

Materials Science and Engineering, B.S.

Program Educational Objectives

Graduates with a B.S. degree from the Materials Science and Engineering program will, within a few years after graduation

1. attain success in a professional position and/or a top graduate school that builds upon their MSE background
2. exhibit professionalism and leadership in contemporary, interdisciplinary engineering practice based on materials, while accounting for the impact of their profession on an evolving, global society
3. contribute to innovative designs of technological systems using principles of materials science and engineering
4. make effective contributions as an individual, team member, and/or a leader to effect global, economic, environmental, and/or societal impact

Student Outcomes

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3. an ability to communicate effectively with a range of audiences
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

Curriculum

Minimum units required for B.S. in Materials Science & Engineering
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Standard Program

First Year

Fall		Units
21-120	Differential and Integral Calculus	10
27-100	Engineering the Materials of the Future *	12
99-101	Core@CMU	3
xx-xxx	General Education Course	9
33-141	Physics I for Engineering Students	12
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Spring		Units
21-122	Integration and Approximation	10
xx-xxx	Second Introductory Engineering Course	12
33-142	Physics II for Engineering and Physics Students	12
76-101	Interpretation and Argument	9
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Sophomore Year

Fall		Units
27-201	Structure of Materials	9
27-210	Materials Engineering Essentials	6
27-215	Thermodynamics of Materials	12
09-105	Introduction to Modern Chemistry I **	10

21-254	Linear Algebra and Vector Calculus for Engineers	11
15-110	Principles of Computing	10
or 15-112	Fundamentals of Programming and Computer Science	
39-210	Experiential Learning I	0

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Spring		Units
27-202	Defects in Materials	9
27-216	Transport in Materials	9
27-217	Phase Relations and Diagrams	12
21-260	Differential Equations	9
39-220	Experiential Learning II	0
xx-xxx	General Education Course	9

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Junior Year

Fall		Units
27-301	Microstructure and Properties	9
27-xxx	MSE Restricted Elective [1]	9
xx-xxx	Free Elective [1]	9
33-225	Quantum Physics and Structure of Matter or	9
or 09-217	Organic Chemistry I	
or 03-121	Modern Biology	
xx-xxx	General Education Course	9
39-310	Experiential Learning III	0

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Spring		Units
27-367	Selection and Performance of Materials	6
27-305	Introduction to Materials Characterization	6
xx-xxx	General Education Course	9
27-xxx	MSE Restricted Elective [2]	9
27-xxx	MSE Restricted Elective [3]	9
xx-xxx	Free Elective [2]	9
36-220	Engineering Statistics and Quality Control	9

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Senior Year

Fall		Units
27-401	MSE Capstone Course I	6
27-xxx	MSE Restricted Elective [4]	9
xx-xxx	Free Elective [3]	9
xx-xxx	General Education Course	9
xx-xxx	General Education Course	9

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Spring		Units
27-402	MSE Capstone Course II	6
27-xxx	MSE Approved Technical Elective	9
xx-xxx	Free Elective [4]	9
xx-xxx	Free Elective [5]	9
xx-xxx	General Education Course	9

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* The Materials in Engineering course 27-100 may also be taken in the spring semester, and must be taken before the end of the sophomore year (the H&SS Elective in the Sophomore Spring may be moved to later in the program to accommodate the 27-100 course).

** These courses must be taken before the end of the sophomore year, but need not be taken in the same order or semester as listed above.

All mathematics (21-xxx) courses required for the engineering degree taken at Carnegie Mellon must have a minimum grade of C in order to be counted toward the graduation requirement for the BS engineering degree.

Notes on the Curriculum

Academic Advising

Paige Houser is the academic advisor for all MSE students.

Quality Point Average

In addition to the College requirement of a minimum cumulative quality point average of 2.00 for all courses taken beyond the freshman year, the Department requires a quality point average of 2.00 or higher in courses taken in the MSE department. Students may repeat a course to achieve the QPA requirement.

MSE Approved Technical Elective

Students are required to take at least 9 units of approved technical electives. Students may take a course from another CIT department to fulfill this requirement or choose an additional 9 units of MSE Restricted Electives. Courses on the exclusion list **cannot** be counted as a technical elective. Students who are pursuing an additional major or minor within CIT should check with their academic advisor regarding double counting of this course.

Courses on this list cannot be counted as a technical elective		Units
06-426	Experimental Colloid Surface Science	9
06-466	Experimental Polymer Science	9
12-201	Geology	9
18-202	Mathematical Foundations of Electrical Engineering	12
18-300	Fundamentals of Electromagnetics	12
24-311	Numerical Methods	10
42-202	Physiology	9
42-610	Introduction to Biomaterials	9

MSE Restricted Electives

Each student in the program must take at least 36 units of MSE restricted electives. Up to 18 units of MSE research can count toward the restricted electives.

All 27-3xx, 27-4xx, 27-5xx, 27-6xx (with the exception of 27-672) and 27-7xx level and cross listed courses will fulfill the MSE Restricted Elective Requirement along with the following non-MSE courses:

Non-MSE courses that count as restricted electives		Units
06-609	Physical Chemistry of Macromolecules	9
09-509	Physical Chemistry of Macromolecules	9
12-411	Project Management for Engineering and Construction	9
12-631	Structural Design	12
18-310	Fundamentals of Semiconductor Devices	12
24-262	Mechanics II: 3D Design	10
24-341	Manufacturing Sciences	9
42-667	Biofabrication and Bioprinting	12