

## UCF Physics Written Candidacy Exam: Rules and Guidelines

The purpose of the written PhD candidacy exam is to test students' knowledge of the fundamental concepts in physics and their ability to solve problems at the upper-division undergraduate core level, considering that this is a necessary basis to successfully conduct research in any area of physics. All PhD students are required to pass a written candidacy exam in order to advance to the oral doctoral candidacy exam.

1. **Subjects.** The written candidacy exam comprises four parts, one for each of the following subjects: 1) Classical Mechanics, 2) Statistical Physics, 3) Electromagnetism, and 4) Quantum Mechanics.
2. **Learning Objectives (LOs): content.** The topics that can be covered in the candidacy exam are specified by one document per subject, listing the books students can use as references, and a detailed list of learning objectives, grouped in categories.
3. **LOs: approval and publication.** The LOs documents must be made available to all graduate students at least three months in advance to the subsequent exam. The documents can be amended and must be approved by the departmental faculty.
4. **Subject Exam.** At any given offering of the exam, each student will be offered four problems for each of the subjects they are required to be examined on. The student must return the solution of three of these problems, of their choice.
5. **Passing Grade.** Students are allowed to retake the exam for any subject they want. To pass the exam, a student must score at least 60% in each subject. If a subject is taken multiple times, the highest score prevails.
6. **Exam Frequency.** The candidacy exam is offered at least twice per year.
7. **Exam Duration and Availability.** The exam will be offered over four separate days: one subject per day. Students will be allowed to attempt each subject within two years of joining the PhD program. Each problem should be solvable within 15 minutes by the responsible members of the committee. Students are given three hours to solve the three problems of their choice. In exceptional cases, the department chair may grant extraordinary attempts to PhD students or to prospective PhD applicants.
8. **Accessibility Services.** Students who qualify for extended time or alternative accommodations must notify SAS and the department sufficiently in advance, for appropriate measures to be taken.

9. **Problems Composition.** The problems in each subject are determined as follows. Half of the problems are chosen by the candidacy committee out of a pool of no fewer than 16 problems for each subject, which must be made available to the students at least three months in advance to the exam, along with their solutions and rubrics. The committee has the latitude to make modifications to these problems, as long as the learning objectives of the problems and the fundamental aspects of their solutions are unchanged. The suggested changes must be approved by a majority of the committee members. The other half of the problems are formulated by the committee, based on the subject learning objectives. These additional problems and their full solutions must be made available to all committee members at least two weeks in advance of the committee meeting, where they must be approved by a majority vote.
10. **Update of the problem pool.** At the end of the evaluation meeting that follows the exam, the new problems are included in the pool, and the modified old problems are appended to the original, as variants. The committee may also decide, by majority vote, to archive some of the pool problems. Archived problems and their solutions remain available to the students for training purposes. Any faculty member can recommend modifications to the existing problems in the pool or propose new problems, as long as they are accompanied by full solutions and conform to the required format. The committee will decide at the earliest opportunity whether to include the suggested problems in the pool, possibly after having modified them, and whether to accept the recommended corrections to the existing problems.
11. **Problem Format.** To be considered for the exam, or to be added to the pool, any problem must be accompanied by its solution and rubric in an editable electronic form, LaTeX (preferred) or docx, using the templates provided in Annex I. The pool of each subject must be kept under revision control in a separate Git repository.
12. **Grading and feedback.** Students' exams will be graded based on the solution and rubric associated with each problem. A subset of student's exams in each subject must be graded by more than one committee member, to promote the use of uniform grading criteria. The graded exams are made available online to all members of the candidacy committee. The committee must certify the grading by a simple majority vote. After their grades are certified, students receive, alongside their grade in each subject, a copy of their graded exams.
13. **Tutoring.** Students are offered a common space online to discuss pool problems among each other. Committee members may participate in the discussion. Committee members will offer at least two recitation sessions per subject prior to the administration of an exam and after the most recent exam offering. Students who do not pass one or more subjects in a written candidacy exam will be offered to meet with a committee member once, to make a study plan, and a second time to follow up on the student's progress, prior to the following offering of the exam.

14. **Bias Control.** To reduce any potential biases, each student will be assigned a written candidacy exam identification number (WCEID) the week after the registration email is sent. The student's WCEID will be assigned by the Graduate Candidacy Committee (GCC) support staff person and sent to the student via email. The student will use their assigned WCEID instead of their name in the written candidacy exam paperwork (and, if applicable, in the appeal).
15. **Published Master-Thesis Option.** Any student who did not pass their allowed attempts may satisfy the candidacy-exam requirement by earning a Master of Science degree with thesis.
- 1) A minimum candidacy score of 30% in each subject is required for the MS option to apply.
  - 2) At least part of the thesis must be submitted to and accepted by an ISI-indexed peer-reviewed journal with the student as first author.
  - 3) The thesis must be completed by the end of the third year of graduate student standing at UCF.