

Why Consider a MATERIALS MINOR?

Materials matter! Advances in materials have driven the development of human civilization and are a key factor in most modern technological progress. Material properties, material processing issues, or material costs are the limiting factor in the design or performance of almost all systems around us— computers, aircraft, automobiles, transportation infrastructure, prosthetics and other biomedical devices, to name just a few. Engineers, scientists, and managers in all technological sectors often must make material selection decisions based on a variety of considerations, including properties, performance, environmental impact, and cost. Material failures or inappropriate material selection decisions are often a factor in tragic loss of human life or financial losses for corporations.

The cross-disciplinary nature of materials is clearly evident at WPI, where active materials research occurs in the departments of Mechanical Engineering, Chemical Engineering, Civil Engineering, Biomedical Engineering, Physics, Chemistry, Mathematical Sciences, and Electrical Engineering.

A Minor in Materials at WPI, feasible within a 15 unit program of study, will benefit students who wish to enhance their disciplinary major with an additional degree designation in the area of materials. Opportunities for "double counting" of courses are available for at least *six* different majors. Here are just a few examples of some reasons why particular majors might consider a Minor in Materials:

Biomedical engineering: Prosthetic devices, materials science of skin and bone

Chemistry and chemical engineering: Material synthesis and processing.

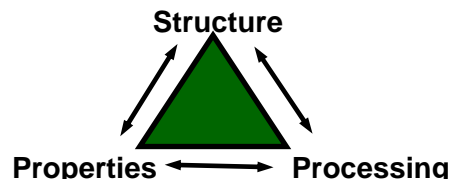
Civil engineering: Construction, infrastructure, and transportation materials

Electrical engineering: Solid state devices.

Mathematics: Modeling and computation of material structure, properties, and processes.

Mechanical engineering: Selection of materials for mechanical designs

Physics: Solid state devices. Learn more broadly about the properties and applications of materials.



Requirements for the Materials Minor

The minor requires the completion of 2 units of work as described below:

1. **1/3 unit: ES2001 Introduction to Material Science**
2. **1 1/3 units of electives**, selected from the following list of courses:

CE3026	Materials of Construction
CH3410	Principles of Inorganic Chemistry
CH2310	Organic Chemistry I
CH2320	Organic Chemistry II
CH2330	Organic Chemistry III
CH4330	Organic Synthesis
CM3601	Chemical Materials Engineering
ECE4904	Semiconductor Devices
ME2820	Materials Processing
ME4718	Advanced materials with Aerospace Applications
ME4810	Automotive Materials and Process Design
ME4813	Ceramics & Glasses for Engineering Applications
ME/BE4814	Biomaterials
ME4821	Plastics
ME4832	Corrosion and Corrosion Control
ME4840	Physical Metallurgy
ME4860	Food Engineering
ME4875/	Introduction to
MTE575	Nanomaterials & Nanotechnology
PH2510	Atomic Force Microscopy
PH3502	Solid State Physics

Students who are able to design their undergraduate program of study such that they have sufficient preparations may also use the following graduate courses toward

a materials Minor: all MTE graduate courses; CHE 508, Catalysis and Surface Science of materials; and CHE 510, Particulate Systems.

3. 1/3 unit: Capstone Experience

The capstone experience requirement for the Minor in Materials must be satisfied by an upper level course **or** IS/P activity that integrates and synthesizes material processing, structure, and property relationships as they affect performance.

- Courses that satisfy the capstone experience requirement currently include ME4810, ME4813, ME 4814 and ME4821. Other courses must be approved in advance by the Program Committee for the Minor in Materials.
- Students may satisfy the capstone experience requirement by completing a 1/3 unit IS/P that receives prior approval from the Program Committee for the Minor in Materials. The IS/P may, for example, take the form of a laboratory experience or may augment the MQP or IQP, considering in depth the materials issues associated with the project topic (see Note c). An IS/P related to the MQP must be distinct from the core 1 unit of the MQP and in most cases would be advised by a faculty member other than the MQP advisor.

Notes:

- In accordance with the Institute-wide policy on Minors, academic activities used in satisfying the regular degree requirements may be double-counted toward meeting all but one unit of the Minor requirements. (see page 12 of the Undergraduate Catalog.)
- An ECE major designing an integrated circuit for her MQP might conduct a separate analysis of the materials issues related to heat management in the device as the capstone experience for the Minor in Materials; a ME major specifying a gear in a design MQP might conduct a separate analysis of the material processing, structure, and property issues affecting fatigue life of the gear.
- In accordance with the Institute-wide policy on Minors, the Major Qualifying Project (MQP)

cannot be counted toward activity for a Minor. Therefore, a ME, CM, or any other major whose MQP is judged to be predominantly in the materials area by the Program Review Committee may not count an extra 1/3 unit augmentation of their MQP as their capstone experience in the Minor.

Permissible Major-Minor Combinations

The Materials Minor is available to students of all majors. Students can earn *either* a Materials Minor designation *or* a Materials Concentration, not both.

Minor Advisors

The following faculty serve as the Program Review Committee for the Minor in Materials and will serve as Minor Advisors:

Richard Sisson (ME): sisson@wpi.edu
Chrys Demetry (ME): cdemetry@wpi.edu
Tahar El-Korchi (CEE): tek@wpi.edu
Karen McNamara (CM): mcnamara@wpi.edu

CONCENTRATIONS IN MATERIALS

Concentrations in Materials are available for Mechanical Engineering and Chemical Engineering majors. Operationally, the Major Qualifying Project is the key factor distinguishing the Concentration from the Minor. A ME or CM major who completes his or her MQP on a materials topic along with the required two units of course work would earn a Materials Concentration. This total of at least three units of work in the Materials area would provide the maximum amount of focus available for these majors.

Requirements for the Materials Concentration in Mechanical Engineering

Select 6

ME2820 Materials Processing
ME4810 Automotive Materials and Process Design
ME4718 Advanced Materials with Aerospace Applications
ME4813 Ceramics and Glasses for Engineering
ME4814 Biomedical Materials

ME4821 Plastics
ME4832 Corrosion and Corrosion Control
ME4840 Physical Metallurgy
ME4860 Food Engineering
ME4875 Introduction to Nanomaterials and Nanotechnology
Any 500-level MTE Course
+ MQP in the area of Materials

Requirements for the Materials Concentration in Chemical Engineering

One unit:

CM3601 Chemical Materials Engineering
ES2001 Introduction to Materials Science
CM543 Molecular Sieves
CM508 Catalysis and Surface Science of Materials
ME2820 Materials Processing
ME3811 Microstructure Analysis and Control
ME4813 Ceramics
ME4814 Biomaterials
ME4821 Chemistry, Properties, and Processing of Plastics
ME4840 Physical Metallurgy
ME4850 Solid State Thermodynamics
CH4550 Polymer Chemistry

One unit:

Additional courses from the above list, or portions of IQP, Sufficiency, or SS courses that result in a coherent and focused program of study in materials.

+ MQP in the area of Materials

Minor in Materials And Concentrations In Materials Science and Engineering



Washburn Shops