The Electrical Engineering PhD Qualifying Examination
School of Engineering and Applied Sciences
Spring 2017

This document sets forth the policies for the structure of the qualifying examination for Electrical Engineering students in the School of Engineering and Applied Sciences. It is intended for students preparing for the examination as well as qualifying examination committee members. This note augments the description of the qualifying examination in the “Policies of the Committee on Higher Degrees of the School of Engineering and Applied Sciences.”

Purpose

The purpose of the qualifying examination is to verify the adequacy of the student's ability and preparation for undertaking research in his or her chosen subfield of Electrical Engineering and to assess the student's ability to synthesize the technical knowledge already acquired. The examination has two components: First, presentation of a small research project that the student has undertaken within his or her subfield; and second, an oral examination of the student's technical expertise and breadth of knowledge in this subfield.

Timing

The qualifying examination must be taken by the end of May of the student’s second year of graduate study. No exceptions are made to this deadline without a prior written request to the CHD by the chair of the qualifying committee. Extensions may be granted in cases of students who have switched advisors or research areas.

It is the student’s responsibility to schedule the examination and determine an appropriate date when all of the committee members are able to conduct the exam. Once a date has been determined, the student contacts the Office of Academic Programs for official scheduling.

Preparation

The student, in consultation with his or her advisor, selects a subfield of Electrical Engineering on which the examination is to be based. The subfield represents a specific area of research in which the student has done some research and taken appropriate courses. Examples of subfields might include devices, circuits, computer architecture, embedded systems, signal processing, control theory, information theory, and combinations thereof. In general, a subfield is intended to be more focused than a broad area of Electrical Engineering, but not so focused that it only covers the student's research project.

No later than two weeks before the examination, the student must deliver to the committee members a short report outlining the research project to be presented, highlighting the background and motivation for the project, the content and results of the project itself, and a
brief survey of related work. No specific format is required for the report, although as a guideline it should be between six and ten pages in length. (This is not an absolute requirement, but a recommendation.) The intent of the report is to aid the committee in preparing for the examination.

The scope of the research project presented during the exam is not meant to represent mature, publishable research. It is acceptable to present negative or partial results. The intention is not to provide evidence that the student has already done PhD level research, but merely that he or she has the capability to do so. The student is expected to have a full knowledge of the technical material and background for the chosen topic. Both students and advisors should keep these scope issues in mind when selecting research projects and subfields.

Format

The qualifying examination proper is an oral examination of two hours in length. During the first hour, the student presents the small research project that he or she has conducted. The presentation should be structured in a manner that outlines the motivation for the project, description of the problem, the approach taken in the project, and a summary of any results to date. The presentation must also include a detailed discussion of related work relevant to the project; this is a critical part of the examination and tests the student's background in the area. During the presentation, the committee will ask questions to probe the depth of the student's understanding of the project and related work.

In the second hour of the exam, the committee will probe the student on more general questions related to the student's chosen subfield of Electrical Engineering. These questions need not be directly related to the research project. In preparing for this portion of the exam, students should work with their advisors to gain an understanding of the possible topics and questions to be raised. Faculty in a particular subfield may wish to supply a syllabus or reading list to assist in the preparation of this portion of the exam. The examination committee should prepare a list of questions prior to the exam and coordinate with the committee chair as to the list of appropriate topics to cover.

Note to Faculty: As it is the student, and not the advisor, who is being examined, it is important for the advisor to allow the student full rein in responding to questions and explaining his or her views. Questioning of the student should cover not only the research project proper but general knowledge of the student's research area, in order to gauge preparation. To this end, members of the qualifying committee are expected to have already read the student's report and to have prepared questions appropriate for gauging the student's background in the area and ability to perform research.

Criteria for Passing the Qualifying Examination
The outcome of the examination is based on the qualifying committee's conclusion as to the adequacy of the student's ability and preparation for undertaking research in his or her chosen subfield of Electrical Engineering. The committee will consider the following questions in making this determination:

1. Did the student demonstrate adequate technical depth during the examination?
2. Was the quality of the presentation clear, in terms of oral delivery, visual materials, and answers to questions?
3. Was the motivation for the chosen research project adequate?
4. Did the student present a detailed and thorough discussion of prior work related to his or her project?
5. Did the student demonstrate a breadth of knowledge in his or her chosen subfield, beyond the specific research project presented during the exam?

All committee members must be satisfied that the student has met these criteria in order to pass the examination. Apart from the presentation and discussion during the examination itself, the committee may use other means at its disposal to determine the outcome of the examination, including a review of the student's full record.

**Outcome**

The qualifying committee may pass the student (perhaps with stipulation of further requirements), fail the student, or fail to come to a conclusion based on the information available to it. Typical stipulations include completion of additional coursework by a certain date, a further written examination, or presentation of a research proposal. In the case of an inconclusive outcome, the student may schedule a second examination as per stipulations by the qualifying committee; the result of the second examination must be conclusive.