DEPARTMENT OF MATERIALS SCIENCE AND ENGINEERING

Undergraduate Study

The Department of Materials Science and Engineering (DMSE) offers several undergraduate degree programs:

- Course 3, leading to the Bachelor of Science in Materials Science and Engineering, is taken by the majority of undergraduates in the department and is accredited by the Engineering Accreditation Commission of Accreditation Board for Engineering and Technology (ABET) (*http://www.abet.org*).
- Course 3-A, leading to the Bachelor of Science as Recommended by the Department of Materials Science and Engineering, provides students greater flexibility in designing their own self-guided program. The New Engineering Education Transformation (NEET) program (*https://neet.mit.edu*) offers a thread in Advanced Materials Machines that meets the 3-A requirements.
- Course 3-C leads to the Bachelor of Science in Archaeology and Materials as Recommended by the Department of Materials Science and Engineering.

The department also offers research and educational specialization in a large number of industrially and scientifically important areas leading to master's and doctoral degrees.

Bachelor of Science in Materials Science and Engineering (Course 3)

The undergraduate program (*http://catalog.mit.edu/degree-charts/materials-science-engineering-course-3*) serves the needs of students who intend to pursue employment in materials-related industries immediately upon graduation, as well as those who will do graduate work in the engineering or science of materials. The program is designed to be started at the beginning of the sophomore year, although it can be started in the spring term of the sophomore year or in the junior year with some loss of scheduling flexibility.

The first four academic terms of the program contain required core subjects that address the fundamental relations between processing, microstructure, properties, and applications of modern materials. The core subjects are followed by a sequence of restricted electives that provide more specialized coverage of the major classes of modern materials: biomaterials, ceramics, electronic materials, metals, and polymers, as well as cross-cutting topics relevant to all types of materials. Course 3 students write either a senior thesis or reports based on industrial internships. This provides an opportunity for original research work beyond that which occurs elsewhere in the program.

The required subjects can be completed in the sophomore and junior years within a schedule that allows students to take a HASS subject each term and a range of elective junior and senior subjects. Departmental advisors assist students in selecting elective subjects. While the program should satisfy the academic needs of most students, petitions for variations or substitutions may be approved by the departmental Undergraduate Committee; students should contact their advisor for guidance in such cases.

Participation in laboratory work by undergraduates is an integral part of the curriculum. The departmental core subjects include extensive laboratory exercises, which investigate materials properties, structure, and processing and are complementary to the lecture subjects. The junior-year core includes a capstone laboratory subject, 3.042 Materials Project Laboratory, that emphasizes design, materials processing, teamwork, communication skills, and project management. Undergraduate students also have access to extensive facilities for research in materials as part of the Undergraduate Research Opportunities Program (UROP) (*http://uaap.mit.edu/research-exploration/urop*) and thesis projects. Engineering design figures prominently in a substantial portion of the laboratory exercises. Students develop oral and written communication skills by reporting data and analysis in a variety of ways.

Students in Course 3 are required to complete an intensive research field experience by participating in either the Internship Program or the Thesis Program. Both programs are conducted under the supervision of faculty members and extend curricular topics to real-world contexts and applications. The internship program consists of completing two paid internships with a significant materials component, typically conducted in the summer after the sophomore (3.930 Internship Program) and junior (3.931 Internship Program) years. The thesis program (3.THU Undergraduate Thesis) consists of a significant materials research project in a faculty laboratory. Both programs conclude with a formal presentation of findings.

Bachelor of Science as Recommended by the Department of Materials Science and Engineering (Course 3-A)

Some students may be attracted to the many opportunities available in the materials discipline but also have special interests that are not satisfied by the Course 3 program. For instance, some students may wish to take more biology and chemistry subjects in preparation for medical school or more management subjects prior to entering an MBA or law program. In these cases, the 3-A program may be of value as a more flexible curriculum in which a larger number of elective choices is available.

The curriculum requirements for Course 3-A (*http://catalog.mit.edu/degree-charts/materials-science-engineering-course-3-a*) are similar to but more flexible than those for Course 3.

A student considering the 3-A program (including NEET) should contact the department Academic Office, who will counsel them more fully on the academic considerations involved. The student will prepare a complete plan of study which must be approved by the departmental Undergraduate Committee. This approval must be obtained no later than the beginning of the student's junior year. The student is then expected to adhere to this plan unless circumstances

require a change, in which case a petition for a modified program must be submitted to the Undergraduate Committee. The department does not seek ABET accreditation for the 3-A program.

The NEET option allows students to pursue a project-centered academic program across multiple departments and disciplines.

Bachelor of Science in Archaeology and Materials as Recommended by the Department of Materials Science and Engineering (Course 3-C)

Students who have a specific interest in archaeology and archaeological science may choose Course 3-C. The 3-C program (*http://catalog.mit.edu/degree-charts/archaeology-materials-course-3-c*) is designed to afford students broad exposure to fields that contribute fundamental theoretical and methodological approaches to the study of ancient and historic societies. The primary fields include anthropological archaeology, geology, and materials science and engineering. The program enriches knowledge of past and present-day nonindustrial societies by making the natural and engineering sciences part of the archaeological tool kit.

The program's special focus is on understanding prehistoric culture through study of the structure and properties of materials associated with human activities. Investigating peoples' interactions with materials, the objects that such interactions produced, and the related environmental settings leads to a fuller analysis of the physical, social, cultural, and ideological world in which people function. These are the goals of anthropological archaeology, goals that are reached, in part, through science and engineering perspectives.

Participation in laboratory work by undergraduates is an integral part of the curriculum. The program requires that all students take a materials laboratory subject. Many of the archaeology subjects are designed with a laboratory component; such subjects meet in the Undergraduate Archaeology and Materials Laboratory. Undergraduate students also have access to the extensive CMRAE facilities for research in archaeological materials as part of UROP and thesis projects. Such projects may include archaeological fieldwork during IAP or the summer months.

The **HASS Concentration in Archaeology and Archaeological Science** provides concentrators with a basic knowledge of the field of archaeology, the systematic study of the human past. Students pursuing the SB in 3-C may not also concentrate in this area. The archaeology and archaeological science concentration consists of four subjects:

Required Subjects		
3.986	The Human Past: Introduction to Archaeology	12
3.985[J]	Archaeological Science	9
Select two other HASS electives from among the following:		18-21
3.094	Materials in Human Experience	
3.982	The Ancient Andean World	
3.983	Ancient Mesoamerican Civilization	
3.987	Human Evolution: Data from Palaeontology, Archaeology, and Materials Science	
3.993	Archaeology of the Middle East	
Total Units		**39-42**

The department does not seek ABET accreditation for the 3-C program. Students may contact Dr. Max Price (maxprice@mit.edu) for more information.

Minor in Materials Science and Engineering

Required Subjects		
3.010	Structure of Materials	12
3.020	Thermodynamics of Materials	12
Core Subjects (Select 2)		**24**
3.013	Mechanics of Materials	
3.023	Synthesis and Design of Materials	
3.030	Microstructural Evolution in Materials	
3.033	Electronic, Optical and Magnetic Properties of Materials	
3.044	Materials Processing	
3.042	Materials Project Laboratory	
Restricted Electives (Select 2)		**24**
Select 2 subjects from the list of Restricted Electives in Course 3/3-A.		
Total Units		**72**

With the approval of the minor advisor, students may substitute one subject taken outside the department for one of the core or restricted elective subjects, provided that the coverage of the substituted subject is similar to one of those in the departmental program. A minimum of 60 units must be Course 3 subject units, with the exception being if the minor proposal includes 18.03. In this case, a minimum of 48 Course 3 credits may be approved. Examples of minor programs in materials science and engineering can be obtained from the department.

Minor in Archaeology and Materials

The Minor in Archaeology and Materials (3-C) consists of six undergraduate subjects as described below.

Required Subjects		
3.010	Structure of Materials	12
3.020	Thermodynamics of Materials	12
3.030	Microstructural Evolution in Materials	12
3.985[J]	Archaeological Science (HASS-S)	9
3.986	The Human Past: Introduction to Archaeology (HASS-S)	12

Elective

Select one of the following: [1]		9-12
3.981	Communities of the Living and the Dead: the Archaeology of Ancient Egypt	
3.982	The Ancient Andean World	
3.983	Ancient Mesoamerican Civilization	
3.987	Human Evolution: Data from Palaeontology, Archaeology, and Materials Science	
3.990	Seminar in Archaeological Method and Theory	
3.993	Archaeology of the Middle East	
Total Units		**66-69**

[1] *All of these subjects, with the exception of 3.990, provide HASS-S credit.*

With the approval of the minor advisor, students may substitute one subject taken outside the Course 3 program, provided the coverage is equivalent. The 3-C minor advisor, Dr. Max Price, will ensure that the minor program forms a coherent group of subjects.

A general description of the minor program (*http://catalog.mit.edu/mit/undergraduate-education/academic-programs/minors*) may be found under Undergraduate Education.

Inquiries

Additional information regarding undergraduate programs may be obtained from the DMSE Academic Office at dmse-ugoffice@mit.edu.