MATERIALS SCIENCE AND ENGINEERING - BS

This program builds a foundation in materials science, merging chemistry, physics and math to develop and engineer materials for diverse applications, from batteries to semiconductors.

Materials Science and Engineering is an interdisciplinary field centered on understanding the physical and chemical properties of matter and designing materials to serve a specific function (a battery cathode that can store more charge, a lightweight but strong alloy to improve the efficiency in cars, smaller faster semiconductors to make our electronics smarter and more efficient, as a few examples). Materials scientists study the connections between how we make and manufacture a material and how it affects its structure and resulting properties. Materials engineers develop materials and manufacturing techniques and integrate these materials into commercial products.

The Bachelor of Science (BS) curriculum builds on a strong foundation in chemistry, physics and mathematics to explore the fundamental concepts and techniques critical to the field of materials science and engineering. Students have the flexibility to explore interdisciplinary studies or to focus in greater depth on one or more areas of concentration in the allotted technical electives and specialty electives.

This department also offers additional studies in the following Academic Areas of Interest:

- Corrosion Science and Engineering
- Electronic Materials
- Materials Characterization and Failure Analysis
- Soft Materials
- Structural Materials

For your success, our program offers:

- Hands-on lab series starting in sophomore year, culminating in a capstone design course
- Flexibility to choose three specialty electives outside of the major to complement your BS curriculum
- Industry-relevant capstone projects
- Faculty mentoring program starting sophomore year

Program Requirements

The freshman year is identical for degrees in aerospace engineering, architectural engineering, biological and agricultural engineering, civil engineering, computer engineering, computer science, data engineering, electrical engineering, electronic systems engineering technology, environmental engineering, industrial distribution, industrial engineering, interdisciplinary engineering, manufacturing and mechanical engineering technology, mechanical engineering, multidisciplinary engineering technology, nuclear engineering, ocean engineering and petroleum engineering. The freshman year is slightly different for chemical engineering, biomedical engineering and materials science and engineering degrees in that students take CHEM 119 or CHEM 107/CHEM 117 and CHEM 120. It is recognized that many students will change the sequence and number of courses taken in any semester. Deviations from the prescribed course sequence, however, should be made with care to ensure that prerequisites for all courses are met.

First Year		
Fall		**Semester Credit Hours**
CHEM 107	General Chemistry for Engineering Students [1,4]	3
CHEM 117	General Chemistry for Engineering Students Laboratory [1,4]	1
ENGL 103 or ENGL 104	Introduction to Rhetoric and Composition [1] or Composition and Rhetoric	3
ENGR 102	Engineering Lab I - Computation [1]	2
MATH 151	Engineering Mathematics I [1,2]	4
University Core Curriculum (https://catalog.tamu.edu/undergraduate/general-information/university-core-curriculum/) [3]		3
	Semester Credit Hours	**16**
Spring		
ENGR 216/ PHYS 216	Experimental Physics and Engineering Lab II - Mechanics [1]	2
MATH 152	Engineering Mathematics II [1]	4
PHYS 206	Newtonian Mechanics for Engineering and Science [1]	3
University Core Curriculum (https://catalog.tamu.edu/undergraduate/general-information/university-core-curriculum/) [3]		3
Select one of the following:		3-4
CHEM 120	Fundamentals of Chemistry II [1,4]	
University Core Curriculum (https://catalog.tamu.edu/undergraduate/general-information/university-core-curriculum/) [3,5]		
	Semester Credit Hours	**15-16**
	Total Semester Credit Hours	**31-32**

1. A grade of C or better is required.
2. Entering students will be given a math placement exam. Test results will be used in selecting the appropriate starting course which may be at a higher or lower level.
3. Of the 21 hours shown as University Core Curriculum electives, 3 must be from creative arts (BS-AREN curriculum take ARCH 249, ARCH 250, or ARCH 350), 3 from social and behavioral sciences (BS-DAEN curriculum take ECON 202 or ECON 203; BS-IDIS curriculum take ECON 202), 3 from language, philosophy and culture (BS-AREN, BS-CVEN, BS-EVEN and BS-PETE curriculum take PHIL 482). In addition, 6 hours are required from American history and 6 hours from government/political science. The required 3 hours of international and cultural diversity and 3 hours of cultural discourse may be satisfied by courses that also meet the creative arts, social and behavioral sciences, language, philosophy and culture or American history requirements if those courses are on the approved list of international and cultural diversity (https://catalog.tamu.edu/undergraduate/general-information/degree-information/international-cultural-diversity-requirements/) courses and cultural discourse (https://catalog.tamu.edu/undergraduate/general-information/degree-information/cultural-discourse-requirements/) courses.

[4] BS-BMEN, BS-CHEN and BS-MSEN require 8 hours of fundamentals of chemistry which are satisfied with CHEM 119 or CHEM 107/CHEM 117 and CHEM 120; Students with an interest in BS-BMEN, BS-CHEN and BS-MSEN can take CHEM 120 second semester freshman year. Students who take CHEM 119 and CHEM 120 can substitute CHEM 120 for CHEM 107/CHEM 117.

[5] For BS-PETE, allocate 3 hours to core communications course (ENGL 210, COMM 203, COMM 205, or COMM 243) and/or 3 hours to University Core Curriculum elective. For BS-MEEN, allocate 3 hours to core communications course (ENGL 203, ENGL 210, COMM 203 or COMM 205) and/or 3 hours to University Core Curriculum elective. For BS-BAEN, allocate 3 hours to core communications course (ENGL 210)

Second Year

Fall		**Semester Credit Hours**
ENGR 217/ PHYS 217	Experimental Physics and Engineering Lab III - Electricity and Magnetism [1]	2
MATH 251	Engineering Mathematics III [1]	3
MSEN 201	Fundamentals of Materials Science and Engineering [1]	3
MSEN 205	Materials in Society [1]	2
PHYS 207	Electricity and Magnetism for Engineering and Science [1]	3
University Core Curriculum (https://catalog.tamu.edu/undergraduate/general-information/university-core-curriculum/) [3]		3
	Semester Credit Hours	**16**
Spring		
COMM 205 or ENGL 210	Communication for Technical Professions [1] or Technical and Professional Writing	3
MSEN 210	Thermodynamics of Materials [1]	3
MSEN 250	Soft Matter [1]	3
MSEN 260	Structure of Materials [1]	3
MSEN 281	Materials Science and Engineering Seminar [1]	1
MSEN 301	Unified Materials Lab I [1]	3
MSEN 380	Communicating Materials Science and Engineering [1,6]	1
	Semester Credit Hours	**17**

Third Year

Fall		
MATH 307	Mathematical Methods for Material Scientists and Engineers [1]	3
MSEN 302	Unified Materials Lab II [1,6]	3
MSEN 305	Kinetics of Materials [1]	3
MSEN 320	Deformation and Failure Mechanisms in Engineering Materials [1]	3
University Core Curriculum (https://catalog.tamu.edu/undergraduate/general-information/university-core-curriculum/) [3]		3
High Impact Experience [7]		0
MSEN 399	High Impact Professional Development	
	Semester Credit Hours	**15**
Spring		
MSEN 325	Properties of Functional Materials [1]	3
MSEN 330	Numerical Methods for Materials Scientists and Engineers [1]	3
MSEN 360	Materials Characterization [1]	3
MSEN 400	Design and Analysis of Materials Experiments [1]	3
University Core Curriculum (https://catalog.tamu.edu/undergraduate/general-information/university-core-curriculum/) [3]		3
Technical elective [1,8,9]		3
	Semester Credit Hours	**18**

Fourth Year

Fall		
MSEN 401	Materials Design I [1]	3
MSEN 410	Materials Processing [1]	3
University Core Curriculum (https://catalog.tamu.edu/undergraduate/general-information/university-core-curriculum/) [3]		3
Specialty elective [1,8,10]		3
Technical elective [1,8,9]		3
	Semester Credit Hours	**15**
Spring		
MSEN 402	Materials Design II [1]	3
University Core Curriculum (https://catalog.tamu.edu/undergraduate/general-information/university-core-curriculum/) [3]		3
Specialty elective [1,8,10]		6
Technical elective [1,8,9]		3
	Semester Credit Hours	**15**
	Total Semester Credit Hours	**96**

[6] This is a writing intensive course.

[7] All students are required to complete a high-impact experience in order to graduate. A list of possible high-impact experiences is available in the MSEN advising office.

[8] With MSEN department approval, students may use up to a combined total of 6 hours of 484, 485, 491, and ENGR 385 courses to meet Specialty and Technical Elective requirements on their degree plan.

[9] Select from any MSEN 300-499 (https://catalog.tamu.edu/undergraduate/course-descriptions/msen/) course not used elsewhere.

[10] Select in consultation with advisor from MSEN 300-499 (https://catalog.tamu.edu/undergraduate/course-descriptions/msen/); AERO 300-499 (https://catalog.tamu.edu/undergraduate/course-descriptions/aero/); BAEN 300-499 (https://catalog.tamu.edu/undergraduate/course-descriptions/baen/); BMEN 300-499 (https://catalog.tamu.edu/undergraduate/course-descriptions/bmen/); CHEN 300-499 (https://catalog.tamu.edu/undergraduate/course-descriptions/chen/); CVEN 300-499 (https://catalog.tamu.edu/undergraduate/course-descriptions/cven/); CSCE 110, CSCE 300-499 (https://catalog.tamu.edu/undergraduate/course-descriptions/csce/); ECEN 300-499 (https://catalog.tamu.edu/undergraduate/course-descriptions/ecen/); ENGR 300-499 (https://catalog.tamu.edu/undergraduate/course-descriptions/engr/); ISEN 300-499 (https://catalog.tamu.edu/undergraduate/course-descriptions/isen/); MEEN 221, MEEN 300-499 (https://catalog.tamu.edu/undergraduate/

course-descriptions/meen/); NUEN 300-499 (https://catalog.tamu.edu/undergraduate/course-descriptions/nuen/); BIOL 300-499 (https://catalog.tamu.edu/undergraduate/course-descriptions/biol/); CHEM 220, CHEM 227, CHEM 228, CHEM 300-499 (https://catalog.tamu.edu/undergraduate/course-descriptions/chem/); MATH 300-499 (https://catalog.tamu.edu/undergraduate/course-descriptions/math/); PHYS 222, PHYS 300-499 (https://catalog.tamu.edu/undergraduate/course-descriptions/phys/); STAT 211, STAT 212, STAT 300-499 (https://catalog.tamu.edu/undergraduate/course-descriptions/stat/); MGMT 309; MKTG 409; FINC 409. All non-MSEN specialty electives must be approved by the Undergraduate Advising Office, on the basis of satisfying one or more of the MSEN BSE program outcomes (e.g., integrating scientific and engineering principles across disciplines).