

DEPARTMENT OF MATERIALS SCIENCE AND ENGINEERING

Graduate Study

The Department of Materials Science and Engineering (DMSE) offers the degrees of Master of Science, Doctor of Philosophy, and Doctor of Science in Materials Science and Engineering. The department also offers opportunities for interdisciplinary study through the programs in Archaeological Materials, Computational Science and Engineering, Polymers and Soft Matter, and Technology and Policy.

Admission Requirements for Graduate Study

General admissions requirements (<https://catalog.mit.edu/mit/graduate-education/general-degree-requirements>) are described under Graduate Education. Programs are arranged on an individual basis depending upon the preparation and interests of the student. Those who have not studied some thermodynamics and kinetics at the undergraduate level are expected to know the material covered in 3.010 Structure of Materials, 3.020 Thermodynamics of Materials, and 3.030 Microstructural Evolution in Materials.

Requirements for Completion of Graduate Degrees

The general requirements (<https://catalog.mit.edu/mit/graduate-education/general-degree-requirements>) for completion of graduate degrees are also described under the section on Graduate Education. Students completing a Master of Science degree are required to present a seminar summarizing the thesis. The department requires that candidates for the doctoral degrees go through a qualifying procedure and pass Institute-mandated general written and oral examinations before continuing with their programs of study and research, and that they satisfy a minor requirement. Information on the qualifying procedure and on the subject areas covered by the general examinations is available in the DMSE Academic Office.

Master of Science in Materials Science and Engineering

The department offers a Master of Science degree in materials science and engineering. The general requirements for the master's degree (<https://catalog.mit.edu/mit/graduate-education/general-degree-requirements>) are described under the section on Graduate Education. The coherent program of subjects (34 units, though not necessarily all DMSE subjects) must be approved by the Department Committee on Graduate Students. Of the 66 total units required for the master's degree, 42 graduate degree credits are required to be in DMSE subjects at the graduate level. The thesis must have significant materials research content. An internal departmental thesis reader is required if the student's advisor is outside DMSE.

The department may also recommend awarding a master's degree without departmental specification; the general requirements (<https://catalog.mit.edu/mit/graduate-education/general-degree-requirements>) are described under Graduate Education. The thesis

must be materials-related. An internal departmental thesis reader is required if the thesis advisor is outside DMSE.

Simultaneous Award of Two Master of Science Degrees for Students from Other Departments

Graduate students may seek two Master of Science degrees simultaneously or in sequence, one awarded by the student's home department and the other by the Department of Materials Science and Engineering. The rules governing dual degrees (<https://catalog.mit.edu/mit/graduate-education/general-degree-requirements>) are found in the section detailing degree requirements under Graduate Education. Additional information on requirements that must also be met to obtain the Master of Science degree from the Materials Science and Engineering Department is available from the department.

Doctoral Degree in Materials Science and

The Department of Materials Science and Engineering (DMSE) offers a Doctor of Philosophy (PhD) and Doctor of Science (ScD) in Materials Science and Engineering (<https://catalog.mit.edu/degree-charts/phd-materials-science-engineering>); the program is the same for both degrees. The DMSE doctoral program provides an advanced educational experience that is versatile, intellectually challenging, and of enduring value for high-level careers relating to the generation and application of knowledge concerning materials. It develops students' ability, confidence, and originality to grasp and solve challenging problems involving materials.

All students in the DMSE doctoral program have the same foundation of core requirements: four core subjects, two seminar-based courses, and first-year thesis research requirements. The courses define what the department considers to be the fundamental knowledge that serves as the basis of materials science and engineering as a discipline—what every PhD materials scientist or materials engineer from MIT ought to know. The first-year student seminars and core subjects provide a rigorous, unified foundation for subsequent advanced-level subjects and thesis research. The successful completion of the core requirements is assessed via the student's performance in each subject.

Each doctoral student must take three post-core electives, selected from among the graduate subjects offered by the department (<https://catalog.mit.edu/subjects/3>) and approved by the thesis committee. A full range of advanced-level subjects is offered in a variety of topics, and arrangements can be made for individually planned study of any relevant topic. In addition, students are required to take a two- or three-subject minor program.

Students in the DMSE doctoral program must successfully complete the general examination, which consists of written and oral evaluations to qualify as a candidate for the doctoral degree:

- A core curriculum assessment and review of research progress during the first year of the graduate program

- A thesis area examination, in which each student is expected to demonstrate a general understanding of the fundamentals of their chosen field and deeper understanding of one or more of its significant aspects that specifically relate to their thesis topic, as reflected in their chosen elective and minor subjects. The thesis area examination includes submission of a written thesis proposal and an oral examination.

Doctoral candidates (who have passed the general examination) must complete a doctoral thesis that satisfies the Institute (<https://catalog.mit.edu/mit/graduate-education/general-degree-requirements/#doctoraldegreetext>) and departmental requirements to receive the doctoral degree. During their first semester, students will meet with faculty members and evaluate research opportunities available in each lab. Selection of a research lab and thesis project is done by the student with the understanding that the student and faculty member mutually agree on the general topic and content area of the thesis. The research culminates in the writing of a thesis document. The results of the research must be of sufficient significance to warrant publication in the scientific literature; depending on the research field, this publication can come in the form of journal articles, conference proceedings, patents, or combinations of these or other public disclosure formats. Visit the DMSE website for additional information on the doctoral program (<https://dmse.mit.edu/education/graduate-program/doctoral-degree-requirements>).

Interdisciplinary Programs

Program in Archaeological Materials

The Department of Materials Science and Engineering offers an interdisciplinary doctoral program for individuals who wish to consider the study of archaeology and materials science and pursue research in the field of archaeological materials. Admission to the program is through the department. The program requires four core subjects—half in materials science and engineering, half in archaeology—and six additional subjects. Many of the subject requirements may be met with coursework in the Architecture; Civil and Environmental Engineering; Earth, Atmospheric, and Planetary Sciences; Mechanical Engineering; and Urban Studies and Planning departments; or in the Technology and Policy Program; the Program in Science, Technology, and Society; and the Anthropology Department at Harvard University. Field research opportunities are available, most notably in Mesoamerica and South America.

Computational Science and Engineering

The Computational Science and Engineering (CSE) doctoral program (<https://cse.mit.edu/programs/phd>) allows students to specialize in a computation-related field of their choice through focused coursework and a doctoral thesis through a number of participating host departments. The CSE PhD program is administered jointly by the Center for Computational Science and Engineering (CCSE) and the host departments, with the emphasis of thesis research activities being the development of new computational methods and/or the

innovative application of computational techniques to important problems in engineering and science.

For more information, see the program descriptions (<https://catalog.mit.edu/interdisciplinary/graduate-programs/computational-science-engineering>) under Interdisciplinary Graduate Programs.

Polymers and Soft Matter

The Program in Polymers and Soft Matter (PPSM) (<http://polymerscience.mit.edu>) offers students from participating departments an interdisciplinary core curriculum in polymer science and engineering, exposure to the broader polymer community through seminars, contact with visitors from industry and academia, and interdepartmental collaboration while working towards a PhD or ScD degree.

Research opportunities include functional polymers, controlled drug delivery, nanostructured polymers, polymers at interfaces, biomaterials, molecular modeling, polymer synthesis, biomimetic materials, polymer mechanics and rheology, self-assembly, and polymers in energy. The program is described in more detail (<https://catalog.mit.edu/interdisciplinary/graduate-programs/polymers-soft-matter>) under Interdisciplinary Graduate Programs.

Technology and Policy Program

The Master of Science in Technology and Policy is an engineering research degree with a strong focus on the role of technology in policy analysis and formulation. The Technology and Policy Program (TPP) curriculum provides a solid grounding in technology and policy by combining advanced subjects in the student's chosen technical field with courses in economics, politics, and law. Many students combine TPP's curriculum with complementary subjects to obtain dual degrees in and either a specialized branch of engineering or an applied social science such as political science or urban studies and planning. For additional information, see the program description (<https://catalog.mit.edu/interdisciplinary/graduate-programs/technology-policy>) under Interdisciplinary Programs or visit the program website (<http://tpp.mit.edu>).

Financial Support

The Department of Materials Science and Engineering offers assistantships and fellowships for graduate study. Research and teaching assistantships are available in the fields in which the department is active.

Inquiries

Contact the Academic Office at dmse-gradoffice@mit.edu for additional information regarding graduate programs, admissions, and financial aid.