

MATERIALS SCIENCE AND ENGINEERING, PHD

Materials science is a highly versatile discipline that enables innovations across a wide variety of technologies from cell phones to solar energy to bioimplants to airplanes. Applying insights from the basic sciences, this discipline designs new materials and fabrication methods to continually expand the scope and combination of mechanical, electrical, optical and transport properties available in materials. The newer fields of nanotechnology, biomaterials and quantum materials are providing materials scientists with an entirely new palette of atomic, molecular, organic, biological and inorganic building blocks to engineer materials with unique functionalities. The research and academic programs in the MSE Department and the broader MSE Graduate Group at Penn reflect these exciting new developments and our goal is to provide students enrolling in our program with a broad and multidisciplinary training so that they can be part of this materials revolution and contribute to solving the 21st century challenges.

For more information: <http://www.mse.seas.upenn.edu/current-students/masters/doctoral-degree.php>

Required Courses

Students are required to take at least 10 graduate level courses, including courses outside of their research area to gain a broader understanding of materials science and engineering. Doctoral students with a Master's degree may transfer up to eight credits as course units to the Ph.D. program upon the approval of the Graduate Group Chair. However, a maximum of five transferred courses count toward the 10 courses required for the Ph.D. program.

Code	Title	Course Units
Core Courses		3
MSE 5200	Structure of Materials	
MSE 5300	Thermodynamics and Phase Equilibria	
MSE 5400	Kinetics of Materials	
Additional Coursework		
Select four non-core courses ¹		4
Select three elective courses ²		3
Seminar		
MSE 6990	MSE Seminar (taken each semester)	
Dissertation/Research		
MSE 9999	Independent Study Research	
MSE 9950	Dissertation	
Total Course Units		10

University PhD Benchmarks

In addition to Program requirements, the following milestones must be completed:

Code	Title	Course Units
	Qualifying Evaluation	
	Candidacy Examination	

Dissertation Defense/Oral Exam
Dissertation Deposit

For more information view the University's Academic Rules for PhD Programs (<http://catalog.upenn.edu/pennbook/academic-rules-phd/>).

- ¹ Non-core courses may be selected from offerings within MSE and other departments in Engineering, as well as the physical, biological, and mathematical sciences. All courses must be graduate level (5000+).
- ² Elective courses must be at the 5000 level or greater.

The degree and major requirements displayed are intended as a guide for students entering in the Fall of 2025 and later. Students should consult with their academic program regarding final certifications and requirements for graduation.

Sample Plan of Study

Code	Title	Course Units
First Year		
<i>Fall</i>		
MSE 5200	Structure of Materials	
MSE 5300	Thermodynamics and Phase Equilibria	
MSE 6990	MSE Seminar	
Three non-core courses ¹		
<i>Spring</i>		
MSE 5400	Kinetics of Materials	
MSE 6990	MSE Seminar	
One non-core course ¹		
Qualifying Exam ³		
Second Year		
<i>Fall</i>		
Two elective courses ²		
MSE 9999	Independent Study Research	
MSE 6990	MSE Seminar	
<i>Spring</i>		
One elective course ²		
MSE 9999	Independent Study Research	
MSE 6990	MSE Seminar	
Third Year and Beyond		
MSE 9999	Independent Study Research	
or MSE 9950 Dissertation		
MSE 6990	MSE Seminar	

- ¹ Non-core courses may be selected from offerings within MSE and other departments in Engineering, as well as the physical, biological, and mathematical sciences. All courses must be graduate level (5000+).
- ² Elective courses must be at the 5000 level or greater.
- ³ The Qualifying Examination will be held at the end of May after the second semester.