Meeting many of the most critical challenges facing modern society requires advances in the materials that underpin new technologies. Examples include providing carbon-free and renewable energy, clean water, advanced medical treatments and devices, and sustainable materials manufacturing. New materials are also required for continued economic growth in areas as diverse as aerospace, computing, and sensors.

Materials scientists and engineers at UW–Madison work toward solutions to these problems via research in a wide variety of areas. Research areas include ceramics, computational material science; composites; corrosion; electrical, optical, magnetic materials; growth and synthesis; joining; materials for energy; metals; materials characterization and microscopy; nanomaterials; phase transformations; photonics; polymers and biomaterials; materials for nuclear energy; quantum computing; self-assembly; semiconductors; structural materials and mechanical properties; surfaces and interfaces; sustainability; thin films; and wear.

More broadly, the field of materials science and engineering is in the middle of a revolution in how we design and deploy new materials. The old way is by trial and error, which involves laboratory testing of hundreds or thousands of candidate materials, which is costly and can take decades to develop a new materials and deploy it in practical technologies. The emerging new method leverages advances in computational materials science; materials databases, data science, and machine learning; and high throughput materials synthesis and characterization to achieve true design of materials. The goal is to develop and deploy new materials much more quickly and much lower cost than ever before. Materials design is a major theme of materials research on campus, organized around the areas of materials design via atomically controlled thin film systems, modular design of nanomaterials, and integrated experimental and computational materials engineering. Materials design and these themes cut across the research and application areas list above.

Materials research extends across campus, well beyond the boundaries of the Department of Materials Science and Engineering, so graduate students in materials can pursue research with a large number of affiliate faculty. Faculty emphasize the cross-cutting, interdisciplinary nature of materials research, which is also reflected by the diverse undergraduate backgrounds of the student body, many of whom do not have undergraduate degrees in materials.

Materials research benefits from major campus facilities, including the Materials Science Center, the Wisconsin Microscopy and Characterization Center, Wisconsin Center for Applied Microelectronics, and the Soft Materials Laboratory. Research is supported by major centers, including the National Science Foundation Materials Research Science and Engineering Center and the Grainger Institute for Engineering.

Materials graduates from Wisconsin find long-term success in careers in private industry, national laboratories, and academia in the US and around the world.

This is a named option, nonthesis master of science program within the Department of Materials Science and Engineering (https://next-guide.wisc.edu/graduate/materials-science-engineering).

Nanomaterials and nanoengineering are part of a rapidly expanding industrial segment. According to the NSF-funded National Nanotechnology Initiative, up to 1 million jobs in nanotechnology are expected to be available in the United States.

**IS THIS PROGRAM RIGHT FOR YOU?**

The demand for engineers who specialize in nanotechnology and nanoengineering is growing rapidly. The Nanomaterials and Nanoengineering program provides students with the opportunity to build a comprehensive fundamental and applied knowledge base for nanomaterials processing, characterization, and nanodevice development.

If you have questions, please contact CoE Grad Admissions at msaegradadmission@engr.wisc.edu; Subject Line: MSE Grad Admissions.

**FUNDING**

The vast majority of students receive funding in the form of fellowships, research assistantships, or advanced opportunity grants. A limited number of teaching assistantships are available.

Financial assistance from the university or the department is not available for the named option master of science program in nanomaterials and nanoengineering. If you would like to pursue funding on your own, the following sites could be helpful:

- Graduate School Funding Resources (https://grad.wisc.edu/studentfunding/prospective)
- Graduate School Costs and Funding (https://grad.wisc.edu/studentfunding/currentstudents)
- Tuition & Fees (https://registrar.wisc.edu/tuition_&_fees.htm)

**REQUIREMENTS**

**MINIMUM DEGREE REQUIREMENTS AND SATISFACTORY PROGRESS**

To make progress toward a graduate degree, students must meet the Graduate School Minimum Degree Requirements and Satisfactory Progress (http://guide.wisc.edu/graduate/#policiesandrequirements) in addition to the requirements of the program.

**MASTER’S DEGREES**

Materials Science and Engineering, M.S.
Materials Science and Engineering: Nanomaterials and Nanoengineering, M.S. (named option)
MINIMUM GRADUATE DEGREE CREDIT REQUIREMENT
30 credits

Suggested Course Credit Allocation for named option in Nanomaterials and Nanoengineering:
- Summer session: 4 credits
- Fall semester: 13 credits
- Spring semester: 13 credits

MINIMUM GRADUATE RESIDENCE CREDIT REQUIREMENT
16 credits

MINIMUM GRADUATE COURSEWORK (50%) REQUIREMENT
At least 50% of credits applied towards the graduate degree requirement must be with graduate-level coursework; courses with the Graduate Level Coursework attribute are identified and searchable in the university's Course Guide (http://my.wisc.edu/CourseGuideRedirect/BrowseByTitle).

PRIOR COURSEWORK REQUIREMENTS: GRADUATE WORK FROM OTHER INSTITUTIONS
With program approval, students are allowed to count graduate coursework from other institutions toward the minimum graduate degree credit requirement and the minimum graduate coursework (50%) requirement. No credits from other institutions can be counted toward the minimum graduate residence credit requirement. For additional requirements, consult the program.

PRIOR COURSEWORK REQUIREMENTS: UW–MADISON UNDERGRADUATE
Typically, no credits from undergraduate coursework may be counted toward graduate program requirements. However, with program approval, students are allowed to count up to 7 credits numbered 300 or above toward the minimum graduate degree credit requirement when taken in excess of the undergraduate degree requirements; if that coursework is numbered 700 or above it may be used to satisfy the minimum graduate coursework (50%) requirement. No credits can be counted toward the minimum graduate residence credit requirement.

PRIOR COURSEWORK REQUIREMENTS: UW–MADISON UNIVERSITY SPECIAL
Typically, no UW–Madison University Special student credits may be counted toward graduate program requirements. However, with program approval, students are allowed to count up to 15 credits of coursework numbered 300 or above taken as a UW–Madison Special student toward the minimum graduate residence credit requirement, and the minimum graduate degree credit requirement; if that coursework is numbered 700 or above it may satisfy the minimum graduate coursework (50%) requirement.

CREDITS PER TERM ALLOWED
15 credits

PROGRAM-SPECIFIC COURSES REQUIRED
Materials Science and Engineering, M.S.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>M S &amp; E 350</td>
<td>Introduction to Materials Science</td>
<td>3</td>
</tr>
<tr>
<td>M S &amp; E 900</td>
<td>Materials Research Seminar</td>
<td>2</td>
</tr>
<tr>
<td>M S &amp; E 553</td>
<td>Nanomaterials &amp; Nanotechnology</td>
<td>3</td>
</tr>
<tr>
<td>M S &amp; E 401</td>
<td>Special Topics in Materials Science and Engineering (by instructor consent)</td>
<td>1-3</td>
</tr>
<tr>
<td>M S &amp; E/CH 421</td>
<td>Polymeric Materials</td>
<td>3</td>
</tr>
<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 448</td>
<td>Crystallography and X-Ray Diffraction</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 521</td>
<td>Advanced Polymeric Materials</td>
<td>3</td>
</tr>
<tr>
<td>M S &amp; E 530</td>
<td>Thermodynamics of Solids</td>
<td>3</td>
</tr>
<tr>
<td>M S &amp; E 551</td>
<td>Structure of Materials</td>
<td>3</td>
</tr>
<tr>
<td>M S &amp; E 552</td>
<td>Advanced Materials Science: Phase Transformations</td>
<td>3</td>
</tr>
<tr>
<td>M S &amp; E 570</td>
<td>Properties of Solid Surfaces</td>
<td>3</td>
</tr>
<tr>
<td>M S &amp; E 699</td>
<td>Independent Study</td>
<td>1-4</td>
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<td>M S &amp; E 748</td>
<td>Structural Analysis of Materials</td>
<td>3</td>
</tr>
<tr>
<td>M S &amp; E 752</td>
<td>Advanced Materials Science: Phase Transformations</td>
<td>3</td>
</tr>
<tr>
<td>M S &amp; E 756</td>
<td>Structure and Properties of Advanced Electronic Materials</td>
<td>3</td>
</tr>
</tbody>
</table>

Select two materials electives

1. Take two semesters.
2. Electives are to be selected from a list of available from the program.

Materials Science and Engineering: Nanomaterials and Nanoengineering, M.S. (named option)
- MSE 350: Introduction to Materials Science must be taken during the first semester of enrollment (3 credits).
- MSE 900: Materials Research Seminar must be taken in both the Fall and Spring semester (1 credit each, 2 credits total).
- MSE 553: Nanomaterials and Nanotechnology
- A minimum of 22 additional credits from the courses listed below:
  - At least 9 credits of the additional coursework must be at the graduate level.
  - At most 6 credits of MSE 699: Independent Study may be taken.


**Overall Graduate GPA Requirement**

3.00

**Other Grade Requirements**
The Graduate School requires an average grade of B or better in all coursework (300 or above, not including research credits) taken as a graduate student unless conditions for probationary status require higher grades. Grades of Incomplete are considered to be unsatisfactory if they are not removed during the next enrolled semester.

**Probation Policy**
The Graduate School regularly reviews the record of any student who earned grades of BC, C, D, F, or Incomplete in a graduate course (300 or above), or grade of U in research credits. This review could result in academic probation with a hold on future enrollment or in being suspended from the Graduate School.

**Advisor / Committee**
Every graduate student is required to have an advisor. An advisor is a faculty member, or sometimes a committee, from the major department responsible for providing advice regarding graduate studies. An advisor generally serves as the thesis advisor. In many cases, an advisor is assigned to incoming students. To ensure that students are making satisfactory progress toward a degree, the Graduate School expects them to meet with their advisor on a regular basis.

Students without a researcher advisor at the end of their first year enrolled are in danger of failing to make adequate progress toward their degree. Students can be suspended from the Graduate School if they do not have an advisor.

**Assessment and Examinations**
Materials Science and Engineering, M.S.
Students must prepare a master's thesis, present it in a public seminar, and defend it in closed examination by their master's committee.

Materials Science and Engineering: Nanomaterials and Nanoengineering, M.S. (named option)
No formal examination is required.

**Time Constraints**
Materials Science and Engineering, M.S.
The master's degree is typically completed within three years.

Master's degree students who have been absent for five or more consecutive years lose all credits that they have earned before their absence. Individual programs may count the coursework students completed prior to their absence for meeting program requirements; that coursework may not count toward Graduate School credit requirements.

**Materials Science and Engineering: Nanomaterials and Nanoengineering, M.S. (named option)**
The master of science in nanomaterials and nanotechnology, which is a named option program within the Department of Materials Science and Engineering, must be completed within one year.

Master's degree students who have been absent for five or more consecutive years lose all credits that they have earned before their absence. Individual programs may count the coursework students completed prior to their absence for meeting program requirements; that coursework may not count toward Graduate School credit requirements.

**Language Requirements**
None.

**Admissions**
Admission to the graduate program in the Department of Materials Science and Engineering is based on the student's previous academic record, Graduate Record Exam (GRE) scores, letters of recommendation, TOEFL scores for non-native English speakers, and a personal statement. Students with undergraduate degrees in science or engineering outside of materials science and engineering are routinely admitted. Admission is competitive.

**Important Application Information**
Admission to the University of Wisconsin–Madison Graduate School (http://grad.wisc.edu) is a prerequisite for admission to study materials science. A minimum GPA of 3.0/4.0 is required. Graduate Record Examinations (http://www.ets.org/gre) scores on the General Test are required. Admission is highly selective. Most admitted students have an undergraduate GPA above 3.5. Mean GRE scores in the most recent admission cycle were quantitative: 166, verbal: 163, and analytical writing: 3.5. However, full consideration will be given to all students meeting the UW–Madison graduate school requirements. Please use institution code: 1846; no department code is necessary.

Foreign students must submit satisfactory results on the TOEFL (http://www.ets.org/toefl) or another acceptable English Language Test. Please use institution code: 1846; no department code is necessary. Information about these exams can be obtained from the Educational Testing Service, Princeton, New Jersey 08540 or Berkeley, California 94704.

Please use the online application (https://www.gradsch.wisc.edu/eapp/eapp.pl) to begin your application. If you have questions about the application or admissions process, please do not hesitate to email msaeradmission@engr.wisc.edu.

The graduate school offers a limited number of application fee grants (waivers of all or part of the application fee) that are available in a few specific circumstances. Further information is available here. (https://grad.wisc.edu/admissions/feegrants)

#Submit only the documents requested.

**Note:** Please do not send documents to the Graduate School. All documents should be uploaded with your application.

**Application Deadlines:**
Spring semester: October 1
Fall semester: January 1
QUESTIONS?
Check out the Admissions FAQ or contact us at msaegradadmission@engr.wisc.edu.

MATERIALS SCIENCE AND ENGINEERING: NANOMATERIALS AND NANOENGINEERING, M.S.
Applicants normally are expected to have a B.S. in the physical sciences or engineering. Undergraduate studies normally would include mathematics through differential equations, at least one year each of general physics and chemistry, a course in physical chemistry or modern physics, and an elementary course in properties of materials. Applicants may be admitted with deficiencies. These must be made up as soon as possible after entering the program.

LEARNING OUTCOMES

KNOWLEDGE AND SKILLS
• demonstrate a strong understanding of mathematical, scientific, and engineering principles in the field.
• demonstrate an ability to formulate, analyze, and solve advanced engineering problems.
• demonstrate creative, independent problem solving skills.
• apply the latest scientific and technological advancements, advanced techniques, and modern engineering tools to these problems.

PROFESSIONAL CONDUCT
• recognize and apply principles of ethical and professional conduct.

PEOPLE

Faculty: Professors: Babcock, Eom, Evans, Gopalan, Kou, Lagally, Lakes, Morgan, Perepezko, Robertson, Stone, Szlufarska, Voyles; Associate Professors: Arnold, Wang; Assistant Professors: Kawasaki.

Affiliate Faculty: Abbott, Allen, Andrew, Ashton, Beebe, Booske, Botez, Cai, Chesler, Coppersmith, Cramer, Crone, Drugan, Eriksen, Eriten, Goldsmith, Gong, Gunasekaran, Harms, Hitchens, Jang, Jin, Kats, Keely, Klingenberg, Kneic, Kuech, Kucinski, Li, Lynn, Ma, Masters, Mawst, Mc Dermott, Murphy, Negrut, Ogle, Onellion, Osswald, Palecek, Pfefferkorn, Ploeg, Reed, Root, Rowlands, Rzhchowski, Sarmadi, Shohet, Sridharan, Thelen, Turng, van der Weide, Vanderby, Weibel, Wendt, Williams, Winokur, Xu, Yu