

CornellEngineering

Department of Materials Science and Engineering

UNDERGRADUATE DEGREE PROGRAM

In every age, those who have dominated materials have also dominated technology. Indeed, the performance of the tiniest microcircuits, the most advanced aircraft, and even the bones in your body, is defined and limited by the material properties. The mastery of materials is more critical today than ever as new materials form the core of technological advances in energy, sustainability, electronics, nanotechnology, and biomaterials. Materials science and engineering (MSE) at Cornell prepares students to couple fundamental physics, chemistry, and biology with engineering to improve and invent novel materials that enable these advances.

**BREAK
THE RULES to
SEE THINGS
DIFFERENTLY**

MSE at Cornell is a broad, multidisciplinary field devoted to understanding and manipulating the mechanical, chemical, electrical, magnetic, optical, and biological properties of materials. The science side of MSE investigates the basic mechanisms that give materials their properties. The applications side explores ways to modify all types of materials, including metals, semiconductors, and plastics—and even ways to create new materials like nanoparticles—

for improving performance metrics, such as speed, strength, compactness, and biocompatibility in engineered products.

With materials required for virtually all engineered products, professionals with training in MSE are employed across all industrial sectors. They are working in every size company, from large corporations in aerospace, chemicals, medicine, and microelectronics to a multitude of tiny startups. Job responsibilities include materials selection and qualification, materials processing, failure analysis, research and design of new materials, and product development. Many MSE students continue for advanced degrees and work in national, industrial, and academic research labs developing the technologies of tomorrow, such as sunlight-harvesting nanopillars or porous scaffolds for tissue regeneration.

MSE also attracts students interested in business, law, and medicine, as it provides a strong technical background covering a broad sweep of both science and engineering.

Although the MSE program is broad and diverse, it has a clearly defined set of core (required) courses that develop a thorough understanding of basic materials principles. These courses cover, for example, the structure of materials, materials chemistry, thermodynamics and kinetics, mechanical and electronic properties, and concepts of materials design. To complement this core curriculum, you will choose (with your advisor) electives tailored to your career and/or academic interests. These electives explore the breadth of materials and their applications, ranging from biomineralization to processing of thin films for microelectronics. Electives, typically at the 5000 level, offer undergraduates and graduate students the opportunity to interact with faculty at the forefront of research.

MSE REQUIRED COURSES

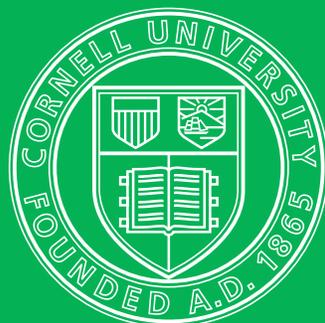
ENGRD 2610	Mechanical Properties of Materials: From Nanodevices to Superstructures
ENGRD 2620	Electronic Materials for the Information Age
MSE 2060	Atomic and Molecular Structure of Matter
MSE 3010	Materials Chemistry
MSE 3030	Thermodynamics of Condensed Systems
MSE 3040	Kinetics, Diffusion, and Phase Transformations
MSE 3050	Electronic, Magnetic, and Dielectric Properties of Materials
MSE 3070 & 4070	Materials Design Concepts I & II
MSE 3110 & 3120	Junior Laboratory I & II
MSE 3111	Technical & Professional Skills
MSE 4020	Mechanical Properties of Materials, Processing, and Design
MSE 4030 or MSE 4050–4060	Senior Materials Laboratory Senior Thesis I & II

MATERIALS SCIENCE AND
ENGINEERING



SOME AREAS OF FACULTY RESEARCH

batteries
biofouling
biomineralization
block copolymers
bone mechanics
carbon sequestration
colloidal particles
computational materials
core-shell nanoparticles
electronics/photonics
fuel cells
laser processing
layered materials
materials genomics
metal & oxide thin films
multiferroic oxides
nitride semiconductors
nanoscale dynamics
photocatalysis
photolithography
supercapacitors
thermoelectric materials
thin film transistors
x-ray science
water purification



Cornell University is an equal-opportunity affirmative-action educator and employer. Produced by the Office of Engineering Admissions.

Students are encouraged to take courses outside MSE, both to broaden their general engineering experience and to understand how materials impact specific applications. The major meshes well with courses in many areas, particularly electrical and computer engineering, mechanical and aerospace engineering, and chemical and biomolecular engineering. Courses in these majors often count as electives within the MSE curriculum, or may be taken to satisfy a formal minor or even a double major. Common minors for MSE students include biomedical engineering, mechanical engineering, electrical and computer engineering, and business for engineering students.

UNDERGRADUATE RESEARCH

Cornell is a leader in materials research and hosts several premier research centers. Many of our students choose to become directly involved in research at some point either as a volunteer, for pay, or for academic credit. Working alongside faculty and graduate students, they contribute extensively to the research program and often author scientific publications based on their work.

MASTER OF ENGINEERING DEGREE PROGRAM

The Master of Engineering (M.Eng.) in MSE is a one-year, professionally-oriented program designed to prepare students for engineering or engineering management careers in business, government, and industry, or for entrepreneurial pursuits.

The MSE M.Eng. curriculum is flexible and interdisciplinary, allowing students to tailor coursework to their personal interests and backgrounds. An option for Cornell undergraduates is the early admission to M.Eng.; this enables students to complete both the B.S. and the M.Eng. degrees in nine semesters.

Our M.Eng. graduates typically join the professional ranks with higher starting salaries and advanced levels of responsibility, compared to those with bachelor's degrees. Some M.Eng. students alternatively use this program to strengthen their research background before applying to Ph.D. programs.

MSE By the Numbers

MSE undergraduate students	68
MSE graduate students	130

Starting salaries of B.S. Materials Science and Engineering graduates (for 2018)

Low	\$64,000
Median	\$69,750
High	\$105,000

MSE SAMPLE ELECTIVE COURSES

ENGR1 1110	Nanotechnology
ENGR1 1140	Materials: The Future of Energy
ENGR1 1190	Biomaterials for the Skeletal System
MSE 4100	Physical Metallurgy & Applications
MSE 4330/ 5330	Materials for Energy Production, Storage & Conversion
MSE 4610	Biomedical Materials & Their Applications
MSE 4890/ 5890	Colloids and Colloid Assemblies
MSE 5120	Mechanical Properties of Thin Films
MSE 5210	Properties of Solid Polymers
MSE 5230	Physics of Soft Matter
MSE 5310	Introduction to Ceramics
MSE 5420	Flexible Electronics
MSE 5430	Thin-Film Materials Science
MSE 5450	Magnetic & Ferroelectric Materials
MSE 5620	Biomineralization: Formation & Properties
MSE 5630	Nanobiotechnology
MSE 5710	Analytical Techniques for Material Science
MSE 5720	Computational Materials Science
MSE 5740	Electrochemistry in Materials Science
MSE 5880	Nanoparticles: Synthesis, Characterization, & Applications

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