

BS IN MATERIALS SCIENCE

Overview

Materials science is the study, discovery, design, and production of new materials of various compositions from the atomic to macro scale. This multidisciplinary undergraduate program focuses on the underlying scientific principles from chemistry, physics, and biochemistry as the basis for understanding the structure and function of both soft and hard materials. Students will explore the mechanical, electronic, and biological properties of materials and experiment with the most exciting current designs and applications of modern materials.

Curriculum Requirements

Code	Title	Credit Hours
Core Chemistry Courses		
CHM 121	Principles of Chemistry	4
CHM 113	Chemistry Laboratory I	1
CHM 221	Introduction to Structure and Dynamics	4
CHM 205	Chemical Dynamics Laboratory	1
CHM 222	Organic Reactions and Synthesis	4
CHM 206	Organic Reactions and Synthesis Laboratory	2
Core Biology Course		
BIL 150	General Biology	4
Core Mathematics Courses		
Choose One of the Following: (Also Fulfills Quantitative Skills Requirement)		8
MTH 161 & MTH 162	Calculus I and Calculus II	
MTH 171 & MTH 172	Calculus I and Calculus II	
MTH 211	Calculus III	3
MTH 311	Introduction to Ordinary Differential Equations	3
MTH 224 or MTH 210	Introduction to Probability and Statistics Introduction to Linear Algebra	3
Core Physics Courses		
Choose One of the Following:		10-11
PHY 201 & PHY 202 & PHY 106 & PHY 108	University Physics I for the Sciences and University Physics II for the Sciences and College Physics Laboratory I and College Physics Laboratory II	
PHY 221 & PHY 222 & PHY 223 & PHY 224 & PHY 225	University Physics I and University Physics II and University Physics III and University Physics II Lab and University Physics III Lab	
PHY 221 & PHY 230 & PHY 224 & PHY 225	University Physics I and Honors University Physics II-III and University Physics II Lab and University Physics III Lab	
Core Computer Science Course		
CSC 120 or CSC 115	Computer Programming I Python Programming for Everyone	3-4
Core Engineering Courses		
CAE 210	Mechanics of Solids I	3
CAE 211 or MAE 207	Mechanics of Solids II Mechanics of Solids II	3
MAE 301	Engineering Materials Science	3
MAE 302	Mechanical Behavior of Materials	3

MAE 351	Mechanics Laboratory	2
BME 335	Biomaterials	3
Concentrations		17-20
Select One of the Following:		
Chemistry Concentration (17 credit hours)		
Take all of these courses:		
CHM 214	Quantitative Analytical Chemistry	
CHM 320	Instrumental Methods in Chemistry and Biochemistry	
CHM 360	Physical Chemistry I (Lecture)	
CHM 365	Physical Chemistry II (Lecture)	
CHM 441	Inorganic Chemistry (Lecture)	
CHM 500-Level Elective		
Physics Concentration (19-20 credit hours)		
Take all of these courses:		
PHY 321	Thermodynamics and Kinetic Theory	
PHY 340	Classical Mechanics I	
PHY 350	Intermediate Electricity and Magnetism	
PHY 360	Introduction to Modern Physics	
PHY 506	Advanced Laboratory	
PHY 522	Solid State Physics	
PHY 560	Quantum Mechanics and Modern Physics I	
Biochemistry Concentration (20 credit hours)		
Take all of these courses:		
BMB 401	Biochemistry for the Biomedical Sciences	
BMB 506	Biomedical Case Studies	
BMB 507	Protein Structure, Function and Biology	
BMB 509	Molecular Biology of the Gene	
BMB 518	Nanomedicine	
CHM 360	Physical Chemistry I (Lecture)	
CHM 365	Physical Chemistry II (Lecture)	
General Education Requirements		
Written Communication Skills:		
WRS 105	First-Year Writing I	3
WRS 106	First-Year Writing II	3
or WRS 107	First-Year Writing II: STEM	
or ENG 106	Writing About Literature and Culture	
Quantitative Skills:		
MTH 161	Calculus I (fulfilled through the major)	
or MTH 171	Calculus I	
Areas of Knowledge:		
Arts and Humanities Cognate		9
People and Society Cognate		9
STEM Cognate (9 credits) (fulfilled through the major)		
Additional Courses		
Foreign Language in 200 level or above		3
Electives		5-9
Total Credit Hours		120

Plan of Study

Year One		Credit Hours
Fall		
CHM 121	Principles of Chemistry	4
CHM 113	Chemistry Laboratory I	1
MTH 161	Calculus I	4
WRS 105	First-Year Writing I	3
BIL 150	General Biology	4
Credit Hours		16
Spring		
CHM 221	Introduction to Structure and Dynamics	4
CHM 205	Chemical Dynamics Laboratory	1
MTH 162	Calculus II	4
WRS 106, 107, or ENG 106	First-Year Writing II or First-Year Writing II: STEM or Writing About Literature and Culture	3
CSC 115	Python Programming for Everyone	3
Credit Hours		15
Year Two		
Fall		
CHM 222	Organic Reactions and Synthesis	4
CHM 206	Organic Reactions and Synthesis Laboratory	2
PHY 201	University Physics I for the Sciences	4
PHY 106	College Physics Laboratory I	1
MTH 211	Calculus III	3
Credit Hours		14
Spring		
PHY 202	University Physics II for the Sciences	4
PHY 108	College Physics Laboratory II	1
MTH 311	Introduction to Ordinary Differential Equations	3
CAE 210	Mechanics of Solids I	3
AH Cognate		3
200-level (or above) Language Course		3
Credit Hours		17
Year Three		
Fall		
MTH 224	Introduction to Probability and Statistics	3
MAE 301	Engineering Materials Science	3
MAE 207	Mechanics of Solids II	3
Concentration Course		3
PS Cognate		3
Credit Hours		15
Spring		
MAE 302	Mechanical Behavior of Materials	3
BME 335	Biomaterials	3
Concentration Course		3
PS Cognate		3
AH Cognate		3
Credit Hours		15
Year Four		
Fall		
Concentration Course		3

Concentration Course		3
PS Cognate		3
AH Cognate		3
Elective		3
Credit Hours		15
Spring		
MAE 351	Mechanics Laboratory	2
Concentration Course		3
Concentration Course		2
Elective		3
Elective		3
Credit Hours		13
Total Credit Hours		120

Mission

The mission of the Bachelor of Science in Material Science focuses on providing undergraduate students with a strong foundation in fundamental scientific concepts as applied for the study, design, and production of modern day materials. Students will have concentrations in specific scientific disciplines, including chemistry, physics, and biochemistry, for materials design and application.

Goals

1. To teach students fundamental scientific concepts in areas of chemistry, physics, and mathematics as applied to materials science.
2. To teach students the fundamental applied concepts of materials, including mechanical, electrical, and biological properties.
3. To teach students foundational laboratory skills for the design, synthesis, and characterization of new and extant materials.
4. To teach students advanced scientific topics in a foundational discipline (chemistry, physics, or biochemistry) as applied to materials design.

Student Learning Outcomes

Upon completion of the Bachelor of Science in Materials Science, students will be able to:

1. apply fundamental concepts in chemistry and physics for the design, development, and production of new materials.
2. apply standard laboratory techniques to characterize and synthesize materials.
3. critically analyze and characterize the properties and potential applications of materials.
4. communicate their results to relevant people, including decision-makers, stakeholders, managers, and the general public.
5. analyze and solve complex scientific problems using critical thinking.