DEPARTMENT OF MATERIALS SCIENCE AND ENGINEERING

Materials science and engineering (MSE) studies the ways in which atoms and molecules can be built into solid materials and how the structural arrangement of the atoms in a material governs its properties. The department's research and academic programs address all classes of materials, used in every domain of human endeavor, including energy, sustainability, nanotechnology, healthcare, information technology, and manufacturing. Because almost all technological advances are based upon materials advances, MSE is unique for its balance of basic science (examining the relationships and connections between processing, structure, and properties of materials) and practical applications. The department draws on scientific perspectives from chemistry, physics, biology, computational, and mathematical approaches, and engineering, economics, and industrial design.

Recent advances in materials have depended as much on advances in materials engineering as they have on materials science. When developing engineering processes for the production of materials and when designing materials for specific applications, the materials scientist and engineer must understand fundamental concepts such as thermodynamics, kinetics, and atomic structure, as well as economic, social, and environmental factors. Today's materials scientists and engineers address some of the key challenges facing humanity, including sustainable energy generation and storage, the environmental impact of human activities, and advancements in health and medicine.

The fundamental concepts and applications of materials science and engineering are taught within core subjects and electives at the undergraduate and graduate levels. Undergraduate lectures are complemented by a variety of laboratory experiences. By selecting appropriate subjects, students can follow many different paths with emphasis on engineering, science, or a mixture of the two. In addition, students may pursue a path in archaeology and archaeological science within the Department of Materials Science and Engineering and the Center for Materials Research in Archaeology and Ethnology (CMRAE) (*http://web.mit.edu/cmrae*). This curriculum is unique within departments of anthropology, archaeology, and engineering.

Materials engineers and materials scientists are continually in high demand by industry and government for jobs in research, development, production, and management. They find a diversity of challenging opportunities in industries related to energy, the environment, electronics, aerospace, consumer products, biomaterials, and medicine, as well as in national laboratories, consulting, and entrepreneurship. A large number of DMSE alumni are faculty at leading universities.

The department has extensive undergraduate materials teaching laboratories containing a wide range of materials processing and characterization equipment. The Undergraduate Teaching Laboratory on the Infinite Corridor includes facilities for biomaterials research, chemical synthesis, and physical and electronic properties measurement. The Breakerspace characterization lab allows undergraduates to explore scanning electron microscopy, X-ray diffraction, and Raman spectrometry. The Laboratory for Advanced Materials contains thermal, electrical, optical, and magnetic characterization equipment. The Laboratory for Engineering Materials has machining and 3D printing capabilities. The Nanomechanics Laboratory has a suite of equipment for probe microscopy and mechanical and tribological measurements. Other departmental laboratories include facilities for preparation of a variety of bulk and thin film materials, and characterization by optical, electron (TEM, SEM), and scanning probe (AFM, STM) microscopy, and electrical, optical, magnetic, and mechanical property measurements. DMSE faculty, students, and staff also access the materials characterization tools in the Materials Research Laboratory (*https://catalog.mit.edu/mit/research/materials-research-laboratory*) and the cleanroom facilities and tools in MIT.nano (*https://mitnano.mit.edu*), including state of the art electron microscopy.