MATERIALS SCIENCE AND ENGINEERING, BACHELOR OF SCIENCE

The Department of Materials Science and Engineering offers a program leading to the Bachelor of Science Degree. The BS program in Materials Science and Engineering is accredited by the Engineering Accreditation Commission of ABET (https://www.abet.org), under the General Criteria and the Program Criteria for Materials (1), Metallurgical (2), Ceramics (3) and Similarly Named Engineering Programs. The student must meet the general university requirements for the chosen degree as well as the departmental requirements and must complete the program approved by the student's professional academic advisor and mentor.

In addition to the degree program in Materials Science and Engineering, students may elect to complete specialized concentrations in biomaterials or nanotechnology. Whether a student chooses to pursue studies following the standard track, the Biomaterials concentration, or the Nanotechnology concentration, the coursework specified for the degree will provide a firm grounding in the principles of materials science and engineering.

The information below describes the academic requirements for students entering JHU as degree-seeking students in Fall 2025. Students who entered JHU as degree-seeking students prior to Fall 2025 should view the appropriate archived catalogue ***(***https://e-catalogue.jhu.edu/archive/***).***

Students must meet the University requirements and the Whiting School of Engineering requirements (see Requirements for a Bachelor's Degree (https://e-catalogue.jhu.edu/ksas-wse/undergraduate-policies/academic-policies/requirements-bachelors-degree/) in this catalogue), as well as the departmental major requirements, to complete a bachelor's degree.

- The Bachelor of Science in Materials Science and Engineering requires 125 credits.
- The MSE department recognizes students with exemplary academic records by awarding Departmental Honors to students with a cumulative Grade Point Average of 3.80 or higher. Students with a primary major or an additional major in Materials Science and Engineering are evaluated for departmental honors.

UNIVERSITY REQUIREMENTS

These requirements are described in this section of the catalogue **(**https://e-catalogue.jhu.edu/ksas-wse/undergraduate-policies/academic-policies/requirements-bachelors-degree/**).**

WSE SCHOOL REQUIREMENTS

FIRST-YEAR SEMINAR OR DESIGN CORNERSTONE REQUIREMENT

All WSE primary majors are required to complete a First-Year Seminar (FYS) or a Design Cornerstone class with a grade of Satisfactory (S).

The first-year seminar requirement is waived for students who transfer into the university after the first year. These students must still complete the minimum number of required credits to graduate.

Code	Title	Credits
One FYS or Design Cornerstone course		2-3
Total Credits		*2-3*

FOUNDATIONAL ABILITIES REQUIREMENTS

All students with a primary major within the Whiting School of Engineering must complete the Foundational Abilities (https://e-catalogue.jhu.edu/ksas-wse/undergraduate-policies/academic-policies/requirements-bachelors-degree/#writingtext) (FA) in six designated areas. Grades of C- or higher are required. No Satisfactory/Unsatisfactory (S/U) grades will be accepted, except in cases where a course is offered on an S/U basis only, such as the Bootcamp Computing courses. For Foundational Abilities that require the submission of ePortfolio assignments in an engineering discipline, students must achieve a minimum assessment of "Proficient".

FA1 WRITING AND COMMUNICATION

This Foundational Abilities requirement has four parts:

1. Foundational Course in Writing: All WSE students are required to successfully complete one foundational course in writing. Courses that will satisfy the writing course requirement are listed below:

Code	Title	Credits
Choose one from the following:		
AS.004.101	Reintroduction to Writing	3
EN.661.110	Professional Writing and Ethics	3

2. Writing ePortfolio Assignment: All WSE students must be assessed as at least proficient in one or more writing ePortfolio assignments. Courses that include at least one assignment eligible for the writing ePortfolio assignment requirement can be identified in SIS (https://sis.jhu.edu/sswf/) by searching the tag listed below:

Code	Title	Credits
EN Foundational Ability tag FA1.1eP		

3. Foundational Course in Oral Communication: All WSE students are required to successfully complete one foundational course in oral communication. The course that will satisfy the oral communication course requirement is listed below:

Code	Title	Credits
EN.661.250	Oral Presentations	3

4. Oral Communication ePortfolio Assignment: All WSE students must be assessed as at least proficient in one or more oral communication ePortfolio assignments. Courses that include at least one assignment applicable to the oral communication ePorfolio assignment requirement can be identified in SIS (https://sis.jhu.edu/sswf/) by searching the tag listed below:

Code	Title	Credits
EN Foundational Ability tag FA1.2eP		

FA2 SCIENTIFIC AND QUANTITATIVE REASONING

This Foundational Abilities requirement has five parts. The Materials Science and Engineering department has specified the courses below that will satisfy the requirements.

1. Calculus I: Calculus I applies to both the FA2 requirement and the MSE Mathematics requirement.

Code	Title	Credits
AS.110.108	Calculus I (Physical Sciences & Engineering)	4

2. Calculus II: Calculus II applies to both the FA2 requirement and the MSE Mathematics requirement.

Code	Title	Credits
AS.110.109	Calculus II (For Physical Sciences and Engineering)	4

3. Probability and Statistics: The Probability and Statistics course applies to both the FA2 requirement and the MSE Mathematics requirement.

Code	Title	Credits
EN.553.311	Intermediate Probability and Statistics	4

4. Computing and Data Science: The computing course applies to both the FA2 requirement and the MSE Basic Science and Engineering requirement.

Code	Title	Credits
Choose one from the following:		
EN.500.113	Gateway Computing: Python (preferred)	3
EN.500.112 & EN.500.133	Gateway Computing: JAVA and Bootcamp: Python	4

5. Natural Science and Laboratory: One natural science lecture and its associated laboratory will apply to both the FA2 requirement and the MSE Basic Sciences requirement. Additional natural science lectures and labs are required for the major; see the Major Requirements section for details.

Code	Title	Credits
Choose one from the following:		
AS.030.101 & AS.030.105	Introductory Chemistry I and Introductory Chemistry Laboratory I	4
AS.030.102 & AS.030.106	Introductory Chemistry II and Introductory Chemistry Laboratory II	4
AS.171.101 & AS.173.111	General Physics: Physical Science Major I and General Physics Laboratory I	5
AS.171.102 & AS.173.112	General Physics: Physical Science Major II and General Physics Laboratory II	5
AS.171.107 & AS.173.111	General Physics for Physical Sciences Majors (AL) and General Physics Laboratory I	5
AS.171.108 & AS.173.112	General Physics for Physical Science Majors (AL) and General Physics Laboratory II	5

FA3 CREATIVE EXPRESSION

A minimum of 12 credits of coursework in creative expression (FA3) and engagement with society (FA4) is required. At least three of these credits must be earned through a course tagged FA3. Courses with the FA3 tag can be identified in SIS (https://sis.jhu.edu/sswf/) by searching the tag listed below:

Code	Title	Credits
EN Foundational Ability tag FA3		3

In addition to the required FA3 and FA4 courses, students must complete six additional credits from any combination of FA3 or FA4 courses, for a total of 12 credits in FA3 and FA4.

FA4 ENGAGEMENT WITH SOCIETY

A minimum of 12 credits of coursework in creative expression (FA3) and engagement with society (FA4) is required. At least three of these credits must be earned through a course tagged FA4. Courses with the FA4 tag can be identified in SIS (https://sis.jhu.edu/sswf/) by searching the tag listed below:

Code	Title	Credits
EN Foundational Ability tag FA4		3

In addition to the required FA3 and FA4 courses, students must complete six additional credits from any combination of FA3 or FA4 courses, for a total of 12 credits in FA3 and FA4.

FA5 ETHICAL REFLECTION

This Foundational Abilities requirement has two parts:

1. Foundational Course in Ethical Reflection: All WSE students are required to successfully complete one foundational course in ethical reflection. The Materials Science and Engineering department has specified the course that will satisfy the ethical reflection course requirement below:

Code	Title	Credits
EN.660.463	Engineering Management & Leadership	3

2. Ethical Reflection ePortfolio Assignment: All WSE students must be assessed as at least proficient in one or more ethical reflection ePortfolio assignments. Courses that include at least one assignment eligible for the ethical reflection ePortfolio assignment requirement can be identified in SIS (https://sis.jhu.edu/sswf/) by searching the tag listed below:

Code	Title	Credits
Courses with EN Foundational Ability tag FA5eP		

FA6 CONCEIVING OF AND REALIZING PROJECTS

All WSE students must be assessed as at least proficient in two or more conceiving of and realizing projects ePortfolio assignments. Courses that include at least one assignment eligible for the conceiving of and realizing projects ePortfolio assignment requirement can be identified in SIS (https://sis.jhu.edu/sswf/) by searching the tag listed below:

Code	Title	Credits
Courses with EN Foundational Ability tag FA6eP		

MAJOR REQUIREMENTS

MATHEMATICS

A total of 20 credits in mathematics is required. If a student receives a waiver for Calculus I and/or II or transfers in courses with fewer credits than the corresponding JHU course credits, they must make up the difference by completing additional mathematics coursework.

Grades of C- or higher are required. No Satisfactory/Unsatisfactory (S/U) grades will be accepted.

Code	Title	Credits
AS.110.108	Calculus I (Physical Sciences & Engineering) (FA2 Requirement)	4
AS.110.109	Calculus II (For Physical Sciences and Engineering) (FA2 Requirement)	4
AS.110.202	Calculus III	4

or AS.110.211	Honors Multivariable Calculus	
EN.553.291	Linear Algebra and Differential Equations	4
or AS.110.201 & AS.110.302	Linear Algebra and Differential Equations and Applications	
or AS.110.212 & AS.110.302	Honors Linear Algebra and Differential Equations and Applications	
or EN.553.295 & AS.110.302	Linear Algebra for Data Science and Differential Equations and Applications	
EN.553.311	Intermediate Probability and Statistics (FA2 Requirement)	4
Total Credits		**20**

BASIC SCIENCES

A total of 22 credits in basic sciences is required. One natural science lecture and its associated laboratory will apply to both the FA2 requirement and the MSE Basic Sciences requirement.

Students who fall short of the required 22 credits, due to receiving laboratory course waivers from Physics I and/or II exam credit, or transferring courses with fewer credits than the equivalent JHU offerings, must complete additional coursework with a Natural Sciences (N) area designation to fulfill the credit requirement.

Grades of C- or higher are required. No Satisfactory/Unsatisfactory (S/U) grades will be accepted.

Code	Title	Credits
AS.030.101	Introductory Chemistry I	3
AS.030.102	Introductory Chemistry II [1]	3
AS.030.105	Introductory Chemistry Laboratory I	1
AS.030.106	Introductory Chemistry Laboratory II [1]	1
AS.030.205	Introductory Organic Chemistry I	4
AS.171.101	General Physics: Physical Science Major I	4
or AS.171.107	General Physics for Physical Sciences Majors (AL)	
AS.171.102	General Physics: Physical Science Major II	4
or AS.171.108	General Physics for Physical Science Majors (AL)	
AS.173.111	General Physics Laboratory I	1
AS.173.112	General Physics Laboratory II	1
Total Credits		**22**

[1] Students who have exam credits for Chemistry I and the lab must take AS.030.103 Applied Chemical Equilibrium and Reactivity w/lab rather than AS.030.102 Introductory Chemistry II and AS.030.106 Introductory Chemistry Laboratory II.

BASIC ENGINEERING

Grades of C- or higher are required. No Satisfactory/Unsatisfactory (S/U) grades will be accepted.

Code	Title	Credits
EN.500.113	Gateway Computing: Python (FA2 Requirement) [1]	3
or EN.500.112 & EN.500.133	Gateway Computing: JAVA and Bootcamp: Python	
EN.660.463	Engineering Management & Leadership (FA5 Requirement)	3
Total Credits		**6**

[1] EN.500.113 Gateway Computing: Python is strongly preferred. If EN.500.112 Gateway Computing: JAVA is taken, EN.500.133 Bootcamp: Python is required.

CORE REQUIREMENTS

Grades of C or higher are required for the Core Requirements, which include MSE Core Courses, Upper-Level Materials Science Electives, and Design. No Satisfactory/Unsatisfactory (S/U) grade will be accepted.

MSE CORE COURSES

Code	Title	Credits
EN.510.311	Structure Of Materials	3
EN.510.312	Thermodynamics/Materials	3
EN.510.313	Mechanical Properties of Materials (FA5eP)	3
EN.510.314	Electronic Properties of Materials (FA1.2eP)	3
EN.510.315	Physical Chemistry of Materials II	3
EN.510.316	Foundations of Biomaterials	3
EN.510.428	Materials Science Laboratory I	3
EN.510.429	Materials Science Laboratory II (FA6eP - Project 1)	3
Total Credits		**24**

UPPER-LEVEL MATERIALS SCIENCE ELECTIVES

At least 15 credits of Upper-Level Materials Science & Engineering courses at 300-level or higher are required. A maximum of 6 materials-based Customized Academic Learning credits may be applied. Click on a Track or Concentration below to view the required courses.

Code	Title	Credits
Upper-Level Materials Sciences & Engineering courses (EN.510.3xx - EN.510.4xx)		15
Total Credits		*15*

DESIGN

Both semesters of design sequence courses must be taken to fulfill one of the FA6eP project requirements and to complete the design requirement for the major. Click on a Track or Concentration below to view the required design sequence courses specific to that area.

Code	Title	Credits
Two semesters of design sequence courses		6
Total Credits		*6*

TRACK AND CONCENTRATIONS

STANDARD TRACK

The Standard Track is intended for those students with general materials science interests. It permits the student to tailor the degree program to specific interests by allowing a broad range of choices for upper-level science and engineering electives.

UPPER-LEVEL MATERIALS SCIENCE ELECTIVES for standard track

A grade of C or higher is required. No Satisfactory/Unsatisfactory (S/U) grade will be accepted. A maximum of 6 materials-based Customized Academic Learning credits may be applied.

Code	Title	Credits
Upper-Level Materials Sciences & Engineering courses (EN.510.3xx - EN.510.4xx)		15

Up to 6 credits of materials-based Customized Academic Learning credits (xx.xxx.5xx) can be applied here	
Total Credits	*15*

DESIGN for standard track

Both semesters of design sequence courses must be taken to fulfill one of the FA6eP project requirements and to complete the design requirement.

- EN.510.433, EN.510.445, and EN.510.447 carry the Foundational Abilities ePortfolio component, FA1.1eP and FA6eP - Project 2
- EN.510.434, EN.510.446, and EN.510.448 carry the Foundational Abilities ePortfolio components, FA5eP and FA6eP - Project 2.

A grade of C or higher is required. No Satisfactory/Unsatisfactory (S/U) grade will be accepted.

Code	Title	Credits
Complete one of the following design sequences:		6
EN.510.433 & EN.510.434	Senior Design Research and Senior Design/Research II	
EN.510.445 & EN.510.446	MSE Design Team I and MSE Design Team II	
EN.510.447 & EN.510.448	MSE Design Team Leader and MSE Design Team II Leader	
Total Credits		*6*

BIOMATERIALS CONCENTRATION

Biomaterials is an exciting and rapidly developing field. Engineered materials are increasingly used in medical applications (such as drug delivery, gene therapy, scaffolds for tissue engineering, replacement body parts, and biomedical and surgical devices) while an understanding of structure-property relationships in natural biomaterials may lead to improved interventions for a wide variety of diseases and injuries. Because it is highly interdisciplinary (involving elements of materials science, engineering, biology, chemistry, and medicine), biomaterials as a discipline requires a deep understanding of the properties of materials in general, and the interactions of materials with the biological environment in particular.

The biomaterials concentration is designed to provide a broad basis in the fundamentals of materials science and engineering, as well as a particular emphasis on the principles and applications of biomaterials. While the fundamental principles of materials science still apply, a complete understanding of biomaterials and their interactions with biological environments requires a greater degree of specialization than the standard undergraduate curriculum provides. The biomaterials curriculum includes topics such as biomimetic materials, natural biomaterials, host responses to biomaterials, biocompatibility, and applications of biomaterials, particularly in tissue engineering, drug delivery, and medical devices and implants. Our goal is to train students who can apply these principles to the development of novel materials that benefit human health. In recognition of completion of the Biomaterials concentration, a student may elect to have their academic transcript annotated to indicate a concentration in Biomaterials.

To receive commendation for completion of the Biomaterials concentration, the student must complete four electives, whose subject matter is some aspect of Biomaterials, Molecules and Cells as a Science & Engineering elective, a biomaterials laboratory course, and complete a biomaterials-related senior design project. Approval of electives must be made by a student's professional academic advisor and mentor prior to taking the courses, and the senior design project must be pre-approved by the senior design instructor.

UPPER-LEVEL MATERIALS SCIENCE ELECTIVES for Biomaterials Concentration

Grades of C or higher is required. No Satisfactory/Unsatisfactory (S/U) grade will be accepted. A maximum of 6 materials-based Customized Academic Learning credits may be applied.

Code	Title	Credits
EN.510.430	Biomaterials Lab	3
4 Upper-Level Materials Sciences & Engineering courses (EN.510.3xx - EN.510.4xx) with SIS POS tag MATS-BIO		12
Up to 6 credits of biomaterials-based Customized Academic Learning credits (xx.xxx.5xx) can be applied here		
Total Credits		*15*

DESIGN for biomaterials concentration

Both semesters of design sequence courses must be taken to fulfill one of the FA6eP project requirements and to complete the design requirement for the major.

- EN.510.438, EN.510.445, and EN.510.447 carry the Foundational Abilities ePortfolio component, FA1.1eP and FA6eP - Project 2
- EN.510.439, EN.510.446, and EN.510.448 carry the Foundational Abilities ePortfolio components, FA5eP and FA6eP - Project 2

Grades of C or higher is required. No Satisfactory/Unsatisfactory (S/U) grade will be accepted.

Code	Title	Credits
Complete one of the following design sequences:		6
EN.510.438 & EN.510.439	Biomaterials Senior Design I and Biomaterials Senior Design II	
EN.510.445 & EN.510.446	MSE Design Team I and MSE Design Team II	
EN.510.447 & EN.510.448	MSE Design Team Leader and MSE Design Team II Leader	
Total Credits		*6*

NANOTECHNOLOGY CONCENTRATION

Nanotechnology advances the utilization of materials and devices with extremely small dimensions. Nanotechnology is a visionary field, as micro- and nano-structured devices impact all fields of engineering, including microelectronics (smaller, faster computer chips), mechanical engineering (micromotors and actuators), civil engineering (“smart”, self-healing nanocomposite materials for buildings and bridges), and biomedical engineering (biosensors and tissue engineering).

Materials science is central to nanotechnology because the properties of materials can change dramatically when things are made extremely small. This observation is not simply that we need to measure such properties or develop new processing tools to fabricate nanodevices. Rather, our vision is that the wide (and sometimes unexpected) variety of phenomena associated with nanostructured materials allow us to envision radically new devices and applications that can only be made with nanostructured materials. The nanotechnology concentration encompasses a curriculum designed to train students in the fundamental interdisciplinary principles of materials science, including physics and chemistry, and also to expose students to the forefront of nanomaterials research through elective classes and research laboratories. In

recognition of completion of the Nanotechnology concentration, a student may elect to have their academic transcript annotated to indicate a concentration in nanotechnology.

To receive commendation for completion of the Nanotechnology concentration, the student must complete four electives, whose subject matter is some aspect of nanotechnology, a Nanomaterials Laboratory course, and complete a nanotechnology-related senior design project. Approval of electives must be made by a student's professional academic advisor and mentor prior to taking the courses, and the senior design project must be pre-approved by the senior design instructor.

UPPER-LEVEL MATERIALS SCIENCE ELECTIVES FOR Nanotechnology Concentration

Grades of C or higher is required. No Satisfactory/Unsatisfactory (S/U) grade will be accepted. A maximum of 6 materials-based Customized Academic Learning credits may be applied.

Code	Title	Credits
EN.510.442	Nanomaterials Lab	3
4 Upper-Level Materials Sciences & Engineering courses (EN.510.3xx - EN.510.4xx) with POS tag of MATS-NANO		12
Up to 6 credits of nanomaterials-based Customized Academic Learning credits (xx.xxx.5xx) can be applied here		
Total Credits		*15*

DESIGN FOR NANOTECHNOLOGY CONCENTRATION

Both semesters of design sequence courses must be taken to fulfill one of the FA6eP project requirements and to complete the design requirement for the major.

- EN.510.440, EN.510.445, and EN.510.447 carry the Foundational Abilities ePortfolio component, FA1.1eP and FA6eP - Project 2
- EN.510.441, EN.510.446, and EN.510.448 carry the Foundational Abilities ePortfolio components, FA5eP and FA6eP - Project 2

A grade of C or higher is required. No Satisfactory/Unsatisfactory (S/U) grade will be accepted.

Code	Title	Credits
Complete one of the following design sequences:		6
EN.510.440 & EN.510.441	Nanomaterials Senior Design I and Nanomaterials Senior Design II	
EN.510.445 & EN.510.446	MSE Design Team I and MSE Design Team II	
EN.510.447 & EN.510.448	MSE Design Team Leader and MSE Design Team II Leader	
Total Credits		*6*

UNRESTRICTED ELECTIVES

Grades of C- or higher are required. Satisfactory (S) grades will be accepted.

Code	Title	Credits
Unrestricted Elective courses		6
Total Credits		*6*

Sample Programs

Sample Program for Standard Track

First Year

First Semester	Credits	Second Semester	Credits
AS.030.101[1]	3	AS.030.102[1]	3
AS.030.105[1]	1	AS.030.106[1]	1
AS.110.108 (FA2 Calculus I Requirement)	4	AS.110.109 (FA2 Calculus II Requirement)	4
EN.510.106 (not required but highly recommended)[1]	3	AS.171.101[1]	4
FYS or Design Cornerstone	2-3	AS.173.111[1]	1
Unrestricted Elective	3	EN.500.113 (FA2 Computing and Data Science Requirement)	3
	16-17		**16**

Second Year

First Semester	Credits	Second Semester	Credits
AS.030.205	4	EN.510.312	3
AS.110.202	4	EN.510.316	3
AS.171.102[1]	4	EN.553.291	4
AS.173.112[1]	1	EN.661.250 (FA1 Foundational Course in Oral Communication)	3
EN.510.311	3	Course with EN Foundational Ability tag FA3 (Creative Expression)	3
	16		**16**

Third Year

First Semester	Credits	Second Semester	Credits
EN.510.313 (FA5eP)	3	EN.510.314 (FA1.2eP)	3
EN.510.315	3	EN.510.429 (FA6eP - Project 1)	3
EN.510.428	3	Upper-Level MSE Elective 1	3
EN.553.311 (FA2 Probability and Statistics Requirement)	4	Course with EN Foundational Ability tag FA4 (Engagement with Society)	3
EN.661.110 or AS.004 101 (FA1 Foundational Course in Writing)	3	Course with EN Foundational Ability tag FA3 or FA4	3
	16		**15**

Fourth Year

First Semester	Credits	Second Semester	Credits
EN.510.433 (FA1.1eP, Must take both EN.510.433 and EN.510.434 to satisfy FA6eP - Project 2)	3	EN.510.434 (FA5eP, Must take both EN.510.433 and EN.510.434 to satisfy FA6eP - Project 2)	3
Upper-Level MSE Elective 2	3	Upper-Level MSE Elective 4	3
Upper-Level MSE Elective 3	3	Upper-Level MSE Elective 5	3
EN.660.463 (FA5 Foundational Course in Ethical Reflection)	3	Course with EN Foundational Ability tag FA3 or FA4	3

Unrestricted Elective	3	Unrestricted Elective	3
	15		**15**

Total Credits 125-126

[1] One of the natural science courses with its associated laboratory will satisfy the FA2 requirement. The other natural science courses with their associated laboratories will satisfy the Basic Sciences requirement for the major.

Sample Program for Biomaterials Concentration

Students pursuing the Biomaterials Concentration will complete a total of 126-127 credits instead of 125-126 credits.

First Year

First Semester	Credits	Second Semester	Credits
AS.030.101[1]	3	AS.030.102[1]	3
AS.030.105[1]	1	AS.030.106[1]	1
AS.110.108 (FA2 Calculus I Requirement)	4	AS.110.109 (FA2 Calculus II Requirement)	4
EN.510.106 (not required but highly recommended)[1]	3	AS.171.101[1]	4
FYS or Design Cornerstone	2-3	AS.173.111[21]	1
Unrestricted Elective	3	EN.500.113 (FA2 Computing and Data Science Requirement)	3
	16-17		**16**

Second Year

First Semester	Credits	Second Semester	Credits
AS.030.205	4	EN.510.312	3
AS.110.202	4	EN.510.316	3
AS.171.102[1]	4	EN.553.291	4
AS.173.112[1]	1	EN.661.250 (FA1 Foundational Course in Oral Communication)	3
EN.510.311	3	Course with EN Foundational Ability tag FA3 (Creative Expression)	3
	16		**16**

Third Year

First Semester	Credits	Second Semester	Credits
EN.510.313 (FA5eP)	3	EN.510.314	3
EN.510.315	3	EN.510.429 (FA6eP - Project 1)	3
EN.510.428	3	Upper-Level MSE Elective 1	3
EN.580.221	4	Course with EN Foundational Ability tag FA4 (Engagement with Society)	3
EN.661.110 or AS.004 101 (FA1 Foundational Course in Writing)	3	Course with EN Foundational Ability tag FA3 or FA4	3
	16		**15**

Fourth Year

First Semester	Credits	Second Semester	Credits
EN.510.438 (FA1.1eP, Must take both EN.510.438 and EN.510.439 to satisfy FA6eP - Project 2)	3	EN.510.430 (Upper-Level MSE Elective 4)	3
Upper-Level MSE Elective 2 (e.g. Biomolecular Materials)	3	EN.510.439 (FA5eP, Must take both EN.510.438 and EN.510.439 to satisfy FA6eP - Project 2)	3
Upper-Level MSE Elective 3 (e.g. Biomaterials Principles & Applications)	3	Upper-Level MSE Elective 5	3
EN.553.311 (FA2 Probabiliy and Statistics Requirement)	4	Course with EN Foundational Ability tag FA3 or FA4	3
EN.660.463 (FA5 Foundational Course in Ethical Reflection)	3	Unrestricted Elective	3
	16		**15**

Total Credits 126-127

[1] One of the natural science courses with its associated laboratory will satisfy the FA2 requirement. The other natural science courses with their associated laboratories will satisfy the Basic Sciences requirement for the major.

Sample Program for Nanotechnology Concentration

First Year

First Semester	Credits	Second Semester	Credits
AS.030.101[1]	3	AS.030.102[1]	3
AS.030.105[1]	1	AS.030.106[1]	1
AS.110.108 (FA2 Calculus I Requirement)	4	AS.110.109 (FA2 Calculus II Requirement)	4
EN.510.106 (not required but highly recommended)[1]	3	AS.171.101[1]	4
FYS or Design Cornerstone	2-3	AS.173.111[1]	1
Unrestricted Elective	3	EN.500.113 (FA2 Computing and Data Science Requirement)	3
	16-17		**16**

Second Year

First Semester	Credits	Second Semester	Credits
AS.030.205	4	EN.510.312	3
AS.110.202	4	EN.510.316	3
AS.171.102[1]	4	EN.553.291	4
AS.173.112[1]	1	EN.661.250 (FA1 Foundational Course in Oral Communication)	3
EN.510.311	3	Course with EN Foundational Ability tag FA3 (Creative Expression)	3
	16		**16**

Third Year

First Semester	Credits	Second Semester	Credits
EN.510.313 (FA5eP)	3	EN.510.314	3
EN.510.315	3	EN.510.429	3
EN.510.428	3	Upper-Level MSE Elective 1	3
EN.553.311 (FA2 Probability and Statistics Requirement)	4	Course with EN Foundational Ability tag FA4 (Engagement with Society)	3
EN.661.110 or AS.004 101 (FA1 Foundational Course in Writing)	3	Course with EN Foundational Ability tag FA3 or FA4	3
	16		**15**

Fourth Year

First Semester	Credits	Second Semester	Credits
EN.510.440 (FA1.1eP, Must take both EN.510.440 and EN.510.441 to satisfy FA6eP - Project 2)	3	EN.510.441 (FA5eP, Must take both EN.510.440 and EN.510.441 to satisfy FA6eP - Project 2)	3
EN.510.442 (Upper-Level MSE Elective 2)	3	Upper-Level MSE Elective 4	3
Upper-Level MSE Elective 3 (e.g. Materials Characterization)	3	Upper-Level MSE Elective 5	3
EN.660.463 (FA5 Foundational Course in Ethical Reflection)	3	Course with EN Foundational Ability tag FA3 or FA4	3
Unrestricted Elective	3	Unrestricted Elective	3
	15		**15**

Total Credits 125-126

[1] One of the natural science courses with its associated laboratory will satisfy the FA2 requirement. The other natural science courses with their associated laboratories will satisfy the Basic Sciences requirement for the major.

Sample Program with Hopkins Semester

This is one example of how a student could structure their degree program to include a Hopkins Semester. Students may explore additional options with their professional academic advisor if their desired Hopkins Semester experience varies from what is presented here.

First Year

First Semester	Credits	Second Semester	Credits
AS.030.101[1]	3	AS.030.102[1]	3
AS.030.105[1]	1	AS.030.106[1]	1
AS.110.108 (FA2 Calculus I Requirement)	4	AS.110.109 (FA2 Calculus II Requirement)	4
EN.510.106 (not required but highly recommended)[1]	3	AS.171.101[1]	4
Course with EN Foundational Ability tag FA3 (Creative Expression)	3	AS.173.111[1]	1
FYS or Design Cornerstone	2-3	EN.500.113 (FA2 Computing and Data Science Requirement)	3
	16-17		**16**

Second Year

First Semester	Credits	Second Semester	Credits
AS.030.205	4	EN.510.312	3
AS.110.202	4	EN.510.316	3
AS.171.102[1]	4	EN.553.291	4
AS.173.112[1]	1	EN.661.250 (FA 1 Foundational Course in Oral Communication)	3
EN.510.311	3	Course with EN Foundational Ability tag FA4 (Engagement with Society)	3
	16		**16**

Third Year

First Semester	Credits	Second Semester	Credits
EN.510.313	3	Hopkins Semester	
EN.510.315	3	Upper-Level MSE Elective 1	3
EN.510.428	3	Upper-Level MSE Elective 2	3
EN.553.311 (FA2 Probability and Statistics Requirement)	4	Unrestricted Elective	3
EN.661.110 or AS.004 101 (FA1 Foundational Course in Writing)	3	Unrestricted Elective	3
		Unrestricted Elective	3
	16		**15**

Fourth Year

First Semester	Credits	Second Semester	Credits
EN.510.433 (FA1.1eP, Must take EN.510.434 to satisfy FA6eP Project 2)	3	EN.510.314	3
Upper-Level MSE Elective 3	3	EN.510.429	3
Upper-Level MSE Elective 4	3	EN.510.434 (FA5eP, Must take EN.510.433 to satisfy FA6eP Project 2, FA5eP)	3
EN.660.463 (FA5 Foundational Course in Ethical Reflection)	3	Upper-Level MSE Elective 5	3
Course with EN Foundational Ability tag FA3 or FA4	3	Course with EN Foundational Ability tag FA3 or FA4	3
	15		**15**

Total Credits 125-126

[1] One of the natural science courses with its associated laboratory will satisfy the FA2 requirement. The other natural science courses with their associated laboratories will satisfy the Basic Sciences requirement for the major.

Accreditation Statement

The BS program in Materials Science and Engineering is accredited by the Engineering Accreditation Commission of ABET (https://www.abet.org), under the General Criteria and the Program Criteria for Materials (1), Metallurgical (2), Ceramics (3) and Similarly Named Engineering Programs.

Program Objectives

The program has as its objectives that within 3 to 5 years, our graduates will:

- Be engaged in advanced education, research, and development to advance materials science and engineering; or in professional disciplines that benefit from an understanding of MSE.
- Employ elements of the materials research process in their careers including the use of:
  - critical reasoning to identify fundamental issues and establish directions for investigation
  - creative processes to define specific plans for problem-solution
  - analytical thought to interpret results and place them within a broader context
  - application of materials solutions to enhance or radically improve existing and future technology
- Conduct themselves to the highest standards of ethical professional practice, understanding the societal and global effects of their work, and using their knowledge and skills to improve the human condition.
- Maintain their curiosity and expand their knowledge and skills through lifelong learning.

Student Outcomes

Students graduating with a B.S. in Materials Science and Engineering will have demonstrated:

1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
3. An ability to communicate effectively with a range of audiences.
4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

Enrollments and Graduates

Enrollment*

Term	Total	First-Year	Sophomore	Junior	Senior
Fall 2016	60	5	22	19	14
Fall 2017	68	21	9	19	19
Fall 2018	67	23	16	9	19
Fall 2019	61	12	26	14	9
Fall 2020	62	12	10	26	14
Fall 2021	69	16	14	14	25
Fall 2022	50	12	16	10	12
Fall 2023	59	17	16	15	11
Fall 2024	56	11	15	16	14

B.S Degrees Awarded**

Academic Year	Total
2016-2017	13
2017-2018	17
2018-2019	20
2019-2020	9
2020-2021	13
2021-2022	26
2022-2023	11
2023-2024	9

* Based on Fall census each year

** Includes August, December, and May conferrals each academic year