

COLUMBIA UNIVERSITY

IN THE CITY OF NEW YORK

DEPARTMENT OF APPLIED PHYSICS AND APPLIED MATHEMATICS

Requirements and Timetable for Doctoral and Doctoral-Track (MS leading to PhD) AP/AM/MSE Students December 16, 2020

1. Requirements for PhD

- a. Year 1: Pass the Written Qualifying Exam in May**
 - i. If you do not pass it and have a GPA of at least 3.0 in APAM approved courses within your field and thesis area, you can retake it only in Year 2, and you can do so as long as you are a student in good standing when the exam is given (see below).
 - ii. If you do not take it in Year 1 and have a GPA of at least 3.0 in APAM approved courses within your field and thesis area, you then get only one chance to take the exam; that chance is in Year 2, and you can do so as long as you are a student in good standing when the exam is given (see below).
- b. Years 1 and 2: Fulfill the Ethics Requirement**
 - i. You must take and pass the Physical Sciences Responsible Conduct of Research (RCR) course (all modules except Human Subjects) @citiprogram.org before the fall term of Year 1 ends, and submit the completion report to the department. (This requirement applies to students who entered the doctoral program in Fall 2010 or later.)
 - ii. You must attend the Research and Professional Ethics Seminar, given in May, in both Year 1 and Year 2.
- c. Year 2: Get NYC Fire Department COF and Laboratory Safety Training**
 - i. You must take and pass the NYC Fire Department Certificate of Fitness Exam by Oct. 31 of Year 2. (This requirement applies to non-theory students, which means it applies to all doing ANY kind of experimental research.)
 - ii. You must give a photocopy of the Certificate of Fitness Card to the department before the fall term of Year 2 ends
 - iii. You must re-certify every 3 years
 - iv. Attend safety training session specific to your laboratory activities by Oct. 31 of Year 2
 - v. You must take refresher training when required
- d. Year 2: Pass the Oral Exam**
 - i. You must pass it by May 1 of Year 2
 - ii. You must take it for the first time by March 1 of Year 2
 - iii. You must take it in the specialty area you chose on the second day of the Written Qualifying Exam
 - iv. Department arranges a three-person Oral Exam committee (suggested by your advisor and approved by the doctoral program committee chair; the department starts the process in Sept. of Year 2)
 1. Usually all three faculty members are from APAM
 2. It includes your Advisor (in AP and AM)MSE oral exams will be arranged by the MSE program, targeting February in the year after you passing quals, with a committee of MSE faculty other than the research advisor (who could be an observer).
 - v. Department sets the actual exam time in consultation with the committee and, for AP and AM, with you.
 - vi. If you do not pass it, you can retake it one more time. If you do not pass the second time, in extraordinary circumstances you can appeal to the Department Chair to take it again.

- vii. If you do not pass the Written Qualifying Exam in Year 1, you should delay taking the Oral Exam to Year 3 (instead you must take it by Nov. 1, and pass it by Feb. 1 of Year 3; the department starts the process in Sept. of Year 3)

e. Year 3: Pass the Thesis Proposal Exam

- i. You must pass it by May 1 of Year 3
- ii. You must take it for the first time by March 1 of Year 3
- iii. Department arranges a three-person Thesis Proposal committee (suggested by your advisor and approved by the doctoral program committee chair; the department starts the process in September of Year 3)
 - 1. May be the same as the Orals Exam Committee (in AP or AM, or have common members)
 - 2. Includes your Advisor
- iv. Department sets the actual exam time in consultation with the committee and you
- v. A week before the exam, give each committee member a ~1-2 page summary of your proposed research.
- vi. If you do not pass it, you can retake it

f. Year x: Submit your Doctoral Thesis and then pass the Thesis Defense

- i. In consultation with your thesis Advisor, the chair of the Doctoral Committee selects the five members of the Defense Committee
 - 1. It will include three or four faculty who are inside the doctoral candidate's home department or program (specialty area), and two or one faculty, respectively, who are defined by GSAS as outside examiners (GSAS University rules)
 - 2. It will likely include the members of the three-person Thesis Proposal Committee
 - 3. It will definitely include your Advisor
- ii. Department sets the actual exam time in consultation with the committee and you, but you must start the process with the APAM office
- iii. You submit the Advisor-approved thesis to each committee member at least three weeks before the exam (University rules)
 - 1. Must be within University style guidelines
- iv. After the defense, you must make all corrections, officially deposit the thesis with the University, and provide a hard copy for the Department
- v. You are allowed to be in the doctoral program for no more than seven years

2. Exams

- a. In the Written Qualifying Exam, you answer general questions and more specialized questions in your discipline over a two-day period. More details about this exam are provided in departmental handouts.

In addition to properly planning your first-year program discussed above, you should read the description of the qualifying examination format and look at past examinations. Practice taking one or more of these exams at home without use of any reference material. Students who have had difficulty with this exam have afterward expressed surprise at the type of questions that were asked on the exam because they never examined previous exams. Practice! Get used to answering questions without your books and notes available. More details about the requirements and timetable for doctoral and doctoral-track students may be found on the APAM Department's website.

- b. In the Oral Exam, you are questioned by a three-faculty-member committee about general topics in your specialty area (e.g. Applied Math, Atmospheric Science, Plasma Physics, Solid State and Optical Physics, Materials Science and Engineering, Medical Physics), unless you are given more specific guidelines (more specific field in specialty area, based on reading material...), in an e-mail or letter by the committee when the exam is scheduled (at least a month before the exam). In Applied Mathematics, the oral exam consists of questioning based on an advisor-approved list of topics and corresponding textbook chapters, papers, etc. In Materials Science and

Engineering, the oral is based on the core program courses: MSAE4100 crystallography, 4200 theory of crystalline materials, 4201 thermodynamics, 4202 kinetics, 4206 electronic and magnetic properties, 4215 mechanical properties.

- c. In the Thesis Proposal Exam you make a 20-30 min presentation to a three-faculty-member committee about your proposed work and then the committee questions you about it. You submit to each committee member a one-page thesis overview at least one week before the exam, unless the student is given more specific guidelines (regarding the length of the overview...), in an e-mail or letter by the committee when the exam is scheduled (at least a month before the exam).
- d. In the Thesis Defense you make a ~30 min presentation to a five-faculty-member committee about the novelty, results and impact of your thesis work---with you either surveying your thesis or emphasizing some aspects of it---and then the committee questions you about it. The alternative “open defense” can occur if both you and your advisor agree to it, in which you make your presentation before your committee and other guests (fellow students who want to attend...), during which time all present except the committee are permitted to ask you questions; the formal defense then begins with questioning by the committee only after other guests have left the room.

3. Doctoral thesis

- a. Criteria for evaluation
 - i. Does it present new and original work?
 - ii. Is it a significant body of work and are the results significant?
 - iii. Is it predominantly the work of the candidate, albeit in collaboration with the advisor and with minor collaborations with others?
 - iv. Is it presented in a thorough, careful, and scholarly way?
- b. A doctoral thesis represents a significantly higher and more extensive level of scholarship than does a Masters thesis
- c. Different advisors may have different styles, but all are looking for the same substance in a thesis
- d. You should consult earlier theses in your research group for examples of style and criteria deemed acceptable by your Advisor
- e. Consult the official university guidelines for the doctoral thesis format (Arts and Sciences for PhD and SEAS for DES), which are available in the APAM office and online
- f. Your Advisor should have a nearly complete draft of your thesis at least two months before you can defend your thesis
- g. Your Advisor may want to see all individual chapters earlier

4. Advisors

- a. Your Advisor must approve all of your courses
- b. Your Advisor provides you general advice on all academic matters
 - i. You may consult other faculty (especially your orals committee) and other experts as well
- c. Your Thesis Advisor must pre-approve any vacation time you want
 - i. It must be at a mutually agreeable time and for a mutually agreeable duration, and in practice is up to two weeks per year (subject to any collective bargaining updates).
 - ii. If you want to be away for an extended time in the summer, your Thesis Advisor must agree with your plans and your summertime appointment may be shortened to reflect your time off
- d. Who is it?
 - i. Year 1: First Year Department Graduate Advisor
 - ii. Years 2-x: Your Thesis (Research) Advisor
 - 1. You must complete and submit the Advisor Search Form to the APAM office by Dec. 1 of Year 1
 - 2. If you are not on a fellowship, your advisor must start supporting you after May 31 of Year 1
 - a. You must give the APAM Student Coordinator details of your support by May 1 of Year 1; this support will be

confirmed as soon as the results of the Written Qualifying Exam are disseminated

3. If your advisor is outside of APAM, the Department will appoint an internal Co-Advisor (who will help coordinate your oral, thesis proposal, and thesis defense exams); your advisor will need to fill out APAM forms agreeing to abide by APAM academic rules and affirming your complete financial support.

5. Degrees awarded

- a. MS (if in MS/PhD): You must complete 30 Department-approved graduate points
 - i. You can receive this degree at the end of Year 1, but it is totally acceptable if you receive it in the Fall or Spring of Year 2 (especially if any research course points are pending or if you need to take English courses—because English courses do not count toward the degree)
 - ii. You must apply to APAM for this degree by the University designated date in a given term
- b. MPhil: You must finish all the PhD requirements except for the thesis submission/defense; the University requires you being awarded the MPhil at least one term before you finish the PhD
- c. PhD or DES: You must finish all the PhD or DES requirements successfully

6. Evaluation Procedures by the Department

(in consultation with your Advisor and Exam Committees, with written notification to you from the Department Chair)

[Your evaluation will also reflect your status in required training; notably, you must have taken the end-of-academic year Ethics Seminar in both of your first two years, and, for experimentalists, you must have taken and be up-to-date on all safety training courses and certifications (FDNY Certificate of Fitness, Columbia safety courses and refresher courses, and so on).]

- a. May, Year 1: You receive the qualifying Exam results notification
- b. May, Year 2-x: You receive an evaluation letter
 - i. The letter states that you have been making either satisfactory or unsatisfactory progress toward the Doctoral degree
 1. Your progress can be judged unsatisfactory if you have not passed the oral and thesis proposal exams in time or if you have not been making satisfactory progress in your thesis research
 - ii. If your performance has been judged unsatisfactory for two years in a row, you must leave the program. (Please speak with your faculty advisor long before you get to this stage. No one should be judged unsatisfactory for two years!)
- c. Moreover, you must always remain a student in good standing within the doctoral program. In addition to fulfilling the above requirements, you must maintain a GPA of at least 3.0 in APAM approved courses within your field and thesis area, have a research advisor and be making satisfactory progress to your thesis, and be financially supported by your research advisor, unless you have an outside fellowship, a TA, or the equivalent.
 - i. If you are not, you will receive a warning letter that states what needs to be rectified and by when.