Changes in the ECE MS Non-thesis exam as OSU transitions from quarters to semesters.

Although the guidelines given for the MS Non-thesis in the online ECE Graduate handbook are quite flexible, they do not indicate how most students are completing their non-thesis exam. For example, many faculty that participate on MS non-thesis exam committees do not require a 1 hr formal presentation, since such a presentation procedure can be an incentive for writing a vague/poor report. A common approach by students is to clear up the vagueness in their report by relying on a formal presentation, but this is highly inefficient for faculty and a poor teaching process for students. Instead, it is preferable that a good report be produced and only a small oral meeting be used for any needed clarification. Therefore, the non-thesis guidelines have been changed, and are described in the following sections, along with a writing template to be used for creating a good technical report.

Note that writing a good technical report is primarily about structuring technical content in terms of logical flow, figures, and consistent statements with regards to technical accuracy and precision. Grammar, style, punctuation and other similar aspects of natural language, such as English, are helpful, but secondary to technical accuracy. Precision and accuracy are related concepts that are easily misinterpreted. With regards to the non-thesis report, technical precision will refer to the amount of detail, in which case a more precise document will contain more detail, and tend to increase in size. Sometimes this implies that a more precise document from the main logical flow and reduce accuracy. Technical accuracy in the non-thesis report will refer to how close the stated solution details align and address the stated problem and requirement details.

Upcoming ECE Grad handbook change for the MS Non-thesis:

The non-thesis option also requires satisfactory performance on the **MS Non-thesis** exam package, which consists of a written take home exam whose format is determined by the student's advisor and/or the ECE MS Coordinator. Depending on the advisor, the non-thesis package may consist of one of the following: (a) Written report + presentation slides + informal meeting, (b) Written report with poster presentation, (c) Written report + presentation slides + formal presentation, (d) other format approved by the ECE MS Coordinator.

For the written report, the content can be based on individual studies courses, extending project work from courses, or projects in research areas in the department. The current format and structure of the written report will be maintained in the course notes of the MS Program Coordination course taken by all MS students.

The rest of this document describes the template for the non-thesis report and some clarification on the reader objectives of the report, with regards to accuracy and precision. There are also some comments on course based problem solving vs. the more open-ended type problem solving that is typical of a non-thesis report.

Template for the non-thesis report writing (on open ended problems).

Working on open ended problems leads to a wide variation on writing about open ended problems. In order to speed up the report evaluation process, this variation should be reduced by requiring certain reporting items to appear in specific parts of the document, according to the following reporting structure:

<u>Abstract</u> - As quantitative as possible about performance metrics and other results.

Table of Contents, Lists of Figures and Tables

<u>Introduction</u> - besides the usual information, there should be an obvious section that has the Problem Statement. In addition, the Introduction should end with an overview of the remaining sections of the report.

<u>Technical Background</u> – besides the usual information, there should be an obvious (ie. with subheading) section which states the Requirements Specification that expands the problem statement. The specification will include requirements that were not actually met by the final solution, consistent with the open ended aspects in the problem statement, and will define performance metrics applied to either parts of the final solution or the whole final solution. Requirements that were not met will be discussed further in the Recommendations section of the report.

<u>System Specification</u> – this is the architecture of the solution to the problem, describing the relationship between various modules of the solution.

<u>Discussion</u> – this includes the results section of the report, with discussion on what requirements were met and how well. This section should include plots of the performance metrics as a function of one or more design variables. If possible, two competing performance metrics of a design variable should be used to highlight a tradeoff made in the solution choices. There should also be some discussion about the problem requirements that were not met.

<u>Conclusion and Recommendations</u> – this should summarize the achieved solution and include suggestions for how to achieve the requirements that were not met, if more resources were available to work on the problem topic. The Recommendations should be under a separate subheading.

Finally, a set of presentation slides that highlight the important content of the report will also be created, both as a guide to the student in writing the report and for the faculty evaluation committee to quickly assess the report. The set of slides should mirror the organizational structure of the report, and it is suggested to use similar headings as those in the written report template. Key figures in the report should show up in the slides. Faculty viewing the slides should be able to identify the same key points as those in the report. Writing a report that is clear without the need for a long presentation requires some thought about the readers' (audience) objectives for the report.

Audience and Purpose.

In the non-thesis report, there are two types of audiences, setting up a basic tradeoff in designing and developing the report to meet the objectives of both types.

<u>1.General Manager (Engineer</u>). This audience type has to read many of these reports, often outside of their area of domain expertise. They look for specific structure in the report and that key statements of the report are in accurate & standard locations, and in general are more interested in the accuracy of the content as opposed to its precision.

<u>2. Domain Expert</u>. This audience type only reads the reports in their domain area, which are relatively few. They look for what requirements were met and which were not, and how to continue working on the problem where the author left off. The content needs to be sufficiently precise to continue the work on the problem, including reproducing what was achieved thus far. Increased precision implies increased content amount.

Course problems vs. Open ended problems.

Problems started in a course, whether letter grade or S/U, are good candidates for non-thesis report problems. Keep in mind, that course based problems are sometimes closed end problems, and should be changed in scope when used as a basis for a non-thesis report. Typically, changing the scope results in a report with a broader context and richer solution space, and does not necessarily mean the problem is dramatically different than the course problem.

Note that problems in course work are nominally constrained to be graded efficiently, and thus tend to be closed end problems. They typically are:

1) well defined, 2) have a single solution,

3) have obvious end points, 4) depend only on material from the course.

Students are typically very good at producing this type of course content.

On the other hand, open ended problems are likely to:

1) be poorly defined, with conflicting requirements (sometimes even with contradictions),

- 2) display a number of possible solutions,
- 3) have unclear stopping points,
- 4) depend on material from a variety of courses, even outside the ECE department.

Students demonstrate their open ended problem solving and writing in their non-thesis report.