

# Materials and Nanotechnology

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## Department Information

- **Program Director:**  
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- **Department Web Site:**  
[www.ndsu.edu/materials\\_nanotechnology/](http://www.ndsu.edu/materials_nanotechnology/) ([http://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

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
<b>Microelectronics Focus</b>		
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
<b>Biomaterials Focus</b>		
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
<b>Nanomaterials Focus</b>		
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
<b>General Materials Science and Engineering Focus</b>		
ABEN 658	Process Engineering for Food, Biofuels and Bioproducts	3
ABEN 644	Transport Processes	3

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