

Materials and Nanotechnology

Department Information

- **Program Director:**
Erik K. Hobbie, Ph.D.
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- **Department Phone:**
(701) 231-6103
- **Department Web Site:**
www.ndsu.edu/materials_nanotechnology/ (http://www.ndsu.edu/materials_nanotechnology/)
- **Application Deadline:**
April 1 for fall semester.
- **Credential Offered:**
Ph.D.
- **Test Requirement:**
GRE
- **English Proficiency Requirements:**
TOEFL iBT 71, IELTS 6; Duolingo 105

By the end of the first academic year, the student will select an academic adviser from among the MNT faculty and arrange for the appointment of a supervisory committee. This committee will consist of at least four members of the graduate faculty. This includes the student's major adviser, at least one additional MNT faculty member, and a graduate school representative

The plan of study will be prepared by the student, in consultation with the major adviser and supervisory committee, by the end of the first year in residence. The plan must be approved by the student's graduate supervisory committee, the MNT Program Director, and the Graduate College dean. Master's students must complete the plan of study by the end of the second semester of study. Doctoral students should complete the plan of study at the end of the first year of study and at least one month prior to the comprehensive oral examination

Master of Science

Materials and Nanotechnology students are able pursue a master's degree under either the Plan A - Master's Thesis or the Plan C - Culminating Experience option. Each option requires a minimum of 30 graduate credits with a cumulative grade point average of 3.0 or better.

The Plan A thesis option represents a more traditional Master of Science degree, with an independent research component in the form of an original thesis that can serve as a foundation for future doctoral work in science or engineering. For the thesis option, of the required minimum 30 graduate credits, at least 16 credits must be from approved graduate courses numbered from 601-689, 691, 700-789, and 791 while the research credits (798) must be not fewer than 6 nor more than 10.

The Plan C option is appropriate for working professional students or students who are certain that they do not wish to pursue a doctorate in any field of science or engineering. . In the context of the MNT program, this option requires a 6-10 credit culminating experience (794) which replaces the research credits (798).

Ph.D.

The doctorate requires a minimum of 90 graduate credits. A minimum of 27 credits of didactic coursework are required; no more than 15 didactic credits may be transferred as part of the Plan of Study. The MNT Ph.D. program requires students to complete a series of 7 core courses totaling 17 semester credits. The student will complete additional elective courses to fulfill the Graduate School requirement of 27 semester credits in academic courses. An overall GPA of 3.0 or better must be maintained.

Core Curriculum

| Code | Title | Credits |
|---------|----------------------------------|---------|
| MNT 729 | Materials Characterization | 3 |
| MNT 730 | Nanotechnology and Nanomaterials | 3 |
| MNT 732 | Physical Properties of Materials | 3 |
| MNT 745 | Preparing Future Researchers | 1 |
| MNT 756 | Molecular Modeling | 3 |

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| MNT 760 | Materials Synthesis Processing | 3 |
| MNT 790 | Graduate Seminar | 1 |

Students must complete at least an additional 12 credits of graduate level coursework. The courses should be chosen by the students in consultation and with the approval of the student's supervisory committee.

Suggested courses include the following:

| Code | Title | Credits |
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| Microelectronics Focus | | |
| ABEN 682 | Instrumentation & Measurements | 3 |
| CPM 796 | Special Topics | 2 |
| CHEM 766 | Quantum Chemistry I | 4 |
| CHEM 767 | Quantum Chemistry II | 2 |
| ENGR 780 | Electromagnetic Theory | 3 |
| ECE 751 | Electromagnetic Theory and Applications | 3 |
| IME 627 | Packaging for Electronics | 3 |
| IME 720 | Surface Engineering | 3 |
| IME 635 | Plastics and Injection Molding Manufacturing | 3 |
| MNT 735 | Optoelectronics Materials and Processing | 3 |
| PHYS 771 | Quantum Physics I | 3 |
| Biomaterials Focus | | |
| ABEN 758 | Applied Computer Imaging and Sensing for Biosystems | 3 |
| BIOC 716 | Protein and Enzyme Biochemistry | 3 |
| BIOC 673 | Methods of Biochemical Research | 3 |
| CE 725 | Biomaterials-Materials in Biomedical Engineering | 3 |
| CPM 771 | Modern Methods of Polymer Characterization | 3 |
| ME 668 | Introduction to Biomechanics | 3 |
| ME 731 | Mechanical Behavior of Materials | 3 |
| ME 743 | Biomechanics Of Impact | 3 |
| ECE 685 | Biomedical Engineering | 3 |
| ECE 687 | Cardiovascular Engineering | 3 |
| PSCI 611 | Principles of Pharmacokinetics and Pharmacodynamics | 3 |
| PSCI 701 | Quantative Drug Design | 2 |
| Nanomaterials Focus | | |
| CE 641 | Finite Element Analysis | 3 |
| CE 793 | Individual Study/Tutorial | 3 |
| CPM 673 | Polymer Synthesis | 3 |
| CHEM 766 | Quantum Chemistry I | 4 |
| CHEM 767 | Quantum Chemistry II | 2 |
| CPM 686 | Corrosion and Materials | 3 |
| CPM 773 | Organic Chemistry Of Coatings | 3 |
| CPM 782 | Physical Chemistry Of Coatings | 3 |
| CPM 796 | Special Topics | 3 |
| IME 720 | Surface Engineering | 3 |
| ME 682 | Fuel Cell Science and Engineering | 3 |
| ME 712 | Advanced Finite Element Analysis | 3 |
| ME 733 | Polymer Nanocomposites | 3 |
| ME 734 | Smart Materials and Structures | 3 |
| PHYS 758 | Statistical Physics | 3 |
| PHYS 781 | Solid State Physics | 3 |
| General Materials Science and Engineering Focus | | |
| ABEN 658 | Process Engineering for Food, Biofuels and Bioproducts | 3 |
| ABEN 644 | Transport Processes | 3 |

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| ME 673 | Engineering with Polymeric Materials | 3 |
| CE 641 | Finite Element Analysis | 3 |
| CE 720 | Continuum Mechanics | 3 |
| CHEM 732 | Advanced Survey of Analytical Chemistry | 4 |
| CHEM 736 | Mass Spectrometry | 2 |
| CPM 673 | Polymer Synthesis | 3 |
| ME 633 | Composite Materials Science and Engineering | 3 |
| ME 751 | Advanced Thermodynamics | 3 |
| PHYS 611 | Optics for Scientists & Engineers | 3 |
| PHYS 781 | Solid State Physics | 3 |