

The University Senate of Michigan Technological University

Proposal 10-18

(Voting Units: Academic)

Proposal for an Undergraduate Minor in Cybersecurity

1. Date

December 20, 2017

2. Proposer Contact Information

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3. Introduction

The proposed minor in cybersecurity is a joint effort of the School of Technology, the Department of Computer Science (CS) and the Department of Electrical and Computer Engineering (ECE). The minor will be hosted in the Computer Network and System Administration (CNSA) program in the School of Technology. The minor offers Michigan Tech students the opportunity to deepen their understanding of cybersecurity concepts and principles, learn offensive and defensive cybersecurity techniques, and develop professional skills to apply cybersecurity knowledge to the general area of their majors.

4. Rationale

Cyberattacks are becoming more common, sophisticated and damaging. People with cybersecurity skills are in great demand as the threat environment increasingly becomes more complex and challenging. The need to have a well-trained and well-prepared cybersecurity workforce is a pressing issue.

Recent cyber breaches indicate that cybersecurity is not just an IT issue, and likely won't be solved by cybersecurity people alone. In many cyberattacks, the initial targets are usually people with little or no cybersecurity knowledge who were used by hackers as stepping stones to high-value assets and data in corporate networks.

Therefore, there are strong needs to allow Michigan Tech students from all disciplines to learn cybersecurity, or at least be exposed to cybersecurity topics at the preparation stage of their professional careers. Simple and basic cybersecurity training such as anti-virus and anti-phishing do help, but are not sufficient in today's fast-changing environment. Students need a systematic way to learn what cybersecurity is, what the common threats are, how to design and develop secure systems, and how to protect sensitive information in workplaces.

One of the main challenges when designing a cybersecurity minor is the long prerequisite chains of the existing security courses in the CNSA, CS, and ECE programs. To open up the minor and streamline the course sequences, the prerequisites of six CNSA courses (SAT2711, SAT3210, SAT3310, SAT3812, SAT3820, and SAT4816) will be revised in 2018-2019 to allow non-CNSA students to take these courses. Table 1 lists the proposed changes to these CNSA courses.

Table 1 – Proposed Changes to Selected CNSA Courses

Course	Credit	Title	Term	Old Prerequisites and Restrictions	Proposed changes on Prerequisites and Restrictions
SAT2711	4	Linux Administration I	Fall, Summer	SAT1610	(SAT1200 or CS1111(C) or CS1121 or CS1131 or CS1142 or MIS2100)
SAT3210	3	Database Management	Fall, Summer	SAT2711	(SAT1200 or CS1111 or CS1121 or CS1131 or CS1142 or MIS2100) Restrictions: Must be enrolled in one of the following Class(es): Junior, Senior
SAT3310	3	Scripting for Administration and Automation	Spring, Summer	SAT2711	(SAT1200 or CS1111 or CS1121 or CS1131 or CS1142 or MIS2100) Restrictions: Must be enrolled in one of the following Class(es): Sophomore, Junior, Senior
SAT3812	3	Cybersecurity I	Fall, Summer	SAT2711	(SAT1200 or CS1111 or CS1121 or CS1131 or CS1142 or MIS2100) Restrictions: Must be enrolled in one of the following Class(es): Junior, Senior
SAT3820	4	Wireless System Administration	Spring, Summer	SAT2711	(SAT1200 or CS1111 or CS1121 or CS1131 or CS1142 or MIS2100) Restrictions: Must be enrolled in one of the following Class(es): Junior, Senior
SAT4816	3	Digital Forensics	Fall	SAT2511 and SAT2711	SAT3812

The minor is structured such that it is accessible to a broad range of majors at Michigan Tech including but not limited to Computer Network and System Administration, Computer Science, Computer Engineering, Management Information Systems, Electrical Engineering, and Mechanical Engineering.

There is a master's program in cybersecurity on campus as a joint effort of the Department of Computer Science, the Department of Electrical and Computer Engineering and the School of Technology. However, there is currently no undergraduate major or minor in cybersecurity. The proposed minor will strengthen Michigan Tech's educational efforts in this critical area.

5. Details

I. Title of Minor

Cybersecurity

II. Catalog Description

The minor in cybersecurity will provide students the opportunity to learn principles and practices of cybersecurity. The minor is designed for students from majors including but not limited to Computer Network and System Administration, Computer Science, Computer Engineering, Management Information Systems, Electrical Engineering, and Mechanical Engineering.

Upon the successful completion of a minor in Cybersecurity, students will be able to:

- a) understand various concepts, principles, and best practices in cybersecurity
- b) utilize various cybersecurity tools, technologies, and mechanisms
- c) develop technical skills to design and develop secure IT systems
- d) apply cybersecurity principles and technologies to the general area of their majors
- e) contribute to their communities and workplaces through application of their knowledge in cybersecurity.

III. List of Courses

The cybersecurity minor requires a total of at least 18 credits, including 12 credits of required courses and 6 credits of electives.

Four courses are required as shown in Table 2. All students are required to take the following three courses: (CS1111 or CS1142 or MIS2100), MA3203, and SAT3812. Students can select one more required course from the following courses: SAT4812, CS4471, or EE4723.

Students can select at least two elective courses from the list shown in Table 3.

All courses are taught at Michigan Technological University on a regular basis.

Table 2 - Required Courses (12 credits)

Course	Credit	Title	Term	Prerequisites and Restrictions
CS1111 or CS1142 or MIS2100	3	Introduction to Programming in C/C++ or Programming at the Hardware Software Interface or Introduction to Business Programming	Fall or Fall, Spring, Summer Spring	No Prerequisites. See note 1 on restrictions. or (CS1122 or CS1131) No prerequisites
MA3203	3	Introduction to Cryptography	Spring, Summer	MA2320 or MA2321 or MA2330
SAT3812	3	Cybersecurity I	Fall, Summer	(SAT1200 or CS1111 or CS1121 or CS1131 or CS1142 or MIS2100) Restrictions: Must be enrolled in one of the following Class(es): Junior, Senior
Select one course from the list below				
SAT4812	3	Cybersecurity II	Spring	SAT3812
CS4471	3	Computer Security	Fall	CS3411 or CS4411

				Restrictions: May not be enrolled in one of the following Level(s): Graduate
EE4723	3	Network Security	Spring	EE4272 or CS4461

Note 1: Restrictions: Must be enrolled in one of the following Major(s): Computer Network & System Admn, Electrical Engineering, Audio Production & Technology; Must be enrolled in one of the following Class(es): Freshman, Sophomore

Table 3 - Elective Courses (6 credits)

Course	Credits	Title	Term	Prerequisites and Restrictions
CS3712	3	Software Quality Assurance	Spring	CS3141
CS4411	3	Operating Systems	Spring	CS3331 and CS3421
CS4431	3	Computer Architecture	Fall, Spring	CS3421
CS4471	3	Computer Security	Fall	CS3411 or CS4411 Restrictions: May not be enrolled in one of the following Level(s): Graduate
CS4710	3	Model-Driven Software Development	Spring	CS3311 and CS3141(C)
EE 4173	3	Computer System Engineering and Performance	Fall, Spring	CS 3421 and EE 3173 Restrictions: Must be enrolled in one of the following Major(s): Computer Engineering
EE 5365	3	In-Vehicle Communication Networks	Spring, Summer	EE 3250
EE4723	3	Network Security	Spring	EE4272 or CS4461
SAT2711	4	Linux Administration I	Fall, Summer	(SAT1200 or CS1111(C) or CS1121 or CS1131 or CS1142 or MIS2100)
SAT3310	4	Scripting for Administration and Automation	Spring, Summer	(SAT1200 or CS1111 or CS1121 or CS1131 or CS1142 or MIS2100) Restrictions: Must be enrolled in one of the following Class(es): Sophomore, Junior, Senior
SAT3820	4	Wireless System Administration	Spring, Summer	(SAT1200 or CS1111 or CS1121 or CS1131 or CS1142 or MIS2100) Restrictions: Must be enrolled in one of the following Class(es): Junior, Senior
SAT4816	3	Digital Forensics	Fall	SAT3812
CS3425 or MIS3100 or SAT3210	3	Introduction to Database Systems or Business Database Management or Database Management	(Fall, Spring) (Fall, Spring) (Fall, Summer)	((CS 2311 or MA 3210) and CS 2321) or (MIS2000(C)) or ((SAT1200 or CS1111 or CS1121 or CS1131 or CS1142 or MIS2100) Restrictions: Must be enrolled in one of the following Class(es): Junior, Senior)
CS4461 or EE4272	3	Computer Networks	Fall, Spring	CS3411
MIS 4200	3	Management of Cyber Security	Spring	MIS2000 or CS1111 or CS1121

IV. Prerequisites not listed in the Minor

Required courses:

CS1142 (CS1122 or CS1131)
SAT3812 (SAT1200 or CS1111 or CS1121 or CS1131 or CS1142 or MIS2100)
MA3203 (MA2320 or MA2321 or MA2330)
CS4471 (CS3411 or CS4411)
EE4723 (E4272 or CS4461)

Elective courses:

SAT2711 (SAT1200 or CS1111(C) or CS1121 or CS1131 or CS1142 or MIS2100)
SAT3210, SAT3310, SAT3820 (SAT1200 or CS1111 or CS1121 or CS1131 or CS1142 or MIS2100)
MIS3100 (MIS2000(C))
CS3425 ((CS 2311 or MA 3210) and CS 2321)
CS3712 (CS3141)
EE4272 or CS4461 (CS3411)
CS4411 (CS3331 and CS3421)
CS4431 (CS3421)
CS4710 (CS3311 and CS3141(C))
EE4173 (CS 3421 and EE 3173)
EE5365 EE 3250
EE4495 (CS 3411 and EE 4173)

6. New Course Descriptions

No new courses associated with a minor in Cybersecurity are proposed.

7. Estimated Costs

No additional costs will be associated with this minor at this time. No additional library resources will be required either. All required and elective courses are currently being taught on a regular basis, and there is existing capacity for additional enrollment of 10-15 students per year in terms of classroom seats, laboratory space, and available equipment.

If the minor proves to be popular and exceeds the enrollment cap, the School of Technology has resources to offer additional lab sections and summer sections for SAT courses.

8. Planned Implementation Date

This minor will be offered Fall 2018.

9. Appendix

The flowcharts of Computer Network and System Administration, Computer Science (BS in Computer Systems), Computer Engineering, and the Cybersecurity minor are included as an Appendix.