

# DEPARTMENT OF MATERIALS SCIENCE AND ENGINEERING

The Department of Materials Science and Engineering is jointly operated by the College of Engineering and College of Arts and Sciences.

The department offers Bachelor of Science, Master of Engineering, Master of Science, and Doctor of Philosophy degrees. This multidisciplinary department includes faculty members from several disciplines, including aerospace engineering, biology, biomedical engineering, chemical engineering, chemistry, electrical engineering, mechanical engineering, nuclear engineering, and physics. Many of today's most pressing scientific problems stem from the limitations of materials currently available, and this department is at the forefront of new knowledge and discovery at Texas A&M University.

## What is Materials Science and Engineering?

Materials science and engineering involves the characterization of the physical and chemical properties of solid materials—metals and alloys, ceramics, magnetic materials, polymers, optical materials, semiconductors, superconductors, and composites—for the purpose of using, changing or enhancing inherent properties to create or improve end products. Materials science and engineering involves examining how the microstructure (crystalline or amorphous) of a material can be changed to influence the strength, electrical conductivity, optical, or magnetic properties of a material. This field is inherently multidisciplinary, encompassing mechanical, chemical, biomedical, civil, electrical, and aerospace engineering; physics; and chemistry.

Materials science comprises the study of materials from the macro to the atomic scale—from highway building materials to carbon nanotubes—but, independent of scale, the study of materials is concerned fundamentally with the effect of structure and chemistry on the properties of materials. Materials have historically been so important that different eras of civilization were named according to the materials from which tools were fabricated: the Stone Age, the Bronze Age, and the Iron Age. The development of the semiconductor spawned the modern era of information technology, often called the Silicon Age. Advances in materials science might make this new millennium the Biomaterials/Nanomaterials/Optical Materials Age.

## What do Materials Scientists and Engineers do?

In industry, materials scientists and engineers work with natural or synthetic materials and, most often, with combinations of materials to improve existing products or develop novel products. For instance, at Intel, the developer of the processing chip used in most PCs, materials scientists optimize the materials used in chip packaging, balancing differing coefficients of thermal expansion, heat dissipation, brittleness and compliancy, and cost for optimum performance and economic feasibility.

Other materials scientists are at the forefront of the revolution in biotechnology, developing materials for the components of artificial joints, heart valves, and other replacement body parts. Smart materials in medical and dental applications show tremendous potential, such as compressible stents that reform to their intended shape upon contact with body heat once inserted into an artery, ceramic cement for bone

repair, or shape-memory alloys to correct misplaced teeth or spine curvature. (Smart materials have one or more properties that can be dramatically altered, such as multi-viscosity oil, with a viscosity that varies with temperature.)

Related research involves developing smaller and more reliable components, such as ferromagnetic activators acting as tiny machines in military and other applications. In aerospace engineering, materials scientists are developing airframe and fuselage materials with high strength-to-weight ratios and developing smart materials into integrated sensors and actuators for reconfigurable wings and other adaptive structures.

## Why is Materials Science and Engineering Important?

Many of the technologies that we need to solve pressing societal problems (efficient energy generation, access to clean water, information processing and storage, safe and efficient transportation, as examples) are fundamentally limited by the materials that we have available to us. Materials scientists and engineers are critical to discovering new materials to advance these technologies.

## Materials Science and Engineering at Texas A&M University

The face of materials science and engineering is continuously evolving. Currently, there is massive interest domestically and internationally in new manufacturing processes (3-D printing, additive manufacturing, etc.) and in utilizing computational and informatics approaches to intelligently and rapidly design new materials. Here at Texas A&M, our faculty embrace these new aspects while maintaining vigorous educational and research efforts in the classical core tenants of materials structure, thermodynamics, and kinetics.

For more information, visit the Department of Materials Science and Engineering website.

## Faculty

Akbulut, Mustafa, Associate Professor  
Materials Science & Engr  
PHD, University of California at Santa Barbara, 2007

Alge, Daniel L, Associate Professor  
Materials Science & Engr  
PHD, Purdue University, 2010

Arroyave, Raymundo, Professor  
Materials Science & Engr  
PHD, Massachusetts Inst of Technology, 2004

Asadi, Amir, Assistant Professor  
Materials Science & Engr  
PHD, University of Manitoba, 2013

Balbuena, Perla B, Professor  
Materials Science & Engr  
PHD, The University of Texas at Austin, 1996

Banerjee, Sarbajit, Professor  
Materials Science & Engr  
PHD, State University of New York at Stony Brook, 2004

Batteas, James D, Professor  
Materials Science & Engr  
PHD, University of California at Berkeley, 1995

Bazzi, Hassan, Professor  
Materials Science & Engr  
PHD, McGill University, 2003

Benzerga, Amine A, Professor  
Materials Science & Engr  
PHD, Ecole Nationale Supérieure Des Mines De Paris, 2000

Bullard, Jeffrey, Professor  
Materials Science & Engr  
PHD, University of California at Berkeley, 1993

Butler, Brady, Visiting Assistant Professor  
Materials Science & Engr  
PHD, Johns Hopkins University, 2017

Cagin, Tahir, Professor  
Materials Science & Engr  
PHD, Clemson University, 1988

Case, Raymundo P, Professor of the Practice  
Materials Science & Engr  
PHD, University of Manchester Institute of Science and Technology, 2002

Castaneda-Lopez, Homero, Professor  
Materials Science & Engr  
PHD, Penn State University, 2001

Creasy, Terry S, Associate Professor  
Materials Science & Engr  
PHD, University of Delaware, 1997

Demkowicz, Michal J, Associate Professor  
Materials Science & Engr  
PHD, Massachusetts Institute of Technology, 2005

Elabd, Yossef A, Professor  
Materials Science & Engr  
PHD, Johns Hopkins University, 2001

Elwany, Alaa Mohamed, Assistant Professor  
Materials Science & Engr  
PHD, Georgia Institute of Technology, 2009

Erdemir, Ali, Professor  
Materials Science & Engr  
PHD, Georgia Institute of Technology, 1986

Fang, Lei, Associate Professor  
Materials Science & Engr  
PHD, Northwestern University, 2010

Gaharwar, Akhilesh K, Associate Professor  
Materials Science & Engr  
PHD, Purdue University, 2011

Grasley, Zachary C, Professor  
Materials Science & Engr  
PHD, University of Illinois Urbana Champaign, 2006

Green, Micah, Professor  
Materials Science & Engr  
PHD, Massachusetts Institute of Technology, 2007

Grunlan, Jaime C, Professor  
Materials Science & Engr  
PHD, University of Minnesota, 2001

Grunlan, Melissa A, Professor  
Materials Science & Engr  
PHD, University of Southern California, 2004

Guo, Bing, Associate Professor  
Materials Science & Engr  
PHD, Tsinghua University, China, 1998

Harris, Harlan R, Associate Professor  
Materials Science & Engr  
PHD, Texas Tech University, 2003

Hartl, Darren, Associate Professor  
Materials Science & Engr  
PHD, Texas A&M University, 2009

Hemmer, Philip R, Professor  
Materials Science & Engr  
PHD, Massachusetts Inst of Technology, 1984

Hipwell, M Cynthia, Professor  
Materials Science & Engr  
PHD, University of California at Berkeley, 1996

Hwang, Wonmuk, Associate Professor  
Materials Science & Engr  
PHD, Boston University, 2001

Jeong, Hae-Kwon, Professor  
Materials Science & Engr  
PHD, University of Minnesota, 2004

Kameoka, Jun, Professor  
Materials Science & Engr  
PHD, Cornell University, 2002

Karaman, Ibrahim, Professor  
Materials Science & Engr  
PHD, University of Illinois at Urbana-Champaign, 2000

Katehi-Tseregounis, Linda, Professor  
Materials Science & Engr  
PHD, University of California, 1984

Kolluru, Pavan, Assistant Professor  
Materials Science & Engr  
PHD, University of Illinois at Urbana-Champaign, 2014

Kuo, Yue, Professor  
Materials Science & Engr  
PHD, Columbia University, 1980

Kuttolamadom, Mathew A, Associate Professor  
Materials Science & Engr  
PHD, Clemson University, 2012

Lagoudas, Dimitris C, University Distinguished Professor  
Materials Science & Engr  
PHD, Lehigh University, 1986

Le Graverend, Jean-Briac B, Associate Professor  
Materials Science & Engr  
PHD, Ecole Nationale de Mécanique et d'Aérotechnique, France, 2013

Liang, Hong, Professor  
Materials Science & Engr  
PHD, Stevens Institute of Technology, 1992

Lin, Paotai, Associate Professor  
Materials Science & Engr  
PHD, Northwestern University, 2009

Lutkenhaus, Jodie, Professor  
Materials Science & Engr  
PHD, Massachusetts Institute of Technology, 2007

Ma, Chao, Assistant Professor  
Materials Science & Engr  
PHD, University of California, 2015

Mansoor, Bilal, Associate Professor  
Materials Science & Engr  
PHD, University of Michigan, 2010

McDeavitt, Sean M, Professor  
Materials Science & Engr  
PHD, Purdue University, 1992

McShane II, Michael J, Professor  
Materials Science & Engr  
PHD, Texas A&M University, 1999

Michaudel, Quentin, Assistant Professor  
Materials Science & Engr  
PHD, The Scripps Research Institute, 2015

Naraghi, Mohammad, Associate Professor  
Materials Science & Engr  
PHD, University of Illinois at Urbana Champaign, 2009

Naugle, Donald G, Professor  
Materials Science & Engr  
PHD, Texas A&M University, 1965

Needleman, Alan, University Distinguished Professor  
Materials Science & Engr  
PHD, Harvard University, 1971

Nyakiti, Luke O, Instructional Assistant Professor  
Materials Science & Engr  
PHD, Texas Tech University, 2008

Ozmetin, Ali E, Senior Lecturer  
Materials Science & Engr  
PHD, Texas A&M University, 2009

Paramore, James, Visiting Assistant Professor  
Materials Science & Engr  
PHD, University of Utah, 2015

Pentzer, Emily, Associate Professor  
Materials Science & Engr  
PHD, Northwestern University, 2010

Pharr IV, George M, Professor  
Materials Science & Engr  
PHD, Stanford University, 1979

Pharr, George, Assistant Professor  
Materials Science & Engr  
PHD, Harvard University, 2014

Qian, Xiaofeng, Associate Professor  
Materials Science & Engr  
PHD, Massachusetts Institute of Technology, 2008

Radovic, Miladin, Professor  
Materials Science & Engr  
PHD, Drexel University, 2001

Raiman, Stephen, Assistant Professor  
Materials Science & Engr  
PHD, University of Michigan, 2016

Reddy, Junuthula, Distinguished Professor and Regents Professor  
Materials Science & Engr  
PHD, University of Alabama at Huntsville, 1974

Ross Jr, Joseph H, Professor  
Materials Science & Engr  
PHD, University of Illinois at Urbana-Champaign, 1986

Sagapuram, Dinakar, Assistant Professor  
Materials Science & Engr  
PHD, Purdue University, 2013

Seminario, Jorge M, Professor  
Materials Science & Engr  
PHD, Southern Illinois University Carbondale, 1987

Shamberger, Patrick J, Associate Professor  
Materials Science & Engr  
PHD, University of Washington, 2010

Shao, Lin, Professor  
Materials Science & Engr  
PHD, University of Houston, 2001

Sheldon, Matthew T, Assistant Professor  
Materials Science & Engr  
PHD, University of California at Berkeley, 2010

Srivastava, Ankit, Associate Professor  
Materials Science & Engr  
PHD, University of North Texas, 2013

Su, Hung-Jue, Professor  
Materials Science & Engr  
PHD, University of Michigan at Ann Arbor, 1988

Sukhishvili, Svetlana A, Professor  
Materials Science & Engr  
PHD, Lomonosov Moscow State University, 1989

Talreja, Ramesh R, Professor  
Materials Science & Engr  
PHD, The Technical University of Denmark, 1974

Tamamis, Phanourios, Assistant Professor  
Materials Science & Engr  
PHD, University of Cyprus, 2010

Teizer, Winfried, Professor  
Materials Science & Engr  
PHD, University of Massachusetts - Amherst, 1998

Thomas, Edwin L, Visiting Professor  
Materials Science & Engr  
PHD, Cornell University, 1974

Tu, Qing, Assistant Professor  
Materials Science & Engr  
PHD, Duke University, 2017

Vaddiraju, Sreeram, Associate Professor  
Materials Science & Engr  
PHD, University of Louisville, 2006

Wang, Jyhwen, Professor  
Materials Science & Engr  
PHD, Northwestern University, 1991

Wang, Shiren, Associate Professor  
Materials Science & Engr  
PHD, Florida State University, 2006

Ware, Taylor, Associate Professor  
Materials Science & Engr  
PHD, University of Texas at Dallas, 2013

Whitcomb, John D, Professor  
Materials Science & Engr  
PHD, Virginia Tech, 1988

Wilkerson, Justin, Assistant Professor  
Materials Science & Engr  
PHD, Johns Hopkins University, 2014

Williams, Richard, Professor  
Materials Science & Engr  
PHD, University of California at Berkeley, 1978

Wong, Zi Jing, Assistant Professor  
Materials Science & Engr  
PHD, University of California at Berkeley, 2015

Wooley, Karen L, University Distinguished Professor  
Materials Science & Engr  
PHD, Cornell University, 1993

Wu, Wenhao, Associate Professor  
Materials Science & Engr  
PHD, University of Chicago, 1992

Xie, Yu Xuan, Assistant Professor  
Materials Science & Engr  
PHD, University of Sydney, 2013

Yu, Choongho, Professor  
Materials Science & Engr  
PHD, The University of Texas at Austin, 2004

Zhou, Hongcai J, Professor  
Materials Science & Engr  
PHD, Texas A&M University, 2000

## Majors

- Bachelor of Science in Materials Science and Engineering (<http://catalog.tamu.edu/undergraduate/engineering/materials-science/bs/>)

## Minors

- Materials Science and Engineering Minor (<http://catalog.tamu.edu/undergraduate/engineering/materials-science/minor/>)

## Certificates

- Corrosion Science and Engineering Certificate (<http://catalog.tamu.edu/undergraduate/engineering/materials-science/corrosion-science-engineering-certificate/>)
- Polymer Specialty Certificate (<http://catalog.tamu.edu/undergraduate/engineering/materials-science/polymer-specialty-certificate/>)