

THE PH.D. COMPREHENSIVE EXAMINATION IN OPTICAL SCIENCES (effective beginning Fall 2005 admitted PhD Students)

This guide explains the procedures and policies governing the conduct of the Comprehensive Examination for prospective Ph.D. candidates majoring and/or minoring in Optical Sciences. Its contents are supplemental to, and in accordance with, the procedures established by the Graduate College (see the Graduate Catalog). Deviation from these procedures and policies shall be made only in special cases where the Associate Dean, Academic Programs, deems such deviation appropriate.

The Comprehensive Examination, which consists of a written and an oral exam, is intended to test the student's general fundamental knowledge of the fields of the major and minor subjects of study.

I. Major-Subject Written Exam.

This section contains information applicable to students who are majoring in Optical Sciences.

- A. **Eligibility.** Ph.D. students in Optical Sciences who have completed 32 or more units of graduate course work (excluding dissertation units, but including transfer credits, if any), are eligible to take the written comprehensive exam. For most students, this will be at the beginning of their third year of full-time study.
- B. **Type of Exam.** The major-subject written portion of the Comprehensive Examination is a comprehensive, closed book, written examination. Students may bring only pens and pencils, a simple non-graphical calculator, and food or drinks with them into the examination room. All other materials, including paper, cell phones, and palmtop/laptop computers are prohibited. The department will provide pencils, paper, drinks, and rolls for those who wish to use them.
- C. **Dates Administered.** It will be given twice each year, in September and again in February.
- D. **Written-Exam Committee.** A Written-Exam Committee, consisting of members of the faculty, appointed by the Associate Dean, will administer the written examination.
- E. **Exam Construction.** The written exam for each student will consist of questions drawn from the material given in the required Optical Sciences core courses taken by that student. For each student's exam, the Written-Exam Committee will select 12 questions, two from each of the required core courses the student has taken in the areas of electromagnetic waves, geometrical optics, physical optics, solid-state optics, and photonics/image science/applied optics. Exam questions may be solicited from the entire faculty. However, all questions included in the exam must be approved by the respective core course instructors as being appropriate given the material taught in the core courses. Questions will be designed to be answered in about 30 minutes.
- F. **Exam Administration.** The Written-Exam Committee will administer the exam. It will be given in two sessions held on consecutive days, with each session being 3-1/2 hours in duration. Six questions will be given in each session, and students are

required to answer all questions.

- G. **Grading of Exam.** The Written-Exam Committee will coordinate the grading of the exam. In order to help standardize the grading, the committee will establish a numerical scale that defines the various levels of student performance.

The Written-Exam Committee will be responsible for determining whether or not a student passes or fails the written examination, based on the performance of each student in answering all 12 questions on the exam. If the committee is unable to make a decision, it may request that the matter be considered by the full faculty at a special meeting. Unless the committee recommends otherwise, a student will be allowed to repeat the written examination only once. The committee may also recommend that a five person oral exam committee be used for students whose performance is deemed marginal.

Each student's written examination answers will be passed on to the student's oral comprehensive exam committee with instructions to particularly examine the student's knowledge in those areas where the student's knowledge and understanding appears to be weak.

During the examining and grading process, the student's identity will not explicitly appear on her/his exam papers. The Academic Office will assign an identification number to each student, and only this number will be placed on the exam papers.

Only after the grades have been determined will the identities of the students be made known to the Written-Exam Committee. At the conclusion of each written examination, copies of the exam will be available for inspection in the academic office. Each student will be notified by mail of the outcome of the written examination, and may obtain a copy of her/his graded exam papers. In addition, a copy of the graded exam paper will be placed in the student's academic file for use by the Oral-Exam Committee at the oral examination.

- II. **Minor-Subject Written Exam.** This section contains information applicable to students who are minoring in Optical Sciences.

- A. **Optical Sciences Majors.**

For students whose major and minor subjects are both in Optical Sciences, a passing grade on the major-subject written exam will automatically satisfy the minor-subject written exam requirement.

- B. **Non-Optical Sciences Majors.**

For students whose major subject is not in Optical Sciences, the written exam will be given during the first session of the major-subject written exam. The administering committee is the same as for the major-subject written exam.

The written exam for each student minoring in Optical Sciences will consist of four questions, one from each of the four Optical Sciences classes taken by the candidate for their minor coursework. Students whose major subjects are other than Optical Sciences will not be required to perform at the same level as the Optical Sciences majors taking the exam, nor must they demonstrate proficiency in all four categories.

Note: In order to satisfy the requirements for a minor in Optical Sciences, a student

must satisfactorily complete, with a grade average of B or better, twelve units of course work in Optical Sciences. At least 9 of the 12 units must be courses for which Optical Sciences is the home department. Two Optical Sciences faculty members are required to be part of the student's oral comprehensive examination committee.

Students whose major departments allow them to have a split minor may do one portion of the split minor in Optical Sciences. In order to satisfy the requirements for a split minor in Optical Sciences, a student must satisfactorily complete, with a grade average of B or better, six units of course work in Optical Sciences for which Optical Sciences is the home department. One Optical Sciences faculty member is required to be part of the oral comprehensive examination committee.

Each student shall be notified by mail of the outcome of the written examination, and shall be provided copies of her/his graded exam papers. In addition, copies of her/his exam papers shall be provided to the Optical Sciences members of the Oral-Exam Committee prior to the oral examination.

III. **Oral Exam.**

This section includes information primarily applicable to students who are majoring in Optical Sciences, although portions of it also apply to students who are minoring in Optical Sciences and majoring in other departments.

- A. **Type of Exam.** The oral portion of the Comprehensive Examination requires the student to respond orally to questioning by a committee of examiners.

Students may expect to be questioned in the six general categories of optics listed below:

- Electromagnetic waves
- Geometrical Optics
- Quantum Optics
- Physical Optics
- Solid State Optics
- Photonics, Image Science, or Applied Optics

- B. **Duration.** The oral exam is expected to last two hours, but not to exceed three.

- C. **Dates Administered.** This exam is given at individually scheduled times during the remainder of the semester that follows the fall and spring written exams. The student will be scheduled to take it during the same semester as his or her successful completion of the major-subject written exam.

- C. **Oral-Exam Committee.** The Oral-Exam Committee will normally consist of four or five faculty examiners, depending upon the recommendation of the Comprehensive Exam Committee. If the student has chosen to minor in another department, there will be five examiners, three from Optical Sciences, and two from the student's minor department.

The Associate Dean, Academic Programs, will select the examiners. In making his selections, the Associate Dean will consider any recommendations for committee members made by the student and/or the students' major professor, as well as the student's program of study and the suggestions of the student's minor department. He will then propose a committee of examiners to the Dean of the Graduate College who officially appoints the committee.

E. **Exam Administration.** The oral exam shall be administered as explained below.

1. **Oral-Exam Chairman.** The Associate Dean, Academic Programs, will designate one member of the Oral-Examination Committee to be the committee chair. This individual is normally not the student's academic advisor, major professor, or dissertation director. The chair is responsible for ensuring that the examination is conducted according to current Optical Sciences policy. If any significant deviations from the approved procedures occur, or if any aspect of the examination seems inappropriate, the chair should ask to recess the examination and excuse the student so that corrective measures might be discussed.
2. **Recorder.** One of the faculty examiners will be designated to be the recorder for the exam. This individual is normally not the student's academic advisor, major professor, or dissertation director. It is the responsibility of the recorder to certify that the conduct of the exam is consistent with the policies of the Graduate College, to conduct the balloting at the completion of the exam, and to report the results to the Graduate College.
3. **Conduct of Exam.** Each member of the committee is expected to be present prior to the scheduled exam time, and to remain throughout the exam (up to the full three hours, if necessary). Each examiner shall come prepared to ask questions from at least one of the general categories of optics listed in Section I, and shall attempt to avoid excessive overlap between his or her line of questioning and that of the other examiners.

The questions should be stated clearly and concisely, and should be designed to determine the depth and breadth of the student's knowledge rather than to demonstrate the examiner's expertise. The examiner should make certain that the student understands the question, realizing that what is clear and obvious to the examiner may not be clear and obvious to the student (possibly only because the student has not had time to think about it). A particular line of questioning should be restricted to no more than 15 or 20 minutes in order to give the student an opportunity to respond to questions pertaining to other categories. If the time spent on one line of questioning does become excessive, the committee chairman should intervene and suggest that the questioning be shifted to a different category.

The above remarks also hold for students minoring in Optical Sciences and majoring in other departments, except that they are not expected to demonstrate knowledge in all of the categories of optics specified for Optical Sciences majors.

F. **Voting.** The voting is conducted by secret ballot, and the votes of all the examiners have equal weight (the presiding officer does not vote). The major- and minor-subject written exams together shall have approximately the same weight as the oral exam. Each examiner shall vote his/her conviction with respect to the student's performance on the entire Comprehensive Examination, not merely the performance on the oral exam. Also, the examiner should base his/her evaluation of the oral exam on the student's overall performance—not simply on the student's responses to the examiner's own questions. However, if the Oral-Exam Committee determines that the student is indeed deficient in one or more of the four established categories, he/she should not be passed regardless of overall performance. Other factors that should be considered in making the decision are the student's course work, research capabilities

and publications.

There is only one official ballot, usually following a discussion of the student's performance (and sometimes following one or more straw ballots), and all examiners are required to mark their ballots either pass or fail. One negative vote will not cause the student to fail the Comprehensive Exam, but two negative votes will. An abstention is counted as a vote for failure.

If the balloting results in a failure, the committee must make a recommendation regarding a reexamination. If their recommendation is to allow the student to repeat the exam, the committee should also make a recommendation regarding the written portion of the reexamination: they may recommend that all or part of the written examination be waived, or that the entire written examination be required. The Oral-Exam Committee should also recommend an approximate date for the reexamination. A reexamination may then be given with the approval of the Graduate Council.

Note: The final decision shall be either to pass the student or to fail the student -- "conditional pass" or "conditional fail" decisions are not allowed. In either event, however, the student should be given any counseling deemed appropriate by the committee, e.g., weak areas, study recommendations, etc.

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