

Materials Science and Engineering

Course 3

Most fields in science and engineering are concerned in some way with materials, yet only the field of materials science and engineering focuses directly on them. This broad discipline studies how atoms can be assembled into solid structures, and how those structures can be engineered to useful ends. The academic and research topics range from atomic physics and chemistry to large-scale engineering analysis and design. Examples of achievements in the field are evident all around us: smaller and faster devices in the electronics industry are almost entirely the result of materials improvements; nanomaterial enabled batteries are revolutionizing energy storage and delivery; modern metal alloys enable stronger infrastructure, lighter aircraft and vehicles, more efficient engines and energy generation, and decrease the environmental impact of manufacturing; and biomaterials form the basis for medical implants and artificial organs and are revolutionizing drug delivery and cancer therapy.

Materials Science and Engineering at MIT

MIT's Department of Materials Science and Engineering (DMSE) is considered a world leader in the field, based both on its academic stature and on the success of its graduates in their chosen careers. DMSE graduates work in academia, industry research, energy technologies, law, medicine, and finance. Many are recipients of major scholarships and national fellowships for graduate study (e.g., Rhodes, NSF, NDSEG). It is the only department at MIT in which the research and academic programs treat all classes of materials (metals, ceramics, polymers, biological materials, and electronic materials) from a unified viewpoint.

The Department's reputation stems from that of its highly regarded faculty. Faculty research projects range from the purely scientific to applied studies, and involve perspectives of chemistry, physics, biology, electronics, materials design, materials entrepreneurship, and the historical and societal aspects of materials. A more

complete list of DMSE research activities may be found on the Department's website (dmse.mit.edu).

Undergraduate Program

In the DMSE undergraduate curriculum, core materials subjects are taken in the sophomore and junior years, followed by advanced elective subjects that treat specific types and applications of materials. Students tailor their academic programs to their interests in certain applications or materials families; for example, materials for the computer and electronics industry, biomaterials, or structural materials. The undergraduate curriculum is centered around hands-on instruction from the first term in which students enter the department, with classroom lectures that emphasize and reinforce the lessons learned in laboratory. The core culminates with a capstone project, where students design materials and build prototypes, integrating what they have learned in their academic subjects with teamwork, analysis, problem-solving, and communications skills.

The Department also has a strong Industrial Internship Program that requires two 10-week work periods (usually summers) in an industrial or governmental establishment. Reports from these work periods are accepted in lieu of the required S.B. thesis.

Undergraduate Research

Undergraduates are encouraged to participate in the Undergraduate Research Opportunities Program (UROP), in which they may earn academic credit or wages by conducting research under faculty or research staff guidance. Research facilities include faculty laboratories as well as shared facilities run by DMSE, the Center for Materials Science and Engineering, the Institute for Soldier Nanotechnologies, and other MIT central facilities.

Undergraduate Life

The Department has a very active undergraduate population. The Society of Undergraduate Materials

Scientists (SUMS) not only organizes social functions and assists in making professional connections, but also plays an important advisory role in coordinating and developing the Department's academic program.

Post Baccalaureate Opportunities

The wide-ranging field of materials provides promising and varied career opportunities for engineers and scientists today. Whether generalists or specialists, materials scientists and engineers are in high demand in both the public and private sectors for jobs in research, development, production, and management/consulting. While many DMSE graduates go on to graduate school for more intensive study in materials, the job market is strong for Bachelor's degree recipients. An education in materials science and engineering provides a natural preparation for further education and careers in medicine, law, and business. Course 3A is specially designed for students wishing to pursue these options.

Archaeology and Materials

Course 3C, a unique degree program in Archaeology and Materials, offers students the opportunity to study ancient cultures by studying the structure and properties

of materials associated with human activities. This includes materials science and engineering, anthropological archaeology, and geology, and leads to the S.B.

Contact Information

For more information about the undergraduate program in the Department of Materials Science and Engineering contact Professor Jeff Grossman, MIT, 77 Massachusetts Avenue, Room 13-5049, Cambridge, MA 02139-4307; Email: jcg@mit.edu. Additional information is also available at <http://dmse.mit.edu/>.

The MIT Course Catalog contains further information on the Institute, including all graduate and undergraduate courses and programs. Please visit the MIT Course Catalog website for more details at <http://web.mit.edu/catalog/index.html>.

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