Materials Science and Engineering, M.S.M.S.E.

Curriculum in Master of Science in Material Science and Engineering

A candidate for the M.S. degree in Material Science and Engineering must comply with the rules and regulations outlined in the WVU Graduate catalog and the specific requirements of the Statler College and the specific department in which the student’s concentration is in.

Program Requirements

All M.S. degree candidates are required to perform research and follow a planned program of study. The student’s research advisor, in conjunction with the student’s Advising and Examining Committee (AEC) will be responsible for determining the plan of study appropriate to the student’s needs. The underlying principle of the planned program is to provide the students with the necessary support to complete their degree and prepare them for their career.

Curriculum Requirements

A minimum cumulative GPA of 3.0 is required in all courses

<table>
<thead>
<tr>
<th>Course Requirements *</th>
</tr>
</thead>
<tbody>
<tr>
<td>A minimum of 60% of courses must be from 500 level or above</td>
</tr>
</tbody>
</table>

Core Courses

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAE 583</td>
<td>Thermodynamics and Kinetics of Materials</td>
<td>3</td>
</tr>
<tr>
<td>MAE 580</td>
<td>Crystallography and Crystals</td>
<td>3</td>
</tr>
<tr>
<td>MAE 649</td>
<td>Microscopy of Materials</td>
<td>3</td>
</tr>
<tr>
<td>MAE 694</td>
<td>Seminar</td>
<td>1</td>
</tr>
</tbody>
</table>

Area of Emphasis Requirement

15

Complete 1 of the following options:

- Thesis Option - 6 hours
  - Any 697 Research (6 hours)
  - Written Proposal/Oral Presentation
  - Oral Defense
  - Thesis
  - Final Oral or Written Examination

- Problem Report Option - 9 hours
  - Complete 6 additional hours of coursework
  - Any 697 Research (3 hours)
  - Written Proposal/Oral Presentation
  - Oral Defense
  - Formal written report or professional report/paper
  - Final Oral or Written Examination

Total Hours: 31-34

* All M.S.M.S.E. students, whether pursuing the thesis option or the problem report option, are allowed to include up to a maximum of three (3), 3-credit courses at the 400 level towards the coursework requirements for their degrees.

Final Examination

M.S. students following the thesis or problem report option must prepare a written research proposal. The proposal must be approved by the student’s AEC at least one semester prior to the final oral examination.

All students, regardless of option, are required to pass a final oral or written examination, administered by their AEC, covering the thesis or problem report and/or related course material.

SUGGESTED PLAN OF STUDY

The plan below illustrates the Thesis Option. It is important for students to take courses in the order specified as much as possible; all prerequisites and concurrent requirements must be observed. A typical M.S.M.S.E. degree program that completes degree requirements in two years is as follows.
### First Year

<table>
<thead>
<tr>
<th>Fall</th>
<th>Hours</th>
<th>Spring</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAE 580</td>
<td>3</td>
<td>AOE Course 1</td>
<td>3</td>
</tr>
<tr>
<td>MAE 583</td>
<td>3</td>
<td>AOE Course 2</td>
<td>3</td>
</tr>
<tr>
<td>MAE 649</td>
<td>3</td>
<td>MAE 697</td>
<td>3</td>
</tr>
<tr>
<td>MAE 694</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>10</td>
<td></td>
<td>9</td>
</tr>
</tbody>
</table>

### Second Year

<table>
<thead>
<tr>
<th>Fall</th>
<th>Hours</th>
<th>Spring</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>AOE Course 3</td>
<td>3</td>
<td>AOE Course 5</td>
<td>3</td>
</tr>
<tr>
<td>AOE Course 4</td>
<td>3</td>
<td>MAE 697</td>
<td>6</td>
</tr>
<tr>
<td>MAE 697</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>9</td>
<td></td>
<td>9</td>
</tr>
</tbody>
</table>

Total credit hours: 37

### Areas of Emphasis

- Chemical Engineering Materials (http://catalog.wvu.edu/graduate/collegeofengineeringandmineralresources/collegewidedegrees/materialscienceandengineering/#ChemicalEngineering)

### Chemical Engineering Materials Area of Emphasis Requirements

#### CHE Electives *

Select 2 of the following:

- CHE 461  Polymer Science and Engineering
- CHE 462  Polymer Processing
- CHE 463  Polymer Composites Processing
- CHE 466  Electronic Materials Processing
- CHE 475  Chemical Process Safety
- CHE 531  Mathematical Methods in Chemical Engineering
- CHE 615  Transport Phenomena
- CHE 620  Thermodynamics
- CHE 625  Chemical Reaction Engineering
- CHE 720  Applied Statistical and Molecular Thermodynamics
- BMEG 482  Introduction to Tissue Engineering

Total: 6

#### Additional Electives *

Select 3 of the following:

- CHEM 422  Inorganic Chemistry
- CHEM 423  Inorganic Synthesis Laboratory
- CHEM 444  Colloid and Surface Chemistry
- CHEM 514  Mass Spectrometry Principles and Practices
- CHEM 521  Organometallic Chemistry
- CHEM 547  Chemical Crystallography
- CHEM 713  Electrochemistry and Instrumentation
- CHEM 723  Physical Methods in Inorganic Chemistry
- EE 528  Biomedical Microdevices
- EE 550  Advanced Semiconductor Electronics
- EE 650  Optoelectronics
- MAE 446  Mechanics of Composite Materials
- MAE 528  Introduction to Fuel Cell Technology
- MAE 543  Advanced Mechanics of Materials
- MAE 640  Continuum Mechanics
- MAE 641  Theory of Elasticity 1
- MAE 643  Inelastic Behavior of Engineering Materials

Total: 9
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAE 644</td>
<td>Fracture Mechanics</td>
</tr>
<tr>
<td>MAE 646</td>
<td>Advanced Mechanics of Composite Materials</td>
</tr>
<tr>
<td>MAE 687</td>
<td>Materials Engineering</td>
</tr>
<tr>
<td>PHYS 471</td>
<td>Solid State Physics</td>
</tr>
<tr>
<td>PHYS 771</td>
<td>Introduction to Solid State Physics</td>
</tr>
<tr>
<td>PHYS 772</td>
<td>Semiconductor Physics</td>
</tr>
<tr>
<td>PHYS 773</td>
<td>Collective Phenomena in Solids</td>
</tr>
<tr>
<td>PHYS 774</td>
<td>Optical Properties of Solids</td>
</tr>
</tbody>
</table>

Total Hours 15

* Students completing the problem report option must take an additional 2 courses (6 credit hours) from either set of electives.

**Major Learning Outcomes**

**MASTER OF SCIENCE IN MATERIALS SCIENCE AND ENGINEERING (MSMSE)**

Upon graduation, with a Masters of Science degree in Materials Science and Engineering, students will have:

- An expert level understanding of the advanced principles of their engineering specialty
- Ability to apply advanced methodologies in their specialty area
- Ability to design and conduct original experiments, analyze and interpret data, and develop recommendations with a high degree of independence
- Advanced ability to use contemporary techniques, skills, and tools necessary for engineering practice in education, industry, and/or government
- Ability to effectively communicate technical information in the form of a thesis, scientific publication or presentation
- Understanding of professional and ethical responsibility
- Ability to understand the impact of engineering solutions in global and societal context
- Recognition of the need to engage in life-long learning
- Foundational preparation to pursue doctoral studies