

# MATERIALS SCIENCE AND ENGINEERING

The master's degree in materials science and engineering is a 30-credit-hour program designed to prepare students in an area of rapid growth and profound impact on society. The curriculum consists of courses designed to provide a comprehensive background in fundamentals of materials science and advanced engineering applications, including applications to automotive technology. The courses are 3 credit hours and most are offered in the evening from 6:00 to 8:45 p.m. and available in the remote-access mode. A thesis option is available.

The program can be completed entirely on campus, entirely online, or as a combination of on-campus, online and hybrid courses.

## Accelerated Master's Options for Undergraduate Students

The accelerated master's (4+1) option allows the most qualified UM-Dearborn undergraduate students to complete both a bachelor and a master's degree in a 5-year accelerated format. This is accomplished by combining portions of undergraduate and graduate coursework. Students enrolled in this option can take eligible 500-level courses during their junior and senior years, with up to 9 credit hours of such coursework being double-counted toward both degrees. Additionally, another 6 credit hours earned but not applied to the bachelor degree can later be counted toward the master's degree. Depending on the number of graduate courses taken while working toward the bachelor program, students will need to complete 15-21 credit hours to finish the master's program after earning their undergraduate degree.

The following undergraduate programs are approved for the MSE-Materials Science and Engineering 4+1 program:

- BSE in Bioengineering
- BSE in Mechanical Engineering

Please see the Mechanical Engineering 4+1 Option webpage for more information.

## Requirements

To maintain satisfactory academic standing, students must earn a C or better in every graduate course to be credited toward the degree requirements. In addition, students must maintain a cumulative GPA of 3.0 or higher.

Code	Title	Credit Hours
<b>Required Core Course:</b>		
ME 518	Advanced Engineering Analysis	3
<b>Material Science and Engineering Elective Courses:</b>		
Select 21-24 credits from the following:		
AENG 581	Materials Sel in Auto Design	3
AENG 584	Lightweight Automotive Alloys	3
AENG 650	Analysis and Design for Vehicle Crashworthiness	3
BENG 521	Biomatsls and Biochem Interface	3
BENG 560	Nanobiosystems Engineering	3
BENG 575	Regenerative Engineering <sup>1</sup>	3

ECE 502	Electromag Theory & Simul	3
ECE 539	Production of Elec Prods	3
IMSE 504	Metal Forming Processes	3
ME 523	Sustainability Science and Engineering	3
ME 555	Computational Uncertainty Quantification for Engineering Applications <sup>1</sup>	3
ME 5561	Vehicle Structure Design with CAE <sup>1</sup>	3
ME 558	Fracture and Fatigue Considerations in Design	3
ME 559	Battery Materials, Manufacturing and Recycling	3
ME 568	Computational Materials Design	3
ME 580	Advanced Engineering Materials	3
ME 582	Injection Molding <sup>1</sup>	3
ME 583	Mechanical Behavior of Materials	3
ME 585	Cast Metals in Engineering Design	3
ME 586	Materials Consideration in Manufacturing	3
ME 589	Composite Materials	3
ME 591	Degradation of Materials <sup>1</sup>	3
ME 593	Powder Materials & Processing	3
ME 595	Digital Manufacturing <sup>1</sup>	3
ME 611	Modeling of Engineering Materials	3
MTSE 501	Materials Thermodynamics and Kinetics	3
or ME 566	Materials Thermodynamics and Kinetics	
MTSE 502	Introduction to Materials Characterization	3
or ME 569	Introduction to Materials Characterization	
MTSE 600	Study or Research in Selected Materials Engineering Topics	1-3
MTSE 699	Master's Thesis	1-6

<sup>1</sup> Simultaneous credit toward eligible undergraduate majors and MSE Materials Science and Engineering for students admitted to the 4+1 option. Please see the College's website for admission requirements and program details.

## Cognate Elective Courses (3 to 6 credit hours):

- **Required:** One graduate level course from CECS (excluding ME 518, MTSE elective courses, ENGR 500, and ENGR 501), CASL, CEHHS, or COB
- **Optional:** One graduate-level course from CECS (excluding ME 518, MTSE elective courses, ENGR 500, and ENGR 501) or natural sciences (BIOL, CHEM, ESCI, ENST, MICR, PHYS)

The thesis option may be elected with the approval of the Materials Science and Engineering graduate program committee. It will count for six (6) credit hours of coursework, replacing two courses in the Materials Science and Engineering electives area.

Students must earn a C or better in every graduate course to be credited toward the degree requirements. In addition, students must maintain a cumulative GPA of 3.0 or higher.

## Learning Goals

1. A strong background in fundamentals of engineering and materials science, and a comprehensive knowledge of the latest technologies in the Materials Science and Engineering field, which extends beyond the undergraduate experience.

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2. The ability to formulate, analyze and solve advanced multidisciplinary MaterialsScience and Engineering problems.
3. The ability to apply the latest scientific and technological advancements, advanced techniques, and modern engineering tools in their professional endeavors.