

MATERIALS SCIENCE AND ENGINEERING

Course 3

Department Contact

Academic Administrator: Becky Shepardson, bshep@mit.edu

Description

As a DMSE major, you'll delve into a vast array of materials—from metals and ceramics to polymers and composites—understanding how their composition and structure influence their behavior. This breadth of study will allow you to explore areas such as nanotechnology, biomaterials, and materials for electronics. What's more, you'll be at the forefront of developing eco-friendly materials, recycling technologies, and energy-efficient systems.

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- 3 Materials Science and Engineering
- 3-A S.B. as recommended by the Department of Materials Science and Engineering
- 3-C Archaeology and Materials as recommended by the Department of Materials Science and Engineering

Introductory Classes

- 3.000 **Coffee Matters: Using the Breakerspace to Make the Perfect Cup**
Uses the Course 3 (DMSE) Breakerspace to delve into the world of materials science through brewing, sipping, and testing several forms of coffee and espresso. Presents cutting-edge materials characterization tools, including optical and electron microscopes, spectroscopy techniques, and hardness/strength testing. Through experiments to analyze the composition and microstructure of coffee beans, grinds, and brewing equipment, students have the opportunity to learn how material properties influence the taste, aroma, and quality of espresso. Equips students with the knowledge and skills to appreciate coffee on a whole new level through application of materials characterization techniques, consideration of relevant physics and chemistry, and sampling. Subject can count toward the 6-unit discovery-focused credit limit for first-year students.
- 3.001 **Science and Engineering of Materials**
Provides a broad introduction to topics in the Department of Materials Science and Engineering's core subjects. Classes emphasize hands-on activities and conceptual and visual examples of materials phenomena and materials engineering, interspersed with guest speakers from inside and outside academia to show career paths. Subject can count toward the 6-unit discovery-focused credit limit for first year students. Preference to first-year students.

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3.002 **Materials for Energy and Sustainability**

Materials play a central role in the ongoing global transformation towards more sustainable means of harvesting, storing, and conserving energy, through better batteries, fuel cells, hydrogen electrolyzers, photovoltaics, and the like. Methods for producing materials such as cement, steel, ammonia, and ethylene, which rank amongst today's largest industrial emitters of greenhouse gases, are being re-invented. Much of this work is taking place at MIT and surrounding cleantech startups. This class discusses the underlying science of selected new technologies, the challenges which must be overcome, and the magnitude of their potential impact. Visits to the startups behind each case study and meetings with the scientists and engineers creating these technologies are included. Subject can count toward 6-unit discovery-focused credit limit for first-year students. Preference to first-year students.

Course 3-Friendly UROP Areas

- Visit <https://dmse.mit.edu/faculty/> and contact a faculty member working in your area of interest to see if they have available opportunities.
- Contact Undergraduate Academic Administrator Becky Shepardson (bshep@mit.edu) about Course 3 UROPs designed specifically for first years.

Get Involved with Course 3

- DMSE Breakerspace
- Merton C. Flemings Materials Processing Lab
- MIT Energy Club
- MIT Energy Initiative
- Mining, Oil, and Gas Club
- Email sums-request@mit.edu to join the DMSE first-year mailing

Skills

- Using materials structure-property relationships to solve engineering problems
- Computer modeling software (ThermoCalc, ImageJ, Solidworks, ABAQUS, etc.)
- Laboratory Techniques: X-Ray Diffraction, Electron Microscopy, Thermal Analysis, Wet Lab Chemistry, and more!
- Fabrication Techniques: Semiconductor fabrication, metal casting, polymer synthesis, ceramic sintering, chemical vapor deposition

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Possible Future Jobs

- Materials engineer: Work on the structure, processing, properties and performance of engineering materials.
- Process engineer: Develop and maintain the processes required to synthesize, purify, process, shape, and control materials.
- Research and development scientist/engineer (R&D): Research structure, processing, properties and performance of materials for the development and use of applications in technology.

Career Industry Examples

Aerospace and Defense	Consulting	Non-profit agency
Automotive	Engineering	Pharmaceuticals
Chemicals and Materials Clean Energy	Manufacturing	Transportation

Sample Employers

Alcoa	Formlabs	Northrop Grumman
Ambri, Inc.	General Motors	NVBOTS
Boeing	Markforged	SanDisk
Cornerstone Research	New Classrooms	Vaxess Technologies, Inc.