# Rules and Principles Governing
## ASCS & ASCC CIS 4980 BAS Thesis, Fall 2023
## Course Coordinator
## Prof. Norm Badler: badler@seas.upenn.edu

**Summary:** The purpose of the document is to delineate the requirements that must be satisfied to successfully complete the **ASCS/ASCC CIS 4980 Senior BAS Capstone Thesis in Fall 2023**. In addition to these stated requirements, this document also offers milestones and guidance on how to approach this process.

⇒ *Please note that the Instructor of record for this course is Prof. Norm Badler. This matters when you fill out the Course Evaluation Form at the end of the term. You are evaluating him NOT your Thesis Advisor.*

**Rules and Principles:**

1. The degree of mix between theory and application for this Thesis is, within reason, negotiable. The most important thing is that you find a suitable topic that meets the requirements stated below, and one that is personally exciting. History shows that lack of enthusiasm on your part leads to degraded performance or even disaster. With a suitable and exciting topic, you are much more likely to work on it consistently throughout the term. Since we recognize that leaving it go to the end results -- with high probability -- in disaster (i.e., failure to graduate), **the milestones in this course are specifically designed to help you avoid procrastination and pace your effort more evenly throughout the term.**

2. If you have not already developed a suitable and exciting proposal topic, you need to do this **now**. Ideally, you generate the energy and insights needed to make this happen. It is reasonable for us to expect that there are aspects of your educational experience in CIS and the wider world that define a set of possible topics. It is up to you to sell one of these ideas to a faculty advisor in CIS (or SEAS, or even outside SEAS). The advisor implicitly promises to guide you where needed. The advisor will not drag you kicking and screaming to the finish line. Obviously, the advisor needs to be knowledgeable about the topic domain and be enthusiastic about the Thesis. **The student is responsible for fully informing the Thesis advisor about all CIS 4980 course requirements and expectations.** Just to be sure, we will also provide this document to any faculty agreeing to be a BAS Thesis advisor.

3. Since this is a CIS course, there should be a substantial substrate of CIS embedded in the Thesis. The amount of CIS substrate is a judgment call that, if necessary, we will help you make. There is no requirement that you write programs as part of this Thesis. The Thesis could be an extensive literature review about some new CIS-related technology that you explore, and show its potential impact on the wider world. A literature review of this new technology must nonetheless **demonstrate that you have a deep understanding of the scientific and engineering basis for this technology**. A review that merely summarizes various sources without showing a deep integrated understanding of the technology is *de facto* insufficient. A useful guide for **depth and breadth** appropriate to your Thesis may be found by looking at full-length feature articles published in the **Communications of the ACM**. (Also, see below under "Grades".)

4. The Thesis proposal should be two single-spaced pages in length and include:
   (i)     your name and email address
   (ii)    a suitable title
   (iii)   your advisor(s) name(s) and email address(es)

(iv)  an abstract (see 9(d) below)
(v)  an introduction (background; core definitions)
(vi)  a paragraph about why we should care about this (motivation)
(vii)  a description of expected technical scope and depth
(viii)  the expected outcomes/results/analyses
(ix)  a schedule (see the course requirement milestones below)
(x)  an initial representative set of bibliographic references
(xi)  a list of undergraduate courses you have taken or are taking: no grades, just titles.

**Please submit your proposal online via forms.cis.upenn.edu.** When you submit your proposal, please also request permission to enroll in the course on Path@Penn. We will carefully review these proposals and if there are required changes, you will receive written feedback for revisions and re-submission. Once your proposal is approved, we will approve your request for the course and you will be able to enroll in Path@Penn. Once registered, all your future course submissions will be via **Canvas**, unless instructed otherwise.

5.  There are **six** major milestones for CIS 4980:

A.  **The completed two page Thesis proposal must be submitted by 12 noon Monday September 11, 2023. A form without a Thesis advisor and their email contact information is incomplete. We will ask the listed advisor(s) for their approval.** The proposal counts towards the final course grade. As soon as possible after proposal submission we will respond with an assessment of its acceptability, including whatever modifications or revisions we require.

B.  **A complete outline of your BAS Thesis, via Canvas, is due by 12 noon Friday September 29, 2023**. The outline should be include and be based, of course, on the Thesis proposal, with any appropriate and requested updates. The outline should consider not just the **structure** of your Thesis, but **must also include a suitable topic sentence for each outline entry**. Topic sentences describe the intent and content of each major *paragraph* of the Thesis. Include a header in the outline document which includes the title, your name, your advisor(s) name(s) and email address(es). You should re-use (and update) as much of the original proposal material as you deem appropriate (the abstract, e.g.).

C.  **You must schedule a 15 minute Zoom meeting between you, your Thesis advisor (if at all possible), and Prof. Badler.** This is to ensure adequate communication, feedback, and agreement between all parties. These meetings will occur after the outline is submitted, during the period **Wednesday October 4 through Monday October 9, 2023**. There may be approval, binding requirements, or helpful suggestions as a result of this meeting.

D.  **You are required to submit a mid-course draft of your Thesis via Canvas by 12 noon on Friday November 10, 2023.** This should be a single **pdf** file documenting your Thesis progress. It should include and follow your (updated) outline and topic sentence materials, with roughly half of the text length in a readable, grammatical, and thorough form. This milestone is to ensure that you are on track to timely completion. The ideal Thesis draft will have some material for all sections, **with the most complete being sections with technical depth**. An introduction can still be sketchy, as can the conclusions. A Thesis draft with only introductory material will not likely be satisfactory. A Thesis based on an implementation should demonstrate that the implementation is essentially complete and what remains is testing and analysis. The document may have gaps and lack some illustrations. **Failure to submit this mid-course draft will reduce your final grade by one full step** (A→B, B→C, etc.).

E. After the draft is submitted, **you must schedule a 15 minute Zoom meeting between you, your Thesis advisor(s) (if at all possible), and Prof. Badler.** This is to ensure adequate agreement between all parties on your progress and remaining tasks. These meetings should occur during the period **Monday November 13 through Friday November 17, 2023**. There may be approval, binding requirements, or helpful suggestions as a result of this meeting.

F. **The written final Thesis of at least 20 single-spaced pages must be submitted via Canvas by 12 noon Friday December 15, 2023.** Computer programs, tabulated data, extended bibliographies, title pages, acknowledgments, charts, tables, figures, and illustrations do not count towards the 20-page minimum requirement. You should communicate with your Thesis advisor for their review and advice. Prof. Badler will be solely responsible for determining the final grade and will consult with the Thesis advisor(s) if necessary. A late or incomplete report will receive a reduced grade. Extensions are at Prof. Badler's discretion, and will be considered only to resolve minor issues with the submitted version. It is extremely likely that Dr. Badler will at least request relatively minor corrections to bring the final document up to expected standards.

6. When writing your Thesis keep in mind that your audience should be **Penn CIS Seniors with appropriate undergraduate background knowledge**. You are **not** writing to reach High School students, other Penn students, or your families. This helps you decide what fundamental knowledge you may assume and where you need to describe new material.

7. Team Theses are **NOT** permitted. If a team approach is important to you, you might consider instead taking the CIS Senior Design course (CIS4000/4010).

8. **Grades**: There is no default grade nor expectation that mere compliance with these formal guidelines will result in "A" grades. In general, we expect your Thesis topic to cover areas not addressed directly in your CIS and related coursework. Your Thesis should explore a current CIS topic, be of interest to a technical or societal community, and provide both the broad context of why this topic is important as well as demonstrating technical depth and understanding. Depth can be achieved in a number of ways. Some approaches are: explanations, evaluations, and trade-offs among core algorithms and their costs; novel and/or challenging applications that can exploit and benefit from new computer science techniques; and actual coding and/or experimental investigations involving real or plausible data sources and analytic tools. **The milestones and meetings with Prof. Badler are designed to appraise you of the depth component and assess how you are addressing it. Theses without appropriate depth are unlikely to receive "A" grades**.

9. **Other Requirements:**

(a) You understand that the work you submit is your original work. Thus, proper citations to all of your sources must be included. Extensive quoted passages are not a substitute for well-analyzed, summarized, and abstracted content. Penn's Academic Code of Integrity must be honored: https://catalog.upenn.edu/pennbook/code-of-academic-integrity/ (See further discussion below.)

(b) You may include and, if necessary, modify appropriate illustrations from other published materials. You should clearly cite these sources in your Bibliography. You must add your own captions. All figures must be numbered and referenced by this number in your text. Your text should discuss any purpose, relevance, and content of an illustration. Figures are welcome, but they do not count in your 20 page minimum length, as noted above.

(c) A similar remark applies to mathematical formulas copied from other sources. If

included, you should explain what the variables or parameters are, what the expression means, perhaps how such an expression is algorithmically or empirically evaluated, and what the relevant units are. Gratuitous math is not a substitute for deep understanding.

(d) The final version of your Thesis abstract should be about a half page summary of the Thesis. It should not have any bibliographic references, so it is self-contained. A good abstract succinctly but clearly states the core content subject matter, outlines the technical methodologies employed in the thesis, and summarizes any results or conclusions reached. You are not "giving anything away" by including the last component; you are helping the reader understand what you have learned by producing the Thesis. The abstract is probably not the same as the introductory paragraph to the Thesis, where you are free to indulge in more motivational background material about why this topic is technically important, interesting, and current in Computer Science.

(e) Since your work, in its entirety, could be subject to dissemination to the faculty and students in CIS and SEAS, the application of any **non-disclosure agreement is completely prohibited**. If your Thesis is derived from or contemporary with a corporate internship role, please discuss this situation with Prof. Badler before embarking on this as a topic.

(f) According to Penn Intellectual Property rules, **you own the rights to your own work**. However, this also makes you responsible for respecting any copyright interests of others (e.g., with respect to "borrowed" illustrations) should you seek to publish all or part of your Thesis on your own. Selected Theses may be candidates for posting to the CIS4980 example website. We will only post your Thesis there with your explicit written permission.

(g) It is also understood that the academic work leading to this Thesis was undertaken solely for CIS 4980 in Fall 2023, and was not derivative of other papers or work you produced for or in conjunction with other courses, academic programs, or outside employment, e.g., paid or unpaid internships. In case of any doubt, please check with Prof. Badler and provide evidence for the background material and how your CIS 4980 Thesis will go well beyond it.

10. **Exemplary Work in CIS 4980:** Prior recent examples of exemplary CIS 498(0) Senior Capstone Theses can be found on the CIS Department's website at: http://www.cis.upenn.edu/current-students/undergraduate/courses/index.php

11. **Access:** Besides the required Zoom milestones, Prof. Badler will be available as much as possible via Zoom and/or email for additional consultation throughout the term. He does not have a Penn office, so these are the only mechanisms available.

12. **Academic Integrity:** We work closely with the *Center for Community Standards and Accountability (CSA)* to ensure that your writing conforms to Penn's Code of Academic Integrity. Canvas materials will include a video of a one hour Workshop on accessing and using available resources, producing plagiarism-free writing, and interpreting TurnItIn software reports. We will also be providing you with reference material to help you read and write computer science prose. We know you can code, but the experience of writing a technical expository document may be quite novel for many of you.

Here are some pointers toward producing a manuscript that reflects your own thinking and expression.

* When you read a paper, take notes but try to avoid cut-and-paste. It will be better to digest what you have read and summarize it in full sentences. This is not the same as "jotting down

notes".  You want to remind yourself why this work is (or isn't) important to your topic. You want to connect some important parts into your Thesis themes; these may be a bit different from the paper's original intent.

* If you do copy useful quotes, figures, math, pseudo-code, or code fragments, keep track of source page numbers.  If you copy figures (which is OK), be sure you write your own version of the captions.  In general, no direct quotation should be longer than a sentence or two and should somehow to crucial in its way of expressing a concept.  Quotations longer than three printed lines should be indented and the source clearly cited; but better yet, try to avoid them at all!

* Citations are critical components of technical writing. You should include all sources, but avoid "throwing in" extras.  If possible, use primary sources rather than reportage or news feeds. Of course, many observations, summaries, and opinions will come through such secondary (usually Internet) sources, and can be used as appropriate.  In such cases, it can be useful for you to state clearly why such a source is meaningful, contributory, and truthful. For Internet sources it is customary to give (at least) the URL and the date you accessed it. You may follow the ACM bibliography format: (https://www.acm.org/publications/authors/reference-formatting), though any other major academic format (such as APA) is acceptable as long as you follow it consistently.

* Your advisor plays at least three critical roles in your Thesis: (1) suggest, evaluate, and even challenge your assertions in the content field you have chosen; (2) help you reach the necessary algorithmic depth required in the Thesis; and (3) guide you to, evaluate your use of, and help you to interpret your citations. This intellectual mentorship is a great asset during the learning experience that is your capstone. Ultimately, your advisor should be your guide to the recognized experts, their publications, the relevant and significant technologies, and the wider societal issues you address. It is your role to synthesize all this into a coherent, well-structured, and grammatical exposition. We will write to all advisors to be sure that they understand their role as well.

* To help avoid any plagiarism issues, all Thesis drafts submitted are checked by TurnItIn. Canvas will do this automatically when you submit. Note that you may submit multiple drafts prior to the deadline, in order to clean up any significant reported issues. In general, the last version submitted before the deadline is the one that will be deemed gradable.

* The same requirement applies to your final Thesis submission. Final Theses must be submitted through Canvas and will be scanned by TurnItIn. You can access the TurnItIn report as well, so you can resolve any issues as needed. You may submit multiple times up to the deadline in order to address any significant detected problems. If for any reason you dispute any part of the TurnItIn report on your ultimate submission, please email Dr. Badler documenting your response.

* If you are planning to use ChatGPT or a similar AI-powered application to write all or part of your thesis, **don't**. Prof. Badler reserves the right to ask you questions on the Thesis content either orally or in writing.