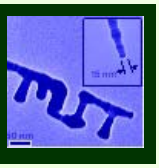
Micro & Nano Engineering

Department of Mechanical Engineering



MITMECHE

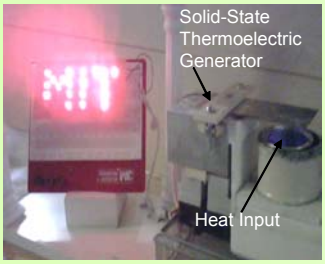
Small Scale Technologies with Large Impacts

http://meche.mit.edu/research/micronano/

Tiny systems offer giant opportunities for technology, consumer products, energy systems, and more. Micro and nanotechnology enable airbag sensors, disposable medical sensors for improved patient safety, rapid DNA analysis, stronger and lighter nanostructured materials for automobiles and airplanes, and both microscale and nanostructured energy conversion devices for improved energy efficiency, to name a few.

Mechanical engineering provides a key foundation for these multidisciplinary advances. Faculty members in our department pursue micro and nanoscale research that extends through mechanical engineering as well as other science and engineering disciplines. We continue to add to our significant roster of educational offerings in micro and nanoscale science and technology. Students interested in micro/nano technology are encouraged to sample these offerings and to pursue the 2A Nano Track.

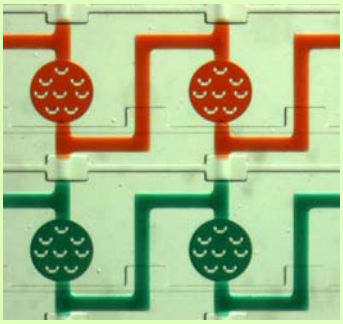
Nano/Micro Enabled Energy and Power Technology



Micro and nanoscale structures are improving the performance of existing energy and power systems and enabling new ones. Examples include high performance nanomaterials for thermoelectrics and photovoltaics, microscale energy harvesters that capture otherwise wasted energy, and microscale chemical systems with enhanced reaction kinetics. Some applications of current research include fuel cells, hydrogen storage, piezoelectric energy harvesters, and MEMS laser components.

Faculty: Chen, Kim, Livermore, Shao-Horn, Wang
Classes: 2.005, 2.006, 2.370, 2.372J, 2.57, 2.60, 2.625

Nanobiotechnology

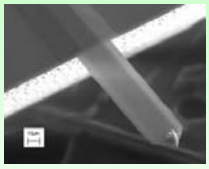
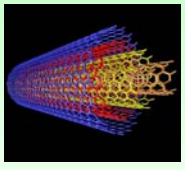


Micro and nanoscale engineering and technology provide faster, more sensitive, and less expensive tools that continue to impact biotechnology and healthcare in new ways. MechE researchers are studying fluidic, biological, and structural phenomena at the nano and microscales and utilizing them to create devices for a range of biological applications, from culturing of embryos and cell separation to analyzing single molecules and biological imaging.

Faculty: Dewey, Grodzinsky, Hamad-Schifferli, Kamm, Karnik, Lang, Manalis, So, Thorsen, Wang, Youcef-Toumi
Classes: 2.371, 2.372J, 2.674, 2.772J; 2.793J, 2.795J, 2.798

What becomes possible when technology goes from


to

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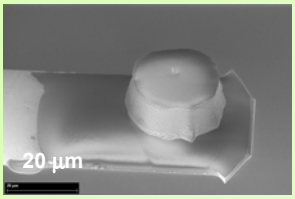
Find out more, and design, build, and test your own microsystems in
2.674 Hands On Micro/Nano Engineering – Offered Spring 2008

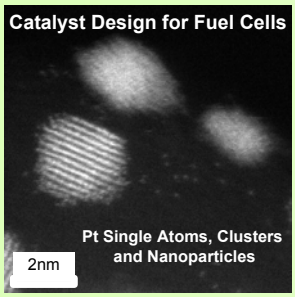
Nano/Micro Design and Manufacturing



Nanomanufacturing transforms nanoscience from a scientific curiosity into products for real applications. Our research efforts create new micro and nanostructures and integrate them into multi-scale systems through innovative fabrication processes in assembly, positioning and manipulation.

Faculty: Barbastathis, Culpepper, Kim, Livermore, Slocum, Youcef-Toumi
Classes: 2.372J, 2.373J, 2.391J, 2.760

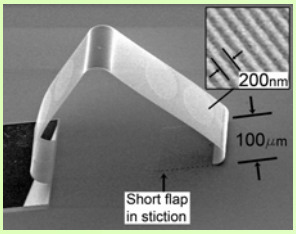
Micro/Nanoscale Mechanics and Materials



Many nanostructured materials have unique properties. Our faculty members are creating nanostructured materials for energy conversion, energy storage, and mechanical systems. These materials include catalysts with high activity and stable oxygen reduction for fuel cells and water splitting, and polymers with exceptional mechanical and thermal properties.

Faculty: Abeyaratne, Chen, Kim, Shao-Horn
Classes: 2.088J, 2.370, 2.57, 2.60

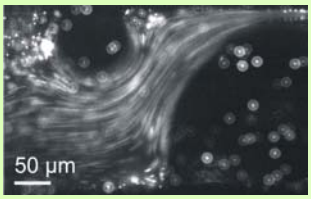
Micro/Nanophotonics



Optics at the subwavelength scale are full of surprises. One focus of our research activities is imaging at subwavelength scales, for example of biological molecules and cells in order to gain a better understanding of diseases and therapies. A second research focus is light propagation in nanostructured (artificial) materials for making powerful optical elements such as lenses with properties that are not available in natural (bulk) materials.

Faculty: Barbastathis, So
Classes: 2.71/2.710, 2.717

Micro/Nanoscale Transport



Transport processes at the nano and microscales can differ significantly from those at the macroscale. Our faculty members are studying fundamental transport processes in heat transfer, fluid flow, and information flow for a wide range of applications.

Faculty: Chen, Hadjiconstantinou, Karnik, Lloyd, Wang
Classes: 2.006, 2.111J, 2.370, 2.371, 2.57, 2.674

Suggested Micro/Nano Electives

2.674 Hands on Micro/Nano Engineering
2.772J Statistical Thermodynamics of Biomolecular Systems
2.088J Introduction to Modeling and Simulation
2.391J Submicrometer and Nanometer Technology
2.60 Fundamentals of Advanced Energy Conversion
2.760 Multi-Scale System Design and Manufacturing
2.372J Design & Fabrication of Microelectromechanical Devices
2.373J Materials and Processes for Microelectromechanical Devices and Systems
2.370 Molecular Mechanics
6.152J Micro/Nano Processing Technology
2.111J Quantum Computation
2.57 Nano-to-Macro Transport Processes
2.71 Optics, 2.717J Optical Engineering
2.371 Microscale Fluid Mechanics
2.625 Electrochemical Systems

For information on Course 2-A on Nano/Micro Engineering Concentration, please visit: http://meche.mit.edu/academic/undergraduate/course2a/samplecon/