Doctor of Philosophy in Manufacturing Engineering

This section of the Graduate Handbook explains the Manufacturing Engineering doctoral degree process.

PhD Degree Requirements

The Doctor of Philosophy in Manufacturing Engineering can typically be completed in three years with a MS degree, and six years with a BS degree, given that the student works on their coursework and dissertation research with focused effort. This degree must be completed within eight years.

Modes of Study

This doctoral program is available for students in two separate modes: online and in-person. While the degree requirements are identical for the two modes, their modes of delivery are different. The online doctoral program is designed for working professionals who want to continue learning. Online students will be responsible for conducting research at their workplace or approved research facility. Traditional, resident students will conduct their research at a Michigan Technological University lab/facility.

PhD Advisor and Advising Committee

All graduate students are required to have an advisor. When students begin their studies, the Director of Graduate Studies will assist in finding the appropriate advisor. The goal is to align the student with an advisor whose expertise and current research interests closely match those of the student. Some research may require an additional oversight and may be necessary at certain times to have co-advisors.

In addition to the student's primary advisor, doctoral students need to have a committee to work with. The committee consists of the primary advisor and three other Graduate School faculty. One of the committee members (the external member) must come from outside of the Manufacturing and Mechanical Engineering Technology department. It is expected that the committee is formed within the first year of the student's enrolment in the PhD program. Once the advisor and committee are selected and finalized, all PhD students should submit their Advisor and Committee Recommendation form to the Graduate School.

Approved Coursework Plan

Before taking the Qualifying exam (see the next section), it is essential that students finalize a coursework plan after discussion with, and with approval of their advisor and co-advisor (if they have a co-advisor).

PhD Qualifying Examination
The Qualifying Examination is taken upon completion of all PhD coursework. This written exam focuses on the coursework the student has completed. The examination will be unique for each student. This is why having a well-considered coursework plan is key to their success.

Scheduling the Qualifying Examination
The examination consists of questions from the student's path/specialization as per their completed coursework. This is a written examination, meaning that all questions are essay questions or numerical problems. The duration of the examination will be four hours. The answers to the examination will be presented and evaluated by the student's committee and they will collectively determine whether the student passes or fails. It is not in the student's best interest to attempt the qualifier until all their approved coursework is completed.

Research Proposal
Students are required to submit a research proposal to the graduate school and the student's PhD committee before they commence any research and after successfully completing their Qualifying Examination. This is not the dissertation, but rather their well-thought-out plan for their research. At a bare minimum, the proposal should consider a thorough literature review, the purpose of the dissertation study, scope of the study, experimental and/or analytical/computational methods to be employed, significance of the study, novel contributions that will result from their investigation, and a holistic overview of all safety considerations involving the research.

Rationale behind the Research Proposal:
- Determine the student's capability to successfully perform all aspects of their proposed research.
- Determine the student's ability to clearly describe what has previously been researched in their field, what is known, and what is still unknown.
- Determine whether the student can identify a significant research question/topic in their research field where the answer is not already known or is not fully explored. If it is known/explored, why are they proposing this topic? Could it have a novel/significant impact on their research field/industry/society/environment, etc.? In summary, if the student were to successfully complete research on their chosen topic, could that research form a sound basis for a defendable PhD dissertation.
- Determine whether the student can thoroughly and critically review and assess the literature relevant to their research to develop and support their claims in a logical, data-driven, and methodical manner that convinces the committee of the following:
    - The answer to the research topic proposed by the student is indeed unknown.
    - The research topic proposed by the student is truly novel as well as significant (i.e., it will have a substantial impact on the student's research field/society/environment/technology, and will result in the generation of new knowledge.)
    - It is relevant to Manufacturing Engineering

Dissertation
The first step in the dissertation process is planning. For example, formatting needs to be consistent throughout the University. Before students begin, they should download the guide to preparing a dissertation, thesis, or report at Michigan Technological University (Guide to Preparing a Dissertation, Thesis, or Report). A draft of the dissertation and optionally any supporting materials must be made available to the committee at least two weeks before the day of the defense. This will allow the committee to carefully review and assess the contents of the dissertation.

Dissertation Oral Examination (Dissertation Defense)
An essential part of the doctoral process is the Oral Examination, which is also known as the final PhD defense. During the defense, students are expected to clearly present their research and its findings to their advisor, the dissertation committee, and any invited audience. Students will be questioned on all aspects of their research, first by the invited audience, and later by the committee members. During the oral examination, they are expected to be able to defend the methodology they adopted in their research (such as experimental techniques, analytical, or computational methods) as well as the findings of their dissertation. To pass the defense, the student will need to answer/address all questions convincingly and satisfactorily.

Preparing for the Final Oral Examination (PhD Defense)
Students should consult with their advisor(s), committee members, the graduate school, and the graduate program to determine program-specific requirements for their defense. Students should consult with their committee to determine an appropriate time and place for their defense.
After the Defense
Students must submit the Report on Final Oral Examination form after the defense. This form reports the result of the defense to the Graduate School. Students should complete all corrections required by their committee and all formatting corrections required by the Graduate School.

Completing the Dissertation or Thesis
It is very common that after the defense there is still work that needs to be done. The feedback students receive from their committee is priceless and needs to be incorporated into the dissertation before being published. Committee members may choose to review the dissertation after the corrections are made to ensure that all corrections have been made to the committee members' satisfaction.

After all technical and formatting corrections are complete, students should submit their dissertation or thesis to Digital Commons and ProQuest by the deadline for the desired completion term. The Graduate School will request a review of the dissertation or thesis by the advisor on Digital Commons. Please note that this is a manual process that is completed during business hours. Their approval on Digital Commons replaces the former approval of a dissertation, thesis, or report form, and will allow faculty to see the work their student has submitted and be notified when it is published. Their approval will indicate that the corrections

have been made to the committee's satisfaction and that the access and embargo requested for the submission are acceptable. The date a student submits a dissertation or thesis approved by the advisor will determine what semester the student completes their degree and whether additional fees or registration are required.

Following the advisor's approval, the Graduate School will review and complete submissions within six business days and either approve the submission or inform the student of any formatting corrections that are required. If formatting corrections are required, students will have until the Friday of Final's Week to complete them and remain eligible to complete their degree in the current semester.

Students who cannot meet the deadline for the current semester, but can submit during the grade period, are eligible to register for UN 5951 in the upcoming semester and pay the resubmission fee to complete their degree in the next semester. The grace period ends at 4:00 p.m. on the Wednesday before classes start for the next semester.

After Acceptance
Submissions are published on Digital Commons and ProQuest after all degrees are granted for the semester. Grace period submissions are published at the beginning of the semester, pending verification of all other degree requirements.

If changes to the document, metadata, or access are required, please review the options and types of changes available.