PhD Advising Topics

Dissertation and Final Defense

Thomas Bradley
Professor, Systems Engineering
Introduction

• Dissertation Credits in the PhD program
• Final Defense for the PhD
  – Dissertation Document
  – Final Defense Presentation
Dissertation Credits in the PhD

• Dissertation Credits
  – SYSE 799A PhD Dissertation Credits: Var [1-9] (0-0-0)
  – These credits should apply to the development and publication of research results
  – The number and timing of credits are up to the student/advisor but
    • Credits in a given semester should be proportional to work planned/accomplished
Dissertation Credits in the PhD

PhD Dissertation is made up of 42 credits (with an applicable Master’s degree)

Systems Engineering Courses (Choose 18 Credits)

- SYSE 501
- SYSE 530
- SYSE/ECE 532

Dissertation Credits (24 Credits)

- Preliminary Exam
- Final Exam Defense

- SYSE 567
- SYSE 569
- SYSE 799A

- SYSE 799A
- SYSE 799A
- SYSE 571
Dissertation Credits in the PhD

• Traditionally Dissertation units have no assignments and no learning objectives
• You should plan on ~1 hr meeting with your advisor 1-2 times per month
  – Highly recommend
    • Scheduled/Structured meetings with PPT
    • Documents to allow for detailed feedback and approval
    • Progress tracking to measure progress towards completion (Annual Evaluation)
Dissertation Credits in the PhD

• Some observations
  – Credits should be aligned with and roughly equivalent to effort (don’t take 9cr/sem, don’t take 0 if you doing tasks)
  – You should be able to use these credits to justify your time spent on research tasks to your employer
  – It is difficult to motivate to do work when you don’t have the hours/credits/audience/advising aligned with the effort
Final Defense

• The final exam for the PhD is made up of two parts:
  – The Dissertation (document)
  – The Defense (presentation)
Dissertation Document

• Document Outline (No page limit or guidance)
  – Abstract
  – Introduction and Background
  – Research Questions and Tasks
    – (Research Question 1)
    – (Research Question 2)
    – (Research Question 3)
  – Research Contributions
  – Conclusions
  – Appendix

Can be 90% copied from your proposal document

Can be 90% copied from your reports, your publications, your conf. papers

Can be updated from your proposal document
Dissertation Document

- Must follow the CSU Graduate School format
  - https://graduateschool.colostate.edu/thesis-dissertation/
- Any formatting of references is acceptable (APA, Harvard, IEEE, etc.)
- Plagiarism should be strictly avoided
  - The dissertation document must be authored by you
  - You can reference ideas from others
  - You can quote others’ text
  - You can cut and paste from your authored reports and papers
  - 99% of figures must be made by you
Good form in answering the research questions is to write a transition at the beginning and end of the chapter to address the questions directly.

Chapter 3 – Experimental investigation of the perceived value of model-based systems engineering

This chapter addresses the research question 1, which is restated as follows:

*RQ1 – In what ways is MBSE perceived by practitioners to provide value to MBSE-enabled robotics design projects?*

The research to address this question has been previously described in a peer-reviewed report to NASA’s MBSE working group [49]. This chapter represents a further refined version of this publication.

3.1 Introduction ...
3.n _________ ...
3.9 Conclusion ...

Upon completion of this research, I am now prepared to answer research question 1. This research provides evidence to support the assertion that MBSE is a toolkit that has perceived value at an organizational and an individual level. To the organization,...
The Defense

• Steps for success
  – Work with your advisor and committee to have your document at 100% highest quality ~1 mo in advance
  – Use Doodle or other professional tool to find time to do the presentation (choose among 5±2 options)
  – Every student has access to CSU calendars, through CSU O365, and send out calendar invites (https://www.acns.colostate.edu/email-accounts/)
  – Send your document (send as pdf) to the committee. They must have 10 business days to review. Do not send out the PPT.
  – You are invited to do the presentation on campus, online is also acceptable. All students have access to Teams through CSU O365
  – Business professional attire https://www.pinterest.com/wisconsinbba/ (profs may not always conform)
The Defense (presentation)

- Presentation Content (option 1)
  - Title Slide (1 pp)
  - Acknowledgements (1 pp)
  - Outline (1 pp)
  - Introduction and Background (5 pp)
  - Research Question 1 (5 pp)
    - Restate RQ1, Results of tasks associated with RQ1, Answer to Research Question 1
  - Research Question 2 (5 pp)
    - Restate RQ2, Results of tasks associated with RQ2, Answer to Research Question 2
  - Research Question 3 (5 pp)
    - Restate RQ3, Results of tasks associated with RQ3, Answer to Research Question 3
  - Research Contributions (1 pp)
  - Conclusions and Future Work (3 pp)
  - Q & A Prompt (1 pp)

- Presentation Content (option 2)
  - Title Slide (1 pp)
  - Acknowledgements (1 pp)
  - Outline (1 pp)
  - Introduction and Background (5 pp)
  - Results
    - Restate RQ1-3 (3 pp)
    - Results of tasks associated with RQ1 (3 pp)
    - Answer to Research Question 1 (1 pp)
    - Results of tasks associated with RQ2 (3 pp)
    - Answer to Research Question 2 (1 pp)
    - Results of tasks associated with RQ3 (3 pp)
    - Answer to Research Question 3 (1 pp)
  - Research Contributions (1 pp)
  - Conclusions and Future Work (3 pp)
  - Q & A Prompt

30+ slides in 40 mins means that you are going very fast. You will not be able to do justice to all the work that you did in your research over 3-4 years, so instead you must pick and choose effective, high impact, cohesive results.
The Defense (presentation)

• Review presentation best practices
  • [http://www.cgl.uwaterloo.ca/csk/presentations.html](http://www.cgl.uwaterloo.ca/csk/presentations.html)
    – Structure, clarity, organization, style, figure formatting, etc.
    – Mistakes are unacceptable
• Most engineers are not great at presenting, this is your chance to shine
  – Memorize a *mirrored* “intro” and “outro” to convey organization and impact (start and close a story in these sections)
  – SE is a field in which it is hard to convey the level of difficulty
    • Use visual frameworks to convey methods
    • Use equations, flow charts, design structure matrices (not code)
    • Present sample results before presenting ensemble results
The Defense

• What is the committee evaluating?
  – Errors in analysis, results, or interpretation (statistics, graphics, math, optimization, meshing, etc.)
  – “Reasoned challenges” Your results say X, but this other paper says Y. Your results conflict with this existing model, why? Unreasoned challenges do not stand.
  – “New knowledge in the field” must be defined
    • (if you are smart enough to define it)
The Defense

- What is the committee evaluating?
  - The process of research is important and so must be documented
    - It is assessed on the basis of
      - Scholarship, repeatability, “systematic approach to the development of new knowledge,”
      - No unconsidered/unevaluated processes, no lightning strikes of genius allowed.
    - Publication and peer review
The Defense

• Committee will excuse you to the hall to come up with recommendations
  – You are then invited in for congrats and communication of takeaways (80% pass)

• Most often, the committee will suggest changes to your process or document.
  – Make the changes, work with committee members to gain their approval.
  – 2 weeks for you to turnaround any changes is not unusual
The Defense

• Graduation
  – Come to CSU, graduate with your advisor