# UNIVERSITY of WYOMING

Academic Affairs

1000 E. University Avenue, Laramie, WY 82071

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Board of Trustees:

This letter serves as a Letter of Commitment for a new Academic Program, the Cybersecurity Certificate to be housed within the Computer Science Department (CS) of the College of Engineering and Applied Sciences (CEAS). The certificate program packages current offered courses within the CS department to enable higher visibility of an in-depend skill set – namely, Cybersecurity. The "Cybersecurity Education and Research Certificate" recognizes not only individual students, but UW as a leader in cybersecurity education in both the state, the region, and ultimately the nation. The certificate is a requirement to achieve NSA/DHS designation for the University of Wyoming as a Center of Academic Excellence in Cybersecurity. The NSA and DHS have specified a list of required "knowledge areas" to achieve the designation, the certificate maps current CS courses onto these knowledge areas to arrive at the requirements for the certificate.

## Needs

Wyoming is surrounded on three sides by states with Cybersecurity-related certificates and programs that have already achieved NSA/DHS Center of Academic Excellence Designation. The CS department already houses all of the minimum resources in place for designation except for providing students a transcript official recognition of their studies and work in the cybersecurity domain.

Based on current growth in CS, and current enrollment in cybersecurity courses, the anticipated certificate enrollment is 15-25 students per year. There are no special acceptance criteria to the certificate program. Any student meeting the pre-requisites to take the courses required are also eligible for the certificate.

## Requirements

The certificate, which will be housed within CS Department, reflects a commitment to cybersecurity foundations, ideas, and practices that are currently grounded within the computer science domain. The certificate itself can be completed in conjunction with any existing computer science degree option given the prior CS required courses (PRs) and with the replacement of 3 electives (REs).

Since the pre-requisites for these courses are not explicitly required for the certificate, this may allow non-traditional students or working professionals, who may be able to waive individual course pre-requisites, on a case-by-case basis, the opportunity to complete the certificate. Foundational courses, especially those dealing with programming,

databases, and networks, may be waived for professionals with prior work experience. This could allow the University of Wyoming to offer the certificate program online in the future.

The following courses (or equivalent industry experience) are required for the Cybersecurity Certificate (Course Numbers and Titles Subject To Change):

1. (PR) Computer Science II [CS 2030]
2. (PR) Statistics [STAT 2050 or higher] or Machine Learning [CS]
3. (PR/RE) Database Systems [CS 4820] or Data Mining / Cybersecurity and Data Science [CS 4000 Level]
4. (PR/RE) Networks [CS 4760 or ECE Equiv.] or another Cybersecurity Topics Course or Senior Capstone w/Networks [CS 4000 Level]
5. (RE) Computer Security [CS 4765]
6. (RE) Advanced Topics in Cybersecurity [CS 4000 Level]

## Resources

No additional special resources are currently needed, though as the program develops, additional resources (e.g. faculty, online courses, equipment) may be required to accommodate the increased student population. It is expected that any such additional resource needs would be sustained long-term through external funding. A byproduct of this certificate may be increase graduate-level enrollment, which may necessitate other tangential resources not directly related to the establishment of an undergraduate certificate.

## Four Year Budget

There are no direct costs associated with the establishment of this certificate program. The department currently has all of the resources needed to initiate and provide the certificate to students. However, based on the implementation plan, and ability to create courses online, positive revenue through an online version of the certificate is feasible by 2020. Cost structure and requirements, especially for working professionals, while flexible could range in the order of $20-30K per certificate (ultracompetitive with respect to nearby institutions). Moving the entire certificate online could require some minimal costs for instructional design – none of which would be certificate specific. The pro forma budget is attached.

## Timeline

The present adoption and implementation timeline aims to enable students graduating in Fall of 2018 to obtain the official Cybersecurity Certificate. The nature of the certificate inherently aligns with national, state, and university missions and workforce development missions, and is supported by the formation of the Cybersecurity Education And Research (CEDAR) Center which currently supports the educational and research objectives set forth by the NSA/DHS. This proposed cybersecurity certificate does not add any additional course, faculty, or space requirements, but rather promotes and recruits based on existing resources and strengths.

Best,


Kate C. Miller

Provost and Vice President, Academic Affairs

# UNIVERSITY OF WYOMIMG

## COLLEGE OF ENGINEERING AND APPLIED SCIENCE

CYBERSECURITY EDUCATION AND RESEARCH CENTER
COMPUTER SCIENCE DEPARTMENT

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# Cybersecurity Certificate
# Request for Authorization

Promoting and leveraging existing capabilities in computer science for student

and university success in Cybersecurity.

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*Date:* February 2018

# Contents

# 1 Executive Summary

As with many highly specialized and rapidly advancing fields, employers are heavily recruiting recent college graduates that have proven cybersecurity content knowledge from reputable academic institutions. The field of cybersecurity, while broad, is squarely situated within the computing domain. The Cybersecurity Education And Research Center (http://www.uwyo.edu/CEDAR), in alignment with requirements from the National Security Agency (NSA) and Department of Homeland Security (DHS), has developed a cybersecurity course sequence that enables undergraduate students to achieve high theory and skill competence in relevant cybersecurity concepts.

The "Cybersecurity Education And Research Certificate" recognizes not only individual students, but the university as a leader in cybersecurity education in both the state, the region, and ultimately the nation. The certificate is a requirement to achieve NSA/DHS designation for the University of Wyoming as a Center of Academic Excellence in Cybersecurity. The NSA and DHS have specified a list of required "knowledge areas" to achieve the designation. We have mapped our courses onto these knowledge areas to arrive at the requirements for the certificate.

# 2   Opportunity

Cybersecurity is a very popular area of study in computer science departments across the country. It is also an area of significant importance to the state of Wyoming and the Department of Computer Science and the College of Engineering and Applied Science have been a focus of efforts by the state to increase awareness of, and education in, cybersecurity issues.

Anecdotally, based on inquiries made to the department office, we can say with certainty that the Computer Science Department looses a number of students every year to surrounding states that have designated CAE programs. Wyoming is one of only five states in the nation[1] that does not have an institution designated as a CAE.

In order to achieve this designation, the University must recognize the students that have completed NSA/DHS aligned curriculum through an official transcripted process. This year alone, the University of Wyoming has over a dozen students who will have completed the requirements needed to obtain the certificate.

Given the strong demand for cybersecurity professionals and higher than average salary - by offering a unique, highly competitive certificate in cybersecurity the University of Wyoming positions itself to complete with institutions from across the country and the world.

Wyoming is surrounded, on three sides by states with Cybersecurity related certificates and programs, that have already achieved NSA/DHS Center of Academic Excellence Designation. **We currently have all of the minimum resources in place for designation except for providing our students a transcript official recognition of their studies and work in the cybersecurity domain.**

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[1] According to the website (https://www.iad.gov/NIETP/reports/current_cae_designated_institutions.cfm) Alaska, Montana, Nevada, North Dakota, and Wyoming are the only states without CAE-C designated institutions.

Based on current growth in computer science, and current enrollment in cybersecurity courses, the anticipated certificate enrollment is 15-25 students per year. There is no special acceptance criteria to the certificate program. Any student meeting the pre-requisites to take the courses required are also eligible for the certificate.

## 2.1 Peer Institutions

The following is a list of near-by peer institutions that already offer Cybersecurity related programs and have already been designated as Centers of Academic Excellence.

**Colorado** 7 Institutions

1. Colorado School of Mines, Center for Cybersecurity and Privacy
2. Colorado State University, Pueblo, National Information Assurance Education and Training Program
3. Colorado Technical University
4. United States Air Force Academy
5. University of Colorado, Colorado Springs, CEAS
6. University of Denver, Daniel Felix Ritchie School of Engineering and Computer Science
7. Regis University, School of CIS

**South Dakota** 1 Institution

1. Dakota State University

**Idaho** 2 Institutions

1. Idaho State University, Information Assurance Program
2. University of Idaho, Center for Secure and Dependable Systems

**Nebraska** 2 Institutions

1. Bellevue University, Center for Cybersecurity Education
2. University of Nebraska, Omaha, Center for Information Assurance

# 3 Certificate Overview

The certificate, housed within the Computer Science Department, reflects a commitment to cybersecurity foundations, ideas, and practices that are currently grounded within the computer science domain. The certificate itself can be completed in conjunction with any existing computer science degree option given the prior CS required courses (PRs) and with the replacement of 3 electives (REs). Note that currently students in the CS program have the option of selecting Databases or Networks, while the Certificate requires both.

Since the pre-requisites for these courses are not explicitly required for the certificate, this may allow non-traditional students or working professionals, who may be able to waive individual course pre-requisites, on a case-by-case basis, the opportunity to complete the certificate. Foundational courses, especially those dealing with programming, databases, and networks, may be waived for professionals with prior work experience. This could allow us to offer the certificate program online in the future. In case by case instances, certain course requirements may be waived in lieu of the completion of senior capstone project that incorporates material normally covered within the course(s) being substituted.

## 3.1 Curriculum / Program of Study

The following courses (or equivalent industry experience) are required for the Undergraduate Cybersecurity Education And Research Certificate (Course Numbers and Titles Subject To Change):

1. (PR) Computer Science II [CS 2030]
2. (PR) Statistics [STAT 2050 or higher] or Machine Learning [CS]
3. (PR/RE) Database Systems [CS 4820] or Data Mining / Cybersecurity and Data Science [CS 4000 Level]

4. (PR/RE) Networks [CS 4760 or ECE Equiv.] or another Cybersecurity Topics Course or Senior Capstone w/Networks [CS 4000 Level]

5. (RE) Computer Security [CS 4765]

6. (RE) Advanced Topics in Cybersecurity [CS 4000 Level]

# 4   Resources

No additional special resources are currently needed. As the program develops, additional resources (e.g. faculty, online courses, equipment etc) may be required to accommodate the increased student population. It is expected that any such additional resource needs would be sustained long-term through external funding. A byproduct of this certificate may be increase graduate-level enrollment, which may necessitate other tangential resources not directly related to the establishment of an undergraduate certificate.

The administration of the certificate is the responsibility of the Cybersecurity Education And Research Center and the Computer Science Department. The primary point of contact will be the Director of the Cybersecurity Education And Research Center (Dr. Mike Borowczak as of January 2017; Mike.Borowczk@uwyo.edu) or another Computer Science designee.

# 5 Implementation Details, Costs, and Timeline

- Currently there are no fees associated with this certificate when taken in conjunction with an undergraduate degree at the University of Wyoming.
- Academic Credits are required for the certificate, and as such, the certificate should appear on final transcripts.
- With courses already in place, the anticipated implementation of the certificate is expected for the Spring 2018 graduates.

The CS department currently has all of the resources needed to execute and provide the certificate to students. However, based on the implementation plan, and ability to create courses online, positive revenue through an online version of the certificate is feasible by 2020. Cost structure and requirements, especially for working professionals, while flexible could range in the order of $20-30K per certificate (ultra-competitive with respect to nearby institutions). Moving the entire certificate online could require some minimal costs for instructional design – none of which would be certificate specific.

The present adoption and implementation timeline aims to enable students graduating in Fall of 2018 to obtain the official Cybersecurity Certificate. The nature of the certificate inherently aligns with national, state, and university missions and workforce development missions, and is supported by the formation of the Cybersecurity Education And Research (CEDAR) Center which currently supports the educational and research objectives set forth by the NSA/DHS. This proposed cybersecurity certificate does not add any additional course, faculty, or space requirements, but rather promotes and recruits based on existing resources and strengths.

# 6 Summary

This proposal is requesting that a set of six classes be offered as a "Cybersecurity Certificate." The classes required are already taught by UWYO faculty and require no additional resources. The establishment of the certificate enables the University of Wyoming to become an NSA/DHS Designated Center of Academic Excellence in Cyber-Defense. The designation would enable the University of Wyoming to complete with surrounding institutions for student enrollment, the application of grants, and development of cutting edge research and collaboration.

# 7 Contributors

This proposal has been prepared with the following contributors.

**Leadership -**

Dean Michael Pishko

Dean of the College of Engineering And Applied Science

**Authors -**

Dr. Mike Borowczak

*Director, Cybersecurity Education And Research Center (CEDAR)*

Dr. James Caldwell

*Department Head, Computer Science Department*

| | FY 2018 | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|---|
| **Enrollment and Pricing Assumptions** | | | | |
| New headcount enrollment | | | | |
| Resident | 0 | 5 | 10 | 15 |
| Nonresident | 0 | 2 | 4 | 6 |
| Total | 0 | 7 | 14 | 21 |
| Per Credit Tuition* | | | | |
| Resident | 134 | 139.36 | 144.9344 | 150.731776 |
| Nonresident | 537 | 558.48 | 580.8192 | 604.051968 |
| Fees | | | | |
| Program | 0 | 0 | 0 | 0 |
| Advising | 6 | 6 | 6 | 6 |
| Mandatory | 690 | 690 | 690 | 690 |
| Total credit hours generated** | 0 | 30 | 60 | 90 |
| | | | | |
| **New Revenue Assumptions** | | | | |
| Total Tuition | 0 | 54412.8 | 236101.248 | 544291.9603 |
| Total Program Fees | 0 | 0 | 0 | 0 |
| Total Advising Fees | 0 | 42 | 84 | 126 |
| Total Mandatory Fees | 0 | 4830 | 9660 | 14490 |
| | | | | |
| **New Expense Assumptions** | | | | |
| Compensation and benefits | | | | |
| Faculty | | | | |
| Other instructional staff | 0 | 0 | 0 | 0 |
| GAs | | | | |
| Staff | | | | |
| Support | 0 | 0 | 0 | 0 |
| Programming | 0 | 0 | 0 | 0 |
| Marketing | 5000 | 2500 | 2500 | 2500 |
| New course development | 0 | 0 | 0 | 0 |

| | | | | |
|---|---|---|---|---|
| Other (specify) | 0 | 0 | 0 | 0 | 0 |

| **Projected Results** | | | | |
|---|---|---|---|---|
| Total Expenses | 5000 | 2500 | 2500 | 2500 |
| Total New Revenues | 0 | 59284.8 | 245845.248 | 558907.9603 |
| Total surplus or deficit | -5000 | 56784.8 | 243345.248 | 556407.9603 |
| Operating margin (surplus or deficit / revenues) | 0 | 0.957830675 | 0.989831 | 0.995526992 |
| Capital expense | 0 | 0 | 0 | 0 |
| Net cash flow generated | 0 | 59284.8 | 245845.248 | 558907.9603 |

* UW's Board of Trustees' current working policy is to raise tuition by 4% each year