

## BACHELOR OF SCIENCE IN ENGINEERING — Major in Materials Science &amp; Engineering

The undergraduate curriculum, leading to the degree of Bachelor of Science in Materials Science and Engineering, consists of the “Case core” — basic courses in mathematics, physics, chemistry, and engineering, with electives in social sciences and humanities — plus materials courses, technical electives, and open electives. A total of 128 credit hours are required.

FALL SEMESTER		CLASS/LAB/CREDIT HOURS	SPRING SEMESTER		CLASS/LAB/CREDIT HOURS
FRESHMAN YEAR					
CHEM 111	Principles of Chemistry for Engineers	4-0-4	ENGR 145	Chemistry of Materials	4-0-4
ENGR 131	Elementary Computer Programming	3-0-3			
ENGL 150	Expository Writing	3-0-3	MATH 122	Calculus for Science and Engineering II	4-0-4
MATH 121	Calculus for Science and Engineering I	4-0-4	PHYS 121	General Physics I - Mechanics <sup>1</sup>	3-1-4
PHED 1xx	Physical Education Activities	0-3-0	PHED 1xx	Physical Education Activities	0-3-0
	Open Elective or Humanities/Social Science Elective <sup>2,7</sup>	<u>3-0-3</u>		Humanities/Social Science Elective or Open Elective <sup>2,7</sup>	<u>3-0-3</u>
	TOTAL	17-3-17		TOTAL	14-4-15
SOPHOMORE YEAR					
CHEM 301	Introduction to Physical Chemistry <sup>3</sup>	3-0-3	ECES 251	Numerical Methods <sup>4</sup>	3-0-3
EMSE 102	Materials Science Seminar	1-0-1	EMSE 202	Phase Diagrams & Phase Transformations	3-0-3
EMSE 201	Introduction to Materials Science & Engr.	3-0-3	EMSE 270	Materials Laboratory I	0-3-2
MATH 223	Calculus for Science and Engineering III	3-0-3	MATH 224	Elementary Differential Equations <sup>5</sup>	3-0-3
PHYS 122	General Physics II - Electricity & Magnetism	3-1-4	ENGR 200	Statics and Strength of Materials	3-0-3
	Humanities/Social Science Elective <sup>7</sup>	<u>3-0-3</u>		Humanities/Social Science Sequence I	<u>3-0-3</u>
	TOTAL	16-1-17		TOTAL	15-3-17
JUNIOR YEAR					
EMSE 280	Materials Laboratory II	0-3-2	EMSE 290	Materials Laboratory III	0-3-2
ENGR 210	Intro to Circuits and Instrumentation	3-2-4	ENGL 398N	Professional Communication <sup>6</sup>	3-0-3
EMSE 203	Applied Thermodynamics	3-0-3	EMSE 303	Mechanical Behavior of Materials	3-0-3
EMSE 314	Electronic, Magnetic, and Optical Properties of Materials	3-0-3	ENGR 225	Thermodynamics, Fluid Mechanics & Heat & Mass Transport	4-0-4
	Humanities/Social Science Sequence II	<u>3-0-3</u>		Technical Elective	3-0-3
				Humanities/Social Science Sequence III	<u>3-0-3</u>
	TOTAL	12-5-15		TOTAL	16-3-18
SENIOR YEAR					
EMSE 301	Fundamentals of Materials Processing	3-0-3	EMSE 313	Engineering Applications of Materials	3-0-3
EMSE 302	Fundamentals of Materials Processing Laboratory	0-3-1	EMSE 399	Senior Project in Materials II	0-4-2
EMSE 310	Applications of Diffraction Principles	0-2-1		Technical Elective	3-0-3
EMSE 312	Diffraction Principles	3-0-3		Open Elective	3-0-3
EMSE 398	Senior Project in Materials I	0-2-1		Open Elective	<u>3-0-3</u>
	Humanities/Social Science Elective <sup>7</sup>	3-0-3			
	Technical Elective	<u>3-0-3</u>			
	TOTAL	12-7-15		TOTAL	12-4-14

<sup>1</sup> Selected students may be invited to take PHYS 123-124; General Physics I-II Honors, in place of PHYS 121-122.

<sup>2</sup> One of these courses must be in the humanities or social sciences.

<sup>3</sup> Satisfies the Math, Natural Sciences, or Statistics requirement of the Engineering Core.

<sup>4</sup> or EMAE 250 or PHYS 250

<sup>5</sup> or MATH 234

<sup>6</sup> Satisfies the Professional Communications requirement of the Engineering Core.

<sup>7</sup> The Engineering Core requires that if the Humanities/Social Science sequence is in Social Science, then 2 of the 3 Humanities/Social Science electives must be in Humanities; if the sequence is in Humanities, then 2 of the 3 electives must be in Social Science.

## APPROVED TECHNICAL ELECTIVES

The following courses are approved technical electives in Materials Science and Engineering. A student is encouraged to discuss with their class advisor a sequence of technical elective courses, which takes into account the biannual nature of some offerings. Students may request approval of other elective courses by submitting a written petition justifying their choices to the department's Undergraduate Studies Committee.

Course number	Course Title	Fall	Spring	Annual	Bi-Annual
ECIV 210	Strength of Materials	√		√	
ECIV 410	Advanced Strength of Materials	√		√	
ECIV 420	Finite Element Structural Analysis	√		√	
EEAP 245	Circuits, Signals and Systems I		√	√	
EEAP 246	Circuits, Signals and Systems II	√		√	
EEAP 309	Electromagnetic Fields I	√		√	
EEAP 321	Semiconductor Electronic Devices		√	√	
EMAC 270	Introduction to Polymer Science	√		√	
EMSE 307	Foundry Metallurgy		√	√	
EMSE 316	Applications of Ceramic Materials	√			√
EMSE 360	Transport Phenomena		√	√	
EMSE 401	Transformations in Materials	√			√
EMSE 403	Modern Ceramic Processing	√			√
EMSE 404	Diffusion Processes in Solids and Liquids	√			√
EMSE 405	Dielectric, Optical, & Magnetic Properties of Materials	√			√
EMSE 407	Solidification of Materials		√		√
EMSE 409	Deformation Processing of Metals		√		√
EMSE 410	Numerical Modeling of Materials Forming Processes	√		√	
EMSE 411	Environmental Effects on Materials Behavior		√	√	
EMSE 417	Properties of Materials at High Temperatures		√		√
EMSE 418	Oxidation of Materials		√		√
EMSE 419	Phase Equilibria & Microstructures of Materials	√			√
EMSE 420	Powder Processing				
EMSE 421	Fracture of Materials	√		√	
EMSE 426	Semiconductor Thin Film Science & Technology		√		√
EMSE 427	Dislocations in Solids		√		√
EMSE 429	Crystallography & Crystal Chemistry		√		√
PHYS 331	Introduction to Quantum Mechanics 1	√		√	
PHYS 315	Introduction to Solid State Physics	√		√	
STAT 312 or STAT 313	Statistics for Engineering and Science Statistics for Experimenters	√ √	√ √	√ √	

## MINOR IN MATERIALS SCIENCE AND ENGINEERING

This sequence is intended primarily for students majoring in science or engineering, but it is open to any student with a sound background in introductory calculus, chemistry, and physics. This program requires the completion of 5 courses with a minimum of 15 credit hours, of which a maximum of 6 hours can be counted towards the student's major. All students will be required to take EMSE 201 (3) and four of the following courses:

EMSE 202, Phase Diagrams and Phase Transformations (3)  
 EMSE 203, Applied Thermodynamics (3)  
 EMSE 301, Fundamentals of Materials Processing (3)  
 EMSE 303, Mechanical Behavior of Materials (3)  
 EMSE 307, Foundry Metallurgy (3)

EMSE 313, Engineering Applications of Materials (3)  
 EMSE 314, Electrical, Magnetic, and Optical Properties (3)  
 EMSE 316, Applications of Ceramics (3)  
 EMSE 312, Diffraction Principles (3)  
 EMSE 360, Transport Phenomena (3)

Prof. De Guire (506 White; x-4221) will assist MSE minors with course selection for their sequence.