MATERIALS SCIENCE AND ENGINEERING, PH.D.

REQUIREMENTS

MINIMUM GRADUATE SCHOOL REQUIREMENTS

Review the Graduate School minimum academic progress and degree requirements (http://guide.wisc.edu/graduate/#policiesandrequirementstext), in addition to the program requirements listed below.

MAJOR REQUIREMENTS

MODE OF INSTRUCTION

<table>
<thead>
<tr>
<th>Face to Face</th>
<th>Evening/Weekend</th>
<th>Online</th>
<th>Hybrid</th>
<th>Accelerated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
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</table>

Mode of Instruction Definitions

Accelerated: Accelerated programs are offered at a fast pace that condenses the time to completion. Students are able to complete a program with minimal disruptions to careers and other commitments.

Evening/Weekend: Courses meet on the UW–Madison campus only in evenings and/or on weekends to accommodate typical business schedules. Students have the advantages of face-to-face courses with the flexibility to keep work and other life commitments.

Face-to-Face: Courses typically meet during weekdays on the UW-Madison Campus.

Hybrid: These programs combine face-to-face and online learning formats. Contact the program for more specific information.

Online: These programs are offered 100% online. Some programs may require an on-campus orientation or residency experience, but the courses will be facilitated in an online format.

CURRICULAR REQUIREMENTS

Requirements | Detail
---|---
Minimum Credit Requirement | 51 credits
Minimum Residence Credit Requirement | 32 credits
Minimum Graduate Coursework Requirement | 26 credits must be graduate-level coursework. Details can be found in the Graduate School's Minimum Graduate Coursework (50%) policy (https://policy.wisc.edu/library/UW-1244/).
Overall Graduate GPA Requirement | 3.00 GPA required.
This program follows the Graduate School's GPA Requirement policy (https://policy.wisc.edu/library/UW-1203/).

Other Grade Requirements | n/a
Assessments and Examinations

Students entering without a previous master's degree:

• Students must pass a qualifying exam in Materials Science and Engineering. The exam must be attempted within 13 months of the start of the student's first semester enrolled. If the first attempt is not passed, a second attempt is required within four months.

• Students must pass a preliminary exam / thesis proposal exam. This exam is typically undertaken by the end of the fourth semester enrolled and must be undertaken by the end of the fifth semester. If the first attempt is not passed, a second attempt is required within three months. Students may earn the M S & E Master's degree the semester they pass their preliminary exam.

• Students must prepare a doctoral dissertation, present it in a public seminar, defend it in closed examination by their doctoral committee, and deposit it with the Graduate School.

Students entering with a master's degree:

• Students on this track must pass the qualifying exam, thesis proposal exam, and thesis defense as described above, on the same schedule with respect to their matriculation date. Students who fail one of these exams will have the opportunity to earn a terminal Master's degree in M S & E, even if they have been granted a course substitution.

Language Requirements

None.

Graduate School Breadth Requirement

All doctoral students are required to complete a doctoral minor or Graduate/Professional certificate. If students choose a distributed minor (Option B), they must select a topic or theme and three courses around that theme. At least one course must be graduate level (numbered 700 or above or has Graduate Course Attribute). There are no other restrictions on the course department or topic.

REQUIRED COURSES

Courses for Students Starting from a Bachelor's Degree and Enrolling Directly in the Ph.D. Program

All course requirements are subject to modification or substitution to better serve the research needs of the student. To request a change, submit a letter to the department Graduate Coordinator signed by the student and advisor proposing a change and explaining how the change will better suit the student's needs, especially as it pertains to their research. Course substitutions and other curriculum variances are decided by the department's director of graduate studies, subject to appeal to the department's Graduate Governance Committee and the grievance procedure.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>M S &amp; E 900</td>
<td>Materials Research Seminar</td>
<td>2</td>
</tr>
<tr>
<td>M S &amp; E 521</td>
<td>Advanced Polymeric Materials</td>
<td></td>
</tr>
<tr>
<td>M S &amp; E 530</td>
<td>Thermodynamics of Solids</td>
<td>9</td>
</tr>
</tbody>
</table>
M S & E 551  Structure of Materials  
M S & E 752  Advanced Materials Science: Phase Transformations

Graduate level math course (students may only count one of the following as materials core course)

E P / E M A  547  Engineering Analysis I
CBE 660  Intermediate Problems in Chemical Engineering
MATH 703  Methods of Applied Mathematics 1
MATH 704  Methods of Applied Mathematics-2
PHYSICS 721  Theoretical Physics-Electrodynamics

Materials electives courses  

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>M S &amp; E 401</td>
<td>Special Topics in Materials Science and Engineering</td>
<td>1-3</td>
</tr>
<tr>
<td>M S &amp; E/CHEM 421</td>
<td>Polymeric Materials</td>
<td>3</td>
</tr>
<tr>
<td>M S &amp; E/N E 423</td>
<td>Nuclear Engineering Materials</td>
<td>3</td>
</tr>
<tr>
<td>M S &amp; E/N E 433</td>
<td>Principles of Corrosion</td>
<td>3</td>
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<tr>
<td>M S &amp; E 434</td>
<td>Introduction to Thin-Film Deposition Processes</td>
<td>3</td>
</tr>
<tr>
<td>M S &amp; E 441</td>
<td>Deformation of Solids</td>
<td>3</td>
</tr>
<tr>
<td>M S &amp; E 448</td>
<td>Crystallography and X-Ray Diffraction</td>
<td>3</td>
</tr>
<tr>
<td>M S &amp; E 451</td>
<td>Introduction to Ceramic Materials</td>
<td>3</td>
</tr>
<tr>
<td>M S &amp; E 456</td>
<td>Electronic, Optical, and Magnetic Properties of Materials</td>
<td>3</td>
</tr>
<tr>
<td>M S &amp; E 460</td>
<td>Introduction to Computational Materials Science and Engineering</td>
<td>3</td>
</tr>
<tr>
<td>M S &amp; E 461</td>
<td>Advanced Metal Casting</td>
<td>3</td>
</tr>
<tr>
<td>M S &amp; E/E M A 462</td>
<td>Welding Metallurgy</td>
<td>3</td>
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<tr>
<td>M S &amp; E 463</td>
<td>Materials for Elevated Temperature Service</td>
<td>3</td>
</tr>
<tr>
<td>M S &amp; E 465</td>
<td>Fundamentals of Heat Treatment</td>
<td>3</td>
</tr>
<tr>
<td>M S &amp; E/CIV ENGR/ G L E/GEOSCI 474</td>
<td>Rock Mechanics</td>
<td>3</td>
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M S & E 521  Advanced Polymeric Materials  
M S & E 530  Thermodynamics of Solids  
M S & E/E M A  541  Heterogeneous and Multiphase Materials

M S & E 551  Structure of Materials  
M S & E 553  Nanomaterials & Nanotechnology  
M S & E 560  Fundamentals of Atomistic Modeling

M S & E 570  Properties of Solid Surfaces  
M S & E 648  Advanced X-ray Scattering Methods in Materials Science and Engineering

M S & E 660  Mesoscale Modeling of Materials  
M S & E 748  Structural Analysis of Materials  
M S & E 750  Imperfections and Mechanical Properties

M S & E 752  Advanced Materials Science: Phase Transformations  
M S & E 756  Structure and Properties of Advanced Electronic Materials

M S & E 760  Molecular Dynamics and Monte Carlo Simulations in Materials Science  
M S & E 803  Special Topics in Materials Science  1-3

B M E/PHM SCI  430  Biological Interactions with Materials  
B M E/M E 615  Tissue Mechanics  
BIOCHEM/ CHEM 704  Chemical Biology  
CBE 540  Polymer Science and Technology  
CBE 747  Advanced Colloid and Interface Science

CHEM 652  Chemistry of Inorganic Materials  
CHEM 653  Chemistry of Nanoscale Materials  
CHEM 654  Materials Chemistry of Polymers  2-3

CHEM 664  Physical Chemistry of Macromolecules  2-3

CHEM 721  Instrumental Analysis  3-4
E C E 745  Solid State Electronics  
GEOSCI 765  Crystal Chemistry  
PHYSICS 415  Thermal Physics  
PHYSICS 551  Solid State Physics  
PHYSICS 715  Statistical Mechanics  
PHYSICS 751  Advanced Solid State Physics  

Additionally, the student’s research advisor must sign a form available from the department Graduate Coordinator approving the five courses taken to fulfill the materials core and materials electives requirements.

Materials Elective Courses

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Courses for Students Starting from a Master’s Degree and Enrolling Directly in the Ph.D. Program

These requirements cover students who (1) have already earned a master’s degree in M S & E or a related field and (2) do not wish to earn an M S & E master’s from UW.
Students must enroll in the introductory seminar, M S & E 900 Materials Research Seminar, for their first two semesters of enrollment.

Students must satisfy all of the course requirements for the Ph.D. given in the preceding section. However, they may request that courses taken as part of a previous master’s degree at another institution serve to satisfy a portion of the requirements. Students will have one month after matriculation to identify that they wish to follow this track to their Ph.D. and to submit all their course substitution requests. Course substitutions will not be considered later in the student’s Ph.D. studies.

To make such a request, the student should submit a request to the department Graduate Coordinator describing (1) the course from a previous institution; (2) the UW course equivalent; (3) the M S & E course requirement that will be satisfied. The request must include sufficient information to determine if the courses are equivalent. Typically, a syllabus listing the course textbook and lecture topics is sufficient. A course catalog description is typically insufficient. Courses taken while enrolled as an undergraduate student at another institution will not be considered for substitution. This includes courses at the graduate level taken while the student is enrolled as an undergraduate.

If a request is not approved, the student must fulfill the corresponding requirement at the University of Wisconsin–Madison.

If one or more course substitutions are accepted, the student will not earn a master’s degree in Materials Science and Engineering from UW–Madison as part of their Ph.D. studies.