

Guidelines and Expectations for MS and PhD Students in ISE
October 31, 2018

The following material is provided to clarify faculty expectations and standards for MS (thesis) and PhD students in ISE. Existing policies are in place from both the Graduate School and the ISE Department, and all students should be aware of and conform to these policies. The material presented here expands upon some of these policies. Each step in the process of completing a thesis or dissertation is critical toward developing and evaluating the ability of MS and PhD students to develop, conduct, and report on an independent research effort. By clarifying our expectations and standards, we hope to ensure that the thesis/dissertation is a rewarding process for all involved. Every thesis/dissertation is obviously unique, and the material here is meant to serve as a starting point for discussions between students and their advisors and committees.

General Guidelines:

Administrative:

- Consult the ISE Graduate Manual for details regarding committee structure and composition.
- The thesis or dissertation research must be proposed to the advisory committee. A written proposal is required, and must be submitted to the committee at least two weeks prior to the oral proposal presentation and defense. In addition to consulting with the advisor and committee, students are encouraged to review the work of more senior students for information on style and content.
- The student should play a major and leading role in every steps of their research design and implementation including problem definition, development of research approach, analysis, and oral and written presentation. Verbatim use of methods developed by others, for example in a funded proposal, is unacceptable. When an existing proposal does serve as a significant basis for a thesis or dissertation, the student is expected to be responsible for the approaches and procedures used, and to work with their advisor and committee to ensure that they make an independent intellectual contribution.
- The majority of research for the thesis or dissertation should not be completed prior to committee approval of the proposal. In practical terms, the proposal should be defended and approved early enough such that the student can benefit from substantive feedback from the committee on the planned research. Pilot or preliminary work is certainly encouraged, especially if it helps justify the value of the proposed topic and/or demonstrates that the research can be completed in a reasonable amount of time.
- The student and advisor are primarily responsible for ensuring that the topic and proposed methodologies are appropriate, though seeking advice from the other committee members is highly recommended. When written documents are prepared (with the exception of responses to the preliminary exam), the advisor should review them before submission to the other committee members. Advisors and committee members should not be expected to provide extensive editorial input (e.g., even first drafts should be well structured and well written).
- Committee members (other than the advisor) typically provide technical and methodological advice only, augmenting the primary role of the advisor. The level of involvement of different committee members will naturally differ, based on expertise and preference.
- Students are strongly encouraged to submit at least one peer-reviewed publication prior to the final defense. Co-authorship by committee members is common, but is neither required or expected by default. Authorship should be discussed early among relevant members of the committee, and those who make appropriate contributions should be considered as potential co-authors on publications resulting from the thesis or dissertation work.

Topic and Content:

- Thesis (MS degree):
 - typically focused on addressing one central research question or objective, though more are certainly acceptable, as are several components.
 - the typical thesis is roughly equivalent to one publishable paper in a peer-reviewed journal, in terms of methods, content, and scope. The thesis should go beyond the typical published paper, however, such as in terms of reviewing existing literature, exploring and presenting data and data analysis, interpreting results, and suggestions for future work.
 - while fundamental new contributions are encouraged, these are not required at the MS level, and many thesis projects are applied.
- Dissertation (PhD degree):
 - typically focused on addressing one or a critical few central research question(s) or objective(s), though more are certainly acceptable, as are several components.
 - dissertation should make a new and fundamental contribution to the relevant field in terms of content or methodology, and this contribution should be clearly identified.
 - the typical dissertation is roughly equivalent to at least three publishable papers in peer-reviewed journals, in terms of methods, content, and scope. The dissertation should go beyond typical published papers, however, in terms of reviewing existing literature, exploring and presenting data and data analysis, interpreting results, and suggestions for future work.
 - most dissertations are written in the so-called “multiple paper format”. If so, it is recommended that introductory and concluding chapters are provided, which should connect different pieces of the dissertation, integrate the work within a larger scope, and convey the central theme and main contributions of the work. Alternative approaches are certainly acceptable.

Preliminary Exam (PhD only):

According to the ISE Graduate Manual: “The intent of the examination is to establish that the student is qualified to pursue creative, original, independent research at a level typically expected of Ph.D. student.” The Preliminary Exam is an opportunity for the student to demonstrate a level of scholarly/academic ability adequate to continue toward completion of the Doctoral Degree in ISE. Students should expect to receive questions directed toward some combination of their immediate research area, related areas, and related course content.

Characteristics of a highly successful Preliminary Exam (written portion):

- Student clearly, completely, and concisely addresses the committee’s questions.
- Student demonstrates a strong ability to acquire, organize, summarize, and present existing literature (where relevant).
- Student demonstrates a strong ability to formulate research questions, hypotheses, and/or experimental designs (where relevant).

Characteristics of a highly successful Preliminary Exam (oral portion):

- Student can competently, confidently, and clearly defend and/or clarify the vast majority of their written responses.
- Student can competently, confidently, and clearly answer the vast majority of questions related to their research area, related areas, and related course content.

Proposal Defense (MS and PhD):

According to the ISE Graduate Manual: "...the student is required to prepare a research proposal that describes the content of the research, the outcome anticipated, the contribution to the field of endeavor, and the creative content of the effort." The purpose of the Proposal Defense is also for the student to demonstrate an adequate level of knowledge within their chosen field of investigation, and to present a proposed research topic in sufficient detail for the committee to determine if it is feasible, relevant, and consistent with eventual completion of the degree sought (MS or PhD). Finally, a successfully-defended proposal is treated as a "contract" between the student and committee members, in terms of an agreed-upon scope and scale of investigation.

Characteristics of a highly successful Proposal Defense (written portion):

- The proposed topic and research area are clearly articulated, motivated, and defined.
- Student demonstrates a good level of knowledge of existing relevant research, in terms of both depth and breadth.
- Sufficient details regarding methodology are described to argue for the feasibility of the proposed research. Pilot results can provide a strong argument for such feasibility.
- The proposal document is well structured, well written, clear, complete, and concise.

Characteristics of a highly successful Proposal Defense (oral portion):

- Student can competently, confidently, and clearly defend and/or clarify the vast majority of questions related to their proposed work.
- Student demonstrates strong public speaking skills and, as relevant, effective use of presentation materials (e.g., slides).

Progress Meeting (MS and PhD):

The purpose of the Progress Meeting is for the student to update the committee on the status of the thesis or dissertation work before it is completed. Changes from what was proposed earlier are not uncommon. However, any substantive changes to the work described in the proposal document, both completed and planned, must be presented and justified to the committee (e.g., to modify the "contract"). Multiple progress meetings can be of use in some cases.

Final Defense (MS and PhD):

The purpose of the Final Defense is for the student to demonstrate that the proposed work has been completed, analyzed, and adequately interpreted and integrated with existing literature, as well as to highlight the major contributions that were achieved. This is done in both the formal thesis/dissertation and an oral presentation.

Characteristics of a highly successful Final Defense:

- Written and oral presentations are concise, clear, well organized, thorough, and well articulated.
- Student displays a strong ability to explain technical material, strong public speaking ability, and effective use of presentation materials.
- Student effectively interprets their results within the context of existing evidence and the broader realm of ISE, and effectively presents the contributions and wider implications of their work.
- Student demonstrates that results are clearly built on methodologically sound approaches and analyses, and major contributions to existing knowledge are clearly conveyed.
- Student effectively justifies and defends conclusions based on their results.
- Student clearly defines and discussed limitations of the work and the extent to which such limitations affect the conclusions provided.