M.S. in Metallurgical and Materials Engineering

The Metallurgical and Materials Engineering Department offers a Master of Science with a major in Metallurgical and Materials Engineering and an undesignated Master of Science with a major in Engineering.

Admission Requirements

General requirements for admission are described in the Admissions section of the Graduate Catalog. Specific admission requirements for the Master’s Program in Metallurgical and Materials Engineering are described below.

1. Undergraduate or graduate degree in Metallurgical and Materials Engineering or a related field from an ABET accredited institution in the United States, or proof of equivalent education from an international institution.
2. Demonstration of academic achievement and potential as indicated by the results of the Graduate Record Examination (GRE), and upper-level undergraduate and graduate coursework. The GRE requirement is waived for students from UTEP.
3. Three letters of recommendation.
4. A written statement of intent, describing his/her career goals and describing his/her vision of the path to those goals (including a summary of previous preparation and of his/her expectations from the graduate program).
5. Submission of a CV/resume summarizing, professional and academic experience and any other evidence of background, knowledge, research, or work experience in Metallurgical and Materials Engineering that may be available.
6. Applicants from countries where English is not the first language are required to demonstrate English proficiency. Please consult the graduate school website for required scores.

Applicants whose undergraduate degrees are not in Metallurgical or Materials Engineering (i.e., a related engineering or physical sciences field) might need to successfully complete specific undergraduate deficiency work as recommended by the Graduate Program Director or Committee.

Additionally, applicants must submit evidence of successful completion (or equivalent) of coursework that includes:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MME 3306</td>
<td>Rate Processes</td>
<td>3</td>
</tr>
<tr>
<td>MME 3308</td>
<td>Appl Chemical Thermodynamics</td>
<td>3</td>
</tr>
<tr>
<td>MME 3406</td>
<td>Nanofctnl Physical Metallurgy</td>
<td>4</td>
</tr>
<tr>
<td>MME 3407</td>
<td>Mechanical Behavior of Matls</td>
<td>4</td>
</tr>
</tbody>
</table>

Degree Requirements

Two options are available for students: Thesis and Non-Thesis (Project or Course Only):

<table>
<thead>
<tr>
<th>Program</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thesis Program</td>
<td>24 semester hours of coursework</td>
</tr>
<tr>
<td></td>
<td>6 semester hours of thesis (MME 5398 and MME 5399)</td>
</tr>
<tr>
<td></td>
<td>30 total semester hours minimum</td>
</tr>
<tr>
<td>Project Program</td>
<td>30 semester hours of coursework</td>
</tr>
<tr>
<td></td>
<td>6 semester hours of project (MME 5396 and MME 5397)</td>
</tr>
<tr>
<td></td>
<td>36 total semester hours minimum</td>
</tr>
</tbody>
</table>

Specific Requirements for Thesis Students

All students must take at least 21 hours of Metallurgical and Materials Engineering elective courses. In addition, the degree plan can include three (3) credit hours of approved coursework in areas outside the Metallurgical and Materials Engineering Program or three (3) credit hours of Individual Studies.

Thesis work should clearly demonstrate the student’s ability to execute independent, innovative research. The research should be original and make a contribution to the state of the art. Thesis work is the substance of the MS degree. It must be written, in whole or in part, as a technical paper and submitted to a peer-reviewed journal prior to scheduling the thesis defense. The student should be the first author along with the research advisor, if applicable.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MME 5398</td>
<td>Thesis</td>
<td>6</td>
</tr>
<tr>
<td>MME 5399</td>
<td>and Thesis</td>
<td></td>
</tr>
</tbody>
</table>

Thesis Option: Select ten additional hours of Graduate MME courses 10

Total Hours 30
Specific Requirements for Non-Thesis Project Students

Students in the Non-Thesis Project Option must take 36 hours approved by the Graduate Advisor Program Director, which include MME 5396 Graduate Projects and MME 5397 Graduate Projects. In addition, the degree plan can include three (3) credit hours of approved coursework in areas outside the Metallurgical and Materials Engineering Program or three (3) credit hours of Individual Studies. A report must be submitted to the supervising project instructor. The project courses (MME 5396 Graduate Projects and MME 5397 Graduate Projects) cannot be counted toward requirements in the Thesis Option. All students must successfully complete all program courses with at least a 3.0 GPA or better.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MME 5396</td>
<td>Graduate Projects</td>
<td>6</td>
</tr>
<tr>
<td>&amp; MME 5397</td>
<td>and Graduate Projects</td>
<td></td>
</tr>
<tr>
<td>Select sixteen hours of Graduate MME courses</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>Total Hours</td>
<td></td>
<td>36</td>
</tr>
</tbody>
</table>

Advisory Committees

The department faculty, as well as the Graduate School, will approve all program curricular proposals. The Graduate Program Director will monitor the academic progress of all graduate students until a thesis or research advisor is chosen. This can be done at any time after the student matriculates into the MS program. The student will form a Research Advisory Committee that will consist of the research advisor (who serves as chair) and at least one additional member of the department faculty and one faculty member from another academic department. An additional member of the committee is often desirable if a concentration is involved, bringing the committee size to four members. All members of the committee must be members of the Graduate Faculty. Students are required to meet with their Research Advisory Committee at least once per year.

Degree Plan

Required Core Courses

The required sequence of courses below is designed to apply the principles of thermodynamics, transport, reaction kinetics, crystal defects, and other materials fundamentals in contemporary materials-engineering areas involving and reinforcing issues of structure, properties, processing, and performance.

For the core courses listed below, a minimum grade of B is required:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
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</thead>
<tbody>
<tr>
<td>MME 5302</td>
<td>Matls Extrac, Synth, &amp; Process</td>
<td>3</td>
</tr>
<tr>
<td>MME 5401</td>
<td>Microstruc &amp; Microchem Charac</td>
<td>4</td>
</tr>
<tr>
<td>MME 5403</td>
<td>Adv Concepts in Matls Sci Engr</td>
<td>4</td>
</tr>
<tr>
<td>MME 5304</td>
<td>Phase Transformations &amp; Micros</td>
<td>3</td>
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</tbody>
</table>

Thesis Option

<table>
<thead>
<tr>
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<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MME 5398</td>
<td>Thesis</td>
<td>6</td>
</tr>
<tr>
<td>&amp; MME 5399</td>
<td>and Thesis</td>
<td></td>
</tr>
<tr>
<td>Thesis Option: Select ten additional hours of Graduate MME courses</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Total Hours</td>
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<td>30</td>
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</table>

Non-Thesis Option

<table>
<thead>
<tr>
<th>Code</th>
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</tr>
</thead>
<tbody>
<tr>
<td>MME 5396</td>
<td>Graduate Projects</td>
<td>6</td>
</tr>
<tr>
<td>&amp; MME 5397</td>
<td>and Graduate Projects</td>
<td></td>
</tr>
<tr>
<td>Select sixteen hours of Graduate MME courses</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>Total Hours</td>
<td></td>
<td>36</td>
</tr>
</tbody>
</table>

Graduate MME Courses

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
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<tbody>
<tr>
<td>MME 5191</td>
<td>Individual Studies</td>
<td>1</td>
</tr>
<tr>
<td>MME 5194</td>
<td>Graduate Research</td>
<td>1</td>
</tr>
<tr>
<td>MME 5195</td>
<td>Graduate Seminar</td>
<td>1</td>
</tr>
<tr>
<td>MME 5245</td>
<td>Electron Microscopy Appl</td>
<td>2</td>
</tr>
<tr>
<td>MME 5294</td>
<td>Graduate Research</td>
<td>2</td>
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</tbody>
</table>
M.S. in Metallurgical and Materials Engineering

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<td>3</td>
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<tr>
<td>MME 5304</td>
<td>Phase Transformations &amp; Micros</td>
<td>3</td>
</tr>
<tr>
<td>MME 5308</td>
<td>Mechanical Behavior of Matls</td>
<td>3</td>
</tr>
<tr>
<td>MME 5311</td>
<td>Ceramics</td>
<td>3</td>
</tr>
<tr>
<td>MME 5313</td>
<td>Advanced Matrls &amp; Composites</td>
<td>3</td>
</tr>
<tr>
<td>MME 5314</td>
<td>Polymer Engineering</td>
<td>3</td>
</tr>
<tr>
<td>MME 5315</td>
<td>Metallography and Micro Inter.</td>
<td>3</td>
</tr>
<tr>
<td>MME 5321</td>
<td>Engineering Alloys</td>
<td>3</td>
</tr>
<tr>
<td>MME 5331</td>
<td>Biomaterials</td>
<td>3</td>
</tr>
<tr>
<td>MME 5333</td>
<td>Biofabrication</td>
<td>3</td>
</tr>
<tr>
<td>MME 5342</td>
<td>Hydrometallurgy</td>
<td>3</td>
</tr>
<tr>
<td>MME 5350</td>
<td>Material Joining Technologies</td>
<td>3</td>
</tr>
<tr>
<td>MME 5351</td>
<td>Non-Destructive Examination</td>
<td>3</td>
</tr>
<tr>
<td>MME 5352</td>
<td>Root Cause Analysis</td>
<td>3</td>
</tr>
<tr>
<td>MME 5353</td>
<td>Fracture Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>MME 5390</td>
<td>Special Topics</td>
<td>3</td>
</tr>
<tr>
<td>MME 5391</td>
<td>Individual Studies</td>
<td>3</td>
</tr>
<tr>
<td>MME 5394</td>
<td>Graduate Research</td>
<td>3</td>
</tr>
<tr>
<td>MME 5396</td>
<td>Graduate Projects</td>
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<td>MME 5397</td>
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<td>Adv Concepts in Matls Sci Engr</td>
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<tr>
<td>MME 5494</td>
<td>Graduate Research</td>
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<td>MME 5594</td>
<td>Graduate Research</td>
<td>5</td>
</tr>
<tr>
<td>MME 5694</td>
<td>Graduate Research</td>
<td>6</td>
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</table>

Undesignated Degrees

A student holding a Bachelor of Science with a major in Metallurgical and Materials Engineering or a related materials area can work toward a 33-semester-hour undesignated MS in Engineering degree without a thesis, leading to a concentration in an area outside of the major. The coursework includes 18 hours in the major field and at least 12 hours in the particular area of concentration. The work in the major field includes credit for MME 5396 Graduate Projects. Possible areas of concentration are indicated below.

Interdisciplinary Concentrations

Possible concentrations for an undesignated degree or to complement a research area or to achieve a broader materials background can involve Business Management, Operations Research, Structural Mechanics, Electronic Device Design and Development, Experimental Design, Manufacturing Engineering emphasizing advanced manufacturing and Materials Processes, Waste Materials Management, and the like. Some examples of other engineering courses which might contribute to developing these areas include the following:

Civil Engineering

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CE 5305</td>
<td>Advanced Structural Analysis</td>
<td>3</td>
</tr>
<tr>
<td>CE 5312</td>
<td>Environmental Processes</td>
<td>3</td>
</tr>
<tr>
<td>CE 5317</td>
<td>Stats Methods for Civil Eng</td>
<td>3</td>
</tr>
</tbody>
</table>

Electrical Engineering and Computer Science

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<tr>
<th>Code</th>
<th>Title</th>
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</tr>
</thead>
<tbody>
<tr>
<td>EE 5311</td>
<td>Semiconductor Device Physics</td>
<td>3</td>
</tr>
<tr>
<td>EE 5312</td>
<td>Advanced Optoelectronic Device</td>
<td>3</td>
</tr>
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</table>

Mechanical/Industrial/Manufacturing Engineering

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<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>IE 5351</td>
<td>Linear and Combin Optimiz Meth</td>
<td>3</td>
</tr>
<tr>
<td>or MECH 5351</td>
<td>Intro to 3D Eng &amp; Additive Mfg</td>
<td></td>
</tr>
<tr>
<td>IE 5352</td>
<td>Design/Analysis Indust Exprmnt</td>
<td>3</td>
</tr>
</tbody>
</table>
M.S. in Metallurgical and Materials Engineering

IE 5390 or MECH 5390

Special Topics Industrial Engr
Special Topics Mechanical Engr

**Metallurgical and Materials Engineering or Materials Engineering Concentration**

Students from other Science or Engineering disciplines might wish to develop a concentration in Metallurgical and Materials Engineering or Materials Engineering. In general, a concentration could be developed by considering the core program:

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**Other Concentrations**

Other concentrations could be developed by other groupings of courses or areas represented by course groupings. The first three core courses shown above from the MS program are also articulated with the PhD program core in materials science and engineering. Students completing the MS degree in Metallurgical and Materials Engineering and pursuing the PhD degree in Materials Science and Engineering can waive MASE 6400, and MASE 6402, substituting work as recommended by the Graduate Program Director.