

Department of Physics and Astronomy Comprehensive Research-based Examination (CRE) Guidelines

For PhD degrees in Applied Physics in the Bagley College of Engineering and Physics and Astronomy in the College of Arts and Sciences

1. Motivation:

The new Comprehensive Research-based Examination (CRE) is designed to encourage and reward more research involvement earlier in the Department of Physics and Astronomy PhD programs. By basing the CRE on the research students are already doing with their advisors, we aim to make competence in a research field an essential skill necessary to become an official candidate for the PhD degree. This will also directly benefit research efforts towards the PhD degree after the CRE. In this way, we aim to make the transition to PhD candidacy less climactic and stressful, while also lessening the average time and variability in when a student qualifies as a PhD candidate. While the primary goal is to make the requirements for PhD candidacy more streamlined towards getting the degree for existing students, we also hope that the CRE will enhance our program's attractiveness amidst the increasing trend among US physics programs to remove written prelim exams, thereby strengthening our program to the benefit of current and future generations of students.

2. Plan:

- 2.1. Require the first attempt of the Comprehensive Research-based Examination (CRE) within 36 months** since joining the Mississippi State University Department of Physics & Astronomy PhD program.
- 2.2. Presentation preceded by a short write-up** about the proposal topic, including some detailed explanations of the content of the slides (formalism, equations, etc.), if needed.
- 2.3. Write-up length and submission:** The written paper should be 4-10 pages, excluding references. It must be submitted to the Comprehensive Research-based Examination Committee (CREC) at least a week before the oral presentation.
- 2.4. Form a Department Ph.D. Advisory Committee (PAC):** The committee will have six members who will rotate off/retire every 3 years, with 2 members exiting and 2 new members joining each year. In such a case, each faculty member could serve on it again after 6 years. Once formed, the committee will internally elect its chair. Its duties will be:
 - 2.4.1.** Review(/create) a "Comprehensive Research-based Examination evaluation form/rubric" (/if not in place yet) that will be used for all students, and revise it as needed based on feedback/experience, and

2.4.2. Keep track of the student's progress and readiness for the CRE (also known as the Ph.D. proposal defense). The PAC chair or their appointee will contact the student, CC'ing their advisor, at least once each academic year to check on such progress. The student, as well as their advisor, are fully responsible for choosing the research project, discussing its details, and proposing the date for its defense. The PAC will only advise the student about the 3-year deadline that should be respected. As needed, the PAC may discuss any reported or requested exceptions for delaying the CRE by the student/advisor. This exception may be granted based on each reported case.

2.4.3. The PAC should be informed about the examination date of each student, and at least one of its members should attend the CRE as an observer to report the examination outcome to the PAC. ONLY when the PAC member is also a member of the CREC, they will participate in the student's evaluation and the Pass/Fail decision. The student/advisor will choose all CREC members, including the external members as required. The CREC will be chaired by the student's advisor.

2.5. **Pass/Fail the CRE:** The student will have 2 attempts to pass their CRE. If the CREC is not satisfied with the first attempt's performance, they must give clear instructions for the points that they want the student to work on/improve for the second attempt. The latter should be done no later than the end of the subsequent semester. The committee is advised to not request another oral presentation if they are satisfied with the student's performance on it, including the related Q&A, but only have comments/suggestions for the write-up. In such a case, they can grant a "GDP" grade and give a grace period, up to one semester, to the student to improve the written part of the proposal and resubmit it. Then, the "Pass" grade will be granted. Other notes are:

2.5.1. If after the 2nd attempt the committee is still not satisfied, even after discussing the student's case with the advisor, the "Fail" grade will be given and that will make the student ineligible for Ph.D. candidacy.

2.5.2. If the student doesn't provide any justification for the 1st attempt delay or fails to request an extension, it will be treated as failing the 1st CRE attempt then they have to go for the 2nd attempt after one semester. If this 2nd attempt is not taken and/or failed then the failure protocol will apply to them (see 3.).

2.6. **Recording the CRE:** Only the 2nd attempt of Comprehensive Research-based Examinations will be videotaped as a reference, particularly in the event of any appeals.

3. The implication of Passing & Failing the CRE:

3.1. The (non-thesis) M.S. degree will be offered with dual enrollment in the (non-thesis) M.S./Ph.D program. It will be awarded to students who successfully completed the (non-thesis) M.S. program of study, including the CRE, with the requisite GPA to fully qualify for our Ph.D. program.

3.2. Students who fail the CRE twice will be removed from the Ph.D. program and will have the option to become (thesis) M.S. candidates upon agreement with their advisor.

3.2.1. If the student objects to completing the thesis M.S. requirements (or their advisor objects), then they will be dismissed from our programs.