

Hood College

Capstone Guidelines for the M.S. in Cybersecurity

INTRODUCTION

This document is prepared to guide the student in completing their Cybersecurity Capstone. The scope and expected rigor of work for a Capstone project is equivalent to a publishable paper in the field of expertise. Hood does not require publication of the data, but it sets publication as the quality standard. It is the responsibility of the capstone coordinator, capstone advisor, the capstone reading committee and the student to plan the project with suitable goals, perform and document the work and prepare to orally defend the written document. It is required that the nature, type and scope of the Capstone is approved by the capstone coordinator before the student embarks on the work. It is the responsibility of the student to adhere to Hood College deadlines for defense of the Capstone and submission of the final approved document.

This document contains guidelines for students and Capstone advisers in preparing the written Capstone in the Cybersecurity Program. These guidelines include Capstone proposal requirements, and stylistic information for the writing and organization of the Capstone. This document is also available on the web at www.hood.edu.

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ADMINISTRATIVE PROCEDURES

General Information

A Capstone is required in the Cybersecurity degree program. To begin working on a Capstone, students must register for CYBR 560 Cybersecurity Capstone. The M.S. in Cybersecurity requires the completion of 30 credits including the 3.0-credit Capstone that is completed towards the end of the student's program of study. There is no option for students to complete the MS in Cybersecurity without completing a Cybersecurity Capstone project.

The Capstone is an individual endeavor, students are not permitted to work in teams. Students may begin work on a topic of interest prior to their enrollment in CYBR 560, but are strongly encouraged to do so after consultation with the Capstone coordinator or their academic advisor. The nature, type and scope of the Capstone topic will remain subject to approval by the Capstone coordinator during enrollment in CYBR 560.

Students should carefully review the most current Hood College Catalog (also available on the Hood College web site: www.hood.edu) and seek the advice of the Capstone coordinator Program Director if they require more information or clarification.

Capstone Coordinator

The Capstone Coordinator is the faculty of record for CYBR 560 Cybersecurity Capstone. The coordinator is ultimately responsible for guiding students through their capstone, including setting deadlines and deliverables in coordination with the Capstone Advisor. The Capstone Coordinator may serve as a Capstone Advisor.

Capstone Advisor

The student is responsible for submitting a Capstone proposal approved by the Reading Committee (see below), and for securing a Capstone Advisor to oversee the project. If the proposed Capstone Advisor is not a member of the Hood College faculty, they must be approved by the Program Director. It is, in this case, the student's responsibility to forward a curriculum vita and three letters of recommendation in support of the Capstone Advisor to the Cybersecurity Program Director prior to registration for Capstone. If the Capstone Advisor is a faculty member (adjunct included) of an accredited college or university engaging in research, the requirement for three letters of recommendation may be waived. The Program Director, with the advice and consent of the faculty, generally reviews the Capstone Advisor's qualifications and gives final approval of the Capstone proposal. It is expected that the Capstone Advisor will hold a terminal degree in the appropriate discipline. A Capstone Advisor who does not hold a terminal degree in the appropriate discipline must be approved by the Graduate Council of Hood College. In such a case, the sponsoring department will present the curriculum vita and three letters of recommendation in support of the Capstone Advisor to the Graduate Council for review. Both the proposal and the advisor must be approved before registering for the Capstone.

Reading Committee

The approved Capstone Advisor serves as Chair of the Reading Committee. The Advisor and the student, in consultation, will identify at least two additional persons to serve on the

Reading Committee. At least one member of the Committee must be a full-time faculty member in a Cybersecurity program. Additional members of the Committee may be a faculty member in the degree program, or another professional familiar with the research topic. The Reading Committee should be kept informed of progress on the Capstone project and should meet as required to help guide the research. The Committee should meet at least once before the Capstone defense.

Registering for Capstone Credits

The Cybersecurity Program requires the completion of at least 21 credits prior to enrolling for Cybersecurity 560.

Capstone students must register during a regular registration period for graduate course number CYBR 560 *Cybersecurity Capstone*. The course is offered during the Fall and Spring semesters as students are expected to work on their capstone only during full-length semesters (Fall or Spring). Students should also be aware that summer capstones are discouraged as they present unique logistical challenges in assembling a reading committee and setting a date for the oral defense. Under special circumstances and after a formal written petition to the Program Director, registration for CYBR 560 may be approved for a summer capstone. However, in such cases, to maintain the full-length semester equivalency, registration in CYBR 560 and the work must commence during the first summer session and include the second summer session.

Laboratory Facilities

Students are encouraged to use the laboratory facilities provided by the program and the College. If Hood College is not able to provide laboratory facilities for students engaged in Capstone research, students are encouraged to work with the Program Director, their Capstone Advisor and the Capstone Coordinator to identify suitable accommodations.

Oral Defense

An oral defense of the Capstone is required and will be presented to the Reading Committee at an agreed upon date and at a specified location. Defense dates should not be set until the Capstone Advisor and the Reading Committee approve the Capstone draft. In order to meet the final submission date, which is the last day of the semester and it is set by the college and published in the Academic Calendar on the Hood Web Site, the defense should be scheduled within the last two weeks prior to the deadline. It is advised that students submit their Capstone to their advisor, Reading Committee members and the Program Director no later than one week before the date set for the oral defense.

The candidate should expect to present the Capstone research and findings in a professional manner, similar to presentations at a professional meeting (e.g. academic conference). The use of well-prepared graphs, charts, and other explanatory aids is encouraged for research-based capstones, while demonstrations of produced artifacts are encouraged for software- and system-based capstones. The candidate will be expected to explain their work and to answer questions relating to the Capstone topic.

Normally, the presentation of the Capstone by the student is an open event for faculty, students, and other invitees. However, the question and answer session is closed and attended

only by the student, the Reading Committee members, and the Program Director and the Dean of the Graduate School if they are present.

Approval of Master's Capstone

The Capstone is approved after (1) the oral defense and (2) corrections recommended by the Capstone Advisor and Reading Committee, the Program Director, and the Dean of the Graduate School have been completed. The Capstone coordinator then submits a letter grade to the registrar.

Grade for Capstone

The Capstone is graded using a letter grade (A-F). If the work is not completed within the designated semester of enrollment in CYBR 560, a student may receive an interim grade of "IP" (in progress) by the Capstone Coordinator for no more than one semester. Students will continue to be enrolled as In Progress (IP) either in the next Fall or Spring semester. As such, students will be responsible to pay the graduate comprehensive fee for the extra semester of IP enrollment. The final grade is awarded by the Capstone Coordinator.

A final grade of "F" on the Capstone usually results in the student's dismissal from the Master's degree program.

An unsatisfactory performance on the oral defense of the Capstone may result in the student's dismissal from the Master's Degree program or a repeated defense. The Program Director, in consultation with the Capstone Coordinator, the Advisor, the Reading Committee, and the Dean of the Graduate School may allow the student one additional opportunity to defend the Capstone. Unsatisfactory performance at the repeated defense will result in dismissal with no additional opportunities to complete the degree.

CAPSTONE PREPARATION

Introduction

Students whose theses are sponsored by the Department of Computer Science and Information Technology will use the format and style found in the IEEE Editorial Style Manual.

Copyright

Under the Copyright Act of 1976, the “copyright in the work of authorship” becomes the property of the author who created it. For further information, please refer to the Copyright Office, Library of Congress, Washington, D.C. 20559.

Students completing a Capstone must take care to obtain permission before using copyrighted materials within their Capstone. Permission to use copyrighted materials, tables, and figures for example, must be obtained from the holder of the copyright. The student needs to search carefully for the source of the copyright and obtain permission to use the copyrighted materials in the Capstone document. The permission to use copyrighted materials should be referenced in the Capstone at the point where such materials are presented. The student must retain copies of the copyright permissions and supply them to Hood College upon request.

Headings, Spacing, and Margins

Section headings should contain all uppercase letters, be boldface, and centered at the top of a new page. All text should be double spaced with a left hand margin of 1.5 inches (3.8 cm.) and with right, top, and bottom margins of 1.0 inch (2.5 cm.). **Capstones which violate these margin requirements will not be accepted.**

The one exception to this is on a “facing” legend page where the right margin (adjacent to the spine) is 1.5 inches and the left margin (toward the outer edge) is 1 inch. The margin requirements apply to all tables and figures as well as pages with text. A facing figure legend page and the figure together have one page number.

GUIDELINES FOR CYBERSECURITY

Preliminary pages

1. Title page format should follow the example and guidelines found in this document.
2. Preliminary pages are presented in the following order:
 - Title Page
 - Statement of Use and Copyright Waiver (see copyright)
 - Dedication (optional)
 - Acknowledgments and Sponsorship
 - Table of Contents – should include the beginning page for each section
 - List of Tables – should include the page location of each Table, and short legends
 - List of Figures – should include the page location of each Figure, and short legends
 - List of Abbreviations (optional)

All of the above sections should begin on separate pages and must be double-spaced. The pages should be numbered in lower case Roman numerals located at the bottom center of each page. The Title page is page I, but is not numbered.

Content Sections

Section headings should be centered, capitalized, and should begin on a new page. Content sections are presented according to the following guidelines:

- *Abstract* – The abstract should be a short, concise summary of the Capstone project outlining the purpose of the work, the rationale and method, and highlighting the most significant findings.
- *Introduction* – This section is used to describe the rationale for the project and to provide an overview of previously published relevant work that serves as a foundation and prelude to the Capstone. Thus, it encompasses the introduction, rationale, and review of the primary literature often used in grant proposals and publications. The introduction should make clear the significance of the research in the context of the wider body of scientific knowledge, and it should have a clear statement of purpose. The review of the literature should be current and thorough, encompassing all pertinent references. Subheadings may be used, and are helpful for organizing the information. In general, it is better to err in favor of excess length than to abbreviate this section. Tables and figures may be used in the introduction.
- *Methodology* – This section should describe in detail all of the methods, protocols, etc. used to conduct the research. In a Capstone, as contrasted to a journal article, the purpose of this section is to provide enough information so that another scientifically knowledgeable person could duplicate your data with only the Capstone available as an information source. Tables and figures may be included in this section (see next section). This section should make clear all of the procedures performed by the candidate, as well as sources, tools, methods not

prepared by the candidate. This section should describe data collection and analysis methods (e.g., description of statistical analyses). Use of abbreviations is acceptable but must be used consistently. Abbreviations should be tabulated in the preliminary pages (see above). Numbers should be spelled out only if they begin a sentence.

- *Results* – This section presents a comprehensive picture of all the research results and data. More data is included in a Capstone than in a scientific paper. The supporting data are included, whereas in a paper, the results would be described briefly. This section usually contains tables and figures, which should be on the page immediately following their first mention in the text. It is also permissible to incorporate tables and figures into the text at the point where they are mentioned. Tables and figures are numbered consecutively (Arabic numerals) throughout the Capstone document. Numbering for tables and figures is independent (start at Table 1 and Figure 1, etc.) Each table or figure has a legend and a title, and is listed by page number in the contents pages. If space for the legend is a problem, the facing-page method can be used. In this case, the figure and its legend share one page number. Each figure or table is interpreted and explained in the text. Do not expect the reader to look at numbers in a table and extrapolate. Write out descriptions of all the tabular and figure data as part of the text, along with appropriate comments and observations relating to collection of the data.
- *Discussion* – Having presented the actual data in the results section, this section is for critique and interpretation. Describe conclusions and compare findings with other reported data. Where there is agreement, use it for validation. Where there is disagreement, suggest reasons and explanations. Suggest future directions for research.
- *Appendices* – Some data may be included in appendices if the data are (a) not original work of the candidate, but required to understand the Capstone; (b) useful, but not results of research (tables of common data); or (c) so extensive it may interrupt the flow of the Capstone (e.g., many photographs or specialized graphics). It is unusual to use an appendix in a Capstone. One common usage, however, is to place reprints of journal articles describing Capstone research in an appendix.

REFERENCE FORMAT FOR CAPSTONES IN CYBERSECURITY

The [IEEE Citation Guidelines](#) for citation and in-text referencing must be followed throughout the Capstone. Examples:

E-books

[1] L. Bass, P. Clements, and R. Kazman, *Software Architecture in Practice*, 2nd ed. Reading, MA: Addison Wesley, 2003. [E-book] Available: Safari e-book.

Article in Online Encyclopedia

[2] D. Ince, "Acoustic coupler," in *A Dictionary of the Internet*. Oxford University Press, [online document], 2001. Available: Oxford Reference Online, <http://www.oxfordreference.com> [Accessed: May 24, 2007].

Journal Article Abstract (accessed from online database)

[1] M. T. Kimour and D. Meslati, "Deriving objects from use cases in real-time embedded systems," *Information and Software Technology*, vol. 47, no. 8, p. 533, June 2005. [Abstract]. Available: ProQuest, <http://www.umi.com/proquest/>. [Accessed November 12, 2007].

Journal Article in Scholarly Journal (published free of charge on the Internet)

[2] A. Altun, "Understanding hypertext in the context of reading on the web: Language learners' experience," *Current Issues in Education*, vol. 6, no. 12, July, 2005. [Online serial]. Available: <http://cie.ed.asu.edu/volume6/number12/>. [Accessed Dec. 2, 2007].

Newspaper Article from the Internet

[3] C. Wilson-Clark, "Computers ranked as key literacy," *The Atlanta Journal Constitution*, para. 3, March 29, 2007. [Online], Available: <http://www.thewest.com.au>. [Accessed Sept. 18, 2007].

COPYRIGHT LETTER EXAMPLE

September 30, 2019

Holder of Copyright

Address

City, State, Zip

Dear Holder of Copyright:

I am a graduate student in the cybersecurity master's degree program at Hood College in Frederick, Maryland. My Capstone is _____

I am requesting permission to include in my Capstone the following material
[Include all your relevant information about your request:] Title, page numbers, year of publication, etc.

If permission is granted, proper acknowledgment and credit will be incorporated in the Capstone document.

Sincerely,

Your Signature

Framework for the Analysis and Evaluation of Strong Cryptographic Methods in IoT

Devices

By

Grace Hopper

B.S. Computer Science (Hood College) 2015

Capstone

Submitted in partial satisfaction of the requirements for the degree of

MASTER OF SCIENCE

In

CYBERSECURITY

In the

GRADUATE SCHOOL

Of

HOOD COLLEGE

May 2019

Accepted:

Full Name, Ph.D.

Committee Member

Full Name, Ph.D.

Committee Member

Full Name, Ph.D.

Capstone Advisor

Full Name, Ph.D.

Program Director, Cybersecurity

Full Name, Ph.D.

Dean of Graduate School