

Materials Science and Engineering

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1. University Requirements: (23-24)

Writing, Rhetoric and American Cultures (WRA)	4
Integrative Studies in Humanities IAH 201-210 & IAH 211 or >	8
Integrative Studies in Social Sciences ISS 2XX & 3XX	8
Bioscience (one of the following):	
BS 161, ENT 205, IBIO 150, MMG 141,	
MMG 201, PLB 105, PSL 250	3-4

2. College Requirements: (30)

*CEM 151	General and Descriptive Chemistry	4
*EGR 100	Introduction to Engineering Design	2
*EGR 102	Introduction to Engineering Modeling	2
*MTH 132	Calculus I	3
*MTH 133	Calculus II	4
MTH 234	Multivariable Calculus	4
MTH 235	Differential Equations	3
*PHY 183	Physics for Scientists & Engineers I	4
PHY 184	Physics for Scientists & Engineers II	4

3. Major Requirements: (62)

a. Complete all of the following: (41)

CE 221	Statics	3
CEM 152	Principles of Chemistry	3
CEM 161	Chemistry Laboratory I	1
**ECE 345	Electronic Instrumentation & Systems	3
ME 222	Mechanics of Deformable Solids	3
MSE 250	Materials Science and Engineering	3
MSE 260	Electronic, Magnetic, Thermal & Optical Properties of Materials	3
MSE 310	Phase Equilibria in Materials	3
MSE 320	Mechanical Properties of Materials	3
MSE 331	Materials Characterization Methods I	2
MSE 360	Fundamentals of Microstructural Dsgn	3
MSE 370	Synthesis & Processing of Materials	3
MSE 381	Materials Characterization Methods II	2
MSE 466	Design and Failure Analysis (W)	3
STT 351	Probability & Statistics for Engineering	3

b. Select four of the following courses: (12)

MSE 425	Biomaterials & Biocompatibility	3
MSE 460	Electronic Struct, Bonding in Materials & Devices	3
MSE 465	Design & Application of Engr Materials	3
MSE 474	Ceramic and Refractory Materials	3
MSE 476	Phys Mtlurgy of Ferrous & Alum Alloys	3
MSE 477	Manufacturing Processes	3

c. Complete at least 6 credits from 400-level courses within the College of Engineering: (6)

d. Technical Electives: (3)

Complete at least 3 credits in courses selected from a list of approved technical electives available from the Department of Chemical Engineering and Materials Science.

Concentrations

Students may elect to complete a more focused set of courses to enhance their ability to function at the interface with another scientific, engineering, or business discipline. Concentrations are available to, but not required of, any student enrolled in the Bachelor of Science degree in Materials Science and Engineering. Completing the Bachelor of Science degree in Materials Science and Engineering with a concentration may require more than 128 credits. The concentration will be noted on the student's transcript.

Biomedical Materials Engineering Concentration: (25)

To gain interdisciplinary skills in human biology and earn a Bachelor of Science degree in Materials Science and Engineering with a biomedical materials engineering concentration, students must complete requirement 3.a. above and the following:

1. Complete all of the following: (12)

ANTR 350	Human Gross Anatomy for Pre Health Prof	3
CEM 251	Organic Chemistry I	3
ME 495	Tissue Mechanics	3
MSE 425	Biomaterials and Biocompatibility	3

2. Complete one of the following courses: (4)

PSL 250	Introduction to Physiology	4
PSL 310	Physiology for Pre-Health Professionals	4

3. Complete two of the following courses: (6)

MSE 460	Electronic Struct, Bonding in Materials & Devices	3
MSE 465	Design and Application of Egr. Materials	3
MSE 474	Ceramics and Refractory Materials	3
MSE 476	Phys Metallurgy of Ferrous & Alum Alloys	3
MSE 477	Manufacturing Processes	3

4. Technical Electives: (3)

At least 3 credits from a list of approved technical electives.

Manufacturing Engineering Concentration: (21)

To gain interdisciplinary skills with business and design engineers for manufacturing projects and earn a Bachelor of Science degree in Materials Science and Engineering with a manufacturing engineering concentration, students must complete requirement 3.a. above and the following:

1. Complete all of the following: (12)

ECE 415	Computer Aided Manufacturing	3
MSE 477	Manufacturing Processes	3
ME 478	Product Development	3
MSE 465	Design and Application of Egr. Materials	3

2. Complete three of the following courses: (9)

GBL 323	Introduction to Business Law	3
MSE 426	Introduction to Composite Materials	3
MSE 474	Ceramic and Refractory Materials	3
MSE 476	Phys Metallurgy of Ferrous and Alum Alloys	3

Metallurgical Engineering Concentration: (21)

To enhance the student's ability to characterize, process, and design with metals in association with mechanical engineers and earn a Bachelor of Science degree in Materials Science and Engineering with a metallurgical engineering concentration, students must complete requirement 3.a. above and the following:

1. Complete all of the following: (18)

ME 423	Intermediate Mechanics of Deformable Solids	3
ME 475	Computer Aided Design of Structures	3
MSE 477	Manufacturing Processes	3
MSE 465	Design and Application of Egr. Materials	3
MSE 476	Phys Metallurgy of Ferrous & Alum Alloys	3
MSE 481	Spectroscopic & Diffraction Analysis of Materials	3

2. Complete one of the following courses: (3)

ME 425	Experimental Mechanics	3
MSE 426	Introduction to Composite Materials	3

Polymeric Engineering Concentration: (21)

To gain interdisciplinary skills to facilitate interactions with chemical engineers and earn a Bachelor of Science degree in Materials Science and Engineering with a polymeric engineering concentration, students must complete requirement 3.a. above and the following:

1. Complete all of the following: (18)

CEM 251	Organic Chemistry I	3
CEM 252	Organic Chemistry II	3
CE 321	Introduction to Fluid Mechanics	3
CHE 472	Composite Materials Processing	3
CHE 473	Chem Engr Prncpls in Polymrs & Matls Sys	3
MSE 426	Introduction to Composite Materials	3

2. Complete the following: (3)

Complete at least 3 credits in courses selected from a list of approved technical electives available from the Department of Chemical Engineering and Materials Science.

The requirements listed apply to students admitted to the major of Materials Science and Engineering in the Department of Chemical Engineering and Materials Science (CHEMS) beginning Fall 2022. The Department of Chemical Engineering and Materials Science constantly reviews program requirements and reserves the right to make changes as necessary. Consequently, each student is strongly encouraged to consult with their advisor to obtain assistance in planning an appropriate schedule of courses. Students who have questions about Materials Science and Engineering should contact Chemical Engineering and Materials Science Department Advising Office, G66 Wilson Hall, phone 517-432-4916. For scheduling academic appointments visit: <https://student.msu.edu/>

Some courses may have prerequisites, which are not otherwise required in the program. Students should check course descriptions to ensure they are aware of prerequisites.

*** College Admission Requirement**

****ECE 302 and ECE 303 may be substituted for ECE 345**

Total Credits Required for Degree

128

Last Revised February 2022

Materials Science and Engineering Sample Program

Freshman Year				Sophomore Year			
Fall	Credits	Spring	Credits	Fall	Credits	Spring	Credits
CEM 161	1	Elective	1	MSE 250	3	Bioscience	3/4
CEM 151	4	CEM 152	3	CE 221	3	MSE 260	3
EGR 100	2	EGR 102	2	MTH 234	4	ME 222	3
MTH 132	3	MTH 133	4	ISS 2XX	4	MTH 235	3
WRA 101	4	PHY 183	4	IAH 201-210	4	PHY 184	4
Total	14	Total	14	Total	18	Total	16/17

Junior Year				Senior Year			
Fall	Credits	Spring	Credits	Fall	Credits	Spring	Credits
Elective	3	Elective	2	Elective	3	Elective	4
MSE 310	3	MSE 360	3	MSE 425/474/476	3	MSE 466	3
MSE 331	2	MSE 370	3	MSE 425/474/476	3	MSE 460/465/477	3
MSE 320	3	MSE 381	2	ECE 345	3	Engr 400 Level	3
Engr 400 Level	3	MSE 460/465/477	3	ISS 3**	4	Technical Elective	3
STT 351	3	IAH 211 or >	4				
Total	17	Total	17	Total	16	Total	16

Last Revised May 2018

Materials Science and Engineering Program Educational Objectives

The MSE program prepares students to apply their understanding of the processing, application, and sustainable use of engineering materials essential to the realization of new ideas coming from engineers, scientists, enterprises, and society. Our overarching objectives are to equip graduates with the confidence that comes from professionalism, and provide them with the tools needed to contribute meaningfully within any of the diverse professional career paths they may choose.

Since the discipline creates bridges between science and engineering, MSE majors must communicate effectively with people in many different specialties, and work effectively in multi-disciplinary teams. MSE graduates must be aware of the economic, social, and environmental implications entailed in the processing and use of materials, and must have a solid grounding in professional engineering ethics.

The faculty provide a rigorous academic environment so that graduates will have mastered the analytical and technical skills needed to successfully compete as professionals, entrepreneurs, or as postgraduate scholars.

The graduates of the MSE Program will:

- Achieve success in Materials Science & Engineering or another chosen career;
- Facilitate success within multidisciplinary environments and advance to leadership roles within their profession and community;
- Contribute innovatively to their disciplines, economies and society;
- Compete with confidence for postgraduate education opportunities;
- Enjoy the benefits of a lifetime of learning and professional development.