DEPARTMENT OF MATERIALS SCIENCE AND ENGINEERING

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

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; for example, 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 to 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, head dissipation, brittleness and compliancy, and cost for optimum performance and economic feasibility.

Other materials scientists are on the forefront of the revolution in biotechnology, developing materials for the components of artificial joints, heart valves, and other replacement body parts. Smart materials show a tremendous potential in medical and dental applications, 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 multiviscosity 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, as well as developing smart materials into integrated sensors and actuators for reconfigurable wings and other adaptive structures.

For more information, visit the Department of Materials Science and Engineering (http://engineering.tamu.edu/materials/) website.

Faculty

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**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/)