

University of Washington Ph.D. Program in Nanotechnology

PROGRAM DESCRIPTION

A) APPLICATION and ADMISSION

Students first have to apply and be admitted by a participating "home" department to their PhD program. Students may enroll in the NT-Ph.D. Program at any later point in their graduate career. (Year 1 or 2 is preferred, and indeed we already have Nanotechnology Early-Bird Research

Awards which are mainly intended to be used by the participating departments for recruiting graduate students, but which allow support for students to do a "lab rotation" (defined below) in the summer before they start courses.) At enrollment in the NT-Ph.D. Program, the student need not have either a real or prospective affiliation with a particular faculty member of the CNT. To enroll, a student must make a formal written application stating his or her interests in and preparation for the program. Applications will be reviewed by the NT-Ph.D. Program Manager for completeness and filed. To enter and stay in the NT program, a student must remain a student in good standing in his

or her participating department and maintain an overall GPA of at least 3.3. The Chair of the Standards Committee (see section D) will decide whether the student formally qualifies to enter and, if so, notify the student of acceptance and send them a description of the program, requirements, timelines, etc. as outlined below.

B) COURSE REQUIREMENTS

Each NT student must:

1. Complete departmental requirements before taking the Ph.D. Candidacy (i.e., General Exam, and
2. Complete at least 9 graded course credits relevant to NT with a minimum GPA of at least 3.3. Six (6) of these credits must be outside the home department. The student can choose from several courses within each of these "topical clusters": (a) "nano-engineered particles and materials", (b) "microfabrication and nano-fabrication", (c) "analytical tools to probe nanostructures", (d) "nano-biology", and (e) "nanotech applications". A detailed list of existing appropriate (i.e., "NT-relevant") courses is given is kept on a web page (<http://www.nano.washington.edu/education/courses.asp>), where it is updated periodically and which also lists the requirements for the Nanotechnology Ph.D. program. These courses can also serve toward required course credits for the home department, if allowed by the standard rules of the home department. Note that some of the courses on this list may only be offered every few (or several) years and some may be discontinued eventually, at the desire of the department which offers the course. A mechanism for adding courses to this list is outlined below.
3. Students must also take at least four quarters (at 1 credit each) of the "Nanotechnology: Seminar" (a weekly interdepartmental seminar course (listed as Chemistry 560A and Bioengineering 599) that focuses on intellectual interactions of the UW NT community; allows NT students to present their own research; and provides a forum for bringing in national and international leaders in nanoscale science and nanotechnology). This course can also serve toward required course credits for the home department, if allowed by the standard rules of the home department.
4. Complete the new "Frontiers in Nanotechnology" course (3 credits) with a grade of at least 3.3 or CR. This course will introduce students to the frontiers of nanoscale science and nanotechnology. It will be a regular course taught jointly by Nanotech faculty. The

course will both introduce students to the thrust areas (nanopatterning, nanoparticles and composites, nanomechanics, bio-analytical nano-tools, and nanoscale drug delivery systems), and be a major platform for recruiting first year graduate students into nanotechnology-related Ph.D. research. Two CNT faculty (from two colleges) will organize and co-teach this course. Other CNT faculty will discuss their research fields, as guest lecturers. Since graduate students from various departments participate, this course will help bring a more interdisciplinary student population into individual research groups. This course can also serve toward required course credits for the home department, if allowed by the standard rules of the home department.

5. Upon completion of the above-outlined NT-specific course requirements, the student will obtain an unofficial transcript of their coursework and submit it to the NT-Ph.D. Program Manager, who will verify on an official database that all the NT-specific course requirements have been met. A letter of verification will be sent to the students and a copy kept in the student's file.

Note that these course requirements are intended to give the student: (a) a solid foundation in selected areas within nanotechnology, (b) a broad-based but less in-depth overview of the entire arena of nanotechnology, as well as, (c) the solid base in the home department field expected of someone with that PhD degree. Ideally, the student will learn through these usable skills in selected areas of nanotechnology, and enough of a broad view of the rest of nanotechnology to know what is experimentally or theoretically possible there, and to know where to go to learn more about those other areas of nanotechnology if needed.

Other Requirements:

1. Lab Rotation: The student must conduct nanotechnology-related research for the equivalent of one quarter within the lab of a scientist outside the department of the student's primary research advisor. (By "lab" here we use the broad definition which includes an experimental laboratory but also includes the research group space used by a purely theoretical group. That is, we do not wish to exclude a theoretical project from such a "lab rotation"). This can be done either in a single quarter as a formal lab rotation, or perhaps more commonly, as an equivalent amount of time spent in another lab via long-term partial involvement, as, for example, when the student is involved in long-term collaborations with another professor or is co-advised by another professor. (A petition from the student, signed by his/her research advisor(s), should be submitted at least a quarter before the Ph.D. Final Exam to the Nanotechnology Standards Committee Chair, requesting approval of Lab Rotation Equivalency. This should outline the nature of the activities which the student requests to fulfill this Lab Rotation requirement. The purpose of the Lab Rotation is to ensure that the student gets sufficient interdisciplinary research experience.
2. External Internship (Optional): may be used in lieu of the Lab Rotation requirement upon formal request to and approval by the Nanotechnology Program Standards Committee as fulfilling Lab Rotation Equivalency. This involves time spent in an industrial or national lab setting doing research related to nanotechnology.

C) THE PH.D. CANDIDACY (i.e. GENERAL) EXAM

The Ph.D. Candidacy (i.e., General) Exam will be that required in the student's home department. However, the student and research advisor(s) are expected to later justify why the research topic qualifies as being of appropriate content for the Nanotechnology Ph.D. option. The research advisor and at least one member of the student's committee must be CNT faculty. (See http://www.nano.washington.edu/research/faculty_research.asp for an updated list of CNT faculty.)

D) APPROVAL OF PROPOSED RESEARCH TOPIC AS "NT" APPROPRIATE

Preferentially prior the Ph.D. Candidacy (i.e., General) Exam (but possibly later by special permission), the student will present his/her proposed research to the Nanotechnology Standards Committee (NT- Standards Committee or NTSC) for approval as being of appropriate content for a Nanotechnology Ph.D. The student will present to the Chair of this NT-Standards Committee an application form along with a written description of the proposed dissertation research, which may be a copy of the written part of the Ph.D. Candidacy (i.e., General) Exam (which contains a proposal for the proposed dissertation research). The application form should also have attached to it a letter to the Chair of the NT- Standards Committee from the student and signed by his/her PhD research advisor (i.e., PhD supervisory committee chairperson) containing a 1 or 2-page summary of the proposed research content with respect to nanotechnology, a list of the members of the student's Ph.D. Candidacy (i.e., General) Exam Committee, and a signed recommendation from the advisor that the proposed research and Exam Committee are both appropriate for the Nanotechnology PhD program. A copy of this letter and form has to be handed to the second CNT faculty member of the Exam Committee who will either endorse or raise his/her concerns in a separate letter which must be sent directly to the Chair of the NT- Standards Committee (or attached to the form also). The Chair of the NT- Standards Committee can immediately approve the topic if both letters are overwhelmingly supportive, or, in questionable cases, will distribute these two letters to the Committee, and take their vote on the appropriateness of the proposed thesis content to be "NT" qualified. It must pass with at least four of the five members approving. Approval by the NT-Standards Committee has to be requested at least six weeks prior the Ph.D. Candidacy (i.e., General) Exam if the Exam Committee desires to have a decision at the time of the Ph.D. Candidacy (i.e., General) Exam. A student can appeal only once the decision of the Standards Committee.

Summary of Nanotechnology-SPECIFIC requirements:

In addition to the home department's normal requirements for the Ph.D., every NT student must do the following before the Ph.D. Candidacy (i.e., General) Exam:

1. Fulfill NT-specific course distribution requirements (9 graded credits of NT-relevant graded electives, 3 credits of "Frontiers in Nanotechnology", 4 credits of Nanotechnology seminar)
2. Fulfill all those course requirements and other requirements within the home department which are required before the Ph.D. Candidacy (i.e., General) Exam.
3. Have the proposed PhD. research topic approved by the Standards Committee as having a sufficient nanotechnology component to qualify for the NT Ph.D. (This may also be done shortly after the Ph.D. Candidacy (i.e., General) Exam).

Before the Ph.D. Final Exam, the student must:

1. Work for the equivalent of at least one quarter in each of two NT faculty laboratories, in two different departments (or do the optional external internship) and have this approved by the Standards Committee as fulfilling the "lab rotation" requirement.
2. Have the Ph.D. dissertation research topic approved by the Standards Committee as having a nanotechnology component that qualifies for the NT- Ph.D.

E) THESIS RESEARCH, WRITING, and PROGRESS EVALUATION

These will be monitored and facilitated by the student's Ph.D. Supervisory Committee. That committee should include the student's chief research advisor(s), who must be CNT faculty, and one additional CNT faculty, who help guide the student so that the thesis research continues to qualify for the NT Ph.D. option.

H) FINAL EXAM

This final exam will be according to the exam requirements of the student's home department.

I) DISSERTATION APPROVAL OF RESEARCH TOPIC AS "NT" APPROPRIATE

The advisor as well as one member of the reading committee has to be a member of the Center for Nanotechnology. Upon submission of the dissertation to the student's Reading Committee, the student will deliver the application Form and a list of all members of the student's Ph.D. Exam and Reading Committee to the Chair of the NT- Standards Committee. At the time that the student's Reading Committee signs the Final Exam Request Form (i.e. after they have seen a full thesis draft, at least three weeks prior the Final Exam date), the student submits a 1 or 2-page statement (assigned by his/her PhD advisor) to the Chair of the NT-Standards Committee recommending that the thesis be approved, summarizing the dissertation content with respect to nanotechnology, and outlining whether the objectives defined in the Ph.D. Candidacy (i.e., General) Exam have been met, or how and why they have been changed. (The student normally writes the first draft of this, and it is then edited by the PhD advisor.) The second CNT faculty member on the Reading Committee sends an independent note to the Chair of the NT-Standards Committee, again three weeks prior the dissertation defense (i.e., Final Exam), confirming that the content of the thesis is of appropriate content for a Nanotechnology Ph.D. In general, if the research followed closely the research plan that was proposed at the time of the Candidacy Exam and approved then as being appropriate for this degree, it still should be considered appropriate. If both letters underwrite that the thesis is NT appropriate, approval will be given by the Chair of the NT-Standards Committee and will be sent in writing to the student at least one week prior the Final Exam.

If concerns are raised by the advisor or the second CNT faculty member whether the content of the thesis is of appropriate content for a Nanotechnology Ph.D., these members of the Reading Committee should delay signature of the Final Exam Request Form until a final decision has been reached. The Chair of the NT-Standards Committee will call a meeting of the NT-Standard Committee. At least three of the five members have to be present. The graduate student will be asked to submit three copies of a draft of the thesis to be handed to the members of the NT Standard Committee. NT-Standard Committee may consult with the advisor and/or the second CNT faculty member. The request must pass with at least three of the five members approving. After approval, the student can again request signatures from the reading committee on the Final Exam Request Form and proceed as above. If the decision is negative and appealed by the student, the student should again request signatures from the reading committee on the Final Exam Request Form. In this case, if the Reading Committee approves the thesis draft except as being appropriate for a Nanotechnology Ph.D., the student should proceed to plan the final exam. At least three of the NT-Standard Committee members must attend this thesis defense. A final decision whether the student be granted the "Nanotechnology Ph.D. Option" has to be reached at the day of the thesis defense, with all of the attending NTSC committee members approving the topic as being appropriate for the Nanotechnology Ph.D. program.

J) THE DEGREE

Students will receive a degree entitled

"Ph.D. in [home department] and Nanotechnology"

K) APPEALS PROCESS

Except as noted immediately above, this will be the same as for the general exam and Ph.D. exam in the student's home department except in special circumstances where the NT-Standards Committee can be asked by the home departments (or appeals officials) to provide Nanotechnology-specific input.