

Department of Electrical and Computer Engineering
Queen's University

Revised: May 2021

PH.D. COMPREHENSIVE EXAMINATION

A. PURPOSE OF EXAMINATION

Graduates in Electrical and Computer Engineering from Queen's University with the degree of Doctor of Philosophy are expected to be an expert in a specific area of research and have the breadth of knowledge and maturity of approach to tackle a wider range of problems in the discipline. It is assumed that the candidate has met the general breadth requirement in Electrical and Computer Engineering, which is a condition for admission into the Ph.D. program.

The objective of Part I of the Ph.D. Comprehensive Examination is to determine whether a candidate has adequate background preparation to undertake Ph.D. research in their chosen area of interest. Specifically, the *objectives* of this exam are to establish suitability of the proposed area of research, establish suitability of the Ph.D. student to work in their proposed area and finally, to provide feedback to the Ph.D. student on the level of preparation, and to determine the ability of the candidate to communicate research ideas. This examination requires a combination of background knowledge in a specific research area as well as more general knowledge of their sub-discipline within Electrical and Computer Engineering.

In Part II of the Ph.D. Comprehensive Examination, the candidate will present a research proposal and defend it before their Ph.D. Advisory committee. This is intended to ensure that the candidate has conducted a background investigation in sufficient depth to define an original research program and has the experimental and/or analytical tools with which to complete it.

B. PART I

1. Preparation

Preparation for the Part I Comprehensive Examination is based on taking one or more graduate courses within the chosen research area. The candidate must be able to, in part, identify and demonstrate a good understanding of recent important literature in their research area. This is achieved by conducting a literature review, including key materials of both tutorial (articles and/or textbooks) and research nature (articles in research journals and refereed conference proceedings). The literature review should contain a critical assessment of the material in the area.

2. Procedures

1. The Ph.D. Part I report must be submitted to the Department within 10 months of the start of the program. The candidate must submit one copy per committee member and an additional copy for the student file. For students admitted to the Ph.D. program in September, the report must be submitted by June 30th. For students admitted to the Ph.D. program in January, the report must be submitted by October 31st. For students admitted to the Ph.D. program in May, the report must be submitted by February 28th. In consultation with the examiners, the Supervisor(s) determines a date to hold the exam and informs the Graduate Program Assistant. The exam should be held no later than two months from the report submission date. The exam may be held in advance of the above deadlines.
2. Failure to meet the stipulated deadline for the first attempt of Part I will constitute a decision of fail for the first attempt. Failure to meet the stipulated deadline for the second attempt of Part I will constitute a failure of Part I of the Comprehensive Examinations.
3. During the first term, and preferably during the first month, of the Ph.D. program, the Ph.D. Advisory Committee is chosen by the Department in consultation with the student's Supervisor(s). This committee consists of (i) the Supervisor(s), (ii) an Internal Examiner as well as (iii) a Department Representative. All examiners are appointed by the Head of Department, or delegate. The Internal Examiner should have expertise as close to the candidate's research area as possible. An oral exam is to be arranged based on the timetable described in Item 1 above.
4. The Part I Examining Committee consists of the members of the Ph.D. Advisory Committee. The Examination is chaired by the Department Representative, who is a voting member. All examiners must vote "pass" for the candidate to pass Part I of the examination.
5. A Background document is written by the candidate. A carefully chosen title of the document should be descriptive enough to define the research area to be examined. The report must not exceed 25 single-spaced pages (of at least 11-point font), including references. Extensive lists of references to papers that are not significant to the area should be avoided, as they create a lack of focus. The document should contain the important concepts related to the research area as defined by the title. Topics and references within the area are to be discussed in proportion to their significance to the area. The precise organization of the document is to be decided by the candidate and will be judged by the examiners.
6. A copy of the Part I report is given to each examiner at least three weeks before the date of the examination.
7. The examination begins with a presentation (normally no longer than 20 minutes) by the candidate. The examiners question the candidate on the material presented in the background document. The exam itself consists of general background questions in the candidate's research area by the committee, as defined by the background document. Rounds of questioning by the three examiners may not only include explanations or clarifications of material appearing in the document, but **it** may also include critical issues deemed to have been omitted. Whereas the Supervisor(s) and Internal Examiner may ask questions that are more detailed in nature and specific to the research cited in the document, the Department Representative may ask more general questions to either explain the more basic concepts, or to place the research area in a broader context within Electrical and Computer Engineering.

8. The Part I exam outcomes are:
 - *Pass.* Ph.D. Candidate moves on to Part II, the Thesis Proposal.
 - *Study Required.* The Ph.D. Advisory Committee produces a list of items that the Ph.D. candidate must study. The nature of the list is necessarily open-ended and discipline specific. It may include reading specified articles or textbook sections or taking additional course(s). It may also include suggestions for improvement of written and/or oral communication. The Department Representative is responsible for producing the list of required items. Copies of the list are circulated to the committee and candidate by the Department. A copy of the list is also placed in the candidate's file. A committee member, normally the Supervisor(s), is chosen to supervise the required study. It is expected that the remedial actions can be completed within three months if no courses are required. Where course work is recommended by the committee, it is expected that the candidate will complete the remedial action within one month of completing the course.
 - *Fail.* The exam must be repeated. For a first failure, feedback is given in list form as above. A second attempt is scheduled upon completion of the list items, which may include coursework, normally no more than three months from the first attempt if no course work is required. Where course work is recommended by the committee, it is expected that the exam will be scheduled within one month of the student completing the course. Upon failure of a second attempt at Part I, the candidate is required to withdraw from the Ph.D. program.
9. At the end of the questioning, the Department Representative asks the candidate to withdraw from the room and the committee comes to a decision. Immediately after arriving at a decision, the Department Representative informs the candidate of the outcome. The Chair of Graduate Studies informs the candidate in writing of the final result normally within two weeks of the completion of the oral examination. The Chair of Graduate Studies also informs the candidate and Supervisor(s) of the due date for the submission of the Ph.D. Part II report.

C. PART II

1. Preparation

Part II of the Ph.D. Comprehensive Examination is intended to formulate an integral part of the research program. The candidate has already conducted a general literature study in their research area, as described in the Part I section. In Part II, the candidate defines the research problem, and discusses the methodology to carry out the research proposal.

The examiners, with a written proposal document on the planned research before them, can develop lines of questioning which will reveal if the candidate's research proposal is well formulated, original, of appropriate significance and whether the proposal is convincing enough that the research could be feasibly carried out.

2. Procedures

1. The Part II report must be submitted to the Department within 22 months of the start of the program. In the case where a student has failed the Ph.D. Part I exam, the Ph.D. Part II report must be submitted within 7 months of the successful second attempt of the Ph.D. Part I exam. The candidate must submit one copy per committee member and an additional copy for the student file. In consultation with the examiners, the Supervisor(s) determines a date to hold the exam and informs the Graduate Program Assistant. The exam should be held no later than two months from the report submission date.
2. Failure to meet the stipulated deadline for the first attempt of Part II will constitute a decision of repeat for the first attempt. Failure to meet the stipulated deadline for the second attempt of Part II will constitute a failure of Part II of the Comprehensive Examinations.
3. Prior to Part II of the Ph.D. Comprehensive Examination, the Supervisor(s), in consultation with the Chair of Graduate Studies, augments the Ph.D. Advisory Committee used for the Part I exam with an External/Internal examiner (outside ECE Department, within Queen's University). That is, the committee for Part II consists of (i) Supervisor(s), (ii) Internal Examiner, (iii) External/Internal Examiner and (iv) Department Representative.
4. The Part II Examining Committee consists of the members of the Ph.D. Advisory Committee. The Examination is chaired by the Department Representative, who is a voting member. All examiners must vote "pass" for the candidate to pass Part II of the examination.
5. The candidate prepares a written proposal on their planned research area, in which the candidate reviews the most pertinent background literature, defines the problem as precisely as possible, and discusses methods by which the research will be pursued. The research proposal should be well formulated, original, of appropriate significance, and convincing enough that it could be feasibly carried out. The candidate should elaborate on methods of analysis or experimental techniques and facilities he/she expects to use. In some cases, preliminary results which support the validity of the proposed research may be useful. The report must not exceed 30 pages singled spaced (of at least 11-point font) including references.

The research proposal report should clearly include:

- What exactly the proposed research will be.
 - What gaps in the research area the research will fill.
 - What the significance of the proposed research is.
 - If the research proposal includes research that has already been completed and research that remains to be done, then a clear indication of what has been done and what remains should be covered in the Comp II report.
 - There should be a timeline for completing the proposed research, which could be by including a Gantt chart or a list of the tasks of the proposed research and dates when the research will be undertaken.
6. A copy of the proposal is given to each examiner at least three weeks before the date of the examination.

7. The examination begins with a brief presentation (normally no longer than twenty minutes) by the candidate on the proposed research. The examiners question the candidate on the material presented in the report and on any other areas which relate to the proposed research. The questions probe (a) the significance of the problem to be solved, (b) the candidate's understanding of the background literature (c) the candidate's understanding of the proposed methodology to be used in solving the thesis problem, and (d) the adequacy of the proposed methodology.
8. The Part II outcomes are: "*pass*" or "*repeat*" at the first attempt, and "*pass*" or "*fail*" at the second attempt.
 - *Pass*: The pass may have conditions, as agreed upon by the examiners: for instance, the self-study of an area or the assignment of additional courses to be taken as part of the candidate's program.
 - *Repeat*: A repeat is required if the examining committee feels that the candidate is not adequately prepared; e.g., has a superficial understanding of the problem, or lacks adequate knowledge of proposed techniques, or is not sufficiently familiar with similar work in the field.
 - *Fail*: A candidate fails a repeated exam if they have not demonstrated adequate research ability to the committee's satisfaction, or if the deficiencies revealed in the first attempt have not been rectified.

The second attempt must take place within three months of the first attempt. Candidates who fail the second attempt are required to withdraw from the Ph.D. program.

9. At the end of the questioning, the chair asks the candidate to withdraw from the room and the committee comes to a decision. Immediately after arriving at a decision, the chair informs the candidate of the outcome. However, if the decision is negative, which results if any of the examiners vote "*fail*", the chair provides a written summary of the reasons to the candidate and Chair of Graduate Studies. Any examiner who votes "*fail*" must provide written justification to the chair. The record of the examination will be kept in the student's file. The Chair of Graduate Studies informs the candidate in writing of the final result normally within two weeks of the completion of the Part II examination.

D. EXTENSIONS

Extensions to any of the aforementioned deadlines will only be granted in exceptional circumstances, for reasons such as health or family crisis. Such extensions must be requested in writing by the candidate, and supported by the Supervisor(s), to the Ph.D. Examination Coordinator. The Ph.D. Examination Coordinator will then inform both the Supervisor(s) and the student of the decision.

E. APPEAL PROCEDURES

A candidate has the right to appeal any of the examining committee decisions made in the process of the Ph.D. Comprehensive Examination, Part I or Part II. The Departmental appeal procedures, as described in the Graduate Students' Handbook, will be followed.