The Master of Science Program in Materials Science and Engineering

Introduction
Over the last 100 years, materials scientists have developed revolutionary materials that now shape everyday life. Electronics, plastics, optical fibers, and biomedical implants are only a few examples of technologies that have depended critically on materials science. Building on a rich history of discovery and ingenuity, materials scientists at Cornell are pursuing a new paradigm that will take our discipline in exciting new directions. This paradigm no longer focuses on a particular class of material, but rather on complex systems that are inherently interdisciplinary: energy and environmental technology, biotechnology and life sciences, nanotechnology, and information and telecommunications technology. Developing interdisciplinary skills is a central goal of the MSE Master’s program, which has been developed to serve two main constituencies: (1) Students who have received an undergraduate degree in a related discipline (e.g., Chemistry, Physics, Electrical Engineering) and wish to develop the skills needed for success in research in materials science or materials engineering, and (2) Students who are interested in pursuing a doctoral degree in materials science and engineering, and wish to acquire a prestigious credential that confirms their ability to perform research at a world-class level.

The Master of Science Program in Materials Science and Engineering

The Master of Science (M. S.) in Materials Science and Engineering (MS&E) is a two-year program that combines academic rigor with a strong research component. Students are expected to develop proficiency in the core topics of materials science (materials chemistry, thermodynamics/statistical mechanics, kinetics, electronic properties, mechanical properties, and structure) through coursework, and will choose specialized courses as well. The M. S. degree is centered on a developing substantive corpus of research conducted as a member of a Faculty Research Group. This research will be documented in a Master’s Thesis that will be defended in a formal examination by the Faculty. Research projects are chosen in consultation with the supervising faculty member and take advantage of the superb infrastructure at Cornell.

The M.S. program represents an opportunity to learn research methodology at one of the premier research universities in the world, earning a highly-regarded credential: a Cornell Master of Science in Materials Science and Engineering.

The M.S. program results in a “terminal” Master’s Degree. That is, it does not directly lead to entry in the Materials Science and Engineering Ph.D. program at Cornell. M.S. students may apply for admission into the Ph.D. program during the regular admissions cycle in their second year, or after completing the M.S. program.
Program Requirements

Special Committee:
The central relationship in the MS&E Master of Science program is the one between student and research advisor. Typically, the research advisor serves as Chair of the student’s Special Committee. The other members of the Special Committee are selected by the student and the committee chair, and typically represent interests and topics that parallel the student’s M.S. research and two minor specializations. The committee chair must be a member of the Graduate Field of Materials Science and Engineering. Together, the student and the committee constitute an independent working unit. Members of the committee guide and supervise the student’s research program. It is the Special Committee – not the Department of Materials Science and Engineering, nor the Graduate Field of Materials Science and Engineering, nor the Cornell Graduate School – that sets specific degree requirements, conducts and reports on oral examinations, and approves the M.S. Thesis.

Course requirements:
The Master of Science Program in Materials Science and Engineering is research based rather than coursework based. Course requirements are determined by the student’s Special Committee, but in a typical semester the program comprises two graduate-level courses (3 credits each), along with MSE8000 “Research in Materials Science” (12 credits) and MSE8010 “Materials Science Colloquium” (1 credit).

Typical Academic Timeline for Materials Science and Engineering, M.S. Students:

Upon arrival on campus:
* Choose research advisor
* Choose minor member of special committee
* Select courses for first semester

First semester:
* Coursework: one core graduate course in MS&E; one specialty graduate course related to a specific research topic
* Begin research—develop laboratory skills

Second semester:
* Coursework: one core graduate course in MS&E; one specialty graduate course related to specific research topic
* Develop detailed outline of research for Master’s Thesis

First Summer:
* Intensive research

Third semester:
* Coursework: one or two specialty graduate courses related to specific research topic

Fourth semester:
* If continuing for second summer; focus on research
* Else; Write thesis; Defend Thesis in B exam; submit M.S. Thesis to Cornell Graduate School

Second summer (if applicable):
* Write thesis; Defend thesis in B Exam; Submit M.S. dissertation to Cornell Graduate School
Teaching:
M.S. students typically do not serve as Teaching Assistants, though they may do so if positions are available.

Foreign Language Requirement:
The Field of Materials Science and Engineering does not require training in a foreign language for the M.S. degree. Applicants whose native language is not English, however, must submit scores from the Test of English as a Foreign Language (TOEFL) unless they have studied for two or more years in a country where English is the native language and the language of instruction.

The Context
The field of Materials Science & Engineering is evolving dramatically as we enter the 21st Century. What began as the study of metals and ceramics in the 1960s has broadened in recent years to include semiconductors and soft materials. With this evolution and broadening of the discipline, current research projects span multiple materials classes and build on expertise in many different fields. As a result, current research in Materials Science and Engineering is increasingly defined by materials systems rather than materials classes. At Cornell, the Department of Materials Science & Engineering (MS&E) has adopted this new systems-based vision of the field by defining four strategic areas which are considered to be critical for today’s emerging research. The four strategic research areas are Energy & Environmental Technology, Biotechnology & Life Sciences, Nanotechnology, and Information & Telecommunications Technology.

Materials Science & Engineering is an exciting and vibrant interdisciplinary research field. Cornell MS&E draws upon its world-class faculty, innovative researchers, state-of-the-art facilities and highly collaborative research environment to respond to challenging technological and societal demands both in the present and the future. A unique feature of the Cornell Graduate Field of Materials Science & Engineering is the extent to which member of other departments are represented: there are currently 15 members of the Department of MS&E in the Field, and over 25 members of other Departments (Applied and Engineering Physics, Biology and Environmental Engineering, Chemical and Biological Engineering, Chemistry and Chemical Biology, Electrical and Computer Engineering, Food Science, and Mechanical & Aerospace Engineering).

Admission Requirements
The MS&E Master of Science program enrolls students with a strong background in science. Obtaining a B.S. in MS&E is not a requirement, but to take full advantage of the program, incoming students should have an undergraduate degree in a discipline such as Chemistry, Physics, Chemical Engineering, Electrical Engineering, Biology, etc. It is expected that students who do not have a comprehensive background in Materials Science and Engineering will take advantage of the opportunity to assimilate the core concepts and language of the field by enrolling in appropriate advanced undergraduate courses.