

Contact: Rachel Boon

**REQUEST FOR NEW PROGRAM AT IOWA STATE UNIVERSITY:
BACHELOR OF SCIENCE IN CYBER SECURITY ENGINEERING**

Action Requested: Consider approval of the request by Iowa State University to establish a Bachelor of Science in Cyber Security Engineering in the College of Engineering.

Executive Summary: The Bachelor of Science in Cyber Security Engineering is proposed to give students a strong foundation in computer engineering concepts that will allow them to apply engineering methodology to solve the complex problems in cyber security. Currently, some estimate over 300,000 workforce openings nationally, with strong growth expected. No other undergraduate cyber security program exists in Iowa. The Council of Provosts and Board office support approval of this program.

Background:

Description of proposed program. The Bachelor of Science (BS) in Cyber Security Engineering will be a new degree offered by the College of Engineering and housed in the department of Electrical and Computer Engineering. Students in the Cyber Security Engineering degree will take the core of the computer engineering curriculum along with courses in cyber security. The students will have a strong foundation in computer engineering concepts that will allow them to apply engineering methodology to solve the complex problems in cyber security.

Academic objectives. The BS in Cyber Security Engineering program is designed to prepare students with the technical skills for entry into positions in industry or government agencies. After graduation, students who completed the BS in Cyber Security Engineering should be:

- Contributing to their communities and society in the area of cyber security technology and applications and demonstrate an understanding of contemporary security issues, both technological and societal;
- Advancing their careers through application of their knowledge of cyber security;
- Working effectively as team members and demonstrating ethics and responsible behavior;
- Applying cyber security methods and concepts to the general area of their BS degree; and
- Continuing their professional development through life-long learning.

After earning the BS in Cyber Security Engineering, students will,

- Demonstrate the ability to apply knowledge of cyber security concepts, tools and technologies to computer systems.
- Understand cyber security risks, threats and countermeasures and apply this understanding to develop cyber defense strategies.
- Demonstrate the ability to design cyber security systems to meet organizational needs within realistic constraints such as economic, environmental, social and ethical expectations.
- Demonstrate the ability to function on teams.

Several companies currently hire computer engineering students for internships in cyber security, so the program will have these work-based learning opportunities.

Need for proposed program. Iowa and the nation are facing an increasing shortage in cyber security workers, with some estimates of over 300,000 unfilled cyber security jobs in 2017 alone.

In preparation for this proposed degree, ISU received input from industry advisory boards for Information Assurance Center, Department of Electrical and Computer Engineering and the College of Engineering. All three groups offered strong support for the program and companies indicated they would hire graduates.

Link to institutional strategic plan. The College of Engineering at Iowa State just released a new strategic plan, which is consistent with the University's mission and strategic plan. In part, the new plan reads:

“We will provide an effective and rigorous learning environment for engineering undergraduate and graduate students to develop the knowledge, skills and abilities necessary to solve the problems facing society.”

As evident from the events of the past 10 years, cyber security is a complex problem facing the world today. In addition, cyber security was identified as one of the strategic research areas within the College of Engineering:

“We will facilitate high impact research by investing in existing and emerging research areas of excellence. These include advanced materials and manufacturing, energy systems, resilient infrastructures, engineered medicine, engineering education and secure cyberspace and autonomy.”

Relationship to existing programs at the institution. The BS in Cyber Security Engineering is modeled after the BS in Computer Engineering offered at Iowa State, with the first year of coursework being the same for both programs. Cyber security is a complex problem that warrants its own degree path. The proposed degree has a minimum of eight courses that are different from the computer engineering degree. This will allow students to focus on cyber security. The proposed degree does not duplicate any programs on campus. There are three related graduate degree programs at Iowa State: Master of Science in Cyber Security, Master of Engineering, and a graduate certificate. These programs are not duplicative of the proposed BS degree.

Relationship to existing programs at other colleges and universities. No other institution in Iowa offers a bachelor's degree in cyber security.

Unique features. Iowa State has been a leader in cyber security research, education and outreach. In 2000, Iowa State created a multi-disciplinary center, the Information Assurance Center (IAC), which has become a nationally recognized authority in information assurance research, teaching and outreach. The IAC has faculty representing several departments across campus, including Electrical and Computer Engineering, Mathematics, Political Science, Management Information Systems, and Computer Science. The IAC is designated as a charter Center of Excellence in Information Assurance by the National Security Agency.

Student demand. Demand for the graduate degree and minor in cyber security is high. Iowa State has been running a statewide high school cyber security outreach program for over 10 years. This program attracts students into computer engineering where they take a few courses in cyber security. Feedback from students indicates they are interested in a full cyber security degree.

A small number of students currently enrolled in Computer Engineering are likely to switch to Cyber Security Engineering in the first couple of years. Since this will be the only Cyber Security Engineering program in the Midwest, it is likely to draw students from neighboring states as well.

Workforce need/demand. The need for cyber security workers is well documented. One source notes,

“In 2017, the U.S. employs nearly 780,000 people in cybersecurity positions, with approximately 350,000 current cybersecurity openings, according to CyberSeek, a project supported by the National Initiative for Cybersecurity Education, a program of the National Institute of Standards and Technology in the U.S. Department of Commerce.”¹

Some estimates indicate the number of cyber security jobs will top three million by 2021.

Resources to establish a high-quality program. Iowa State has one of the largest cyber security graduate programs in the country and the Department of Electrical and Computer Engineering has been providing support for the graduate program. The department also supports the current minor in cyber security and has established a new lab for the minor. The department will need to hire two additional faculty members to meet the teaching needs for the new program.

The Department of Electrical and Computer Engineering has four full-time equivalent faculty teaching current graduate and undergraduate courses in cyber security. In the first few years, the proposed program will need to hire two additional faculty and one lab support person.

The department has a dedicated facility to teach cyber security labs. The current equipment will not support the increase in courses or increase in course size. The Information Security Education Laboratory will need to expand and add equipment.

If the program reaches or exceeds the growth projected by year five, all currently available space will be in use. Long-term plans to accommodate unexpected growth will be developed at that time.

Cost.

	TOTAL COSTS	INCREMENTAL COSTS	INCREMENTAL NEEDS
Year 1	\$44,000	\$44,000	Adjunct fac + TA
Year 2	\$248,000	204,000	Tenure-track fac + lab coord
Year 3	\$616,000	\$368,000	Tenure-track fac, advisor + TA
Year 4	\$635,000	\$19,000	Lecturer + 2 TAs
Year 5	\$930,000	\$295,000	Tenure-track fac, lecturer + 2 TAs
Year 6	\$1,174,000	\$244,000	Tenure-track fac, 2 TAs + support staff
Year 7	\$1,556,000	\$382,000	2 Tenure-track fac + 2 TAs

Through Iowa State University’s decentralized financial management model, 25% of net tuition revenue is allocated to academic colleges based on student major and 75% is allocated to academic colleges based on teaching (measured by number of credit hours taught). The proposed program will be funded through this existing financial model and is expected to be fully self-sustaining over time.

In addition, financial resources may also come from internal reallocations made in the department and in College of Engineering during program start-up (~\$350,000). The proposed program will not depend on grants, contracts, gifts, central university resources or reallocations from other academic colleges.

¹ <https://www.csonline.com/article/3200024/security/cybersecurity-labor-crunch-to-hit-35-million-unfilled-jobs-by-2021.html>

Projected enrollment.

Undergraduate	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7
Majors	30	50	90	120	166	239	355
Non-Majors							

Articulation agreements. Iowa State University is working with Des Moines Area Community College (DMACC) to articulate two or three of the cyber security engineering courses with its pre-engineering pathway program.

Iowa State University partnered with DMACC to create the Iowa Cyber Hub with a goal to create a regional facility where companies can work with ISU and DMACC on cyber security issues and ultimately create a larger cyber security workforce. This will provide enhanced pathways for students to enter the cyber workforce.

Accreditation. The ABET organization accredits engineering degrees. ABET is in the process of creating criteria for cyber security engineering and should have it in place in 2019. Iowa State will apply for accreditation once the criteria are approved.

Date of implementation. August 2019

Letters of Support



COLLEGE OF ENGINEERING

Office of the Dean

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February 16, 2018

Sarah A. Rajala
Dean of Engineering
Iowa State University
4100 Marston Hall
533 Morrill Road
Ames, IA 50011-2103

Re: Endorsement of Bachelors of Science degree in Cyber Security Engineering

Dear Sarah:

My colleagues and I at the University of Iowa College of Engineering have reviewed your proposed Bachelors of Science degree in Cyber Security Engineering at Iowa State University. We agree that this is a well-designed degree program in an important area for the future of the state and the nation. We are delighted to express our support and wish you success with this new degree.

Sincerely,

A handwritten signature in cursive script that reads "Alec Scranton".

Alec Scranton
Dean of Engineering

College of Humanities, Arts and Sciences
Office of the Dean



February 21, 2018

Dean Rajala:

I have reviewed the proposed B.S. degree in cyber security proposed by the College of Engineering at Iowa State University. Based on my review, the College of Humanities, Arts and Sciences at the University of Northern Iowa supports the proposal and has no objections to the degree.

We wish you the best of successes with the program in cyber security.

Sincerely,

A handwritten signature in black ink, appearing to read "John Fritch", written over a horizontal line.

John Fritch
Dean, College of Humanities, Arts and Sciences
Professor, Communication Studies