Materials Science & Engineering

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Interdisciplinary PhD in Materials Science & Engineering

To earn a PhD degree, students must complete the requirements of the McKelvey School of Engineering, along with program-specific requirements. Courses include the following:

- Four IMSE Core Courses (12 units)

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>MEMS 5610</td>
<td>Quantitative Materials Science &amp; Engineering</td>
<td>3</td>
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<tr>
<td>Physics 537</td>
<td>Kinetics of Materials</td>
<td>3</td>
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<tr>
<td>EECE 502</td>
<td>Advanced Thermodynamics in EECE (or a new thermodynamics course to be offered through MEMS in Fall 2023)</td>
<td>3</td>
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<tr>
<td>Chem 5620</td>
<td>Solid-State and Materials Chemistry (or Physics 5072 Solid State Physics)</td>
<td>3</td>
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- Total Units: 12

- Two semesters of IMSE 500 First-Year Research Rotation (6 units)
- Three courses (9 units) from a preapproved list of Materials Science & Engineering electives
- A minimum of three graduate-level technical elective courses (9 units) in mathematics or any science or engineering department, to reach a total of at least 36 academic credit units
  - A maximum of 3 units of IMSE 505 Material Science Journal Club will be permitted toward this requirement.
  - Any 400-level courses not included on the preapproved list of Materials Science & Engineering electives must be approved by the Graduate Studies Committee.
- A maximum of 12 units of 400-level courses may be applied toward the required 36 academic credit units. Undergraduate-only courses (below the 400 level) are generally not permitted and may not be used to fulfill this requirement.
- IMSE 501 IMSE Graduate Seminar every semester of full-time enrollment
- 18 to 36 units of IMSE 600 Doctoral Research (Students must identify an IMSE faculty member willing and able to support their dissertation research on a materials-related topic.)
- Students must maintain a grade-point average of at least 3.0 for all graded courses and have no more than one grade of B- or below in a core course or a Materials Science & Engineering elective.

Additional program requirements include the following:

- Pass the IMSE Qualifying Examination (oral and written components)
- Identify an IMSE graduate program faculty member willing and able to support the student's dissertation research on a materials-related topic
- Maintain satisfactory research progress on a topic in materials science and engineering, as determined by the dissertation advisor and the mentoring committee
- Successfully complete research ethics training by the end of the third semester
- Successfully complete teaching requirements by the end of the third year:
  - Attend two or more Teaching Center workshops
  - Complete 15 units of Mentored Teaching Experience
  - Successfully complete the dissertation proposal and presentation, with approval from the dissertation examination committee
- Successfully complete and defend a PhD dissertation, with final approval from the dissertation examination committee

Failure to meet these requirements will result in dismissal from the program.

Recommended Course Plan

Year 1

Fall Semester (12 credits)

- IMSE First-Year Research Rotation IMSE 500
- IMSE Graduate Seminar (IMSE 501)
- Quantitative Materials Science & Engineering (MEMS 5610)
- Graduate course on advanced thermodynamics of materials (EECE 502 or new MEMS course in development)*
- Elective

* Students entering in Fall 2022 will complete their thermodynamics requirements in Fall 2023. These students should take an additional elective in Fall 2022.

Spring Semester (12 credits)

- IMSE First-Year Research Rotation IMSE 500
- IMSE Graduate Seminar (IMSE 501)
- Kinetics of Materials (Physics 537)
- Solid State Physics (Physics 5072) (if Chem 5620 not taken in Fall) or elective
- Elective
Summer

- Begin dissertation research
- Prepare for IMSE Qualifying Examination (typically taken in August):
  - Written document and oral presentation on research rotation
  - Oral examination on fundamentals from core courses
- Participate in Graduate Student Mentored Teaching Orientation offered through the Teaching Center in August

Years 2 and Beyond

- Fall 2022-entry students only: Complete EECE 502 Advanced Thermodynamics in EECE or new course on thermodynamics of materials to be offered by MEMS in Fall 2023
- Complete remaining electives (discuss with dissertation advisor)
- IMSE Graduate Seminar (IMSE 501)
- Doctoral Research (IMSE 600)
- Teaching requirements (to be completed by the end of the third year):
  - Attend two or more Teaching Center workshops
  - Complete 15 units of Mentored Teaching Experience
- Regular meetings (at least once per year) with the mentoring committee
- Dissertation proposal and presentation (fifth semester)
- Dissertation and oral defense