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The Materials Science and Engineering PhD Program

The flexibility of the materials science and engineering program encourages students to explore topics at the boundaries between traditional disciplines. There are many research and educational thrusts in materials at ASU that span a wide range of cutting-edge and cross-disciplinary topics including understanding the structure-property relationships of nanomaterials, and applications in energy, security, and sustainability. The doctoral programs emphasize original research and provide students with a strong background for employment by academic institutions, government laboratories and industrial research laboratories. SEMTE offers a broad-based curriculum in materials characterization and modelling, electronic materials, mechanical properties, 2-D materials, energy generation and storage, and engineering education. Modern materials fabrication and characterization facilities are available to support research investigations. The following sections provide information about program requirements, policies, and curricula.

Plan of Study

Students are able to submit a Plan of Study from the first day of their graduate studies. The Plan of Study (iPOS) is an interactive web based form that graduate students complete and which outlines all coursework required to obtain their degree. Doctoral students should file the iPOS no later than their 8th week of their second semester. Students should read the Graduate College Policies on the plan of study requirements.

All SEMTE graduate students are required to submit and have their Plan of Study (iPOS) approved prior to registration for their third semester classes. This means students will have a hold placed on their account before they begin their third semester. To prepare for this, students are expected to make use of their first semester in the program getting to know faculty, selecting a faculty advisor, and creating their Plan of Study to demonstrate their intended path to graduate from the program.

Audited courses do not apply toward the degree program and cannot be listed on the iPOS. In general, SEMTE graduate students are typically not granted permission to audit a course. Special requests to audit courses must be submitted to the graduate program chair after approval by the faculty chair.

Program Policy on Maximum Course Load

Per the Graduate College, registration in nine credits is considered a full-time load for graduate students. SEMTE students are restricted to 11 credit hours per semester. RAs or TAs will be allowed to take 12 credit hours with confirmation of their approved TA or RA position.

Academic Standing

A student who has been admitted to an MS, MSE, or PhD degree program in Materials Science & Engineering, with either regular or provisional admission status, must maintain a 3.0 or higher grade point average (GPA) as stated below.

Updated: 5/22/18
1. In all work taken for graduate credit (courses numbered 500 or higher);
2. In the coursework on the student’s approved program of study, and
3. In all post baccalaureate coursework taken at ASU (overall GPA).

A. A student will be placed on academic probation if:
   - One or more of the student's GPAs listed above falls below 3.0;
   - Or the student receives a grade of D or E in a course at the 400 level or above;

   Students will be notified by mail when placed on academic probation.

B. A student will return to academic good standing by obtaining a minimum 3.0 in the
   GPAs listed above by the time the next nine hours are completed. Coursework such as
   research and thesis/dissertation registration that are for Z or Y grade cannot be included
   in these nine hours.

C. A student may be recommended for dismissal from a graduate program if:
   - The student fails to increase all of the GPAs listed above to a minimum of 3.0 by
     the time he/she completes the next nine credit hours as defined in section B;
   - Or the student receives a grade of D or E while on academic probation for any
     reason;
   - Or a provisionally admitted student fails to meet the required provision(s) of
     admission.

A student may appeal actions concerning dismissal by petitioning the departmental unit in
which they are enrolled.

Core Courses
Students can petition to waive any core course if they have taken an equivalent graduate
course at another accredited university and have achieved a grade of B or better. No more
than two core courses may be waived. Students must provide proof in the form of transcripts
and a syllabus of that course. A petition should be submitted to the graduate program chair
who reviews requests for waivers or substitutions of the core courses. The students must take
an approved technical elective in place of the waived core course. Students will be responsible
for material from waived courses during the qualifying exam (if applicable).

Students wanting to repeat a core course must have approval from their faculty advisor to
repeat the course. All core course grades will be used in calculating the core course GPA for
waiver of the qualifying exam.
**Dissertation**

The dissertation topic can be initiated by either the student or the faculty advisor. The dissertation must be composed of original work and archival journal publications should result from the research project. Students must meet SEMTE deadlines for submission.

**Selection of Faculty Advisor and Research Topic**

Of paramount importance to a successful doctoral student is the selection of a suitable research topic. The selection of the research topic is the student’s responsibility. Students are urged to select a topic and a faculty advisor early in their plan of study, and no later than the end of the first semester in residence. The faculty advisor or co-advisors selected must be part of the graduate faculty for Materials Science and Engineering and can be found on the following website: [https://graduateapps.asu.edu/graduate-faculty/degree/G3](https://graduateapps.asu.edu/graduate-faculty/degree/G3)

In the selection of a faculty advisor, students should interview faculty members and select an advisor and dissertation topic that matches their goals and interests. Students must obtain the agreement of the faculty member to serve as the faculty advisor and chair of the dissertation committee.

The faculty advisor supervises the research performed by the student. This requires that the faculty member understands the time involved in helping the student complete the plan of study and to coordinate the coursework and research activities. The faculty advisor guides the student in the selection of the other members that would serve on the dissertation committee. One member of this committee must also be a member of the MSE Program Faculty. Frequent contact between the student and the faculty advisor is necessary to accurately define the research project. This helps to ensure that the student's research prospectus is acceptable.

**Doctor of Philosophy (PhD) Program**

The following chart summarizes the chronological steps which should be followed by Ph.D. students. These guidelines vary, as some students may take longer to complete the dissertation for various reasons.

- **Gain Admission to the PhD Program**
  - Select a faculty advisor and begin research by the 8th week of their 2nd semester

- **Complete and submit a Plan of Study (iPOS)**
  - by the 8th week of their 2nd semester

- **Successfully complete the four core courses**
  - by 3rd semester

Updated: 5/22/18
Take and pass the qualifying examinations (if needed) by the end of 2nd or 3rd semester
Complete remaining technical electives by 4th semester
Prepare draft of the dissertation prospectus 3rd year
Take and pass the comprehensive examinations end of the 3rd year
Apply for graduation 4th year
Schedule the dissertation defense 4th year

Selection of a PhD Dissertation Committee
Students must select a committee which consists of a minimum of 3 to a maximum of 5 faculty members. The chair or at least one co-chair of the committee must be a member of the graduate faculty approved to chair a dissertation committee in the Materials program. There must be a majority of graduate faculty on a student’s faculty committee. At least one member of the committee must be a member of the Materials Science and Engineering (Undergraduate) Program Faculty. Academic professionals, research scientists, industrial professionals and other non-ASU faculty may serve on dissertation committees with approval of the program chair and the Office of Graduate Education. There is an approval process for these individuals and students should contact their academic advisor for instructions.

PhD Qualifying Exam
All doctoral students are required to take an oral qualifying examination except for those that earn a cumulative GPA of 3.5 or above in completed core course subjects. The qualifying exam tests the students’ knowledge on the four core subjects: MSE 523: Structures and Mechanical Properties, MSE 524: Advanced Thermodynamics, MSE 561: Kinetics and Phase Transformations, and MSE 598: Fundamentals of Electrical, Optical, and Magnetic Materials and Device Applications. This exam is to be taken no later than three (3) semesters (excluding summer sessions) after admission to the doctoral program.

Students may be allowed one retest, although not guaranteed, and must petition the program to retake the exam. If students fail the test twice, they will be recommended for dismissal from the program. However, upon failure of the qualifying exam, students may be given the option of pursuing the master’s degree. Students who have had more than one core course waived, are required to take the qualifying exam.

Comprehensive Examination and Dissertation Prospectus
All doctoral students are required to take comprehensive examination and to submit a dissertation proposal prospectus and presentation. A Doctoral Plan of Study must have been submitted and approved prior to scheduling the comprehensive exam. Students must schedule
an appointment with Academic Advisor in the Graduate Advising Office to be advised of any recent procedural changes and/or academic issues. Students must be registered in at least one credit hour during the semester in which they plan to complete the comprehensive exams and dissertation proposal prospectus. All members of the dissertation committee must be listed and approved on the plan of study (iPOS). Students should prepare to take the comprehensive examinations no later than 18 months after completing the core courses and passing the qualifying examinations (if applicable).

**Format for the Comprehensive Examinations**
The comprehensive examination is made up of two components: a written document and an oral presentation. These written and oral components are designed to test the student’s mastery in the student’s research area. Failure in the comprehensive examinations is considered final. Should a failure occur, a one-time re-examination request may be petitioned and must be approved by the dissertation committee, the head of the academic unit, and the Office of Graduate Education. A re-examination may be administered no sooner than three months and no later than one year from the date of the original examination. A student who fails the comprehensive examination twice is recommended for dismissal from the doctoral program for not making satisfactory academic progress. The comprehensive exams in the Materials Science and Engineering Graduate Program are administered by the dissertation committee. Before the exam can take place, it must be scheduled through the Graduate Advising Office.

**Written Component**
In preparing for the future defense, students are required to write a paper on the dissertation topic called the “dissertation prospectus.” The document may deal with experimental or theoretical research, or a combination of the two. Actual independent research on the proposal is expected to be carried out by the student and should be included. Students should consult with their dissertation committee to determine the appropriate structure of the prospectus. However, a typical dissertation prospectus contains:

- Literature review (note: a more comprehensive literature review is expected for the dissertation)
- Description of the proposed research and the goals of the research
- Discussion of the significance of the research in the materials field
- Statement of the hypothesis/hypotheses to be tested
- Description of the research methodology
- Discussion of the specific data to be collected
- Description of the means by which the data will be analyzed
- Description of the results or conclusions obtained to date
- Timeline towards graduation

**Format Guidelines**

Updated: 5/22/18
The length of the paper should be no less than 25 pages including figures and references. Spacing is 1.5, left margin 1.25", right margin 1", top and bottom margins 1", including page numbers. The document should include a table of contents, an abstract, introduction, and reference page(s). Acknowledgements should be included if others participated in data collection and analysis and if there were agencies which supported or funded the research. A copy of the future works with deliverables and timelines must be included in the document and submitted with the signed Report of Doctoral Comprehensive Examinations / Dissertation Proposal Prospectus form. The student must give the members of his/her dissertation committee copies of the document no less than seven (7) business days prior to the scheduled examination. The faculty committee members will read the prospectus and prepare questions for the exam.

**Oral Component**

The oral presentation of the dissertation prospectus to the faculty committee is designed to test the student’s overall comprehension of the problem selected for investigation. It also provides a forum for the student to receive input and advice from experienced researchers.

Approval of the prospectus implies that the proposed research is suitable for a Ph.D. degree and can be accomplished within the resources available. It does not guarantee that the student’s effort in conducting research will, in all cases, satisfy the requirements for a successful defense.

**Presentation Guidelines**

The presentation must be scheduled through the Graduate Advising Office. The student is responsible for bringing the paperwork that they have received from the Office of Graduate Education. **The chair or both chairs must be physically present at the presentation. Only one member is allowed to video/telephone into the presentation.** The oral presentation should take approximately 30 minutes (~15-20 slides). The total time of the examination including committee deliberation should not exceed an hour and a half. The student may be questioned on his/her presentation during the course of the examination or the committee can choose to wait until the presentation is finished to have a question-and-answer period. After the student finishes his/her oral presentation, he/she and other non-committee members are excused from the room to allow the committee members to discuss the presentation and to make a decision to "pass or fail" the student. Finally, the student must submit all forms and the timeline toward graduation slide to the Graduate Advising Office.

**Master’s in Passing**

The Materials program established a Master's in Passing (MIP) for doctoral students who maintain good standing in the program and wish to obtain a Master's degree once they completed significant milestones in the doctoral program.

**Conditions for the Master’s Degree in Passing in Materials Science and Engineering:**
• Students must be in good standing in the doctoral program and must have passed the written and oral Ph.D. comprehensive exams
• Students must not already have a previously awarded Master’s degree, regardless of discipline and/or country/institution
• Students maintain a cumulative grade point average of 3.0 or higher
• Students have successfully completed twenty-four (24) credit hours of approved graduate courses at ASU (as outlined in degree requirements) including two (2) credits of student seminar, and six (6) credits of core courses

PhD Candidacy
PhD students achieve candidacy status in a letter from the Graduate College Dean upon passing the comprehensive examination and successfully defending the dissertation prospectus with an approved iPOS on file. This is sent directly from the Graduate College and is found in the MyASU system.

PhD Dissertation Defense
The dissertation defense is an oral and public examination administered by the dissertation committee in accordance with Graduate College guidelines. The purpose of the examination is to evaluate the student's research efforts and written presentation (dissertation), and to determine if the candidate is worthy of receiving a PhD degree. The emphasis of this examination is on the student's research as detailed in the dissertation and the general areas of study related to it. It is the student’s responsibility to adhere to and be familiar with the deadlines set forth by the Graduate College regarding defenses. Students must be registered in at least one credit hour at the time of their defense. Before the defense can take place, it must be scheduled through the Graduate Advising Office.

Office of Graduate Education Policies
The Graduate College must have final approval of all plans of study and is responsible for the conferral of the degree. All SEMTE policies must abide by Graduate College policies, although the School may impose stricter guidelines. Students are thus responsible for reading, understanding, and abiding by all of the policies found in the Graduate College Handbook as well as all SEMTE policies as described herein.

Graduate Student Academic Advising
The initial advising of all incoming students is carried out by the SEMTE Graduate Academic Advising Office prior to the student’s arrival to ASU. Throughout the student’s graduate program, the SEMTE Graduate Academic Advising Office can assist with the process towards completing the degree (i.e. registration, iPOS questions), but not with academic content. Questions involving academic content should be directed to either the faculty chair or the graduate program chair.
**Professionalism and Honor Code**

Ethics and professional conduct are cornerstones of the Engineering profession and graduate students are fully expected to adhere to these expectations. Ethical violations (e.g. “cheating”) and unprofessional conduct with regards to faculty and staff will not be tolerated.

ASU has an approved Honor Code to which the students have to adhere.
# Checksheet (with previously awarded Master’s Degree)

**Materials Science & Engineering (MSE) PhD Degree Checksheet**

**With previously awarded Master’s Degree**

<table>
<thead>
<tr>
<th>Name</th>
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**Previously Awarded Master’s Degree**

**MSE Seminar**

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<th>Term Taken</th>
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**MSE Core Courses**

If approved equivalent courses were completed as part of a Master’s degree, additional technical electives equivalent to those total credit hours must be taken.

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<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Term Taken</th>
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<tbody>
<tr>
<td>MSE 523</td>
<td>Structural and Mechanical Properties of Materials (Fall ONLY)</td>
<td>3</td>
</tr>
<tr>
<td>MSE 524</td>
<td>Advanced Thermodynamics (Fall ONLY)</td>
<td>3</td>
</tr>
<tr>
<td>MSE 561</td>
<td>Phase Transformation, Kinetics, &amp; Diffusion in Solids (Spring ONLY)</td>
<td>3</td>
</tr>
<tr>
<td>MSE 598</td>
<td>Fund of Elec, Optical &amp; Magnetic Mtls &amp; Device App (Spring ONLY)</td>
<td>3</td>
</tr>
</tbody>
</table>

**Core GPA:**

3.5 Core GPA required to waive Qualifying Exam. Students required to take the qualifying exam MUST do so at the end of the second term of the program, and no later than the end of the third.

**Technical Electives**

*From MSE, CHM, PHY, EEE, MAE, CHE or by faculty advisor approval. Must be completed at the 500+ level*

<table>
<thead>
<tr>
<th>Course</th>
<th>Term Taken</th>
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<tbody>
<tr>
<td>MSE 792 Research</td>
<td>24</td>
</tr>
<tr>
<td>MSE 799 Dissertation</td>
<td>12</td>
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</tbody>
</table>

**Total Credit Hours**

84
# Checksheet (no previous Master’s Degree Awarded)

## Materials Science & Engineering (MSE) PhD Degree Checksheet

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## MSE Seminar

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## MSE Core Courses

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Term Taken</th>
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<tbody>
<tr>
<td>MSE 523</td>
<td>Structural and Mechanical Properties of Materials (Fall ONLY)</td>
<td>3</td>
</tr>
<tr>
<td>MSE 524</td>
<td>Advanced Thermodynamics (Fall ONLY)</td>
<td>3</td>
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<tr>
<td>MSE 561</td>
<td>Phase Transformation, Kinetics, &amp; Diffusion in Solids (Spring ONLY)</td>
<td>3</td>
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<tr>
<td>MSE 598</td>
<td>Fund of Elec, Optical &amp; Magnetic Mtls &amp; Device App (Spring ONLY)</td>
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### Core GPA: __________

3.5 Core GPA required to waive Qualifying Exam. Students required to take the qualifying exam MUST do so at the end of the second term of the program, and no later than the end of the third.

## Technical Electives

From MSE, CHM, PHY, EEE, MAE, CHE or by faculty advisor approval. Must be completed at the 500+ level

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## MSE 792 Research

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## MSE 799 Dissertation

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## Additional Research/Elective Hours

Any combinations of additional research hours (MSE 792) and/or technical electives.

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## Total Credit Hours

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Updated: 5/22/18