

## **Nuclear Engineering and Radiological Sciences Graduation Requirements for Master's and Ph.D. Degree (2018)**

This document describes the requirements of the Department of Nuclear Engineering and Radiological Sciences for Master's and Doctoral degrees. Besides the requirements outlined here, students should review the requirements of the Rackham Graduate School, available online at <https://rackham.umich.edu/academic-policies/>

### **1. Master Graduation Requirements**

The Master's degree in Nuclear Engineering and Radiological Sciences requires 30 hours of coursework at the graduate level, including 20 hours from NERS (of which four courses must be at the 500 level or above). NERS also requires a minimum of four credit hours of cognate graduate-level coursework. The cognate courses be related to the student's degree program and should be chosen with the advice of the student's graduate advisor. A student must also take at least one 400 level or higher laboratory course for the M.S. degree while a graduate student. The average grade in NERS courses must be a B (a grade point of 3.0/4.0) or better, and the average grade for all courses must also be a B or higher. Undergraduates who earned the following degrees should apply for the corresponding diplomas.

- Bachelor of Science (BS): Apply for the Master of Science (MS)
- Bachelor of Science in Engineering (BSE): Apply for the Master of Science in Engineering (MSE)

Please review the "Checklist for Master Degree Requirements" available here:

<https://ners.engin.umich.edu/academics/graduate/requirements/>

### **2. Ph.D. Candidacy and Graduation Requirements**

All Ph.D. students start as precandidates. Once certain coursework taken while a graduate student and exam requirements have been met, they may advance to candidacy. Advancement to candidacy is an important step and should not be delayed. Precandidates are expected to do research, but once candidacy is achieved research becomes the major focus of the candidate's work. All students must find a research advisor to supervise their research.

#### **Requirements for the Ph.D. degree comprise:**

- Laboratory course requirement
- Breadth course requirements
- Rackham candidacy requirements
- NERS candidacy requirements
- Thesis prospectus
- Dissertation and dissertation defense

#### **Laboratory Course Requirement**

All Ph.D. students must take NERS 515, Nuclear Measurements Laboratory and obtain a grade of B (3.0/4.0) or better. Students who have taken NERS 315 or equivalent as an undergraduate must instead take one of NERS 425, NERS 535, NERS 575, NERS 586, NERS 590 (Transmission Electron Microscopy Lab), MSE 562 or AEROSP 521. The student's advisor and PHD graduate program chair must approve in writing any variances and substitutions

### **Breadth Course Requirements**

All Ph.D. students must take and obtain a grade of B (3.0/4.0 scale) or better in 6 credit hours of NERS courses selected from outside the student's option, as defined by the following lists of courses. Courses not listed do not satisfy this requirement; the student's advisor and graduate chair must approve any variances in writing. The purpose of this requirement is to ensure the breadth of nuclear engineering and radiological science education of our Ph.D. students and to ensure that the student is exposed to the quantitative analytical methods used in other specialties in the field. A laboratory course used to satisfy this breadth requirement cannot be used to satisfy the laboratory requirement (above). Breadth courses are not required for candidacy; however, they are required for final degree approval.

- **Breadth Requirement Courses and Option Classification:**

Fission Systems and Radiation Transport: NERS 441, 442, 444, 462, 543, 544\*, 546, 547, 551, 554\*, 561, 590\*\*, 644

Materials: NERS 521, 522, 524, 531, 622

Measurements: NERS 481, 484, 518, 532, 535, 555, 580, 581, 582, 583, 585, 586, 587

Plasmas and Fusion: NERS 471, 472, 571, 572, 573, 574, 575, 576, 577, 578

\*Students in the Measurements Option cannot elect these courses as breadth courses

\*\*590 Computational Transport Methods

\*\*590 Solvers for Nuclear Applications

### **NERS and Rackham Candidacy Requirements:**

- Time to Candidacy – A student must achieve candidacy within 2.0 years after the first enrollment in the NERS PhD program.
- Coursework In Residence - A precandidate must complete at least 18 credit hours of graded (including the grade of S – Satisfactory) graduate coursework registered as a Rackham student while in residence on the Ann Arbor campus.
- Cognate Requirement - Before advancing to candidacy, students must complete 3 credit hours of cognate coursework with a grade of B or better according to the NERS graduation requirements. Additional Rackham requirements can be found at <https://rackham.umich.edu/navigating-your-degree/>
- All courses in Responsible Conduct of Research and Scholarship (RCRS) for PHD students must be completed. <http://rcrs.engin.umich.edu/>

### **Advancement to Candidacy**

<http://www.rackham.umich.edu/students/navigate-degree/candidacy-requirements>

The entire NERS faculty will decide a student's advancement to candidacy based on a broad assessment of the student's performance on a written examination, the student's academic and research record, and the recommendation of the student's advisor.

The written examination is a six-hour test in a specific option: 1) Fission Systems and Radiation Transport; 2) Plasmas and Fusion; 3) Materials; 4) Measurements; or 5) an alternative area approved in advance by the NERS Executive Committee. The exam will cover topics at the

graduate level. Students are encouraged to access google site for copies of previous examinations, and to discuss with their research advisor specific topics covered and relevant courses. Access to the google site is given to all NERS student at the start of every semester. The written exam is prepared by the examination committee in each Option and is given twice a year, in January and May.

To take the written exam, a student must be a doctoral precandidate in good standing with the graduate school, have identified a thesis advisor, and have a minimum graduate GPA of 3.3/4.0 scale (B+) at the time of the exam. Exceptions will be considered by petition to the Departmental Graduate Committee. Also, a student must receive the written approval of their advisor and the NERS Graduate Chair.

The written exam will be graded anonymously, and the scores will be communicated to the student within two weeks of the exam. The student will be considered by the Option Faculty for advancement to candidacy within a month of the written exam, taking into account the score on the written exam, the student's academic and research record, and the input of the student's advisor. A recommendation on advancement to candidacy will be prepared by the Option Faculty for the full NERS faculty, who will decide each case. If the faculty decision is not to advance the student to candidacy, the student will be informed of the reasons for the decision and the specific recommendations of the faculty. A student may be considered for candidacy a second time, but attempts beyond the second will require approval of the department faculty.

Note on advancement to candidacy: before the student advances to candidacy, the department will audit the student's Ph.D. checklist to ensure that all candidacy requirements have been met. The breadth courses are not required for candidacy, but they must be taken before completion of the doctoral degree.

### **Thesis Prospectus**

**\*\*If you are preparing to take the prospectus exam in the near future, please let your graduate coordinator know at least two weeks before the exam so adequate preparations can be made.**

An oral thesis prospectus is required for completion of the PhD degree. This exam must be taken within 12 months of achieving candidacy status, and after the candidate has formed a dissertation committee.

<https://rackham.umich.edu/faculty-and-staff/dissertation-committees/guidelines-for-dissertation-committee-service/>

The exam will consist of a presentation by the candidate on his or her proposed research program lasting about 30 minutes and followed by questioning. After questions covering the presentation material, questions of a more fundamental but related nature may be introduced.

These questions may cover material found in standard undergraduate or introductory graduate NERS courses. This question period is nominally expected to last 60 minutes.

This examining committee will consist of at least three members of the student's dissertation committee (the full committee will be invited), and one randomly selected NERS faculty member from outside the candidate's dissertation committee. The chair of the examining committee will be the student's dissertation committee chair. Following the questioning the examining committee will discuss the proposed research and prospectus, and vote on passing or failing the student; their decision will be communicated to the student as soon afterwards as practicable, generally along with suggestions for the direction of the research, and to the NERS faculty as a whole at the next faculty meeting.

This exam may be attempted twice; the second attempt must occur within 12 months of the first. Additional attempts beyond the second will require approval of the NERS faculty.

The oral examination will be scheduled at the advisor's request. The student should then submit his or her name, option, research topic, along with some dates that the committee and student find convenient. The graduate coordinator confirms the committee with Rackham Graduate School, schedules the exam, and reserves the room for the exam. Additionally, the student is required to send an electronic abstract to the full examining committee and departmental graduate coordinator a minimum of three working days before the exam. (However, a paper, publication, report, and/or slides are encouraged in addition to the abstract.)

### **Dissertation and Dissertation Defense**

Ph.D. students must complete a written dissertation describing an original, substantive, and scholarly contribution to their field of study. A dissertation committee, chaired by the student's research advisor, will read this dissertation and its abstract and judge their adequacy. The committee may require changes to the dissertation. Each student must also present and successfully defend his or her dissertation work at a public meeting. Rackham doctoral dissertation guidelines can be found at: <https://rackham.umich.edu/navigating-your-degree/>

To take the written exam, a student must be a doctoral precandidate in good standing with the graduate school, have identified a thesis advisor, and have a minimum graduate GPA of 3.3/4.0 scale (B+) at the time of the exam. Exceptions will be considered by petition to the Departmental Graduate Committee. Also, a student must receive the written approval of their advisor and the NERS Graduate Chair.

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