

COLLEGE OF ENGINEERING  
DEPARTMENT OF MATERIALS SCIENCE AND ENGINEERING  
DEGREE: **BACHELOR OF SCIENCE IN MATERIALS SCIENCE AND ENGINEERING, NUCLEAR MATERIALS OPTION**  
MAJOR: MATERIALS SCIENCE AND ENGINEERING  
FOR STUDENTS ENTERING UNDER UG CATALOG 2022-2023  
CREDITS REQUIRED FOR GRADUATION: 125

FALL SEMESTER FIRST YEAR		Credits	SPRING SEMESTER FIRST YEAR		Credits
CHEM 1035 General Chemistry <i>Pre: Eligible to enroll</i>	3		ENGL 1106 <sup>3</sup> First-Year Writing <i>Pre: ENGL 1105</i>	3	
CHEM 1045 General Chemistry Lab <i>Co: CHEM 1035</i>	1		MATH 1226 <sup>3</sup> Calculus of a Single Variable <i>Pre: MATH 1225</i>	4	
ENGL 1105 <sup>3</sup> First-Year Writing	3		PHYS 2305 <sup>3</sup> Found of Physics I w/lab <i>Pre: MATH 1225 or Math 1226; Co: MATH 1226</i>	4	
MATH 1225 <sup>3</sup> Calculus of a Single Variable (C-) <i>Pre: Eligible to enroll</i>	4		ENGE 1216 <sup>3</sup> Foundations of Engineering (C-) <i>Pre: ENGE 1215</i>	2	
ENGE 1215 <sup>3</sup> Foundations of Engineering (C-)	2		MATH 1114 Elementary Linear Algebra	2	
<b>TOTAL</b>	<b>13</b>		<b>TOTAL</b>	<b>15</b>	
FALL SEMESTER SECOND YEAR		Credits	SPRING SEMESTER SECOND YEAR		Credits
MATH 2204 Intro Multivariable Calculus <i>Pre: MATH 1226</i>	3		CHEM 1036 General Chemistry <i>Pre: CHEM 1035</i>	3	
PHYS 2306 <sup>3</sup> Foundations of Physics I w/lab <i>Pre: MATH 1226, PHYS 2305</i>	4		MATH 2214 <sup>3</sup> Intro Diff Equations <i>Pre: (1114 or 2114 or 2114H or 2405H), 1226</i>	3	
ESM 2104 Statics <i>Pre: MATH 1226 Co: MATH 2204 or MATH 2204H or MATH 2406H</i>	3		ESM 2204 Mechanics of Deformable Bodies <i>Pre: (2104 or 2114), (MATH 2204 or MATH 2204H)</i>	3	
ISE 2214 Manufacturing Processes Lab	1		MSE 2054 <sup>1</sup> Fund of Materials Science <i>Pre: 2044</i>	3 <sup>[S]</sup>	
MSE 2044 <sup>1</sup> Fund of Materials Eng (C) <i>Pre: CHEM 1035, Co: PHYS 2305</i>	4 <sup>[F,S]</sup>		MSE 2114 <sup>2</sup> Math Programming MSE I <i>Pre: 2044</i>	1 <sup>[S]</sup>	
MSE 2884 <sup>3</sup> Matls Engr Professional Dev I	1 <sup>[F]</sup>		MSE 3314 <sup>1</sup> Materials Lab I <i>Pre: 2044</i>	1 <sup>[S]</sup>	
<b>TOTAL</b>	<b>16</b>		Pathways <sup>3</sup> (2, 3, 6a, or 7)	3	
<b>TOTAL</b>			<b>TOTAL</b>	<b>17</b>	
FALL SEMESTER THIRD YEAR		Credits	SPRING SEMESTER THIRD YEAR		Credits
ECON 2005 <sup>3</sup> or ECON 2006 <sup>3</sup> Principles of Economics (Pathway 3)	3		MSE 3044 <sup>1</sup> Transport Phenomena MSE <i>Pre: 2044, MATH 2214</i>	3 <sup>[S]</sup>	
MSE 3114 <sup>2</sup> Math Programming MSE II <i>Pre: 2114</i>	1 <sup>[F]</sup>		MSE 3054 (ESM 3054) Mech Behavior of Materials <i>Pre: ESM 2204, (MSE 2034 or MSE 2044 or MSE 3094 or AOE 3094 or CEE 3684)</i>	3 <sup>[F,S]</sup>	
MSE 3134 <sup>1</sup> Crystallography and Crystal Structures <i>Pre: 2044 (C)</i>	3 <sup>[F]</sup>		MSE 3064 (ESM 3064) Mech Behavior Matls Lab <i>Co: 3054</i>	1 <sup>[F,S]</sup>	
MSE 4034 <sup>1</sup> Thermo of Materials <i>Pre: 2044; Co: CHEM 1036</i>	3 <sup>[F]</sup>		MSE 3884 <sup>3</sup> Matls Engr Professional Dev II <i>Pre: junior standing, 2884</i>	1 <sup>[S]</sup>	
MSE 4424 <sup>1</sup> Materials Lab II <i>Pre: 2044</i>	1 <sup>[F]</sup>		MSE 4644 Materials Design Experiments <i>Pre: 3314 or 4424</i>	3 <sup>[S]</sup>	
Physical Materials Course <sup>2</sup>	3		Physical Materials Course <sup>2</sup>	3	
Physical Materials Course <sup>2</sup>	3		MSE 4164 <sup>4</sup> Principles of Materials Corrosion <i>Co: 4034</i>	3	
<b>TOTAL</b>	<b>17</b>		<b>TOTAL</b>	<b>17</b>	
FALL SEMESTER FOURTH YEAR		Credits	SPRING SEMESTER FOURTH YEAR		Credits
MSE 4055 <sup>2</sup> Materials Selection & Design <i>Pre: 3044, 3054, 2 of (3204, 3304 4414, 4554)</i>	3 <sup>[F]</sup>		MSE 4076 <sup>1</sup> Senior Design Laboratory <i>Pre: 4075 Co: 4086,</i>	2 <sup>[S]</sup>	
MSE 4075 <sup>1</sup> Senior Design Laboratory <i>Pre: 4644 Co: 4055, 4085</i>	1 <sup>[F]</sup>		MSE 4086 <sup>3</sup> Senior Design Recitation <i>Pre: 4085 Co: 4076 or 4096H</i>	1 <sup>[S]</sup>	
MSE 4085 <sup>3</sup> Senior Design Recitation <i>Pre: senior standing, 3884 Co: 4075 or 4095H</i>	2 <sup>[F]</sup>		Physical Materials Class <sup>2</sup>	3	
MSE 4384 <sup>4</sup> Nuclear Materials <i>Pre: (MSE 3044 or ME 3304), (MSE 3054 or ESM 3054 or ME 3614)</i>	3		NSEG 3146 <sup>4</sup> Fundamentals of Nuclear Engr <i>Pre: NSEG 3145 or ME 3145</i>	3	
NSEG 3145 <sup>4</sup> Fundamentals of Nuclear Engr <i>Pre: MATH 2214 or 2214H</i>	3		Pathways <sup>3</sup> (2, 3, 6a, or 7)	3	
Pathways <sup>3</sup> (2, 3, 6a, or 7)	3		Pathways <sup>3</sup> (2, 3, 6a, or 7)	3	
<b>TOTAL</b>	<b>15</b>		<b>TOTAL</b>	<b>15</b>	

**General Information about Checksheet:** : Superscripted annotation after the course number (1) indicates common degree core, (2) indicates major requirements, (3) indicates Pathways General Education, and (4) indicates option courses. Additionally, (F, S, SI, SII) in credits column indication terms when a course is expected to be offered. 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

<b>Pathways Concept 1:</b> Discourse (6 hrs foundational, 3 hrs advanced)	<i>Foundational: ENGL 1105</i>	(3)	<i>Foundational: ENGL 1106</i>	(3)
	<i>Advanced: MSE 2884, 3884, 4085, 4086</i>			(3)
<b>Pathways Concept 2:</b> Critical Thinking in the Humanities (6 hrs)		(3)		(3)
<b>Pathways Concept 3:</b> Reasoning in the Social Sciences (6 hrs)	<b>ECON 2005 or ECON 2006</b>	(3)		(3)
<b>Pathways Concept 4:</b> Reasoning in the Natural Sciences (8 hrs)	<b>PHYS 2305</b>	(4)	<b>PHYS 2306</b>	(4)
<b>Pathways Concept 5:</b> Quantitative and Computational Thinking (11 hrs)	<i>Foundational: MATH 1225</i>	(4)	<i>Foundational: MATH 1226</i>	(4)
	<i>Advanced: MATH 2214</i>			(3)
<b>Pathways Concept 6:</b> Critique and Practice in Design and the Arts (7 hrs)	<i>Arts:</i>			(3)
	<i>Design: ENGE 1215 + ENGE 1216</i>			(4)
<b>Pathways Concept 7*:</b> Critical Analysis of Identity & Equity in the US (3 hrs)				(3)

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

**Electives:** No technical electives required.

**Change of Major Requirements:** Please see <https://eng.vt.edu/em>

**Foreign Language Requirements:** Students must have had 2 years of a foreign language in high school or one year at the college level (6 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 and summarized in the Undergraduate Catalog (<https://www.undergradcatalog.registrar.vt.edu/>)
- Maintain an in-major GPA of 2.0 or better and an overall GPA of 2.0 or better. (In-major GPA is calculated using all courses taken under the MSE designator)
- Students may not earn a semester GPA less than 2.0 in any 2 consecutive semesters
- Students must complete a minimum of 9 credits per semester satisfying the MSE checksheet,
- A grade of C or better in MSE 2044 is required as a prerequisite for all MSE courses, and
- Students are allowed to take MSE 2044 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 after the 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.

**Graduation Requirements:** Each student must complete at least 125 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.

**Additional Checksheet Comments:**

1. Programming elective: The following may be substituted for 2114/3114 pair: CS 1044, Intro Prog in C (3c), CS 1064, Intro to Prog in Python (3c), CS 1114, Intro Software Design (3cr); AOE 2074 Comp Methods (2c); BIT 2405, Quant Methods (3c); ECE 1574 Engr Prob Solv C++ (3c), ENGE 2514 Intro Engr Labview (2c).
2. Honors students may substitute MSE 4095H/4096H Honors Senior Project Lab for MSE 4075/4076.
3. Physical Materials Courses:
  - MSE 3204<sup>[F,S]</sup> Fund Electronic Materials Pre: 2054, PHYS 2306
  - MSE 3304<sup>[F,S]</sup> Physical Metallurgy Pre: 2044 (C)
  - MSE 4414<sup>[F,S]</sup> Physical Ceramics Pre: 2044 (C)
  - MSE 4554<sup>[F,S]</sup> Polymer Engineering Pre: 2044 (C)
4. MATH 2114 Linear Algebra (3c) may be substituted for MATH 1114 Linear Algebra (2c)
5. Students interested in focusing in the area of polymers are strongly encouraged to take CHEM 1036 Freshman Spring semester and to speak with the MSE undergraduate advisor.