

Doctoral Candidacy Assessment Procedure for the Physics and Engineering Physics Department

(Version 2024-05)

1. Introduction

The candidacy assessment is a crucial milestone for PhD students in the Physics and Engineering Physics department. It is designed to maintain standards of excellence and rigour in our academic endeavours. Motivations for the assessment include:

- Ensure that PhD recipients from the department have an adequate grounding in Physics.
- Catch students who will struggle in the PhD program.
- Motivate students to sharpen up on their basics.
- Ensure students have sufficient understanding of undergraduate-level physics to support their teaching assistant roles and succeed in graduate courses.
- Ensure that students have the ability to conduct advanced original research independently using relevant methodologies.
- Ensure that students have identified a goal for their doctoral research program, can motivate the research with respect to the current state of understanding, and can propose a feasible plan of investigation.

This document outlines the procedure for the candidacy assessment exam and the criteria for passing.

2. Timing of the Assessment

- Students are required to take the written portion of the candidacy assessment within the first 12 months of the program¹.
- Students are required to take the oral portion of the candidacy assessment within the first 24 months of the program.
- The written portion of the assessment will be offered twice a year, in April and December during the exam periods of the Winter and Fall terms, respectively.
- Students starting in the Spring and Fall terms must take the written portion in December of the same calendar year. Students starting in the Winter term must take the written portion in April of the same calendar year.
- The oral portion can be taken any time during the first 24 months of the program and might count as the first advisory committee meeting (if occurring during the first year). The student's advisory committee must inform the student in writing at least 60 days in advance that the oral portion candidacy assessment is to take place, including the academic unit's procedures as well as preparatory guidance and assessment details specific to the student. At the student's request, and with the support of the advisory committee, the oral assessment may be scheduled earlier.
- Additionally, students are required to complete all credit courses and ethics training requirements, as listed in their program of studies within their first 24 months of the program.

¹Students accepted in the Physics PhD program and having completed the Physics GRE test with an overall score of 60/100 or more will automatically get a pass for the written portion of the assessment

3. Structure of the Assessment

a. Written Portion:

The written assessment consists of a 4-hours closed book written exam, which includes six problems covering the following topics²:

- 1) Classical Mechanics and Fluid Dynamics
- 2) Thermodynamics and elementary Statistical Physics
- 3) Oscillations and waves
- 4) Electromagnetism
- 5) Light and Optics
- 6) Modern Physics with an emphasis on bachelor-level Quantum Mechanics

²A Student enrolled in a multidisciplinary program might be required to write a modified version of the written assessment reflecting their different background. The decision is made by their advisory committee.

b. Oral Portion (research proposal):

The student presents their proposed research topic, the motivation, purpose, hypothesis to be tested, methods and reviews the relevant literature and demonstrate their understanding of the necessary background knowledge.

The advisory committee will have an opportunity to test the student's knowledge and thereby assess the student's candidacy for the completion of the doctoral program and thesis.

4. Assessment Content

a. Written portion:

The six problems for the exam will be selected by the Graduate Affairs Committee. The problems will be at the level of the problems found in the Serway and Jewett, "Physics for Scientists and Engineers with Modern Physics", 9th and 10th edition textbooks. The problems will be representative of bachelor (honours) level understanding and will assess students' ability to apply fundamental concepts in each topic area.

b. Oral portion:

- One week before the scheduled oral presentation, the student is required to send a brief report (15 pages max) to their Advisory Committee presenting the outline of their proposed research topic, the motivation, purpose, hypothesis to be tested and reviews the relevant literature.

- The student gives a short (15-20 min) presentation outlining the main aspects of proposed research topic and the necessary background knowledge.

- The advisory committee will pose questions to assess the student's grasp of relevant background knowledge and the feasibility of the research plan.

5. Passing Criteria

To pass the candidacy assessment, students must:

- a) Achieve an overall mark of at least 60% on the written portion.
- b) Demonstrate sufficient understanding of their research topics and ability to conduct advanced original research, as evaluated by the advisory committee.

6. Retake Policy

Students are strongly encouraged to adequately prepare and demonstrate their proficiency during their initial attempt.

A student who does not satisfy the requirements of their candidacy assessment is permitted a second attempt at the recommendation of the academic unit and with the permission of the Dean of CGPS or designate:

- The retake of the written portion must occur at the next offering of the written portion of the assessment
- The retake of the oral portion must occur within two months.

A second unsatisfactory outcome will automatically result in a requirement to discontinue from the doctoral program.

An unsatisfactory candidacy assessment, and/or the denial of a second attempt at the candidacy assessment, may be appealed to the Graduate Academic Affairs Committee of CGPS on substantive grounds in accordance with Part IV of University Council's Procedures for Student Appeals in Academic Matters, or on grounds other than substantive academic judgment limited to those outlined in Part V.B.1.

7. Preparation Resources

Students are encouraged to utilize resources such as textbooks, lecture notes, and practice problems to prepare for the candidacy assessment exam.

Additionally, faculty members and supervisors are available to provide guidance and support to students as they prepare for the exam.