MATERIALS SCIENCE AND ENGINEERING, MINOR

Requirements for a minor may be completed at any campus location offering the specified courses for the minor. Students may not change from a campus that offers their major to a campus that does not offer their major for the purpose of completing a minor.

Program Description

The minor in Materials Science and Engineering prepares students to understand the materials properties, materials processing techniques, characterization methods, and selection criteria in implementing engineering solutions. The materials selection and use for cutting edge technology requires precise and definite knowledge of choice of materials, processing route, and material response in service conditions. A wide variety of industries such as aerospace, automotive, energy, biomedical, chemical, industrial, and electrical to name a few, have a demand for engineers with a strong background in materials engineering.

The materials minor includes an introductory course on materials science to provide a foundation on properties and processing of materials, materials thermodynamics and kinetics, and characterization of mechanical, microstructural and electrical properties of materials. Students then have the freedom and flexibility to enhance their knowledge on the processing, structure, and properties of materials such as metals, ceramics, polymers, electronics, biomaterials, composites, nanomaterials, and materials for energy. The minor can easily complement most engineering, chemistry, and physics studies.

This minor is intended for students in other engineering or science majors who have the necessary foundational knowledge in math, physics, and chemistry [even if the courses taken are not exactly the same as the listed prerequisites for MATSE courses (i.e., MATH 250 and MATH 252 vs. MATH 251, CHEM 210 vs. CHEM 202, etc.)]. Therefore, we recommend students reach out to the MATSE department or the faculty member teaching a specific MATSE course if they have questions about meeting prerequisites.

What is Materials Science and Engineering?

Materials are ubiquitous. Materials play a role in every industry and facet of life. Materials science and engineering is an interdisciplinary study of the properties of matter and the exploration for new and creative uses of ceramics, metals, polymers and composites. Materials scientists and engineers study the entire life cycle of materials (production, synthesis and processing, manufacturing, use, recycling and reclamation) by employing science to solve engineering problems. This engineering discipline is unique in that our studies begin with understanding materials at the atomic scale, allowing for prediction and measurement of material properties, and creation of materials by design. What do you want to do with your career? Make alternative energy more economical? Improve human health, cure cancer? Provide clean drinking water to the world? Make transportation more efficient and environmentally friendly? Make everyday materials more sustainable? All these outcomes and more are possible by studying materials.

You Might Like This Program If...

- · You enjoy problem-solving, math, and the physical sciences.
- You like understanding why materials react the way they do to various stimuli.
- You are interested in creating tools and materials for the aerospace, automotive, energy, biomedical, or electronics industries.

Program Requirements

Requirement	Credits
Requirements for the Minor	18

The minor in Materials Science and Engineering requires the completion of a total of 18 credits in materials related and other supporting courses. With the approval of the student's program chair, some of these courses may also be used to satisfy the requirements for the student's major bachelor's degree.

Requirements for the Minor

A grade of C or better is required for all courses in the minor, as specified by Senate Policy 59-10 (https://senate.psu.edu/students/policiesand-rules-for-undergraduate-students/59-00-minors-and-certificates/). In addition, at least six credits of the minor must be unique from the prescribed courses required by a student's major(s).

Code	Title	Credits
Additional Cours	es	
Additional Course	s: Require a grade of C or better	
Select one of the	following:	3
ESC 414M	Elements of Material Engineering	
MATSE 201	Introduction to Materials Science	
MATSE 259	Properties and Processing of Engineering Materials	
Select 3-9 credits	s from the following MATSE Core Courses:	3-9
MATSE 400	Crystal Chemistry	
MATSE 401	Thermodynamics of Materials	
MATSE 402	Materials Process Kinetics	
MATSE 413	Solid-State Materials	
MATSE 419	Computational Materials Science and Engineering	ng
MATSE 430	Materials Characterization	
MATSE 436	Mechanical Properties of Materials	
Select 6-12 credi	ts from the following MATSE Supporting Courses:	6-12
MATSE 403	Biomedical Materials	
MATSE 404	Surfaces and the Biological Response to Materia	als
MATSE 409	Nuclear Materials	
MATSE 410	Phase Relations in Materials Systems	
MATSE 411	Processing of Ceramics	
MATSE 412	Thermal Properties of Materials	
MATSE 415	Introduction to Glass Science	
MATSE 417	Electrical and Magnetic Properties	
MATSE 421	Corrosion Engineering	
MATSE 425	Processing of Metals	
MATSE 426	Aqueous Processing	
MATSE 427	Microstructure Design of Structural Materials	
MATSE 429	Non-Ferrous Structural Metals	
MATSE 435	Optical Properties of Materials	

	MATSE 440	Nondestructive Evaluation of Flaws	
	MATSE 441	Polymeric Materials I	
	MATSE 445	Thermodynamics, Microstructure, and Characterization of Polymers	
	MATSE 446	Mechanical and Electrical Properties of Polymers and Composities	
	MATSE 447	Rheology and Processing of Polymers	
	MATSE 449	Fundamentals of Composite Materials Science and Engineering	
	MATSE 450	Synthesis and Processing of Electronic and Photonic Materials	
	MATSE 455	Properties and Characterization of Electronic and Photonic Materials	
	MATSE 497	Special Topics	
Sı	pporting Cours	es and Related Areas	
Sι	pporting Course	s and Related Areas: Require a grade of C or better	
Se	elect 0-6 credits	from the following:	0-6
	BME 408	Solid Mechanics of Biological Materials	
	BME 443	Biomedical Materials	
	BME 444	Surfaces and the Biological Response to Materials	
	BME 446	Polymers in Biomedical Engineering	
	CHE 320	Phase and Chemical Equilibria	
	CHE 430	Chemical Reaction Engineering	
	CHE 443	Introduction to Polymer Science	
	CHEM 410	Inorganic Chemistry	
	CHEM 480	Chemistry and Properties of Polymers	
	ESC 417	Electrical and Magnetic Properties	
	ESC 419	Electronic Properties and Applications of Materials	
	ESC 450	Synthesis and Processing of Electronic and Photonic Materials	
	ESC 475	Particulate Materials Processing	
	EE 340	Introduction to Nanoelectronics	
	EE 441	Semiconductor Integrated Circuit Technology	
	EE 442	Solid State Devices	
	EGEE 304	Heat and Mass Transfer	
	EGEE 420	Hydrogen and Fuel Cells	
	EGEE 441	Electrochemical Engineering Fundamentals	
	EGEE 442	Electrochemical Methods	
	EGEE 455	Materials for Energy Applications	
	EME 301	Thermodynamics in Energy and Mineral Engineering	
	EME 303	Fluid Mechanics in Energy and Mineral Engineering	
	EME 407	Electrochemical Energy Storage	
	IE 311	Principles of Solidification Processing	
	IE 312	Product Design and Manufacturing Processes	
	IE 428	Metal Casting	
	ME 403	Polymer Electrolyte Fuel Cell Engines	
	ME 404	Gas Turbines	
	PHYS 412	Solid State Physics I	

Additional 300- or 400-level courses within a science or engineering major and with a materials focus may be approved at the discretion of the Materials Science and Engineering department.

Academic Advising

The objectives of the university's academic advising program are to help advisees identify and achieve their academic goals, to promote their intellectual discovery, and to encourage students to take advantage of both in-and out-of class educational opportunities in order that they become self-directed learners and decision makers.

Both advisers and advisees share responsibility for making the advising relationship succeed. By encouraging their advisees to become engaged in their education, to meet their educational goals, and to develop the habit of learning, advisers assume a significant educational role. The advisee's unit of enrollment will provide each advisee with a primary academic adviser, the information needed to plan the chosen program of study, and referrals to other specialized resources.

READ SENATE POLICY 32-00: ADVISING POLICY (https://senate.psu.edu/ students/policies-and-rules-for-undergraduate-students/32-00-advisingpolicy/)

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Contact

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