

CS 560 Cybersecurity Capstone Thesis – Sample Syllabus

Catalog Course Description

The capstone thesis is designed to be inclusive of any possible expression of research and scholarly output in cybersecurity, ranging from the practical development of systems and software related to cybersecurity to the theoretical analysis or interpretive contribution to a research topic. In all cases, the capstone thesis should demonstrate the student's summative expression of what the student has learned in the MS program and should be evidenced in the form of a significant, thesis document. The thesis is evaluated by faculty and it is expected to be in level and depth comparable to a peer-reviewed publication. The course should be taken on the last semester of the student's program. The purpose of the semester-long capstone thesis is to provide students the opportunity to work with a faculty or industry mentor on a cybersecurity research topic. Students are expected to demonstrate their mastery by generating serious, in-depth, scholarly and professional level output. Prerequisites: CYBR 521, CYBR 532 or CYBR 556, CYBR 534, CYBR 535 or permission of the instructor.

Overview

This course is the culmination of theory, principles, best industry practices, methodologies, tools, and technologies associated with cybersecurity. Students are expected to use scholarly research methods and leverage their analytic, problem-solving, and research skills to study and address significant scholarly issues in the discipline. Students are expected to solve relevant problems and conflicts, analyze and synthesize "what if" scenarios predict and draw conclusions, evaluate and make recommendations. The capstone thesis requires concise exposition, and informed scholarly research utilizing skills developed throughout the program. Students will receive guidance and support along with graded evaluation and feedback from their faculty advisor throughout the semester. The final thesis and oral presentation (defense) is evaluated by a faculty committee. The capstone thesis also sets the stage for further scholarly work at a doctoral level.

Capstone Thesis Student Learning Objectives

A student working on a capstone thesis is expected to complete a significant scholarly study on a cybersecurity topic. By the end of their capstone thesis, students will be able to:

1. Work with a concrete and well defined problem within the subject area
2. Recognize, explain, and juxtapose academic arguments within the context of their own research
3. Apply acquired knowledge as well as gathering new insights
4. Evaluate competing positions in academic debates in cybersecurity and use evidence-based arguments to develop and defend their own position
5. independently plan and solve a problem of the research, development or possibly investigation type
6. Clearly articulate their research work in a well-written and orally presented project

Grading

Thesis Prospectus: 5%, Proposal:35%, Thesis: 40%, Oral Defense¹: 15%, Weekly Reports: 5%

The lowest passing grade in this course is "B." All course requirements must be submitted on or before the last day of the session. An Incomplete ("I") grade is only submitted in extreme circumstances. Please refer to the Graduate Catalog for the policy on Incompletes. Students who do not pass the course may repeat it once with a different topic.

Advisor and Faculty Committee Roles & Responsibilities

A student's Capstone Thesis is under the direct supervision of a faculty advisor. The responsibilities of the thesis advisor besides grading all the generated work products are:

- Provide a learning environment for the graduate student that is intellectually stimulating and supportive.

¹ Failure to pass the Oral Defense will result to a non-passing grade for the entire course.

- Consistently enforce standards of rigor and academic conduct that model the best practices in research and scholarship in their discipline for the graduate student.
- Meet one-on-one with the student on a regular basis. The advisor should provide timely feedback on the student's work to facilitate ongoing progress on the thesis.
- Help the graduate student to select faculty examiners.
- Be knowledgeable of the program requirements and deadlines as well as those of the Graduate School and advise the student throughout the process.

Each Capstone Thesis must include a minimum of two additional faculty, serving as committee members. At least one of the faculty must be from the Department of Computer Science & Information Technology. Faculty outside of the department may be selected by the candidate as long as their academic or professional background is relevant to the topic. The selection of faculty committee members must be approved by the faculty advisor. The responsibilities of the faculty committee members are:

- Provide subject matter expertise as requested by the advisor or student
- Reading drafts, as requested, and providing meaningful feedback
- Guiding the candidate, as requested, in the selection of methods, procedures and data analysis
- Evaluate the candidate's Thesis and Oral Defense

The Process

The Prospectus. At the beginning of the semester (or earlier), the student must produce a written description of their proposed project—a prospectus, a project outline—in order for the advisor to determine the viability of the project and to ascertain how the advisor can best serve the student. The prospectus contains a description of the thesis topic, an outline, the scope of expected activities and includes the list of proposed faculty members that will serve as the student's oral defense committee. The student must provide sufficient detail in their description to ensure that the topic is sound and appropriate for a thesis. The faculty advisor evaluates the pre-proposal to ensure that the proposed scope of work is also manageable (possible to complete) and adequate (has appropriate breadth and depth). Specific guidelines are provided by the advisor. **It is the student's responsibility to contact prospective Capstone faculty advisors with at least two possible project ideas (one paragraph description is sufficient). Students are strongly advised to do so the semester before the Capstone.**

The Project Proposal. The proposal is a substantial work product that is completed toward the final thesis. In the proposal, students should have completed much of the background research, framed their introduction around the thesis statement or project objective, written much of the literature review, described the method (if primary research will be conducted), experimentation, development plans and provide a timeline toward completing the remainder of the thesis. Specific guidelines are provided by the advisor.

The Thesis. The thesis is the work product that demonstrates in a single, cohesive academic document the student's project. The thesis must be written on an interesting and well defined problem within the subject area of cybersecurity that expands the student's knowledge and contains a thorough analysis of the work and its result. Specific structure and formatting guidelines are provided by the advisor and they must meet institutional guidelines for theses.

The Oral Defense. The thesis is the work product that demonstrates in a single, cohesive academic document the student's project. The thesis must be written on an interesting and well defined problem within the subject area of cybersecurity that expands the student's knowledge and contains a thorough analysis of the work and its result.

Students deliver an oral presentation of their findings upon completion of the course using PowerPoint slides. PowerPoint slides (6 slides per page) are to be included in the written report. Specific guidelines are provided by the advisor.

Activities and Deliverables Schedule

	STUDENT DELIVERABLES	DUE DATE Submissions are due by Sunday 23:59 of the stated week	SOURCES, INFORMATION
1	Prospectus	Week 01	
2	Project proposal	Draft version: Week 03 Final version: Week 06	Project Proposal
3	Capstone thesis	Draft version: Week 09 Final version: Week 13	
4	Oral presentation/Defense	Week 15	Final Presentation All final, supporting material must be submitted.
5	Weekly Status Update	Every week	Weekly Status Update

Thesis Evaluation Rubric

THESIS EVALUATION RUBRIC	
THESIS/REPORT	
<p>Introduction</p> <ol style="list-style-type: none"> 1. Is the project topic and context adequately described? 2. Is the project motivation adequately described and justified? 3. Is the research area of the project properly defined? 4. Is the problem clearly defined? 5. Are the research objectives appropriate for the problem? 6. Are the expected outcomes aligned with the research objectives and the problem? 7. Is the research methodology sound? 8. Is there scholarly evidence that justifies this project? 	15%
<p>Background/Literature Review</p> <ol style="list-style-type: none"> 1. Was the relevant research reviewed? 2. Was both seminal and current research identified? 3. Was the relevant research current? 4. Where the sources credible? 5. Did the review contribute (supported, informed) the project? 	15%
<p>Project Description/Methods/Experimentation</p> <ol style="list-style-type: none"> 1. Does the work provide an adequate description of the methods? 2. Does the work provide an adequate description of the tools and experimentation? 3. Are the methods and experimentation sound, following best practices? 4. Does the work/solution adequately address each research objective? 	15%
<p>Results, Discussion</p> <ol style="list-style-type: none"> 1. Does the paper provide an adequate description of the methods and experimentation? 2. Does the work provide an objective view of the advantages and disadvantages of the selected experimentation and methodology? 3. Does the work provide an objective assessment of the results? 4. Are the results appropriately and adequately presented as measures of success and failure of the problem solution? 	15%
<p>Conclusions and Future Work</p> <ol style="list-style-type: none"> 1. Is there an appropriate and objective overview of the work including the results from the project? 2. Are the conclusions reasonable and supported by the previous sections? 3. Are there clear statements of overall evaluation of the project's success? Are there adequate recommendations and future work that address this project's limitations? 4. Are there adequate recommendations and future work based on the overall study of the problem? 5. Are there insightful, adequately described and actionable recommendations for future work? 	15%
Oral Presentation	
<p>Presentation</p> <ol style="list-style-type: none"> 1. Was the project work presented clearly and succinctly? 2. Did the presentation clarify the rationale for the project and work? 3. Did the presentation demonstrate an appropriate level of coverage (breadth) of the topic? 4. Did the presentation demonstrate an appropriate level of complexity (depth) of the topic? 	20%
Project Management & Communication	
<p>Reports & Deliverables</p> <ol style="list-style-type: none"> 1. Weekly reports were submitted on time. 2. Weekly reports were meaningful and informative. 3. Project deliverables were on time. 4. Project final deliverables were complete. 	5%

Weekly Status Update

The Weekly Status Update is a weekly progress report. The report must be maintained and provided as a single, weekly updated document that contains all weekly status reports (the latest week at the top) and contain enumerated full sentences (or paragraphs) structured as follows:

EXAMPLE

Spring 20xx Project: Title
Capstone Thesis Weekly Status Updates
Name (email
URL [if student maintains a thesis website, blog or repository]

WEEK 2 (FEB 1 - FEB 7)

Weekly Accomplishments

- 1) ...
- 2) ...
- 3) ...

Problems/Issues

- 1) ...
- 2) ...
- 3) ...

Next week's planned work

- 1) ...
- 2) ...
- 3) ...

WEEK 1 (JAN 24- JAN 31)

Weekly Accomplishments

- 4) ...
- 5) ...
- 6) ...

Problems/Issues

- 4) ...
- 5) ...
- 6) ...

Next week's planned work

- 4) ...
- 5) ...
- 6) ...