## 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 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.

The program objectives for the cyber security 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 for expertise, engagement, learning, leadership and teamwork are defined below for the program.

The objectives of the cyber security engineering program at Iowa State University are:

- Graduates, within five years of graduation, should demonstrate peer-recognized expertise in computer security principles together with the ability to articulate that expertise and use it for contemporary problem solving in the analysis, design, and operation of the physical, software and human components of a system, including system integration and implementation.

- 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 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 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 while working with others of diverse cultural and interdisciplinary backgrounds.

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. Diversity: 3 cr. \(^1\)

Communication Proficiency/Library requirement:

<table>
<thead>
<tr>
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<th>Title</th>
<th>Credits</th>
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<tr>
<td>ENGL 150</td>
<td>Critical Thinking and Communication (Must have a C or better in this course)</td>
<td>3</td>
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<tr>
<td>ENGL 250</td>
<td>Written, Oral, Visual, and Electronic Composition (Must have a C or better in this course)</td>
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</tr>
<tr>
<td>LIB 160</td>
<td>Information Literacy</td>
<td>1</td>
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<td>One of the following:</td>
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<tr>
<td>ENGL 314</td>
<td>Technical Communication (C or better in this course)</td>
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<tr>
<td>ENGL 309</td>
<td>Proposal and Report Writing (C or better in this course)</td>
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General Education Electives: 21 cr. \(^3\)

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<td>ENGL 250</td>
<td>Written, Oral, Visual, and Electronic Composition (Must have a C or better in this course.)</td>
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<tr>
<td>ENGL 314</td>
<td>Technical Communication (Must have a C or better in this course.)</td>
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or ENGL 309 Proposal and Report Writing

Complete minimum of 6 cr. from Approved General Education Component 300 level and above. \(^3\)
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>CHEM 167</td>
<td>General Chemistry for Engineering Students</td>
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<tr>
<td>or CHEM 177</td>
<td>General Chemistry I</td>
<td>3</td>
</tr>
<tr>
<td>ENGL 150</td>
<td>Critical Thinking and Communication (Must have a C or better in this course)</td>
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<tr>
<td>ENGR 101</td>
<td>Engineering Orientation</td>
<td>R</td>
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<tr>
<td>CPR E 185</td>
<td>Introduction to Computer Engineering and Problem Solving 1</td>
<td>3</td>
</tr>
<tr>
<td>LIB 160</td>
<td>Information Literacy</td>
<td>1</td>
</tr>
<tr>
<td>MATH 165</td>
<td>Calculus I</td>
<td>4</td>
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<tr>
<td>MATH 166</td>
<td>Calculus II</td>
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<td>PHYS 221</td>
<td>Introduction to Classical Physics I</td>
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**Math and Physical Science: 17 cr.**

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<tr>
<td>COM S 227</td>
<td>Object-oriented Programming</td>
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</tr>
<tr>
<td>COM S 228</td>
<td>Introduction to Data Structures</td>
<td>3</td>
</tr>
<tr>
<td>MATH 267</td>
<td>Elementary Differential Equations and Laplace Transforms</td>
<td>4</td>
</tr>
<tr>
<td>STAT 330</td>
<td>Probability and Statistics for Computer Science</td>
<td>3</td>
</tr>
<tr>
<td>Math Elective 3</td>
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**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).

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>CPR E 230</td>
<td>Cyber Security Fundamentals</td>
<td>3</td>
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<tr>
<td>CPR E 231</td>
<td>Cyber Security Concepts and Tools</td>
<td>3</td>
</tr>
<tr>
<td>CPR E 234</td>
<td>Legal, Professional, and Ethical Issues in Cyber Systems</td>
<td>3</td>
</tr>
<tr>
<td>CPR E 331</td>
<td>Application of Cryptographic Concepts to Cyber Security</td>
<td>3</td>
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<tr>
<td>CPR E 281</td>
<td>Digital Logic</td>
<td>4</td>
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<tr>
<td>CPR E 288</td>
<td>Embedded Systems I: Introduction</td>
<td>4</td>
</tr>
<tr>
<td>CPR E 308</td>
<td>Operating Systems: Principles and Practice</td>
<td>4</td>
</tr>
<tr>
<td>CPR E 310</td>
<td>Theoretical Foundations of Computer Engineering</td>
<td>3</td>
</tr>
<tr>
<td>CPR E 381</td>
<td>Computer Organization and Assembly Level Programming</td>
<td>4</td>
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<tr>
<td>COM S 309</td>
<td>Software Development Practices</td>
<td>3</td>
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<tr>
<td>CPR E 315</td>
<td>Applications of Algorithms in Computer Engineering</td>
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<tr>
<td>or COM S 311</td>
<td>Introduction to the Design and Analysis of Algorithms</td>
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<td>Total Credits</td>
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**Other Remaining Courses: 26 cr.**

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<tr>
<td>CPR E 491</td>
<td>Senior Design Project I and Professionalism</td>
<td>3</td>
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<tr>
<td>CPR E 492</td>
<td>Senior Design Project II</td>
<td>2</td>
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<td>Cyber Security Technical Electives 3</td>
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<td>Computer Engineering Technical Electives 3</td>
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**Seminar/Co-op/Internships**:

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<td>CPR E 166</td>
<td>Professional Programs Orientation</td>
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<tr>
<td>CPR E 294</td>
<td>Program Discovery</td>
<td>R</td>
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<td>CPR E 494</td>
<td>Portfolio Assessment</td>
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<tr>
<td>Total Credits</td>
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**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 computer engineering. These 30 credits must include CPR E 491 Senior Design Project I and Professionalism, CPR E 492 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. diversity 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](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.

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

Cyber Security Engineering, B.S.
### First Year

<table>
<thead>
<tr>
<th>Fall</th>
<th>Credits</th>
<th>Spring</th>
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<tbody>
<tr>
<td>CHEM 167</td>
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<td>4 COM S 227</td>
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<td>ENGL 150</td>
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<td>3 MATH 166</td>
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### Second Year

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<tr>
<td>CPR E 281</td>
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<td>3 ENGL 250</td>
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### Third Year

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<th>Spring</th>
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<tbody>
<tr>
<td>CPR E 381</td>
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<td>4 COM S 311 or CPR E 315</td>
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<td>CPR E 310</td>
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<td>3 CPR E 308</td>
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<tr>
<td>COM S 309</td>
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<td>3 ENGL 314 or ENGL 309</td>
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<td>CPR E 331</td>
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### Fourth Year

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<tr>
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<td>CPR E 494</td>
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<td>R Tech Elective</td>
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<td>General Education Elective</td>
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