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1. Introduction – In Accordance with the Faculty of Engineering Graduate Calendar

“Candidacy: Admission to graduate study does not imply admission to candidacy for a degree. The candidacy of a student normally will be determined within the second year after initial registration in the doctoral program.

Candidacy will be granted to students who meet all of the following requirements:

- (a) satisfactory completion of the comprehensive examination;*
- (b) demonstration to the doctoral committee of ability to conduct independent research;*
- (c) acceptance by the doctoral committee of the research proposal.*

The doctoral committee will assess the student's competence to continue research on the basis of (a), (b) and (c), and inform the Chair of the Program Graduate Committee.”

2. Organization and Administration

The comprehensive exam is designed to be an effective and straightforward assessment of the student's command of their declared research fields of interest, and their preparation to move on to the challenges of performing research and writing the dissertation.

The comprehensive exam consists of two parts (i.e., a written report and an oral examination) where students must:

- i. demonstrate an adequate background in the general discipline of engineering which may include Microsystems, Communication and Signal Processing, Control and Power, and Computer Engineering related to their proposed research fields. The defined background area is recommended by the supervisor. The declared area will be communicated with the comprehensive exam committee at the time of written proposal submission.
- ii. demonstrate an advanced knowledge in their field of specialization identified based on the advisor's recommendation and the student's written proposal. Student research proposal soundness and proposed methodology should be fully assessed during comprehensive examination.
- iii. Doctoral candidates are expected to be able to communicate effectively and knowledgeably both in writing and orally.

a. Written Proposal:

The PhD student is to submit to the ECE graduate secretary, the written PhD proposal. The graduate secretary will forward the proposal to the members of the comprehensive examination committee.

The written proposal should be concise and include:

- i. Introduction – problem definition and background to set the context of the proposed research. It should start with a big picture and narrow down to the questions to be answered through research.
- ii. Objectives – in form of hypothesis or research question. These should be defined and descriptive.
- iii. Literature review – a comprehensive review of relevant literature related to thesis to establish what is the state-of-the-art. It could also include a review paper the student may have written by now.
- iv. Knowledge Gap – identifying research and knowledge gap that is proposed to be filled. It is encouraged to include a methodology.
- v. Significance of filling the knowledge gap – novelty and applicability of candidate's work.
- vi. Timeline – anticipated schedule to completion (Gantt chart).

The comprehensive exam committee will evaluate the written proposal and will question the candidate during the oral examination.

b. Oral Evaluation:

The objective of this part of the comprehensive examination is to test the student's ability to integrate general knowledge from different areas of the field of study in order to solve problems the student has not previously encountered.

- i. The oral examination will last maximum three hours, with maximum 30min dedicated to the student's presentation summarising their written proposal.
- ii. Student's background is assessed orally during this oral presentation along with the proposed research topic.
- iii. Each committee member must submit at least two background and fundamental research questions related to the student's declared area (identified at the time of written proposal submission) to the chair in writing at the beginning of the oral examination. The question and discussion period will start by the background questions in first round of Q/A and will move to the research related questions in the second round and onward.
- iv. Each examiner will ask questions. The question-and-answer period format can shift between relatively structured background/fundamental questions and a more free-flowing discussion. The examiners will be looking to fill in any perceived gaps in the written proposal.
- v. The committee may seek further clarification of materials that were provided in the written proposal or ask additional questions intended to gauge the Candidate's knowledge and background in the area of intended research.
- vi. During the oral presentation and question and answer period, students must:
 1. demonstrate an effective grasp of the fundamental concepts
 2. effectively and explicitly answer the background questions as asked

3. show deep knowledge related to their proposed PhD research background, identify research gaps, and illustrate an effective research methodology
 4. indicate proper research procedure to answer the fundamental research questions related to their PhD research field
- vii. The research discussion will center on the identified background field and the student's written proposal. The scope of the questions is not, however, limited to that material. It is, rather, a test of the student preparation to work as an independent scholar at the highest level. The exam probes candidates to see whether they should be functioning like a scholar, and not just like a student.

3. Committee

The written research proposal and the oral examination will be evaluated by the comprehensive exam committee which shall be the same as the student's PhD dissertation committee excluding the outside program reader and the external examiner. Presence of outside program reader is optional, but it is encouraged. The PhD supervisor will chair the oral examination.

The comprehensive examination committee will consist of at least three members, with the student's advisor as chairperson. The committee includes the student's PhD advisor, co-advisor(s) if any, and two faculty members from the ECE program.

Additional members may be added with the approval of the graduate program committee.

The supervisor must be from the student's program (ECE) and have full graduate faculty status in ECE.

The majority of the committee members must have graduate faculty status.

4. Timing

The satisfactory progress shall be examined according to the following timetable.

The comprehensive examination must be attempted within the time frame stated in the graduate calendar.

- 1) Written proposal: The written comprehensive research proposal must be submitted to the comprehensive exam committee 1 month before the oral examination. Student's field must be declared at the time of proposal submission.
- 2) Oral comprehensive examination: The oral comprehensive examination seminar must be administrated within one month after the written proposal submission.

5. Results

The comprehensive exam committee will evaluate both the written proposal and the oral examination. Passing the comprehensive exam requires the comprehensive exam committee members to vote "satisfied" that the examining student has an appropriate mastery of the central material of the field and is prepared to go on to focused and independent work on a dissertation.

- i. Each examiner is responsible for assigning a grade of pass or fail based on the combined responses from the written and oral portions of the examination.

- ii. In order to pass the comprehensive exam and receive a satisfactory vote, a student must not receive more than one negative vote from a member of the examining committee.
- iii. The student will be informed of the decision of the comprehensive exam committee immediately following the committee's deliberations after the oral examination.
- iv. Students who do not pass the comprehensive exam will be asked to return within six months for a second attempt. In such case, the comprehensive exam committee may request the student to also re-submit the written proposal, provide a clear timeline and recommend additional research tasks, and attempt a second oral examination to answer questions on background and fundamental research, recommended major fields and also related and recommended minor fields.
- v. Students who do not pass the second attempt by receiving more than one negative vote (an unsatisfactory vote) will not be allowed to continue for the PhD and will be required to withdraw from the program.

The comprehensive exam form is to be signed by the members of the committee. This form and the result (either satisfactory/pass or unsatisfactory/fail) shall be reported to the ECE graduate program committee and the graduate secretary by the student's advisor within one week of the comprehensive exam oral presentation.

Revised and approved, July 2021