

# MATERIALS SCIENCE AND ENGINEERING: RESEARCH, M.S.

This is a named option within the Materials Science and Engineering M.S. (<http://guide.wisc.edu/graduate/materials-science-engineering/materials-science-engineering-ms/>)

The Research named option in the Materials Science and Engineering M.S. is designed for students wishing to conduct research during their program. This program takes approximately two years to complete and a thesis is required.

## ADMISSIONS

Please consult the table below for key information about this degree program's admissions requirements. The program may have more detailed admissions requirements, which can be found below the table or on the program's website.

Graduate admissions is a two-step process between academic programs and the Graduate School. **Applicants must meet** the minimum requirements (<https://grad.wisc.edu/apply/requirements/>) **of the Graduate School as well as the program(s)**. Once you have researched the graduate program(s) you are interested in, apply online (<https://grad.wisc.edu/apply/>).

Requirements	Detail
Fall Deadline	December 15
Spring Deadline	October 1
Summer Deadline	December 15
GRE (Graduate Record Examinations)	Required.*
English Proficiency Test	Every applicant whose native language is not English or whose undergraduate instruction was not in English must provide an English proficiency test score and meet the Graduate School minimum requirements ( <a href="https://grad.wisc.edu/apply/requirements/#english-proficiency">https://grad.wisc.edu/apply/requirements/#english-proficiency</a> ).
Other Test(s) (e.g., GMAT, MCAT)	n/a
Letters of Recommendation Required	3

\*Due to COVID-19, GRE scores will not be required for applications to Materials Science and Engineering graduate programs for admission to the Spring 2023, Summer 2023, and Fall 2023 terms.

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.

## 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://apply.grad.wisc.edu/Account/Login/?ReturnUrl=%2f>) to begin your application. To be considered for fellowships, all application materials are due by December 15. If you have questions about the application or admissions process, please do not hesitate to email [msaegradadmission@engr.wisc.edu](mailto:msaegradadmission@engr.wisc.edu).

The graduate school offers a limited number of application fee grants (covers 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: December 15  
Summer: December 15

## QUESTIONS?

Check out the Admissions FAQ or contact us at [msaegradadmission@engr.wisc.edu](mailto:msaegradadmission@engr.wisc.edu).

## FUNDING

### GRADUATE SCHOOL RESOURCES

Resources to help you afford graduate study might include assistantships, fellowships, traineeships, and financial aid. Further funding information (<https://grad.wisc.edu/funding/>) is available from the Graduate School. Be sure to check with your program for individual policies and restrictions related to funding.

## PROGRAM RESOURCES

### FINANCIAL ASSISTANCE

Please note that most funding is available for Ph.D. students and there is limited resources for M.S. students.

Various types of financial assistance are available for entering graduate students, including research assistantships, teaching assistantships, fellowships and special grants. Decisions regarding financial support are made on the basis of letters of recommendation, grades, GRE general test scores, and, for research assistantships, the matching of the interests or experience of the applicant to the research programs of individual faculty members. December 15th is the deadline for receipt of fellowship applications. Foreign students are generally not eligible for university fellowships. Applications for other types of support are accepted until mid-February.

### RESEARCH AND TEACHING ASSISTANTSHIPS

Research assistantships (RAs) are available in any materials science area. These appointments are under the supervision of the major professor directing the research. Students interested in research assistantships in a particular area are encouraged to contact professors whose work is of special interest. The faculty's research interests are given in the Department of Materials Science and Engineering faculty section. An RA permits the most rapid progress toward a degree. Research assistantships in materials science graduate students are comparable to similar stipends from other institutions. Information about stipends can be obtained from the Associate Chair of Graduate Studies, [acgs@mse.wisc.edu](mailto:acgs@mse.wisc.edu) (<http://guide.wisc.edu/graduate/materials-science-engineering/materials-science-engineering-ms/acgs@mse.wisc.edu>).

Teaching assistantships involve teaching rather than research experience. They pay approximately the same as research assistantships. Teaching experience is especially desirable for students considering an academic career. The Department of Materials Science and Engineering supports a limited number of teaching assistantships, which are allocated after admissions.

### FELLOWSHIPS

Herb Fellowships in Materials Science are given out each year. The Herb Fellowship is a one-year full-ride fellowship for incoming graduate students. It is intended to provide especially strong students extra flexibility and independence in formulating their graduate research program.

Fellowships supporting graduate education are also offered on a competitive basis by organizations such as the National Science Foundation (<http://www.nsf.gov/>), the Hertz Foundation (<http://www.hertzfndn.org/>), UW–Madison Graduate School (<http://www.wisc.edu/grad/>), the U.S. Department of Defense and a number of industries and foundations. Because some of these fellowships have fall application deadlines, early application is necessary. GRE scores for the General Test are required for fellowship applications.

### OTHER FUNDING INFORMATION

If you choose to attend UW-Madison and plan to pursue funding on your own, the following sites could be very helpful:

- Graduate School Funding Resources (<https://grad.wisc.edu/studentfunding/prospective/>)

- Graduate School Costs and Funding (<https://grad.wisc.edu/studentfunding/currentstudents/>)

## REQUIREMENTS

### MINIMUM GRADUATE SCHOOL REQUIREMENTS

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

### NAMED OPTION REQUIREMENTS MODE OF INSTRUCTION

Face to Face	Evening/ Weekend	Online	Hybrid	Accelerated
Yes	No	No	No	No

#### 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	30 credits
Minimum Residence Credit Requirement	16 credits
Minimum Graduate Coursework Requirement	15 credits must be graduate-level coursework. Details can be found in the Graduate School's Minimum Graduate Coursework (50%) policy ( <a href="https://policy.wisc.edu/library/UW-1244">https://policy.wisc.edu/library/UW-1244</a> ).
Overall Graduate GPA Requirement	3.00 GPA required. This program follows the Graduate School's GPA Requirement policy ( <a href="https://policy.wisc.edu/library/UW-1203">https://policy.wisc.edu/library/UW-1203</a> ).
Other Grade Requirements	n/a

**Assessments and Examinations** Students must prepare a Master's thesis, present it in a public seminar, and defend it in closed examination by their Master's committee. The format and procedures must

conform to the Graduate School rules for a Master's thesis, currently found at <https://grad.wisc.edu/current-students/masters-guide> (<https://grad.wisc.edu/current-students/masters-guide/>).

**Language** None.

**Requirements**

## REQUIRED COURSES

Code	Title	Credits
<b>Materials Research Seminar</b> <sup>1</sup>		<b>2</b>
M S & E 900	Materials Research Seminar	
<b>Materials Core Courses</b>		<b>9</b>
Select three courses:		
M S & E 521	Advanced Polymeric Materials	
M S & E 530	Thermodynamics of Solids	
M S & E 551	Structure of Materials	
M S & E 752	Advanced Materials Science: Phase Transformations	
<i>Graduate-level Math Course (students may only count one of the following as a Materials Core Course)</i>		
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	
<b>Materials Elective Courses</b>		<b>6</b>
Electives must be selected from the list of Materials Elective Courses below.		
<b>Research</b>		<b>13</b>
M S & E 790	Master's Research or Thesis	
<b>Total Credits</b>		<b>30</b>

1

Take two consecutive semesters for 1 credit each semester.

### Materials Elective Courses:

The same course may not satisfy more than one requirement. For example, if M S & E 530 Thermodynamics of Solids is taken as a Materials Core Course, it could not be used as a Materials Elective Course. In addition, only one mathematics course may be counted as a materials core or materials elective course. Students or faculty may request that a course be added to the list by submitting a letter to the department graduate secretary including the course syllabus and explaining why the course is a materials-centric course.

Code	Title	Credits
M S & E 401	Special Topics in Materials Science and Engineering	1-3
M S & E/CHEM 421	Polymeric Materials	3
M S & E/N E 423	Nuclear Engineering Materials	3
M S & E/N E 433	Principles of Corrosion	3

M S & E 434	Introduction to Thin-Film Deposition Processes	3
M S & E 441	Deformation of Solids	3
M S & E 448	Crystallography and X-Ray Diffraction	3
M S & E 451	Introduction to Ceramic Materials	3
M S & E 456	Electronic, Optical, and Magnetic Properties of Materials	3
M S & E 460	Introduction to Computational Materials Science and Engineering	3
M S & E 461	Advanced Metal Casting	3
M S & E/M E 462	Welding Metallurgy	3
M S & E 463	Materials for Elevated Temperature Service	3
M S & E 465	Fundamentals of Heat Treatment	3
M S & E/CIV ENGR/ G L E/GEOSCI 474	Rock Mechanics	3
M S & E 521	Advanced Polymeric Materials	3
M S & E 530	Thermodynamics of Solids	3
M S & E/E M A 541	Heterogeneous and Multiphase Materials	3
M S & E 551	Structure of Materials	3
M S & E 553	Nanomaterials & Nanotechnology	3
M S & E 560	Fundamentals of Atomistic Modeling	3
M S & E 570	Properties of Solid Surfaces	3
M S & E 648	Advanced X-ray Scattering Methods in Materials Science and Engineering	3
M S & E 660	Mesoscale Modeling of Materials	3
M S & E 748	Structural Analysis of Materials	3
M S & E 750	Imperfections and Mechanical Properties	3
M S & E 752	Advanced Materials Science: Phase Transformations	3
M S & E 756	Structure and Properties of Advanced Electronic Materials	3
M S & E 760	Molecular Dynamics and Monte Carlo Simulations in Materials Science	3
M S & E 803	Special Topics in Materials Science	1-3
B M E/PHM SCI 430	Biological Interactions with Materials	3
B M E/M E 615	Tissue Mechanics	3
BIOCHEM/ CHEM 704	Chemical Biology	3
CBE 540	Polymer Science and Technology	3
CBE 747	Advanced Colloid and Interface Science	3
CHEM 652	Chemistry of Inorganic Materials	3
CHEM 653	Chemistry of Nanoscale Materials	3
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	3
GEOSCI 765	Crystal Chemistry	3
PHYSICS 415	Thermal Physics	3
PHYSICS 551	Solid State Physics	3
PHYSICS 715	Statistical Mechanics	3
PHYSICS 751	Advanced Solid State Physics	3

Students can be suspended from the Graduate School if they do not have an advisor.

## CREDITS PER TERM ALLOWED

15 credits

## TIME LIMITS

The Master's degree is typically completed within three years.

This program follows the Graduate School's Time Limits policy. (<https://policy.wisc.edu/library/UW-1221/>)

## GRIEVANCES AND APPEALS

These resources may be helpful in addressing your concerns:

- Bias or Hate Reporting (<https://doso.students.wisc.edu/bias-or-hate-reporting/>)
- Graduate Assistantship Policies and Procedures (<https://hr.wisc.edu/policies/gapp/#grievance-procedure>)
- Hostile and Intimidating Behavior Policies and Procedures (<https://hr.wisc.edu/hib/>)
  - Office of the Provost for Faculty and Staff Affairs (<https://facstaff.provost.wisc.edu/>)
- Dean of Students Office (<https://doso.students.wisc.edu/>) (for all students to seek grievance assistance and support)
- Employee Assistance (<http://www.eao.wisc.edu/>) (for personal counseling and workplace consultation around communication and conflict involving graduate assistants and other employees, post-doctoral students, faculty and staff)
- Employee Disability Resource Office (<https://employee disabilities.wisc.edu/>) (for qualified employees or applicants with disabilities to have equal employment opportunities)
- Graduate School (<https://grad.wisc.edu/>) (for informal advice at any level of review and for official appeals of program/departmental or school/college grievance decisions)
- Office of Compliance (<https://compliance.wisc.edu/>) (for class harassment and discrimination, including sexual harassment and sexual violence)
- Office of Student Conduct and Community Standards (<https://conduct.students.wisc.edu/>) (for conflicts involving students)
- Ombuds Office for Faculty and Staff (<http://www.ombuds.wisc.edu/>) (for employed graduate students and post-docs, as well as faculty and staff)
- Title IX (<https://compliance.wisc.edu/titleix/>) (for concerns about discrimination)

## MS&E Grievance Procedures

Students who feel they have been unfairly treated or otherwise have a grievance related to the policies and procedures for graduate study in the Materials Science and Engineering Department may choose to submit a formal grievance to the department. Before taking this step, however, students are encouraged to discuss their grievance directly with the person or persons involved. Respectful, professional, direct communication can often reach a more satisfactory resolution to an issue more quickly than a formal grievance procedure.

To pursue a formal grievance, the student should submit a letter describing the issue in detail to the department Associate Chair of Graduate Studies within 60 days of the precipitating incident. (Should the grievance involve the Director of Graduate Studies, the letter should be submitted to the department Chair.) The Director (or Chair) will convene

## POLICIES

### GRADUATE SCHOOL POLICIES

The Graduate School's Academic Policies and Procedures (<https://grad.wisc.edu/acadpolicy/>) provide essential information regarding general university policies. Program authority to set degree policies beyond the minimum required by the Graduate School lies with the degree program faculty. Policies set by the academic degree program can be found below.

### NAMED OPTION-SPECIFIC POLICIES

#### PRIOR COURSEWORK

##### Graduate Work from Other Institutions

Typically, no graduate work from other institutions may be counted toward graduate program requirements. Under unusual circumstances and 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.

##### 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.

##### 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.

#### PROBATION

This program follows the Graduate School's Probation policy. (<https://policy.wisc.edu/library/UW-1217/>)

#### ADVISOR / COMMITTEE

This program follows the Graduate School's Advisor policy (<https://policy.wisc.edu/library/UW-1232/>) and the Graduate School's Committees policy (<https://policy.wisc.edu/library/UW-1201/>).

Students without an advisor at the end of their first year enrolled are in danger of failing to make adequate progress towards their degree.

a committee of not fewer than three department faculty. The committee will obtain a written response from the person or persons who are the subject of the complaint. The committee will then decide a course of action in response to the grievance. The response from the subject of the complaint and the committee course of action will be communicated in writing to the student within 15 working days of submission of the grievance. The course of action will be implemented no later than 10 working days of the communication.

If the departmental procedure does not resolve the grievance, the student may appeal to the College of Engineering or the Graduate School. The College grievance procedures are currently available at <http://www.engr.wisc.edu/current/current-students-how-to-file-a-grievance.html>, (<http://www.engr.wisc.edu/current/current-students-how-to-file-a-grievance.html>) and the Graduate School procedures are available at <http://grad.wisc.edu/acadpolicy/>. (<http://grad.wisc.edu/acadpolicy/>)

The Assistant Dean for Graduate Affairs ([engr-dean-graduateaffairs@engr.wisc.edu](mailto:engr-dean-graduateaffairs@engr.wisc.edu)) provides overall leadership for graduate education in the College of Engineering (CoE), and is a point of contact for graduate students who have concerns about education, mentoring, research, or other difficulties.

## OTHER

n/a

## PROFESSIONAL DEVELOPMENT

### GRADUATE SCHOOL RESOURCES

Take advantage of the Graduate School's professional development resources (<https://grad.wisc.edu/pd/>) to build skills, thrive academically, and launch your career.

### PROGRAM RESOURCES

Find information about professional development from the College of Engineering at the following webpage: <https://epd.wisc.edu/>.

## PEOPLE

### PROFESSORS

Izabela Szlufarska (Chair)

Michael S. Arnold

Susan Babcock

Chang-beom Eom

Paul Evans

Padma Gopalan

Sindo Kou

Roderic Lakes

Dane Morgan

John Perepezko

Ian Robertson

Kumar Sridharan

Donald Stone

Dan J. Thoma

Paul Voyles

Xudong Wang

### ASSISTANT PROFESSORS

Dawei Feng

Jiamian Hu

Jason Ken Kawasaki

Daniel Rhodes

Jun Xiao

See also Materials Science and Engineering Faculty Directory (<https://directory.engr.wisc.edu/mse/faculty/>).