The University Senate of Michigan Technological University
Proposal 7-24

Proposal for a Graduate Certificate in Foundations of Cybersecurity

Basic Program Information

Primary Contact: Jean Mayo, jmayo@mtu.edu, Department of Computer Science
Program/Degree type: Graduate Certificate
Program Title: Foundations of Cybersecurity
Planned Implementation Date: Fall 2024
Program location/modality: Online; in-person
Target student population: Working professionals; MTU graduate students wanting to earn an extra credential in cybersecurity

General description and characteristics of program

We are proposing a three course, 9-credit graduate certificate in cybersecurity. The certificate is aimed primarily at online participants but will also be available in-person.

The certificate can be completed online in two semesters when a student can take two courses in a single semester. The certificate can be completed in one year when only one course can be taken in a semester. Initially, the online and in-person deliveries will be concurrent during the Fall and Spring semesters, and online only during the Summer semester. After a start-up cost for course development, the ongoing cost to deliver the program will be low. The number of courses offered and the offerings per year will be expanded as indicated by enrollment.

Rationale

There is strong and growing demand in the labor market for cybersecurity expertise. Completions of distance programs (at all levels) in Computer and Information Systems Security/Auditing/Information Assurance grew almost 200% between 2012 and 2021. Yet post-baccalaureate certificates account for only 2% of this market. This certificate will allow MTU to participate in the online market. From conception, the program has been designed with a low start-up cost and sustainable maintenance costs in mind. Increases in maintenance cost are only expected to be driven and financed by enrollment growth.

Related programs: within MTU and at other institutions

MTU offers the MS in Cybersecurity, which is not available online. There are many other in-person and online MS degree programs in Cybersecurity nationally, as there are many other online graduate certificates. Creation of this certificate will fill an immediate need for our (current and future) students and is expected to serve as the first step to a fully online degree in Cybersecurity (or similar program). Students are required to have the prerequisite knowledge for the three certificate courses. Commonly this is students with a BS in Computer Science, a BS in Computer Engineering, a BS in Software Engineering, or a minor in Computer Science.

Projected Enrollment

It is difficult to project enrollment. The certificate has been structured with a low start-up cost and with ongoing instructional costs covered by enrollment.

During the Fall and Spring semesters, online sections will coincide with the in-person offerings of the certificate courses. For example, CS 5471 is offered regularly (only) during the Fall semester. An online section of CS 5471 will also be offered during the Fall semester. Delivery of the online section will be asynchronous. During the Summer semester, courses will be entirely online. Approximately 30 online students can be enrolled in the certificate program without additional teaching resources, which are not being requested at this time. This enrollment represents an additional enrollment of approximately 10 online students (in addition to our standard in-person enrollment) per certificate course, for a total of 30 in the 3-course program. When the additional load on an in-person class exceeds 10, additional teaching resources will likely be required. The chair of Computer Science and dean of the College of Computing have committed to meet these needs as they arise.

Specialized Accreditation Requirements

There is no discipline-specific accreditation.

Professional Licensure Requirements

No licensure is required.

Curriculum Details

Three courses are required:

CS 5471 Computer Security
CS 4723 Network Security
CS 5740 Trusted Software Development

Learning Goals

(1) Identify and describe the foundational principles of securing a computer system and securing a computer network.
(2) Identify and describe the foundational principles of secure software development and apply them effectively

Assessment Plan

The assessment plan is included as Appendix A.

Curriculum Design

The courses have been offered for many years in-person. None of the three courses have been offered online. The schedule for development and review of the online materials is given below.

Course	Development	Review	First Offering
CS 4723	Summer 2024	Summer 2024	Fall 2024
CS 5471	Summer 2024	Fall 2024	Spring 2025
CS 5740	Summer 2024	Fall 2024	Spring 2025

New Course Descriptions

No new courses are required.

Model Schedule

The schedule below shows all online offerings of the required three certificate courses. Where noted, courses are also available in-person. All courses will initially be offered in a standard semester length. The department anticipates offering one of CS 4723 or CS 5740 during the summer. This will be determined by the availability of graduate students or faculty, as well as student interest.

Certificate Course Offerings		
Fall	Spring	Summer
CS 5471 (+in-person)	CS 4723 (+in-person) CS 5740 (+in-person)	CS 5471 CS 4723 OR CS 5740

CS 5471 is a prerequisite for CS 5740. CS 4723 can be taken concurrently or sequentially with the other two courses.

Below are schedules for Fall, Summer, and Spring starts. These schedules focus on online students. Schedules for each start are shown for students that have as a goal the shortest possible completion and students that have as a goal only one course per semester.

1. **Fall Start**. Below is the shortest possible completion with a Fall start.

Fall Start: Shortest timeline	
Fall	Spring
CS 5471	CS 4723 CS 5740

Below are schedules that allow completion with only one course per semester. Note that these schedules require one of CS 4723 or CS 5740 to be offered in summer.

Fall Start: One course per semester		
Fall	Spring	Summer
CS 5471	CS 4723	CS 5740
CS 5471	CS 5740	CS 4723

2. **Spring Start**. Shown below is the shortest possible completion time with a Spring start. Note that additional Summer offerings will not reduce this timeline because CS 5740 must follow CS 5471. Note that this schedule also meets the goal of one course per semester.

Spring Start: Shortest timeline			
Spring	Summer	Fall	Spring
CS 4723	CS 5471	CS 5471 (*If not in Summer*)	CS 5740

3. **Summer start**. Below is the shortest possible timeline with a Summer start. Note that the second schedule requires CS 4723 in Summer and requires only one course per semester.

Summer Start: Shortest timeline

Summer	Fall	Spring
CS 5471		CS 4723 CS 5740
CS 4723	CS 5471	CS 5740

Faculty Qualifications

Faculty teaching in the certificate courses have been teaching these same courses in-person for many years.

Bo Chen https://www.mtu.edu/cs/department/people/faculty/chen/
Xinyu Lei https://www.mtu.edu/cs/department/people/faculty/lei/
Jean Mayo https://www.mtu.edu/cs/department/people/faculty/mayo/

Dr. Chen and Dr. Mayo have been recognized as meeting Michigan Tech's qualification standards for online/remote instruction. Dr. Lei will complete the required training prior to offering an online section.

Program-specific policies, regulations, and rules

There are no program-specific policies or rules.

Resources Needed

Library and other learning resources needed

No special resources are needed.

Suitability of existing space, facilities, and equipment

Existing space, facilities and equipment are sufficient.

Program Costs

The College of Computing is compensating faculty to develop the online courses. No additional resources are needed currently. During the Fall and Spring semester, faculty will offer the courses along with their in-person offerings with no additional compensation, until online enrollment exceeds around 10 students per course, which is an arrangement that has been agreed to by the faculty listed above, chair of the Department of Computer Science, and dean of the College of Computing. Summer offerings will be compensated by enrollment. Marketing of the program will be through the existing College of Computing marketing investments and infrastructure.

These courses will be on a standard 14 week semester. The courses have been offered for many years in-person. None of the courses have been offered online.