

MATERIALS SCIENCE AND ENGINEERING MAJOR WITH NUCLEAR MATERIALS OPTION

Program Curriculum

Code	Title	Credits
Degree Core Requirements		
MSE 2044	Fundamentals of Materials Engineering (C)	4
MSE 2054	Fundamentals of Materials Science	3
MSE 3314	Materials Laboratory I	1
MSE 3134	Crystallography and Crystal Structures	3
MSE 4034	Thermodynamics of Materials Systems	3
MSE 4424	Materials Laboratory II	1
MSE 3044	Transport Phenomena in MSE	3
MSE 4075	Senior Design Laboratory	1
MSE 4076	Senior Design Laboratory	2
Subtotal		21
Major Requirements		
MSE 2114	Math Programming MSE I	1
MSE 3114	Mathematics Programming in Materials Science II	1
Select four Physical Materials courses		12
MSE 4055	Materials Selection and Design I and II	3
Subtotal		17
Option Required Courses		
MSE 4164	Principles of Materials Corrosion	3
MSE 4384	Nuclear Materials	3
NSEG 3145	Fundamentals of Nuclear Engr	3
NSEG 3146	Fundamental of Nuclear Engr	3
Subtotal		12
Additional Course Requirements		
CHEM 1035	General Chemistry	3
CHEM 1045	General Chemistry Laboratory	1
MATH 2114	Introduction to Linear Algebra	3
MATH 2204	Introduction to Multivariable Calculus	3
ESM 2104	Statics	3
ISE 2214	Manufacturing Processes Laboratory	1
CHEM 1036	General Chemistry	3
ESM 2204	Mechanics of Deformable Bodies	3
MSE 3054	Mechanical Behavior of Materials	3
MSE 3064	Mechanical Behavior of Materials Laboratory	1
MSE 4644	Materials Optimization Through Designed Experiments	3
Subtotal		27
Pathways to General Education		
<i>Pathways Concept 1 - Discourse</i>		
ENGL 1105	First-Year Writing (1F)	3
ENGL 1106	First-Year Writing (1F)	3
MSE 2884	Materials Engineering Professional Development I (1A)	1

MSE 3884	Materials Engineering Professional Development II (1A)	1
MSE 4085	Senior Capstone Recitation (1A)	2
MSE 4086	Senior Capstone Recitation (1A)	1
<i>Pathways Concept 2 - Critical Thinking in the Humanities</i>		
Select six credits in Pathway 2 (https://catalog.vt.edu/course-search/?attrs_pathways=attrs_pathways_G02)		6
<i>Pathways Concept 3 - Reasoning in the Social Sciences</i>		
ECON 2005	Principles of Economics	3
or ECON 2006	Principles of Economics	
Select three credits in Pathway 3 (https://catalog.vt.edu/course-search/?attrs_pathways=attrs_pathways_G03)		3
<i>Pathways Concept 4 - Reasoning in the Natural Sciences</i>		
PHYS 2305	Foundations of Physics	4
PHYS 2306	Foundations of Physics	4
<i>Pathways Concept 5 - Quantitative and Computational Thinking</i>		
MATH 1225	Calculus of a Single Variable (5F)	4
MATH 1226	Calculus of a Single Variable (5F)	4
MATH 2214	Introduction to Differential Equations (5A)	3
<i>Pathways Concept 6 - Critique and Practice in Design and the Arts</i>		
Select three credits in Pathway 6a (https://catalog.vt.edu/course-search/?attrs_pathways=attrs_pathways_G06A)		3
ENGE 1215	Foundations of Engineering	4
& ENGE 1216	and Foundations of Engineering (6D (C-))	
<i>Pathways Concept 7 - Critical Analysis of Identity and Equity in the United States</i>		
Pathway 7 ¹		
Subtotal		49
Total Credits		126

¹ Pathway 7 should be double counted with either Pathway 2, 3, or 6a to avoid taking any additional credit hours.

Each student must complete at least 126 semester credit hours with a minimum overall GPA of 2.00 and a minimum in-major GPA of 2.00. In-major GPA is calculated using all courses taken under the MSE designator.

Course offerings are subject to change and the availability of sufficient resources. Students should confirm course offerings in advance with their department.

Pathways to General Education (Pathways)

Consult the pathways courses table: <https://www.pathways.prov.vt.edu/about/table.html>. Pathways courses need to be completed prior to graduation.

Change of Major Requirements

Please see <https://eng.vt.edu/em> (<https://eng.vt.edu/em/>)

Foreign Language Requirements

Students must have had two years of a foreign language in high school or one year at the college level (six credit hours) of the same language. College-level credits used to meet this requirement do not count towards the degree.

Satisfactory Progress Towards Degree

University Policy 91 outlines university-wide minimum criteria to determine if students are making satisfactory progress towards the completion of their degrees. The MSE Department fully supports this policy. Specific expectations for satisfactory progress for Materials Science and Engineering majors are as follows:

- Each student must meet the minimum University-wide criteria as described in Policy 91
- Maintain an in-major GPA of 2.0 or better and an overall GPA of 2.0 or better
- Students may not earn a semester GPA less than 2.0 in any two consecutive semesters
- Students must complete a minimum of nine credits per semester satisfying the MSE degree requirements,
- A grade of C or better in MSE 2044 Fundamentals of Materials Engineering is required as a prerequisite for all MSE courses, and
- Students are allowed to take MSE 2044 Fundamentals of Materials Engineering a maximum of two times in their attempt to achieve a grade of C or better.

Statement of Hidden Prerequisites

Prerequisites for each course are listed in the linked course title. The (letter grade) notation, such as (C-), indicates the minimum grade students must earn in the prerequisite course. There are no hidden prerequisites in the program of study. Prerequisites may change from what is indicated. Be sure to consult the timetable for the most current prerequisites.

Additional Comments

- Honors students may substitute MSE 4095H Honors Senior Design-Laboratory/MSE 4096H Honors Senior Design Laboratory for MSE 4075 Senior Design Laboratory/MSE 4076 Senior Design Laboratory.
- Physical Materials Courses:
 - MSE 3204 Fundamentals of Electronic Materials
 - MSE 3304 Physical Metallurgy
 - MSE 4414 Physical Ceramics
 - MSE 4554 Polymer Engineering
- ENGE 1414 Foundations of Engineering Practicemay be substituted for ENGE 1215 Foundations of Engineering and ENGE 1216 Foundations of Engineering
- MATH 2405H Mathematics in a Computational Context may be substituted for MATH 2114 Introduction to Linear Algebra
- MATH 2405H Mathematics in a Computational Context and MATH 2406H Mathematics in a Computational Context may be substituted for MATH 2114 Introduction to Linear Algebra, MATH 2204 Introduction to Multivariable Calculus, and MATH 2214 Introduction to Differential Equations
- ISE 2014 Engineering Economy may be substituted for ECON 2005 Principles of Economics. One additional credit of free elective will be needed.
- MSE 2034 Elements of Materials Engineering and MSE 2014 Materials Engineering Transition may be substituted for MSE 2044 Fundamentals of Materials Engineering
- ENGE 4735 Interdisciplinary Design Capstone and ENGE 4736 Interdisciplinary Design Capstone may be substituted for MSE 4075 Senior Design Laboratory, MSE 4085 Senior Capstone

Recitation, MSE 4076 Senior Design Laboratory, and MSE 4086 Senior Capstone Recitation. These courses will also count in the in-major GPA.

- Students interested in focusing in the area of polymers are strongly encouraged to take CHEM 1036 General Chemistry Freshman Spring semester and to speak with the MSE undergraduate advisor.

Roadmap

Course	Title	Credits
First Year		
Fall Semester		
CHEM 1035	General Chemistry	3
CHEM 1045	General Chemistry Laboratory	1
ENGL 1105	First-Year Writing	3
MATH 1225	Calculus of a Single Variable (C-)	4
ENGE 1215	Foundations of Engineering (C-)	2
Credits		13
Spring Semester		
ENGL 1106	First-Year Writing	3
MATH 1226	Calculus of a Single Variable	4
PHYS 2305	Foundations of Physics (w/lab)	4
ENGE 1216	Foundations of Engineering (C-)	2
MATH 2114	Introduction to Linear Algebra	3
Credits		16
Second Year		
Fall Semester		
MATH 2204	Introduction to Multivariable Calculus	3
PHYS 2306	Foundations of Physics	4
ESM 2104	Statics	3
ISE 2214	Manufacturing Processes Laboratory	1
MSE 2044	Fundamentals of Materials Engineering (C)	4
MSE 2884	Materials Engineering Professional Development I	1
Credits		16
Spring Semester		
CHEM 1036	General Chemistry	3
MATH 2214	Introduction to Differential Equations	3
ESM 2204	Mechanics of Deformable Bodies	3
MSE 2054	Fundamentals of Materials Science	3
MSE 2114	Math Programming MSE I	1
MSE 3314	Materials Laboratory I	1
Select three credits in Pathway 2 (https://catalog.vt.edu/course-search/?attrs_pathways=attrs_pathways_G02), Pathway 3 (https://catalog.vt.edu/course-search/?attrs_pathways=attrs_pathways_G03), Pathway 6a (https://catalog.vt.edu/course-search/?attrs_pathways=attrs_pathways_G06A), or Pathway 7 (https://catalog.vt.edu/course-search/?attrs_pathways=attrs_pathways_G07)		3
Credits		17
Third Year		
Fall Semester		
ECON 2005 or ECON 2006	Principles of Economics or Principles of Economics	3
MSE 3114	Mathematics Programming in Materials Science II	1
MSE 3134	Crystallography and Crystal Structures	3
MSE 4034	Thermodynamics of Materials Systems	3
MSE 4424	Materials Laboratory II	1
Select two Physical Materials Courses		6
Credits		17
Spring Semester		
MSE 3044	Transport Phenomena in MSE	3
MSE 3054	Mechanical Behavior of Materials	3
MSE 3064	Mechanical Behavior of Materials Laboratory	1
MSE 3884	Materials Engineering Professional Development II	1

MSE 4644	Materials Optimization Through Designed Experiments	3
Select one Physical Materials Course		3
MSE 4164	Principles of Materials Corrosion	3
Credits		17
Fourth Year		
Fall Semester		
MSE 4055	Materials Selection and Design I and II	3
MSE 4075	Senior Design Laboratory	1
MSE 4085	Senior Capstone Recitation	2
MSE 4384	Nuclear Materials	3
NSEG 3145	Fundamentals of Nuclear Engr	3
Select three credits in Pathway 2 (https://catalog.vt.edu/course-search/?attrs_pathways=attrs_pathways_G02), Pathway 3 (https://catalog.vt.edu/course-search/?attrs_pathways=attrs_pathways_G03), Pathway 6a (https://catalog.vt.edu/course-search/?attrs_pathways=attrs_pathways_G06A), or Pathway 7 (https://catalog.vt.edu/course-search/?attrs_pathways=attrs_pathways_G07)		3
Credits		15
Spring Semester		
MSE 4076	Senior Design Laboratory	2
MSE 4086	Senior Capstone Recitation	1
Select Physical Materials Class		3
NSEG 3146	Fundamental of Nuclear Engr	3
Select six credits in Pathway 2 (https://catalog.vt.edu/course-search/?attrs_pathways=attrs_pathways_G02), Pathway 3 (https://catalog.vt.edu/course-search/?attrs_pathways=attrs_pathways_G03), Pathway 6a (https://catalog.vt.edu/course-search/?attrs_pathways=attrs_pathways_G06A), or Pathway 7 (https://catalog.vt.edu/course-search/?attrs_pathways=attrs_pathways_G07)		6
Credits		15
Total Credits		126