

FORM A
Board of Regents, State of Iowa

**REQUEST TO IMPLEMENT A NEW BACCALAUREATE, MASTERS,
DOCTORAL, OR FIRST PROFESSIONAL DEGREE PROGRAM**
January 28, 2015

THE PURPOSE OF ACADEMIC PROGRAM PLANNING: Planning a new academic degree program provides an opportunity for a Regent university to demonstrate need and demand as well as the university's ability to offer a quality program that is not unnecessarily duplicative of other similar programs offered by colleges and universities in Iowa.

Institution: Iowa State University

CIP Discipline Specialty Title: _____

CIP Discipline Specialty Number (six digits): _____

Level: B M D FP

Title of Proposed Program: Cyber Security Engineering

Degree Abbreviation (e.g., B.S., B.A., M.A., Ph.D.): B.S

Approximate date to establish degree: Month Aug Year 2019

Contact person: (name, telephone, and e-mail) Doug Jacobson,

515-294-8307

dougj@iastate.edu

College that will administer new program: Engineering

1. Describe the proposed new degree program, including the following:

a. A brief description of the program.

The Bachelor of Science 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.

b. A statement of academic objectives;

Objectives

The B.S. degree in cyber security engineering is designed to prepare students with the technical skills for entry into cybersecurity positions in industry or government agencies.

A few years after graduation, students completing the cyber security engineering B.S. degree 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 in 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
- Continuing their professional development through life-long learning

Learning Outcomes

After earning the B.S. degree 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.

- c. What the need for the program is and how the need for the program was determined;
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, we received input from three different industrial advisory boards: Information Assurance Center, Department of Electrical and Computer Engineering, and the College of Engineering. All three groups showed strong support for the program and companies indicated they would hire the graduates.
- d. The relationship of the proposed new program to the institutional mission and how the program fits into the institution's and college's 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 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 by events of the past 10 years, cyber security is a complex problem facing the world today. In addition, cyber security has been identified as one of the major 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. "
- e. The relationship of the proposed new program to other existing programs at the institution; describe how the proposed program will enhance other programs at the university. Will the proposed program duplicate existing programs at the university?
The B.S. degree in cyber security engineering is modeled after the B.S. degree in Computer Engineering offered at Iowa State, with the first year being the same for both programs. Cyber security is a very complex problem that warrants its own degree path. The proposed Cyber Security Engineering degree has a minimum of 8 courses that are different from the computer engineering degree. This will allow students to focus on cyber security. The proposed cyber security engineering degree does not duplicate any programs on campus. There are three graduate degree programs at ISU in cyber security, MS, Masters of Engineering, and Grad Certificate. These programs are not duplicative of the proposal B.S. degree
- f. The relationship of the proposed new program to existing programs at other colleges and universities in Iowa, including how the proposed program is different or has a different emphasis than the existing programs.
No other school in Iowa offers a 4-year degree in cyber security.
- g. Special features or conditions that make the institution a desirable, unique, or appropriate place to initiate such a degree program.
ISU has been a leader in cyber security research, education and outreach. In 2000, Iowa State created as a multidisciplinary center, the Information Assurance Center (IAC), which has become a nationally recognized authority in information assurance research,

teaching, and outreach. The center has faculty representing several departments across campus including: Electrical and Computer Engineering; Mathematics; Political Science; Management Information Systems; and Computer Science. The center is designated as a charter Center of Excellence in Information Assurance by the National Security Agency.

IAC Vision:

The Information Assurance Center at Iowa State University will be a national leader in cybersecurity research, education, training, and outreach.

IAC Mission:

The mission of the IAC is to lead research initiatives of national importance and provide comprehensive education, training, and outreach programs through 1) a comprehensive research portfolio including both fundamental and applied research; 2) security education and training; 3) educational pathways to grow the cyber workforce; 4) security literacy and outreach to all citizens; and 5) partnerships with government, industry and academia.

- h. Are the university's personnel, facilities, and equipment adequate to establish and maintain 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 2 additional faculty members to meet the teaching needs for the new program.

- i. How does student demand for the proposed program justify its development?

Demand for our graduate degree and minor in cyber security has been high. Iowa State University has been running a state wide high cyber security outreach program for over 10 years. This program has attracted students into computer engineering where they take a few courses in cyber security. Feedback from the students indicates they are interested in a cyber security degree.

- 2. Describe the state and/or national workforce need and/or demand for graduates of the proposed program currently and in the foreseeable future (provide documentation about the current sources of data used to estimate need and demand).

The need for cyber security workers is well documented. This is a link to one of many reports: <https://www.csoonline.com/article/3200024/security/cybersecurity-labor-crunch-to-hit-35-million-unfilled-jobs-by-2021.html>

A quote from the article: " 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 (NICE), a program of the National Institute of Standards and Technology (NIST) in the U.S. Department of Commerce."

Some estimates indicate the number of cyber security jobs will top 3 million by 2021.

3. List all other public and private institutions of higher education in Iowa currently operating programs similar to the proposed new degree program. (For comparison purposes, use a broad definitional framework, e.g., such identification should not be limited to programs with the same title, the same degree designation, having the same curriculum emphasis, or purporting to meet exactly the same needs as the proposed program.)

There are no other 4-year cyber security degree program offered in the state of Iowa.

If the same or similar program exists at another public or private institution of higher education in Iowa, respond to the following questions:

- a. Could the other institution reasonably accommodate the need for the new program through expansion? Describe collaboration efforts with other institutions.
 - b. With what representatives of these programs has there been consultation in developing the program proposal? Provide a summary of the response of each institution consulted.
 - c. Has the possibility of an inter-institutional program or other cooperative effort been explored? What are the results of this study? (Consider not only the possibility of a formally established inter-institutional program, but also how special resources at other institutions might be used on a cooperative basis in implementing the proposed program solely at the requesting institution.)
 - d. Do other colleges in Iowa offer programs similar to the proposed program at comparable quality and cost?
 - e. Are letters of support included with the program proposal?
4. Estimate the number of majors and non-majors students that are projected to be enrolled in the program during the first seven years of the program.
- a. Undergraduate

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							

- b. Graduate (N/A)

Graduate	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7
Majors							
Non-Majors							

- c. What are the anticipated sources of these students?
We anticipated a small number of students currently enrolled in Computer Engineering will switch to Cyber Security Engineering during the first couple of years. Given this will be the only Cyber Security Engineering Program in the Midwest (as far as we know), we expect to draw students in from a nearby states.

5. If there are plans to offer the program away from the campus, briefly describe these plans, including potential sites and possible methods of delivery instruction. Will off-campus delivery require additional **HLC accreditation**?

This will be an on campus degree only.

6. Has the proposed program been reviewed and approved by the appropriate campus committees and authorities?

Yes

7. List date the program proposal was submitted to the Iowa Coordinating Council for Post High School Education (ICCPHSE) and results of listserv review.

8. Will the proposed program apply for programmatic accreditation? When?

Yes. ABET is the organization that accredits engineering degrees. ABET is in the process of creating the criteria for cyber security engineering and should have it in place in 2019. We plan to apply for accreditation once the criteria has been approved.

9. Will articulation agreements be developed for the proposed program? With whom?

Yes, we are working with DACC as part of their pre-engineering pathway program to articulate two or three of the cyber security engineering courses. Once the degree is established and articulation is agreements are in place with DACC we will work other community colleges across the state.

10. Will there be opportunities for student internships?

Yes, companies current hire our computer engineering students for internships. Several companies hire interns in cyber security

11. Describe the faculty, facilities, and equipment that will be required for the proposed program.

The department of Electrical and Computer Engineering has 4 FTEs that teach the current graduate and undergrad courses in cyber security. As a result of this proposed degree the department will need to hire 2 additional faculty members in cyber security and one lab support person during the first few years.

The department has a dedicated facility to teach cyber security labs. The current equipment will not support the increase in the courses and the increase in course size. The department will need to expand the ISELab (Information Security Education Laboratory) by adding more equipment.

If the program reaches or exceeds the growth projected by Year 5, all currently available space will be utilized. Plans will need to be initiated to determine how to accommodate this program in the long term. Additional faculty and support staff would be needed to manage the growing student population as well.

12. From where will the financial resources for the proposed program come (list all that apply, e.g., department reallocation, college reallocation, grants, new to the university)?

SOURCES	TOTAL AMOUNT
Department reallocation	\$175,000
College reallocation	\$175,000

Note: The above numbers represent anticipated funding for the first 3 years of operations. After year 3, projections indicate the program will be self-supporting and additional reallocation of resources will not be required.

13. Estimate the total costs/total new costs (incremental increases in expenditures) that will be necessary for the next seven years as a result of the new program. Be as specific as possible.

	TOTAL COSTS	INCREMENTAL COSTS	INCREMENTAL NEEDS
Year 1	\$44,000	\$44,000	Adjunct faculty + TA
Year 2	\$248,000	\$204,000	Tenure track faculty salary + Lab coordinator
Year 3	\$616,000	\$368,000	Tenure track faculty + academic advisor + TA
Year 4	\$635,000	\$19,000	Lecturer + 2 TAs
Year 5	\$930,000	\$295,000	Tenure track faculty + Lecturer + 2 TAs
Year 6	\$1,174,000	\$244,000	Tenure track faculty + 2 TAs + administrative support staff
Year 7	\$1,556,000	\$382,000	2 Tenure track faculty + 2 TAs

14. Describe the marketing plan developed to communicate the new program and recruit students.

ISU and the Technology Association of Iowa have jointly run a state wide information technology outreach program for high schools and middle schools for the past 11 years. One of the hallmark part of the program is the cyber defense venue. We plan on use this state wide effort to help recruit students. We have also partnered with DMACC to create the Iowa Cyber Hub. The goal of the Iowa Cyber Hub is to create a regional facility where companies can work with Iowa State University and Des Moines Area Community College on cyber security issues with the goal of creating a larger cyber security workforce. The Iowa Cyber Hub will also facilitate closer interaction between ISU and DMACC with the goal of providing enhanced pathways for students wishing to enter the cyber workforce and to increase the number of students studying cyber security.

We will also work with ISU admissions to market the degree outside of Iowa. As far as we know this will be the only cyber security engineering degree in the Midwest.

15. Describe the program evaluation plan to determine if the program is meeting the intended

objectives, if the expected student enrollment has occurred, funding for the program, and any other components that affect the effective operation of the program.

The program will strive to become accredited through ABET. As part of the ABET process the program will need to assess student outcomes. The department has an assessment committee that will oversee the assessment of the cyber security degree. The department is also evaluated by the college based on enrollment and student performance.

16. Include any additional information that justifies the development of this program.

IOWA STATE UNIVERSITY
OF SCIENCE AND TECHNOLOGY

College of Engineering
Office of the Dean
4100 Marston Hall
533 Morrill Road
Ames, Iowa 50011-2103
515 294-5933

February 20, 2018

To Whom it May Concern:

The College of Engineering is supportive of the creation of a new undergraduate degree program in cybersecurity engineering. The Department of Electrical and Computer Engineering and the College of Engineering will share in the initial startup costs for the program. Longer term, resources will be made available based on enrollments in the program.

Sincerely,

A handwritten signature in cursive script, reading "Sarah A. Rajala", followed by a horizontal line.

Sarah A. Rajala
James L. and Katherine S. Melsa Dean of Engineering
Iowa State University



COLLEGE OF ENGINEERING

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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,

Alec Scranton
Dean of Engineering

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,



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

	CprE	CY E	Cpr E CR	Cy E CR	
Year 1					
General Chemistry	Chem 167.	Chem 167.	4	4	
First Year Composition I	Engl 150.	Engl 150.	3	3	
Engineering Orientation	Engr 101.	Engr 101.			
Introduction to Cpr E and Problem Solving	Cpr E 185.	Cpr E 185.	3	3	
Library Instruction	Lib 160.	Lib 160.	1	1	
Calculus I	Math 165.	Math 165.	4	4	
Object-Oriented Programming	Com S 227.	Com S 227.	4	4	
Professional Programs Orientation	Cpr E 166.	Cpr E 166.			
Gen Ed	Gen ED	Gen ED	3	3	
Calculus II	Math 166.	Math 166.	4	4	
Introduction to Classical Physics I	Phys 221.	Phys 221.	5	5	
	31	31			
Year 2					
Introduction to Digital Design	Cpr E 281.	Cpr E 281.	4	4	
Introduction to Data Structures	Com S 228.	Com S 228.	3	3	
Calculus III	Math 265.	Math Elec	4	3	
Introduction to Classical Physics II	Phys 222.		5		
Cyber Security Infrastructure		Cy E 230		3	Old
Legal, professional, and ethical issues in security		Cy E 234		3	NEW
Program discovery	CprE 294.	CprE 294.			
Differential Equations	Math 267.	Math 267.	4	4	
Embedded Systems	Cpr E 288.	Cpr E 288.	4	4	
Composition II	Engl 250.	Engl 250.	3	3	
Cyber Security Concepts and tools		Cy E 231		4	Old
Electric Circuits	E E 201.		4		
	31	31			
Year 3					
Theoretical Foundations of CprE	Cpr E 310.	Cpr E 310.	3	3	
Gen Ed	Gen ED	Gen ED	3	3	
Computer Organization and Design	Cpr E 381.	Cpr E 381.	4	4	
Circuits and Systems in Electronics intro to cyber security (old 431)	E E 230.		4		
		Cy E 331		3	Old
Software Development Practices	Com S 309.	Com S 309	3	3	
Program Exploration	CprE 394.	CprE 394.			
Operating Systems	Cpr E 308.	Cpr E 308.	4	4	
Design and Analysis of Algorithms	Com S 311.	Com S 311.	3	3	
Technical Communication	Engl 314.	Engl 314.	3	3	

Cy E courses are in red

Courses in blue are removed from Cpr E curriculum to make room for security courses

EE Elective	EE Elec		3		
Cyber Elective		CY Elec		3	NEW Security of IoT
Gen Ed	Gen ED	Gen ED	3	3	
	33	32			
Year 4					
Senior Design Project I	Cpr E 491.	Cpr E 491.	3	3	
Portfolio Assessment	CprE 494.	CprE 494.			
Cpr E Elective	Cpr E Elec	Cpr E Elec	3	3	
Cyber Elective	Tech Elec	CY Elec	3	3	NEW Forensics, IDS, SOC
Cyber Elective	Tech Elec	Cy Elec	3	3	NEW Web/App security
Probability and Statistics for CS	Stat 330:	Stat 330:	3	3	
Gen Ed	Gen ED	Gen ED	3	3	
Senior Design Project II	Cpr E 492.	Cpr E 492.	2	2	
Computing Elective	CS Elec	Comp Elec	3	3	Any Com S, Cpr E, S E course in list of approved
Computing Elective	Cpr E Elec	Comp Elec	3	3	technical elective from CS, ECE, SE
Cyber Elective	Tech Elec	Cy Elec	3	3	NEW wireless security
Gen Ed	Gen ED	Gen ED	3	3	
	32	32			
Totals			127	126	

Academic Program Approval Voting Record

This document is to be appended as the last page of the proposal for any new or revised academic program to record the successive votes of approval as the proposal moves through its required review and approval steps. Consult Faculty Handbook Section 10.8 or the Faculty Senate Curriculum Committee website for information regarding Committee review and voting requirements for each action.

Curricular Action: (check appropriate boxes below)

1. New Program Name Change Discontinuation Concurrent Degree for:
2. Undergraduate Major Graduate Major Undergraduate Minor Graduate Minor
 Undergraduate Certificate Graduate Certificate Other: _____
3. Name of Proposed Change: Cyber Security Engineering
4. Name of Contact Person: Doug Jacobson e-mail address: dougj@iastate.edu
5. Primary College: Engineering Secondary College: _____
6. Involved Department(s): Electrical and Computer Engineering _____

Voting record for this curricular action:

Voting Body	Votes			Date of Vote
	For	Against	Abstain	
Dept. or Program Committee	9	0	0	9/28/2017
ECpE Department faculty	24	4	2	11/3/2017
College Curriculum Committee	7	0	1	11/16/2017
College Approval Vote	122	10	3	12/15/2017
Graduate Council	N/A			
Faculty Senate Curriculum Committee	7	0	0	2/2/2018
Faculty Senate Academic Affairs Council	7			2/6/2018
Faculty Senate				

[FSCC – November 2013]