

Engineering Physics

Sample Curriculum for Materials Science and Engineering Specialization

Student Information

Name: _____ OSU Email: _____

Suggested Curriculum

This should be used as a **guide** only. Semester offerings are subject to change.

| Year | Autumn | Spring |
|------|--|--|
| 1 | ___ Physics 1270 ¹ (<i>Intro Physics I</i>) 5 hr ___ Math 1151 (<i>Calculus I</i>) 5 hr ___ Engineering 1181 (<i>Intro Engineering I</i>) 2 hr ___ Engineering 1100 (<i>Engineering Survey</i>) 1 hr ___ Writing & Info Literacy GE 3 hr | ___ Physics 1271 ¹ (<i>Intro Physics II</i>)..... 5 hr ___ Math 1172 (<i>Eng Mathematics A</i>)..... 5 hr ___ Engineering 1182 (<i>Intro Engineering II</i>)..... 2 hr ___ Chemistry 1210 (<i>General Chemistry I</i>)..... 5 hr ___ GenEd 1201 ³ 1 hr |
| 2 | ___ Physics 2300 (<i>Mechanics I</i>)..... 4 hr ___ Physics 2095 (<i>Physics Seminar</i>)..... 1 hr ___ CSE 1222 ² (<i>C++ Programming</i>)..... 3 hr ___ Math 2173 (<i>Eng Mathematics B</i>)..... 3 hr ___ MSE 2010 (<i>Intro to Engineering Materials</i>)..... 3 hr ___ Literary, Visual and Performing Arts GE..... 3 hr | ___ Physics 2301 (<i>Mechanics II</i>)..... 4 hr ___ Math 2174 ⁴ (<i>Differential Eq/Linear Algebra</i>)..... 3 hr ___ MSE 2241 (<i>Structure, Characterization of Mtrls</i>).. 3 hr ___ MSE 2251 (<i>Thermodynamics of Materials</i>)..... 3 hr ___ MSE 2331 (<i>Structure and Characterization Lab</i>)... 2 hr ___ Physics 3700 (<i>Data Analysis Lab</i>)..... 3 hr |
| 3 | ___ Physics 5500 (<i>Quantum Mechanics</i>)..... 4 hr ___ MSE Elective..... 3 hr ___ MSE Elective..... 3 hr ___ Targeted Elective ⁶ 3 hr ___ Citizenship Theme GE ⁷ 3 hr | ___ Physics 5400 (<i>Electromagnetism</i>)..... 4 hr ___ Physics 4700 (<i>Electronics Lab</i>)..... 3 hr ___ MSE Elective..... 2 hr ___ Historical and Cultural Studies GE..... 3 hr ___ Race, Ethnicity, Gender Diversity GE..... 3 hr |
| 4 | ___ Physics 5800 ⁸ (<i>Eng Phy Capstone I</i>)..... 3 hr ___ MSE Elective..... 3 hr ___ MSE Elective..... 3 hr ___ Targeted Elective ⁶ 3 hr ___ Citizenship Theme GE ⁷ 3 hr ___ Student Choice Theme GE ⁷ 3 hr | ___ Physics 5801 ⁸ (<i>Eng Phy Capstone II</i>)..... 3 hr ___ MSE Elective..... 2 hr ___ Targeted Elective ⁶ 3 hr ___ Physics Elective ⁵ 4 hr ___ Student Choice Theme GE ⁷ 3 hr ___ Social and Behavioral Sciences GE..... 3 hr |

Total Hours to complete the degree program = 131; Courses printed in **bold** are taught only during the term shown.

¹ Students can take Physics 1250-1251, 1250H-1251H, 1260-1261, or 1270-1271

² Students can take CSE 1222, CSE 1223, CSE 1224, Astronomy 1221, or Engr 1281H as their programming course

³ GenEd 1201 must be taken within the first three semesters

⁴ Or (Math 2415 and Math 2568) or (Math 2255 and Math 2568) or Math 5520H can be completed in pace of Math 2174.

⁵ Physics Elective options are Physics 3470, 5300, 5401H, 5501, 5600, 5680, and 5810

⁶ A list of Targeted Electives options is available at go.osu.edu/targeted-electives.

⁷ Take either two 3-credit hour classes or one 4-credit hour class for each of the two GE Thematic Pathways requirements. If two 3-hour courses are taken, they must be from different subjects.

⁸ Students can take the College of Engineering Multidisciplinary Capstone Design sequence, Engineering 5901.01-5902.01 in place of Physics 5800-5801. Enrollment in ENGR 5901.01 requires approval. More information about ENGR 5901.01, including the

enrollment request details, can be found on the [Department of Engineering Education website](#).

Engineering Specializations

Engineering Physics students are required to take at least 27 hours from one of the following engineering specializations.

Note: this document outlines the requirements for the **Materials Science and Engineering** (MSE) specialization.

Aerospace Engineering
Chemical & Biomolecular Engineering
Computer Science & Engineering
Electrical and Computer Engineering
Industrial & Systems Engineering
Materials Science & Engineering
Mechanical Engineering
Nuclear Engineering

Requirements for each specialization can be found below and at physics.osu.edu/engineering-physics-program/engineering-physics-degree-requirements

Materials Science and Engineering Specialization

Required courses (11 hours)

| Course | Course title | Credits | Term | Prerequisites |
|----------|---|---------|--------|--|
| MSE 2010 | Introduction to Engineering Materials | 3 | Au, Sp | Physics 1250, 1260, or 1270; and Math 1151; and Chemistry 1210, 1250, or 1910H |
| MSE 2241 | Structure and Characterization of Materials | 3 | Sp | MSE 2010 |
| MSE 2251 | Thermodynamics of Materials | 3 | Sp | MSE 2010 |
| MSE 2331 | Structure and Characterization Lab | 2 | Sp | MSE 2010 |

Electives courses (choose 16 hours)

| Course | Course title | Credits | Term | Prerequisites |
|----------|--|---------|------|--|
| MSE 2321 | Modeling and Simulation Lab I | 3 | Sp | MSE 2010 |
| MSE 3141 | Transformation and Processing of Materials | 3 | Au | MSE 2251 |
| MSE 3151 | Transport Phenomena and Kinetics | 3 | Au | MSE 2010, 2241, and (Math 2174 or 2415) |
| MSE 3261 | Introduction to the Mechanical Behavior of Materials | 3 | Sp | MSE 2010 and (ME 2020 or 2040) |
| MSE 3271 | Electronic Properties | 3 | Sp | MSE 2010, Math 1151, and (Physics 1251, 1261, or 1271) |
| MSE 3321 | Modeling and Simulation Lab II | 2 | Sp | MSE 3231, 3141, and 3151 |

| | | | | |
|-------------|---|-----|--------|--|
| MSE 3331 | Materials Science and Engineering Lab I | 2 | Au | MSE 2331 |
| MSE 3332 | Materials Science and Engineering Lab II | 2 | Sp | MSE 2241, 2331, and 2251 |
| MSE 3611 | Biological Response to Biomaterials | 3 | Sp | MSE 2010 |
| MSE 4181 | Materials Selection | 2 | Au | MSE 2241, 2331, 2251, and 2321 |
| MSE 4321 | Modeling and Simulation-Based Design | 3 | Au | MSE 2321 and 3321 |
| MSE 5431 | Advanced Metals Laboratory | 1 | Au | MSE 2241, 2331, 3141, 3261, and 3332; Prereq or concur: MSE 5441 or 5451 |
| MSE 5441 | Physical Metallurgy | 3 | Au | MSE 3141 and 3261 |
| MSE 5451 | Molten Metal Processing | 3 | Sp | MSE 2251 or 3151 |
| MSE 5531 | Ceramics Processing Laboratory | 1 | Sp | MSE 3141, 3261, 3271, and 3332 |
| MSE 5551 | Ceramic Processing | 3 | Au | MSE 3141 and 3151 |
| MSE 5571.71 | Electroceramics I: Electronic and Ionic Conductors | 1.5 | Sp | MSE 3271 |
| MSE 5571.72 | Electroceramics II: Dielectric, Magnetic, and Optical Ceramics | 1.5 | Au | MSE 3271 |
| MSE 5572 | Ultrafast Laser Materials Processing | 3 | Au | MSE 2241 and MSE 3271 |
| MSE 5575 | Polymer Processing Fundamentals | 3 | Sp | Math 1172; and prereq or concur: Physics 1251, 1261, or 1271 |
| MSE 5631 | Biomaterials Laboratory | 1 | Au | prereq or concur: MSE 5641 |
| MSE 5641 | Structure-Property Relationships of Polymers | 3 | Au | MSE 2010 |
| MSE 5651 | Biomaterials Processing | 3 | Sp | MSE 5641 |
| MSE 5711.70 | Introduction to Composites | 1.5 | Sp | MSE 3261 |
| MSE 5761.71 | Mechanical Behavior of Crystalline Solids at Lower Temperatures | 1.5 | Au | MSE 3261 or 3332 |
| MSE 5763.70 | Fracture and Fatigue of Engineering Materials | 1.5 | Au | MSE 3261 |
| MSE 5951 | Corrosion | 3 | Au, Sp | Senior standing (Rank 4) |
| MSE 5952 | Failure Analysis of Materials | 3 | Sp | Senior standing (Rank 4) |

General Education Requirement

A list of approved general education courses can be found at advising.engineering.osu.edu/current-students/curriculum/general-education