement for Entry into Professional Program in College of Engineering Overview section.

CHEM 1670	General Chemistry for Engineering Students	4
or CHEM 1770	General Chemistry I	
ENGL 1500	Critical Thinking and Communication (Must have a C or better in this course)	3
ENGR 1010	Engineering Orientation	R
CPRE 1850	Introduction to Computer Engineering and Problem Solving I	3
LIB 1600	Introduction to College Level Research	1
MATH 1650	Calculus I	4
MATH 1660	Calculus II	4
PHYS 2310	Introduction to Classical Physics I	4

PHYS 2310L	Introduction to Classical Physics I Laboratory	1
Total Credits		24

Math and Physical Science: 17 cr.

COMS 2270	Object-oriented Programming	4
COMS 2280	Introduction to Data Structures	3
MATH 2670	Elementary Differential Equations and Laplace Transforms	4
STAT 3300	Probability and Statistics for Computer Science	3
Math Elective		3
Total Credits		17

Cyber Security Engineering Core: 37 cr.

(A minimum GPA of 2.00 required for this set of courses, including any transfer courses; please note that transfer course grades will not be calculated into the Core GPA).

CYBE 2300	Cyber Security Fundamentals	3
CYBE 2310	Cyber Security Concepts and Tools	3
CYBE 2340	Legal, Professional, and Ethical Issues in Cyber Systems	3
CYBE 3310	Application of Cryptographic Concepts to Cyber Security	3
CPRE 2810	Digital Logic	4
CPRE 2880	Embedded Systems I: Introduction	4
CPRE 3080	Operating Systems: Principles and Practice	4
CPRE 3100	Theoretical Foundations of Computer Engineering	3
CPRE 3810	Computer Organization and Assembly Level Programming	4
COMS 3090	Software Development Practices	3
COMS 3110	Introduction to the Design and Analysis of Algorithms	3
Total Credits		37

Other Remaining Courses: 26 cr.

CPRE 4910	Senior Design Project I and Professionalism	3
CPRE 4920	Senior Design Project II	2
Cyber Security Technical Electives		12
Computer Engineering Technical Electives		3
Technical Electives		6
Total Credits		26

Seminar/Co-op/Internships⁴:

CPRE 1660	Professional Programs Orientation	
CPRE 4940	Portfolio Assessment	

Transfer Credit Requirements

The degree program must include a minimum of 30 credits at the 3000-level or above in professional and technical courses earned at ISU

in order to receive a B.S. in computer engineering. These 30 credits must include: CPRE 4910 Senior Design Project I and Professionalism, CPRE 4920 Senior Design Project II, and credits in the core professional curriculum and/or in technical electives. The Electrical and Computer Engineering Department 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. cultures and communities and international perspectives courses may not be taken Pass/Not Pass but are used to meet the general education electives.
2. See Basic Program for Professional Engineering Curricula for accepted substitutions for curriculum designated courses in the Basic Program.
3. From department approved lists. (<http://www.ece.iastate.edu/academics/bachelors-degree-requirements/>)
4. Co-op / Internships are optional.

See also: A 4-year plan of study grid showing course template by semester. (<https://catalog.iastate.edu/previouscatalogs/2025-2026/collegeofengineering/cybersecurityengineering/#fouryearplantext>)

Note: International perspectives and U.S. cultures and communities courses are used to meet the general education electives.

Cyber Security Engineering, B.S.

First Year

Fall	Credits Spring	Credits
CHEM 1670	4 COMS 2270	4
CPRE 1850	3 CPRE 1660	R
ENGL 1500	3 MATH 1660	4
ENGR 1010	R PHYS 2310	4
LIB 1600	1 PHYS 2310L	1
MATH 1650	4 General Education Elective	3
	15	16

Second Year

Fall	Credits Spring	Credits
CPRE 2810	4 CPRE 2880	4
COMS 2280	3 ENGL 2500	3
MATH 2670	4 Math Elective	3
CYBE 2300	3 CYBE 2310	3
	CYBE 2340	3
	14	16

Third Year

Fall	Credits Spring	Credits
CPRE 3810	4 CPRE 3080	4
CPRE 3100	3 COMS 3110	3
COMS 3090	3 ENGL 3140 or ENGL 3090	3
CYBE 3310	3 General Education Elective	3
General Education Elective	3 Cyber Security Elective	3
	16	16

Fourth Year

Fall	Credits Spring	Credits
CPRE 4910	3 CPRE 4920	2
CPRE 4940	R Tech Elective	6
STAT 3300	3 General Education Elective	3
Cyber Security Elective	6 Cyber Security Elective	3
CPRE Elective	3	
General Education Elective	3	
	18	14

Cyber Security Engineering Minor

The cyber security engineering minor (<https://catalog.iastate.edu/previouscatalogs/2025-2026/collegeofengineering/cybersecurityminor/>) is intended for students studying computer engineering, computer science, software engineering, or management information systems with the goal of enabling them to work in cyber security. The minor consists of a series of lab-based courses that are designed to provide students with both the technical background and the hands-on experiences along with the theoretical background to allow them to compete for jobs in cyber security.

The Professional Certificate in Cybersecurity (<https://catalog.iastate.edu/previouscatalogs/2025-2026/collegeofengineering/cybersecuritycertificate/>) is aimed at graduates with an AAS degree (two-year degree) who are working in a security or IT-related field. The certificate will provide the material needed to upskill students so that they can gain cybersecurity knowledge. The certificate will be offered online as a series of half-semester 2 credit courses (the professional communications course is 3 credits). The certificate will be 21 credits. The courses in the certificate will map to federal training standards as outlined in the NIST/NICE framework.

Cyber Security Engineering students have the opportunity to become a concurrent undergraduate/graduate student in a few programs.

CONCURRENT B.S./M.ENG OR M.S. IN COMPUTER ENGINEERING

CONCURRENT B.S./M.ENG OR M.S. IN ELECTRICAL ENGINEERING

CONCURRENT B.S./M.ENG OR M.S. IN CYBER SECURITY

Cyber Security Engineering students have the opportunity to begin their coursework towards their master's degree in computer engineering, cyber security during, or electrical engineering their final semester(s) of undergraduate coursework. In order to be eligible, student must have a 3.0 cumulative GPA or higher to begin a Master of Engineering ("M.ENG") degree or a 3.3 cumulative GPA to begin a Master of Science ("M.S.") degree. Students should meet with their academic advisor to discuss this option.

CONCURRENT B.S./MBA

Juniors and Seniors have the opportunity to continue their undergraduate coursework while also pursuing a Master of Business Administration (MBA) degree. For additional information please visit the concurrent MBA website www.ivybusiness.iastate.edu/full-time-concurrent-mba (<https://www.ivybusiness.iastate.edu/full-time-concurrent-mba/>).

The department offers work for the degrees Master of Science and Doctor of Philosophy with a major in cyber security and minor work to students with other majors. Minor work for cyber security majors is usually selected from a wide range of courses outside cyber security.

Master of Engineering degree is coursework only. It is recommended for off-campus students.

The degree Master of Science with thesis is recommended for students who intend to continue toward the Doctor of Philosophy degree or to undertake a career in research and development. The non-thesis Master of Science degree requires a creative component.

The department also offers a graduate certificate program in cyber security.

The normal prerequisite to major in graduate work in cyber security is the completion of undergraduate work substantially equivalent to that required of cyber security students at this university. Because of the diversification in the cyber security graduate program, however, it is possible for a student to qualify for graduate study in certain areas of cyber security even though the student's undergraduate or prior graduate training has been in a discipline other than cyber security. Supporting work, if required, will depend on the student's background and area of research interest. Prospective students from a discipline other than cyber

security are required to submit, with the application for admission, a statement of the proposed area of graduate study.

The department requires submission of GRE General test scores by applicants. All students whose first language is not English and who have no U.S. degree must submit TOEFL examination scores. Students pursuing the Doctor of Philosophy must complete the department qualifying process.

The Department of Electrical and Computer Engineering is a participating department in the interdepartmental Master of Science and Doctor of Philosophy degree programs in bioinformatics and computational biology. Students interested in these programs may earn their degrees while working under an advisor in electrical and computer engineering.

Well-qualified juniors or seniors in cyber security who are interested in graduate study may apply for concurrent enrollment in the Graduate College to simultaneously pursue both the Bachelor of Science and Master of Science degrees, the Bachelor of Science and Master of Business Administration, or the Bachelor of Science and Master of Engineering degrees. Under concurrent enrollment, students are eligible for assistantships and simultaneously take undergraduate and graduate courses. Details are available in the Student Services Office and on the department's website.