

# NANOSCIENCE, PH.D.

The Ph.D. in Nanoscience requires a minimum of 49 credit hours and is designed to prepare students to take positions in industrial, governmental, or academic research settings by providing a solid background in nanoscience theory and experimental techniques through course work and dissertation research. Advanced elective courses in nanoscience areas ensure students will have substantial depth of understanding in their area of interest and enable them to effectively carry out advanced nanoscience research.

For information regarding deadlines and requirements for admission, please see <https://grs.uncg.edu/programs/>.

In addition to the application materials required by the Graduate School, applicants must submit a personal statement indicating their interest in the program and a current curriculum vitae.

Qualified applicants with a B.S. degree in an area related to Nanoscience (physics, chemistry, biology, mathematics, computer science, or engineering) and, as a minimum, completed calculus through differential equations may apply to the Ph.D. program.

## Degree Program Requirements

**Required:** 49 credit hours

| Code  | Title  | Credit Hours |
|---|--|--------------|
| <b>Foundations of Nanoscience Courses (6 credits)</b>           |  |              |
| NAN 700   | Principles of Nanoscience I: Physical, Chemical, and Biological Foundations          | 3            |
| NAN 706   | Principles of Nanoscience II: Analytical, Statistical, and Computational Foundations | 3            |
| <b>Advanced Nanoscience Courses (9 credits)</b>                 |  |              |
| Select one concentration option (9 credits) from the following: |  | 9            |
| <i>Without a concentration</i>                                  |  |              |
| NAN 727   | Advanced Quantum and Solid State Physics   |              |
| NAN 729   | Mathematical Methods in Modeling Complex Systems                                     |              |
| NAN 731   | Systems and Synthetic Biology  |              |
| NAN 732   | Nanomaterials Chemistry  |              |
| NAN 733   | Physical Biology   |              |
| Two approved elective courses (6 credits)                       |  |              |
| <i>Synthetic Biology Concentration</i>                          |  |              |
| <i>Material Science and Nanomaterials Concentration</i>         |  |              |
| <b>Additional Required Courses (16 credits)</b>                 |  |              |
| NAN 707   | Lab Protocols and Practice <sup>1</sup>  | 6            |
| NAN 708   | Science Communications <sup>1</sup>  | 6            |
| NAN 710   | Scientific Integrity   | 1            |
| NAN 746   | Nanosafety   | 3            |
| <b>Dissertation Research (18-30 credits)</b>                    |  |              |
| NAN 790   | Doctoral Research <sup>2</sup>   | 6            |
| NAN 799   | Nanoscience Dissertation Research <sup>3</sup>                                       | 12-24        |
| <b>Total Credit Hours</b>                                       |  | <b>49</b>    |

<sup>1</sup> Students must complete NAN 707 and NAN 708 twice each for a total of 6 credits each.

<sup>2</sup> Students must take NAN 790 twice for a total of 6 credits.

<sup>3</sup> Students must complete a minimum of 12 credits in NAN 799.

## Students Entering with a M.S. in Nanoscience from UNC Greensboro

Entering doctoral students who have completed a Master's of Science in Nanoscience at UNC Greensboro will complete the following course requirements for the Ph.D. in Nanoscience.

**Required:** 30-42 credit hours

| Code   | Title                               | Credit Hours |
|--|-------------------------------------|--------------|
| <b>Required Courses (6 credits)</b>                      |                                     |              |
| NAN 708  | Science Communications <sup>1</sup> | 3            |
| NAN 746  | Nanosafety <sup>2</sup>             | 3            |
| <b>Elective Courses (6 credits)</b>                      |                                     |              |
| Select two courses (6 credits) of electives <sup>3</sup> |                                     | 6            |
| <b>Dissertation Research (18-30)</b>                     |                                     |              |
| NAN 790  | Doctoral Research                   | 6            |
| NAN 799  | Nanoscience Dissertation Research   | 12-24        |
| <b>Total Credit Hours</b>                                |                                     | <b>30-42</b> |

<sup>1</sup> Must be taken in the Fall semester.

<sup>2</sup> If taken as an elective course in the M.S. program, the student may substitute another elective course to fulfill the requirement.

<sup>3</sup> NAN 790 may be substituted for one or both elective courses if the student's committee determines that the student has developed an adequate formal background during their M.S. program.

## Materials Science and Nanomaterials Concentration

| Code   | Title  | Credit Hours |
|--|--|--------------|
| <b>Required Courses (6 credits)</b>                  |  |              |
| Select two courses (6 credits) from the following:   |  | 6            |
| NAN 727  | Advanced Quantum and Solid State Physics         |              |
| NAN 729  | Mathematical Methods in Modeling Complex Systems |              |
| NAN 732  | Nanomaterials Chemistry                          |              |
| <b>Elective Courses (6 credits)</b>                  |  |              |
| Select two courses (6 credits) from the following: * |  | 6            |
| NAN 728  | Nanotechniques                                   |              |
| NAN 748  | Macromolecular and Supramolecular Chemistry      |              |
| NAN 749  | Spectroscopy Methods in Nanoscience              |              |
| NAN 755  | Biomimetics and Biomaterials                     |              |
| NAN 762  | Nanoscale Reactions                              |              |
| NAN 764  | Materials, Syntheses, and Processes by Design    |              |
| NAN 771  | Computational Quantum Nanochemistry              |              |
| <b>Total Credit Hours</b>                            |  | <b>12</b>    |

\* Or elective course approved by the student's committee and advisor.

## Synthetic Biology Concentration

| Code   | Title  | Credit Hours |
|--|--|--------------|
| <b>Required Courses (6 credits)</b>                  |  |              |
| Select two courses (6 credits) from the following:   |  | 6            |
| NAN 731  | Systems and Synthetic Biology                |              |
| NAN 732  | Nanomaterials Chemistry                      |              |
| NAN 733  | Physical Biology                             |              |
| <b>Elective Courses (6 credits)</b>                  |  |              |
| Select two courses (6 credits) from the following: * |  | 6            |
| NAN 750  | Nanomedicine                                 |              |
| NAN 752  | Molecular Biology in Nanosciences            |              |
| NAN 753  | Introduction to Stem Cell Biology and Ethics |              |
| NAN 754  | Immunology                                   |              |
| NAN 755  | Biomimetics and Biomaterials                 |              |
| NAN 757  | Nanomechanics                                |              |
| <b>Total Credit Hours</b>                            |  | <b>12</b>    |

\* Or elective course approved by the student's committee and advisor.

## Required Milestones\*

- Residency (Immersion)
- Plan of Study
- Research Competency
- Comprehensive Exam (Written & Oral)
- Dissertation Proposal
- Admission to Candidacy
- Dissertation Defense
- Filing the Final Approved Dissertation
- Publication of at least one Peer-Reviewed Manuscript
- Annual Committee Meetings
- Attendance and Participation in Departmental Seminar Program

\* General information about milestones for doctoral programs is available in Section III (<https://catalog.uncg.edu/academic-regulations-policies/graduate-policies/#sectioniiisummaryofgraduateschoolregulationsforallcertificatesanddegreestext>) of the Graduate Policies (<https://catalog.uncg.edu/academic-regulations-policies/graduate-policies/>) page in the University Catalog. For information about how milestones are accomplished for a specific program, please refer to the doctoral program's handbook.

## Accelerated B.S. in Physics to Ph.D. in Nanoscience

### Application and Admission

Qualified UNC Greensboro undergraduate students who are pursuing the B.S. in Physics may apply for admission to the accelerated B.S. to Ph.D. in Nanoscience. A cumulative undergraduate GPA of at least 3.5 based on at least 30 credits earned at UNC Greensboro is required. Students must also maintain a 3.5 GPA in the courses listed under Major Requirements and Additional Area Requirements in the undergraduate program. Applicants will be required to take the Graduate Record Examination (GRE) during the second semester of their junior year. Applicants must have completed at least 60 credits before applying for admission to the

accelerated program. During the summer after their junior year applicants will complete the accelerated program information when applying for admission to the Ph.D. degree program.

### Courses

Admitted students may apply the following 12 credits of graduate-level course work toward completion of both the undergraduate and graduate degree, provided that they earn a grade of B (3.0) or better in each course and fulfill graduate-level requirements:

| Code    | Title  | Credit Hours |
|---------|--|--------------|
| NAN 601 | Nanomaterials Chemistry                          | 3            |
| NAN 602 | Physical Biology                                 | 3            |
| NAN 603 | Principles of Quantum and Solid-State Physics    | 3            |
| NAN 605 | Mathematical Methods in Modeling Complex Systems | 3            |

Please consult with an advisor to determine how the courses taken at the graduate level will meet requirements in the bachelor's degree program. All degree requirements for the Ph.D. in Nanoscience remain the same.