Materials Science and Engineering Graduate Program

Graduate Student Handbook

Academic Year 2012-2013

Materials Science and Engineering Graduate Program
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Introduction

1. Objective of the Handbook

This handbook describes the academic degree requirements, policies and practices for graduate students in the Materials Science and Engineering (MSE) Graduate Program at Arizona State University (ASU). The handbook serves as a guide by outlining the requirements for each degree, important milestones, and rules and policies established by the ASU Graduate College and the Fulton Schools of Engineering (FSE). It also outlines the standards of performance and integrity expected of graduate students in the materials program. In some cases, inconsistencies may arise between the contents of this handbook and the policies of the ASU Graduate College and the Fulton Schools of Engineering as these policies change every year. In these cases, the university published rules and policies take precedence. Please report any inconsistencies to the materials graduate advisor.

2. Graduate Student Responsibility to Understand Policies and Procedures

It is the responsibility of the graduate student to know, understand, observe and adhere to all policies and procedures outlined in this handbook as well as those policies of the university, Graduate College and Ira A. Fulton Schools of Engineering.

3. Overview of the Graduate Program

The Materials Science and Engineering Graduate Program is ranked nationally among public research institutions and encourages students to explore topics at boundaries between traditional disciplines. Graduate students can choose graduate faculty mentors from a diverse group of engineering units, as well as from the departments of physics and chemistry, and various research institutes on campus. Our research spans a wide range of cutting-edge areas which include, but are not limited to:

- Applied nanobioscience
- Computation modeling
- Electronic materials
- Energy and sustainability
- Microscopy (transmission electron microscopy and scanning probes)
- Nanoelectronics
- Nanomechanics
- Photonics
The materials web site has a list of the graduate faculty who are performing research in these areas:
http://engineering.asu.edu/research/programs/mse

Students in the program have access to many laboratory and research facilities including four large research facilities: The LeRoy Eyring Center for Solid State Science, the Center for Solid State Electronics Research, The Flexible Display Center, and the Biodesign Institute. A list of research centers can be found on our web site at: http://engineering.asu.edu/research/centers

4. Academic Degrees and Programs

The Materials Science and Engineering Graduate Program offers two graduate degrees in materials science and engineering: Doctor of Philosophy (Ph.D.); the Master of Science (thesis and non-thesis options). The program also offers a Master's in Passing for doctoral students who do not already have a previously awarded Master's Degree and an accelerated joint bachelor's/master's program (Four + One Program) for high achieving ASU MSE undergraduate students. Information on the specific requirements for the degrees can be found later in this document.

5. Admissions

Admission information may be found on our website:
http://engineering.asu.edu/semte/materials_check.html

6. Doctor of Philosophy Degree

6.1 Goal of the Doctoral Program

The Doctor of Philosophy degree is the highest university degree. It is granted to students upon evidence of excellent in research and the demonstration of independent, creative scholarship culminating in a dissertation. Coursework in the doctoral program focuses primarily on the engineering science concepts. As students advance in the program, they are introduced to research techniques, procedures and philosophical attitudes necessary for exploring unknown research areas in his/her concepts chosen area of research. The student is then able to identify areas within the materials science and engineering major suitable for research; identify the current state of knowledge in these areas using literature search resources; propose plans for investigating the area; and apply fundamental principles to science and engineering to complete the investigation and teach these skills to others who follow. The student is taught the scientific method through in-depth study of a specific research topic. This also yields a more in-depth knowledge of the research area. Often included in the graduate educational
experience is an opportunity to teach undergraduates as a teaching assistant and to assist an instructor in curriculum development or a research advisor in assisting in undergraduate laboratories.

6.2 Selection of Research 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 research advisor early in their plan of study, no later than the end of the first semester in residence. The advisor selected must be part of the graduate faculty for materials science; graduate faculty may be found on the following website: http://graduate.asu.edu/graduate_faculty

In the selection of a faculty mentor, the student should interview with faculty members and select an advisor and dissertation topic that match his/her goals and interests. The program does not guarantee that a student will be selected to work on a specifically desired research project, funded or not, sponsored by a given faculty member. Several students may desire to work on the same project, and the faculty advisor may not be able to financially support all students interested in the project. For this reason, the student should identify several projects of interest among those offered by the faculty. In some instances, students propose projects that may or may be of interest to the faculty. The program does not require faculty to supervise students on projects outside their realm of expertise or interest. In all cases, the student must obtain the agreement of a faculty member to serve as the research advisor and chair of the faculty supervisory committee or dissertation committee. Likewise, the student is responsible for recruiting faculty to serve as members of the supervisory or dissertation committee. It is strongly advised that the student consult with the dissertation chair prior to approaching proposed committee members for guidance and input.

The research advisor supervises the research performed by the student. This requires that the faculty member understand the time involved in helping the student complete the plan of study and to coordinate the coursework and research activities. Generally, the advisor advises the student to select other members of the student's supervisory committee that would be appropriate to serve on the faculty supervisory committee. Frequent contact between the student and the advisor is necessary to accurately define the research project. This helps to ensure that the student's research prospectus is acceptable.

The dissertation topic can be initiated by either the student or the faculty advisor. Most doctoral research plans include both theoretical analysis and experimental measurements. The doctoral student is expected to have major input in defining and shaping the research topic. Research by nature is not precisely programmed. Often, well-planned experimental designs are unsuccessful. This requires the application of different procedures. For these reasons, students should initiate their dissertation research before they are able to devote full-time to the dissertation project. This helps to eliminate unnecessary delays in graduation.
Original work, as defined by a dissertation, is required for the Doctor of Philosophy degree. One of more research publications or presentations should result from the research project.

Throughout the plan of study, the student is encouraged to actively participate in efforts to acquire funding in support of the advisor’s research program. The student should assist the research advisor in the preparation of grant proposals to local, state and national agencies seeking funding for the project. The student-advisor relationship is a vital one during the Ph.D. years and often continues after graduation. Each such relationship is unique, and usually offers personal and professional benefits beyond the conduct of the Ph.D. research. These benefits might include meeting important post-degree job contacts, advice on professional development, and training in non-research related professional skills (e.g., teaching). It is expected that in most circumstances student-advisor disagreements will be minor and can be amicably resolved. In the uncommon instances that attempts to resolve disagreements are unsuccessful, the student and advisor are encouraged to meet with the graduate program chair and the school director for further assistance in resolving difficulties.

6.3 Maximum Time Limit

The Graduate College policies state that doctoral students must complete their plans of study, including the dissertation defense, no later than ten (10) years after admissions to the degree program or five (5) years after passing the comprehensive examinations, whichever comes first. Please read the exact policy in the Graduate College polices at: http://graduate.asu.edu/sites/default/files/Grad_Policies.pdf

6.4 Credit Requirements for the Ph.D. Degree

The Ph.D. degree in materials consists of 84 semester hours beyond the bachelor’s degree; 12 are dedicated to dissertation. Students entering the program who have completed a master’s degree in materials, engineering, or an applied science may apply up to 30 blanket credits toward the Ph.D. plan of study. Students who have taken graduate level courses that have not been used towards a previously awarded degree may only apply 12 credits to the Ph.D plan of study if the grade for each course is a 3.0 or above on a 4.0 scale. The balance of credits must be completed upon admission to the Ph.D. program. Students are expected to take a minimum of ten (10) graduate level lecture courses, which includes core and technical electives. Students with a completed master’s degree must take 5 graduate level courses (core plus an elective).
6.5 Core Course Requirements

The core curriculum consists of four (4) courses that define the essential knowledge of materials science and engineering for all materials graduate students. In addition, students are required to take graduate seminar (1 credit) for three (3) semesters. The remaining credits in the plan of study can be devoted to 500 graduate level electives and research. The core courses usually take 2 to 3 semesters to complete.

<table>
<thead>
<tr>
<th>Course</th>
<th>Description</th>
<th>Credit</th>
<th>Offered</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 MSE 523</td>
<td>Structure and Mechanical Properties</td>
<td>3</td>
<td>Fall</td>
</tr>
<tr>
<td>2 MSE 524</td>
<td>Advanced Thermodynamics</td>
<td>3</td>
<td>Fall</td>
</tr>
<tr>
<td>3 MSE 561</td>
<td>Kinetics and Phase Transformations in Solids</td>
<td>3</td>
<td>Fall</td>
</tr>
<tr>
<td>4a or 4b + 4c MSE 598 PHY 526 PHY 527</td>
<td>Electrical, Magnetic &amp; Optical Properties Materials Physics I ((prerequisite to PHY 512)) Materials Physics II</td>
<td>3</td>
<td>Spring</td>
</tr>
<tr>
<td>5 MSE 591</td>
<td>Graduate Student Seminar</td>
<td>1 x 3</td>
<td>Fall, Spring</td>
</tr>
</tbody>
</table>

Total Core Credits 15

6.6 Waiver of a Core Course

Students can petition to waive any core course if the student has taken an equivalent course at another accredited university and achieved a grade of B or better at the graduate level. The student must provide proof in the form of transcripts and a syllabus of that course. A petition should be submitted to the graduate program chair via the graduate advisor who reviews requests for waivers or substitutions of the core courses. The student must take an approved
technical elective in the place of the waived core course. Students will be responsible for material from waived courses during the qualifying exam.

6.7 Technical Electives

Students may take 500+ level technical electives from the list of electives offered in the Materials Science and Engineering Graduate Program; or a student may take electives from other disciplines such as chemistry, physics, electrical engineering, and mechanical engineering as long as these electives relate to the student’s research area and are approved by the faculty advisor. A sample list of technical electives offered this past academic year is provided for your reference; however, please check the schedule of classes for a comprehensive list course offering.

<table>
<thead>
<tr>
<th>Course</th>
<th>Description</th>
<th>Credits</th>
<th>Offered</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSE 510</td>
<td>Introduction to Materials Characterization</td>
<td>3</td>
<td>Spr, Online</td>
</tr>
<tr>
<td>MSE 513</td>
<td>Polymers and Composites</td>
<td>3</td>
<td>Fall</td>
</tr>
<tr>
<td>MSE 514</td>
<td>Physical Metallurgy</td>
<td>3</td>
<td>Spr</td>
</tr>
<tr>
<td>MSE 516</td>
<td>Mechanical Properties of Solids</td>
<td>3</td>
<td>Fall, Online</td>
</tr>
<tr>
<td>MSE 517</td>
<td>Introduction to Ceramics</td>
<td>3</td>
<td>Fall</td>
</tr>
<tr>
<td>MSE 518</td>
<td>Fundamentals of Microelectronics Packaging</td>
<td>3</td>
<td>Fall, Online</td>
</tr>
<tr>
<td>MSE 519</td>
<td>Growth and Processing of Semiconductors</td>
<td>3</td>
<td>Spr</td>
</tr>
<tr>
<td>MSE 523</td>
<td>Structures and Mechanical Properties</td>
<td>3</td>
<td>Fall</td>
</tr>
<tr>
<td>MSE 524</td>
<td>Advanced Thermodynamics</td>
<td>3</td>
<td>Fall</td>
</tr>
<tr>
<td>MSE 526</td>
<td>Materials Physics I</td>
<td>3</td>
<td>Fall</td>
</tr>
<tr>
<td>MSE 527</td>
<td>Materials Physics II</td>
<td>3</td>
<td>Spr</td>
</tr>
<tr>
<td>MSE 540</td>
<td>Fracture, Fatigue and Creep</td>
<td>3</td>
<td>Fall</td>
</tr>
<tr>
<td>MSE 546</td>
<td>Surfaces and Thin Films</td>
<td>3</td>
<td>Spr</td>
</tr>
<tr>
<td>MSE 550</td>
<td>Advanced Materials Characterization</td>
<td>3</td>
<td>Fall</td>
</tr>
<tr>
<td>MSE 552</td>
<td>Electron Microscopy I</td>
<td>3</td>
<td>Fall</td>
</tr>
<tr>
<td>MSE 553</td>
<td>Electron Microscopy I Lab</td>
<td>3</td>
<td>Fall</td>
</tr>
<tr>
<td>MSE 554</td>
<td>Electron Microscopy II</td>
<td>3</td>
<td>Spr</td>
</tr>
<tr>
<td>MSE 555</td>
<td>Electron Microscopy II Lab</td>
<td>3</td>
<td>Spr</td>
</tr>
<tr>
<td>MSE 561</td>
<td>Phase Transformations, Kinetics and Diffusion in Solids</td>
<td>3</td>
<td>Spr</td>
</tr>
<tr>
<td>MSE 565</td>
<td>Structural Materials in Nuclear Power Systems</td>
<td>3</td>
<td>Fall</td>
</tr>
<tr>
<td>MSE 598</td>
<td>Topic: Nanomechanics of Materials</td>
<td>3</td>
<td>Spr</td>
</tr>
<tr>
<td>MSE 598</td>
<td>Topic: Advanced Ceramics</td>
<td>3</td>
<td>Spr</td>
</tr>
<tr>
<td>MSE 598</td>
<td>Topic: Composite Materials</td>
<td>3</td>
<td>Spr</td>
</tr>
</tbody>
</table>
Students who do not have an undergraduate degree in materials may need to take remedial or deficiency courses before they are allowed to take graduate level courses. Students who are deficient in any of the following courses may be required to complete courses in those areas, in addition to the required graduate coursework. Any deficiencies are determined at the time of admission and are found on the admission letter.

### 6.8.1 Mathematics and Basic Sciences

- Mathematics: Calculus I, II, and II through Partial Differential Equations (e.g., MAT 270, 271, 272, and 274 typically a total of 15 semester hours of credit total).
- Physics: One year of calculus-based physics, including laboratory (8 semester hours) and one course in modern physics (3 semester hours).
- Chemistry: One semesters of General Chemistry, including laboratory (8 semester hours), and one semester of Physical Chemistry or Thermodynamics (3 semester hours).
- Computers: Demonstration of computer literacy through coursework or a diagnostic exam.

### 6.8.2 Engineering Core Courses

- Structure/Properties Materials (MSE 250)
- Probability and Statistics (MSE 315 or IEE 380))
- One or more of the following: Statics (CEE 210+212 or MSE 211)
- Introduction to Deformable Solids (CEE 213);
- Thermodynamics (MSE 330)
- Materials Engineering Design (MSE 482) or engineering design experience.
- Other Prerequisite Courses: Any other course that is a prerequisite for a course in the student's graduate program of study.
6.8.3 Materials Science and Engineering Fundamentals

Depending upon the student's stated intentions to pursue a graduate program with a particular emphasis, the student's supervisory committee may require that the student's undergraduate degree program include any of the following courses (or the equivalent thereof) that provide basic undergraduate fundamentals in materials science and engineering. In the event that the student's undergraduate program does not contain those courses identified as required, then those courses may be considered as deficiencies, and the student will be expected to take those courses in addition to the 33 hours of coursework required for the degree. Deficiency courses may not be used on a plan of study:

- Structure and Properties of Materials (MSE 250)
- Thermodynamics of Materials (MSE 330)
- Physical Metallurgy (equivalent ( MSE 420)
- Mechanical Properties of Solids (MSE 440)
- Introduction to Materials Characterization (MSE 450)
- Polymers and Composites (equivalent to MSE 470)
- Introduction to Ceramics (MSE 471)

6.9 Qualifying Examinations

All doctoral students who entered the program in Fall 2006 or later are required to take an oral qualifying examination. Students who entered before Fall 2006 may elect to follow procedures that were in place for the MSE or SEM programs at the time of their admissions, to the extent possible that those formats can be delivered. The qualifying exam tests the student's knowledge on the four core subjects: Structures and Mechanical Properties, Advanced Thermodynamics, Kinetics and Phase Transformations, and EMOP or Materials Physics. This exam is to be taken no later than three (3) semesters (excluding summer sessions) after admission to the doctoral program. Part-time doctoral students must take the qualifying examination after the completion of four core courses and no later than four semesters (excluding summer sessions) after admitted to the program. A student who fails the qualifying exam is deemed as not making satisfactory academic progress in the program. He/she may be allowed one retest, although not guaranteed, and must petition the program to retake the exam. If a student fails the test twice, he/she will not be allowed to continue in the doctoral program and recommended for dismissal for failing to meet satisfactory academic progress. Upon failure of the qualifying exam, students may be given the option of pursuing the master's degree. However, if a student declines this option, he/she will be recommended for dismissal from the doctoral program. Effective Fall 2011, students who earn a cumulative GPA of 3.5 or above in the completed core courses are exempt from the qualifying exam; students who have a cumulative GPA below a 3.5 in the completed core course are required to take the qualifying examination. Students who have courses completed at a university other than ASU and used towards the core course requirement will take the qualifying exam if they have waived more than one core courses (two or more courses are waived); students who have waived one core course will take the qualifying exam if their core course GPA at ASU in the remaining 3 core courses is less than 3.5.
6.9.1 Format of the Qualifying Examination

- The exam is oral in format and lasts approximately 90 minutes. Students are expected to show a reasonable level of knowledge of the four core courses.
- Exams will be administered twice per year by an appointed examination committee in a designated period, generally during the first few weeks of the semester. The committee shall comprise at least 3-faculty members, with at least 2 core-course instructors. For repeat exams (2nd and last attempt), 5 faculty shall be present and will include the graduate program director.
- A “pass” result will be determined by a composite numerical score over all subjects and all examiners. Scores are not released to the students or general faculty. Students are informed that they passed or failed.
- Faculty advisors are not allowed to be present for exams of their own students. They are allowed and encouraged to attend other exams, in order to understand the procedure.

6.10 Comprehensive Examination and Dissertation Prospectus

All doctoral students are required to take comprehensive examinations and a dissertation prospectus proposal and presentation. A Doctoral Plan of Study must have been submitted and approved by the faculty advisor, graduate program chair, and the Graduate College prior to scheduling the comprehensive exams. Students must be registered in at least one credit hour during the semester in which they plan to complete the comprehensive exams and/or dissertation proposal prospectus. All members of the faculty supervisory committee must have been listed and approved on the plan of study (iPOS). Students should prepare to take the comprehensive examinations after: 1) completing the approved core coursework listed in the plan of study, 2) two years after passing the qualifying examinations, but absolutely no later than the semester prior to the dissertation defense. Exceptions may be made for doctoral students who are pursuing the Ph.D. degree part-time.

6.10.1 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 and the student is then considered not making satisfactory academic progress. Should a failure occur, a onetime re-examination may be requested and must be approved by the faculty supervisory committee, the head of the academic unit, and the dean of the Graduate College. 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 withdrawal 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 Faculty Supervisory/Dissertation Committee.

6.10.2 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 done by the student. Students should consult their faculty supervisory committees to determine the appropriate structure of the prospectus.

The content of the dissertation prospectus should contain:

- detailed literature review,
- 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, and
- timeline towards graduation.

Format Guidelines

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 be bound. A sample of the cover page is included in the last page of this document. 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.

The student must give the members of his/her faculty supervisory 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.

6.10.3 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 degree requirements.

Presentation Guidelines
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 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. The committee may recommend that the student make minor or major modifications to the proposal before giving final approval. After the committee has made its decision, the student is called back to the room and given the results of his/her examination.

Finally, the student must submit a copy of the final document to the graduate coordinator to be placed in the student's file.

6.10.4 Forms

Students may need to request a room reservation for their examination. They will need to submit a completed Room Reservation Request form 15 working days prior to the exam. The Graduate Coordinator will assist the student in securing a room if necessary. The student is also responsible to bring two forms to the exam: The Report of Doctoral Dissertation Proposal Prospectus and the Report of Doctoral Comprehensive Exams. At the end of the examination, the student will submit both of these completed forms to the Graduate Coordinator for processing. All of these forms may be found on the following website: [http://engineering.asu.edu/semte/GradForms.html](http://engineering.asu.edu/semte/GradForms.html)

6.10.5 Candidacy

Upon the recording of the "Report of Doctoral Comprehensive Examinations and Report of Doctoral Dissertation Proposal/Prospectus" and the completion of iPOS, the Candidacy Letter is produced. This letter will be placed in the student's MyASU.

6.10.6 Eligibility for Salary Increase

Passing the comprehensive examinations and advancing to candidacy are milestones in a doctoral student’s degree program. Once a student successfully passes his/her comp exams, he/she becomes eligible for an increase in his research/teaching assistant salary. Salary increase for students who are being supported from faculty grants are subject to available funding. Please be aware that being eligible for a pay increase does not guarantee one.

6.10.7 Selecting the Faculty Supervisory Committee
Students must select a faculty supervisory committee which consists of a minimum of 3 to a maximum of 5 faculty members. The chair of the committee must be a member of the graduate faculty approved to chair dissertation committee in the materials program. There must be a majority of graduate faculty on a student’s faculty committee. Academic professionals, research scientists, industrial professionals and other non-ASU faculty may serve on doctoral supervisory committees with approval of the graduate director and the Graduate College. There is an approval process for these individuals and students should contact the graduate advisor for instructions.

6.10.8 Dissertation and Research Credits

Doctoral students must take exactly 12 credits of Dissertation (MSE 799) as part of the Ph.D. plan of study. Although dissertation credits may be taken at anytime during the plan of study, most students take dissertation credits after the completion of the comprehensive examinations. Research credits (MSE 792) may be taken at anytime as long as the student is performing research under the supervision of a faculty advisor. There is no minimum or maximum number of research credits required; but, students should take enough research credit to complete the credits requirements for the degree. Refer to Section 6.4 for research credits.

6.10.9 The Dissertation – The Final Product

The dissertation, the culminating experience of the Ph.D. degree, is based on original and independent research conducted by the student, under the guidance of the graduate supervisory committee. The dissertation should demonstrate the candidate’s ability to address a major intellectual problem and to propose meaningful questions and hypothesis through the mastery of research methods, theory, and tools of the discipline. An oral, public defense of the dissertation is required and is scheduled for a minimum of 2 hours. A copy of the dissertation is given to the department and a copy is placed in the ASU library through the electronic submission of the document to ProQuest. Information on how to select a topic for the dissertation is discussed earlier in this document in Section 6.2.

6.10.10 Critical Path to the Ph.D. Degree

The following flowchart summarizes the chronological steps which should be followed by Ph.D. students. These guidelines maybe varied as some students may take longer to complete the dissertation for various reasons such as finding a permanent research advisor, changing of advisors or research projects, taking a leave of absence during the degree plan, and other such events.

<table>
<thead>
<tr>
<th>Gain Admission to the PhD Program</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Select a faculty advisor and supervisory committee</td>
<td>by the end of 2nd semester</td>
</tr>
<tr>
<td>Complete and submit a Plan of Study (iPOS)</td>
<td>by the end of 2nd semester</td>
</tr>
</tbody>
</table>
Successfully complete the four core courses by 3rd semester
Take and pass the qualifying examinations by 2nd or 3rd semester
Complete remaining technical electives by 4th semester
Submit the interactive Plan of Study
Begin research on the dissertation 2nd year
Prepare draft of the dissertation prospectus 3rd year
Take and pass the comprehensive examinations end of the 3rd year
Advance to candidacy end of 3rd year
Apply for graduation 4th year
Complete the dissertation 4th year
Schedule the dissertation defense 4th year
Submit document for format review 4th year
Successfully defend the dissertation and make any necessary revisions 4th year
Submit document to ProQuest after the document has been approved by chair as the final version, received format approval, and the Pass/Fail form has been approved by the Director of the school and the Graduate College 4th year
Participate in graduation ceremonies 4th year
Return all keys and department properties 4th year

7. 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. The motivations for this degree are:

- to provide an expedient career path for students who embark upon the Ph.D., but for various reasons cannot complete the doctoral degree,
- to assist students with job placement. Many students receive job offers before they formally complete the PhD degree.

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 qualifying exams and 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 “B” or higher in approved lecture courses,
students have taken with passing grades of 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,

8. Master of Science Degree (thesis track option)

8.1 Credit Requirements

A total of 32 credits are required for the Master of Science Degree (MS) in Materials Science and Engineering, as detailed below. This degree includes a thesis track option.

<table>
<thead>
<tr>
<th>Core</th>
<th>Electives</th>
<th>Seminar</th>
<th>Thesis</th>
<th>Total Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>18</td>
<td>2</td>
<td>6</td>
<td>32</td>
</tr>
</tbody>
</table>

8.2 Required Courses

Students must take six (6) credits of core courses selected from the table below. Note that the choice 5a&b requires both Materials Physics I and II. Materials Physics I is a prerequisite to II and can be counted as a technical elective. Materials Physics I and II are most appropriate for students who have a physics background and or students who have taken modern physics and quantum mechanics.

<table>
<thead>
<tr>
<th>Course</th>
<th>Description</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>MSE 523: Structure and Mechanical Properties</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>MSE 524: Advanced Thermodynamics</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>MSE 561: Kinetics and Phase Transformations in Solids</td>
<td>3</td>
</tr>
<tr>
<td>4 or both</td>
<td>MSE 598 or both</td>
<td>Electrical, Magnetic &amp; Optical Properties</td>
</tr>
<tr>
<td>5a and</td>
<td>MSE 526 and MSE 527</td>
<td>Materials Physics I</td>
</tr>
<tr>
<td>5b</td>
<td></td>
<td>Materials Physics II</td>
</tr>
</tbody>
</table>

8.3 Technical Electives

Students must take 18 credits of technical electives, with the following stipulations:

- Must take 3 credits of either IEE 570 Advanced Quality Control or IEE 572 Design of Engineering Experiments.
- May not take more than six (6) credits at the 400 level (Graduate College stipulation).
- May not take more than six (6) credits at the 51x level.
- May take up to nine (9) credits may be outside MSE, by faculty advisor approval.
- May replace three (3) credits of MSE 590 reading and conference.
- May not take MSE 592: Research as technical elective credit

8.4 Seminar
The seminar is a one (1) credit course. Master’s students are required to take two semesters or two credits of MSE 591 Seminar.

8.5 Thesis

Exactly six (6) credits of MSE 599 Thesis are required for the degree. The student must successfully complete an independent research project, write a thesis, and must successfully defend the thesis to the Faculty Supervisory Committee. Student should read Section 6.2 for guidelines on selection a research advisor and research topic.

8.6 Transition Program

Students who do not have a materials bachelor's degree may have to take deficiency courses. Please refer to Section 6.8 for transitional courses.

9. Master of Science Degree (non-thesis option)

The Materials Science and Engineering Graduate Program offers a professional track in the Master’s degree which is the non-thesis. This non-thesis track is designed to bridge the gap between knowledge of engineering sciences and creative engineering practice while at the same time increasing depth and knowledge in areas of emphasis. This degree was designed for individuals who are employed full-time and want to pursue a master's degree on a part-time basis. Online courses are also available for this degree. The MS, non-thesis track degree has three options: 1) General Option, 2) the Semiconductor Processing and Packing (SPP) Program - Processing option and 3) the Semiconductor Processing and Packaging Program - Packaging option. The SPPP tracks have designated course requirements for those specializations. Financial assistance is not available for students in the non-thesis track options.

9.1 Credit Requirements

The MS non-thesis track degree requires 32 credits comprised of technical electives, seminar/reading and conference and applied project courses. Students who pursue the degree online can take all 32 credits of course work if they so choose. However, applied project credits provide the student an opportunity to take independent study credits while preparing their final report and presentation. There are no specific required core courses for this degree; three hours of MSE 593: Applied Project are required. Rather to allow for maximum flexibility, students are expected to design a plan of study in consultation with their faculty advisor. Advising holds are placed on all MSE students, which prevent them from registering for classes each semester until they consult with and receive clearance from their faculty advisors.

<table>
<thead>
<tr>
<th>Core</th>
<th>Electives</th>
<th>Seminar or Reading and Conference</th>
<th>Applied Project</th>
<th>Total Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>24-27</td>
<td>2</td>
<td>3 min - 6 max</td>
<td>32</td>
</tr>
</tbody>
</table>
9.2  **Technical Electives**

Students must take 24-27 credits of technical electives, with the following stipulations:

- Must take 3 credits of either IEE 570 Advanced Quality Control, IEE 572 Design of Engineering Experiments, MSE 501 Linear Algebra in Engineering, MSE 502 Partial Differential Equations or any 400 Level Math or higher.
- May not take more than six (6) credits at the 400 level (Graduate College stipulation).
- May not take more than six (6) credits at the 51x level in the MSE prefix.
- May take up to nine (9) credits from other engineering or science disciplines, with faculty advisor approval.
- May replace three (3) credits of electives with MSE 590 reading and conference with faculty advisor approval.
- MSE 592: Research does not count as a technical elective

9.3  **Seminar**

The seminar is a one (1) credit course. Master's students are required to take two semesters or two credits of MSE 591 Seminar. Online students must substitute Reading and Conference for the seminar.

9.4  **Applied Project and Final Comprehensive Report and Presentation**

A written applied project and a final oral presentation that captures the essence of the master’s degree focus and represents a major portion of the student’s course work are required for this degree as the final culminating experience. Students register for a minimum of 3 credit hours of MSE 593: Applied Project in the semester they anticipate presenting their final project; students may register for a maximum of 6 hours of MSE 593 to be used towards the plan of study. The final oral presentation consists of an overview report and incorporating knowledge gained from the program with integration and reflection of learning as applied to the project. The written applied project report, typically 25 pages (1.5 spaced) plus figures, is on a materials topic of the student's and approved by the Faculty Supervisor. Arrangements can be made for the distance learning students to conduct the presentation via video conferencing, such as Skype. Students should meet with the faculty advisor to complete an Applied Project goal and plan early in the plan of study.

9.5  **Semiconductor Processing and Packaging (SPP) non-thesis track Option**

The fast-paced and global nature of technologically challenging microelectronics industry necessitates an educational offering that is up-to-date, as well as, flexible for diverse and globally-based learners/students. In recognition of this need, Arizona State University which has strong collaborative programs with many microelectronics industry leaders has developed the SPP non-thesis track option. This option is offered for both campus based and online students;
online students may only take online courses, but campus based students may take either campus or online courses.

The MSE SPP program offers two focused areas of study, one emphasizing the semiconductor processing of semiconductor device or systems, and a second accentuating the microelectronics packaging that bridges the device or system to the external world and enables its functionality. This option is available both on-line and on-campus, however on-line students must complete all coursework on-line.

9.5.1 SPP Processing Track

Semiconductor Processing Track of the SPP program focuses on semiconductor processing and fabrication, emphasizing materials and electrical characterization of devices for various applications. Students must complete a total of 32 credit hours to earn the MS, non-thesis track with an option in Semiconductor Processing and Packaging.

9.5.1.1 Credit Requirements

The MS degree is 32 credits irrespective of what track and/or a student chooses. Students take 24 credits of graduate coursework, 2 credits of seminar or reading and conference, and a minimum of 3, but may take up to 6 credits, of applied project (independent study) credits.

<table>
<thead>
<tr>
<th>Total</th>
<th>Core</th>
<th>Technical Electives</th>
<th>Reading &amp; Conference</th>
<th>Thesis</th>
<th>Applied Project</th>
</tr>
</thead>
<tbody>
<tr>
<td>32</td>
<td>15</td>
<td>12-15</td>
<td>2</td>
<td>0</td>
<td>3 minimum to a maximum of 6</td>
</tr>
</tbody>
</table>

9.5.1.2 Core Courses

Five (5) courses equaling 15 credits with options in 1 - 5 are recommended for a specialization in the processing track. Students are also required to take two (2) semesters of seminar as part of the plan of study. The seminar is a one-credit course in which students attend weekly seminars given by invited speakers and on-campus graduate students. Reading and conference can be substituted for seminar for online students.

1. EEE 435/591 or EEE 531 or (3) Microelectronics Fall, Spr
   EEE 570 or Semiconductor Device Theory I Fall, Online
   
2. IEE 570 or (3) Advanced Quality Control Spr, Online
### 9.5.1.3 Technical Electives

Students should take the remaining balance of 15-12 credits with 500 or above numbered technical electives. A maximum of six (6) credits of 400 level or higher electives are allowed. The last page lists some suggested technical electives for the SPP tracks. Students are also allowed to take three (3) credits of MSE 590 Reading and Conference in lieu of a technical elective when there is not a course offered that covers the topic that a student wishes to pursue and the faculty advisor is willing to develop an independent curriculum for the student. The course may include assignments such as intensive reading in a specialized area, writing a synthesis of literature on a specified topic, or writing a literature review of a topic.

### 9.5.1.4 Applied Project Credits

Students are required to take a minimum of three (3) credits of MSE 593: Applied Project in their final semesters, but may take six (6) credits of independent study MSE 593 Applied Project. This gives students an opportunity to prepare their final report and presentation as the final culminating event for the degree. If students only take 3 hours of MSE 593, they may opt to take 3 hours of additional technical electives. An applied project can be done at an industrial site (or at a reputable university or national laboratory) in collaboration with ASU faculty and local industry mentors.
The applied project captures the essence of the master’s degree focus and represents a major portion of the student’s course work is required for this specialization. The applied project (AP) culminates in a final overview written report and oral presentation incorporating knowledge gained from the program with integration and reflection of learning as applied to the job. This comprehensive report, typically 20-25 pages (1.5” spaced) plus figures, is on a topic of their choice and approved by their Faculty Supervisor. Arrangements may be made for the distance learning students to conduct an oral telephone examination. Student should meet with the faculty advisor early in the plan of study to discuss the topic of the applied project and to draft an AP plan.

9.5.2  SPP Packaging Track

The MSE SPP Packaging track focuses on packaging of microelectronics products which enables functionality of microsystems by providing physical, electrical, and thermal functions. As the functionality and complexity of the components continue to advance, and the need for low cost and high reliability increases, packaging technology becomes very important and must keep pace with the technological demands.

The multifunctional nature of a package (or packaging system) requires the integration of all of the engineering disciplines. Packaging engineers must solve complex, coupled problems today that require a fundamental understanding of electrical, thermal, mechanical, materials science, and manufacturing principles; hence, the need for a multidisciplinary effort. The Packaging Track provides fundamental and advanced courses to educate both novice and experienced engineers on these multidisciplinary topics. Future packaging programs require engineers to become even more aware of --and capable of solving-- multi-disciplinary problems. In this program track, students will have an opportunity to develop a curriculum across disciplines.

9.5.2.1 Credit Requirements

The Materials Science MS degree, non-thesis track is comprised of 32 credits, 24-30 credits of graduate coursework, 2 credits of seminar, and 3-6 credits of Applied Project, for a total of 32 credits.

<table>
<thead>
<tr>
<th>Total</th>
<th>Core</th>
<th>Electives</th>
<th>Seminar or Reading &amp; Conference</th>
<th>Thesis</th>
<th>Applied Project</th>
</tr>
</thead>
<tbody>
<tr>
<td>32</td>
<td>18</td>
<td>9-12</td>
<td>2</td>
<td>0</td>
<td>3-6</td>
</tr>
</tbody>
</table>

9.5.2.2 Core Courses

Eighteen (18) credits should be selected from the 4 groups below. All courses in the core are offered both on-campus and online. Online students may only take online courses.
<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
<th>Description</th>
<th>Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSE 598</td>
<td>(3)</td>
<td>Introduction to Microelectronics Packaging</td>
<td>Fall</td>
</tr>
<tr>
<td>EEE 691</td>
<td>(9)</td>
<td>Electrical Considerations (3)</td>
<td>Fall</td>
</tr>
<tr>
<td>IEE 691</td>
<td>(9)</td>
<td>Advanced Analysis Methods (3)</td>
<td>Fall</td>
</tr>
<tr>
<td>MAE 602</td>
<td>(3)</td>
<td>Mechanical Considerations (3)</td>
<td>Fall</td>
</tr>
<tr>
<td>MAE691</td>
<td>(3)</td>
<td>Thermal Considerations (3)</td>
<td>Spring</td>
</tr>
<tr>
<td>MSE 691</td>
<td>(3)</td>
<td>Material Considerations (3)</td>
<td>Spring</td>
</tr>
<tr>
<td>IEE 591</td>
<td>(3)</td>
<td>DOE/SPC for Semiconductor Processing</td>
<td></td>
</tr>
<tr>
<td>or IEE 570</td>
<td></td>
<td>Advanced Quality Control</td>
<td></td>
</tr>
<tr>
<td>or IEE 572</td>
<td></td>
<td>Design of Engineering Experiments</td>
<td>Fall, Spring</td>
</tr>
<tr>
<td>IEE 552</td>
<td>(3)</td>
<td>Strategic Tech Planning</td>
<td></td>
</tr>
<tr>
<td>or SCM 4XX or 5XX</td>
<td></td>
<td>Business course (e.g., Supply Chain Management)</td>
<td></td>
</tr>
</tbody>
</table>

### 9.5.2.3 Technical Electives

Students must take 9-12 credits of technical electives at the 500 level or higher, with the following restrictions:
- At least six (6) credits are from a single engineering discipline,
- At least three (3) credits are from a second engineering discipline,
- Leveling courses (see below) may be used as technical electives,
- MSE 592: Research may not count towards technical electives

### 9.5.2.4 Seminar

Student must take two (2) semesters of MSE 591 seminar. The seminar is a one (1) credit course and consists of seminars presented by invited speakers and graduate students. Online students can take two (2) credits of MSE 590 Reading and Conference online in place of the seminar.

### 9.5.2.4 Applied Project Credits

Student must take a minimum of 3 credit hours of MSE 593: Applied Project, but may take up to a maximum of six (6) credits of the independent study MSE 593 Applied Project. This gives students an opportunity to prepare their final report and presentation as the final culminating event for the degree. Students can opt to take 3 credit hours of technical electives in lieu of 6 credit hours of applied project should they wish to do so. An applied project can be done at an
industrial site (or at a reputable university or national laboratory) in collaboration with ASU faculty and local industry mentors.

The final culminating experience for the MS, non-thesis option degree consists of an applied project culminating in a final written overview report and oral presentation with a focus on a microelectronic packaging topic incorporating knowledge gained from course work with integration and reflection of learning as applied to the job. This comprehensive report (20-25 pages, 1.5" spacing) plus figures, is on a topic of the student's choice and approved by the Faculty Supervisor. Arrangements can be made for the distance learning students to conduct an oral telephone examination.

10. Joint Bachelor's /Master's Degree (4+1) Program

The Materials Science and Engineering Graduate Program offers an integrated BSE/MS (4+1) program for students completing the Bachelor of Science degree in materials science and engineering at ASU and who want to pursue the Master of Science, either thesis or non-thesis option, degree through an accelerated curriculum. This program was designed to provide strong undergraduate materials students with the opportunity to combine advanced undergraduate coursework with graduate coursework and advance graduate degree completion. Students can complete both degrees in five years of full-time course work. Students typically enter the dual program in their senior year. Only graduate level courses are allowed to be counted for both degrees.

10.1 Eligibility

Students interested in accelerated 4+1 program must meet the following eligibility requirements:

1. Be enrolled in the B.S. degree in materials science and engineering at ASU.
2. Have a cumulative undergraduate ASU GPA of 3.3 or higher.
3. Have completed at least 75 credit hours toward the BSE degree in order to apply to the program.
4. Have completed a minimum of 90 credit hours of BSE coursework upon enrollment and acceptance in the accelerated program.

10.2 Application Procedures

The application for the 4+1 is a two step process. Students must complete the SEMTE Application for the 4+1 Program. The form can be obtained from the graduate advisor. The application will ask the student to list a prospective faculty advisor for the master's degree. The application must be approved by the undergraduate and graduate advisors, and the prospective graduate faculty advisor. When the form has been signed by the parties, the application is forwarded to the Graduate Program Chair for final approval.
The student will be notified by the graduate academic advisor once the application has been approved, and the student will be instructed to submit the Graduate College online application. The student must apply to the term and year that they plan to start the accelerated 4+1 program. The student is also responsible for paying the fees associated with the application. An "Application Checklist" containing a list of documents that must be submitted as part of the online application is available on the last page of this document and can also be viewed on the materials web site: http://engineering.asu.edu/graduate/mse/checklist

The student must notify the graduate advisor when they have submitted the online application. The admission decision will become visible on the student's "MyASU" after the application has been reviewed.

Students must notify the graduate advisor in the semester in which they complete the bachelor's degree. The student's record must be reactivated upon completion of the bachelor's degree. The graduate advisor will notify the Graduate College Admissions Office once the bachelor's degree is awarded to re-activate the graduate career.

10.3 Sharing courses for both the BSE and MS degrees

Students the completing the BSE degree in materials science and engineering can apply six (6) credits of graduate (500+) course work towards both the bachelor's degree requirements and the master's degree requirements. The courses used for both degrees must be approved by the undergraduate and graduate advisors as they pertain to the respective degree requirements. Only courses completed after admission into the 4+1 accelerated program will be permissible for reserving and sharing. Students may reserve up to a maximum of 9 credit hours completed at the 500 level or above and earned with a grade of "B." Reserved courses will only count towards the MS degree and will not work toward the 120 hour requirement for the BSE.

10.4 Reserving Graduate Courses by Undergraduates Toward a Graduate Degree

Bachelor's/master's students are also eligible to take an additional nine (9) credits of graduate courses to be used for their future master's degree in addition to the shared credits in the 4+1 program after they are admitted into the 4+1 program. These "pre-admission" graduate courses cannot be used to complete the bachelor's degree. Only graduate level courses with a grade of "B" or higher may be used towards a graduate degree. The Graduate College Policy for reserving courses can be found at:

"Using Graduate Credits earned by Undergraduate Students towards a Graduate Degree - Credit hours earned in graduate level courses (per Graduate College policy) by undergraduate students can count towards their graduate degree at ASU as long as these credit hours have not been used towards a previously awarded degree. These credit hours are classified as "pre-admission credits". At ASU, prior to awarding of their bachelor's degree, undergraduate students must
contact their undergraduate advisor to set aside any graduate courses for use towards a future graduate degree so that these courses do not count towards their undergraduate degree."

General Policies

11. Academic Integrity

The Materials Science and Engineering Graduate Program, the School for Engineering of Matter, Transport, and Energy, and the Ira A. Fulton Schools of Engineering, and the Graduate College expect the highest standards of academic integrity of all graduate students both in coursework and research activities. The failure of graduate students to meet these standard may result in serious consequences including suspension or expulsion from the university and/other sanctions as specified in the academic integrity policies of the program and the school.

Students must read the Academic Integrity Policy on the university web site: http://provost.asu.edu/academicintegrity. The policy according to the web site addresses "violations which fall into five broad categories which include but not limited to: 1) cheating on an academic assignment 2) plagiarizing, 3) academic deceit such as fabricating data or information 4) aiding academic integrity policy violations and inappropriately collaborating and 5) falsifying academic records."

12. Grades and Grading Policies

The university grades and grading policies can be found at http://students.asu.edu/grades-grading-policies.

This site covers grades, grade reports, grade changes, repeating courses, grade appeals, GPA calculation, etc.

The Graduate College policies on grading can be found at: http://graduate.asu.edu/sites/default/files/Grad_Policies.pdf

Courses at the 500, 600, and 700 levels are considered graduate level courses. Courses at the 400 level are upper division undergraduate courses. These courses, however, may be allowed to satisfy graduate degree requirements when appearing on the graduate plan of study. The Graduate College limits the number of 400 level credits that may be applied to the plan of study to six (6) credits.
12.1 Grading Exceptions

The Graduate College policies have special grade considerations for independent study courses, such as thesis and dissertation. Thesis and dissertation credits may only be assigned a grade of "Y" for satisfactory or "Z" for pending completion/in progress. Refer to the GCP http://graduate.asu.edu/sites/default/files/Grad_Policies.pdf (page 10)

Incomplete grades given for graduate level courses (500, 600, and 700) must be completed within one (1) calendar year or the grade will turn into a permanent “I” grade. The students would have to re-register for the course if they want credit in that course. Refer to the GCP http://graduate.asu.edu/sites/default/files/Grad_Policies.pdf (page 10). Courses with an “I” grade may not be listed on the Plan of Study.

After the university add/drop period, a student who drops a class will receive a "W" for withdrawal. Refer to the GCP http://graduate.asu.edu/sites/default/files/Grad_Policies.pdf (page 10). A “W” on the transcript does not impact the GPA. Courses with a “W” grade may not be listed on the Plan of Study.

12.2 Audit Enrollment

The Graduate College policy on audit enrollment reads: "Graduate students may register for audit one or more courses with the approval of the supervisory committee chair and the consents of the instructor involved. An audited course does not count towards the minimum number of credits required for international students with visa restrictions, enrollment requirements for research and teaching assistants, or students receiving financial assistance." (GCP http://graduate.asu.edu/sites/default/files/Grad_Policies.pdf (page 10)). Also, the program does not allow audit courses to be included in the plan of study.

13. Academic Standards

13.1 University Academic Standards Policy

There are separate policies by the university, the Graduate College, and the program that address academic standards. Students are expected to know and adhere to all of these policies.

13.1.2 University Academic Standards Policies

The university academic standards policies can be found at: http://students.asu.edu/academicstandards
13.2 Satisfactory Academic Progress

The Graduate College has policies on grade point average and restricted grades and satisfactory academic progress. Student must know these policies which are described on the Graduate College policies web site at: [http://graduate.asu.edu/sites/default/files/Grad_Policies.pdf](http://graduate.asu.edu/sites/default/files/Grad_Policies.pdf) (page 12)

13.3 Program and Fulton Schools of Engineering Academic Standards Policy

The Materials Graduate Program adopted the following “Policy for Maintaining Academic Satisfactory Progress” that was established by the Ira A. Fulton Schools of Engineering. Students who have been admitted to the graduate program in engineering, with either regular or provisional admission status, must maintain a 3.0/4.0 GPA or higher grade point average in the following:

- All work taken for graduate credit (courses numbered 500 or higher)
- All coursework in the student’s approved Plan of Study, including those courses at the 400 level that have been approved in the plan of study
- In all course work taken at ASU post baccalaureate (overall GPA), including courses taken in the joint bachelors/master’s program, deficiency courses, and pre-admission course work.

a. A student will be placed on academic probation if one or more of the student’s GPAs listed above falls below 3.0. Students will be notified by mail when placed on academic probation by the academic program.

b. A student will earn academic good standing by obtaining a 3.0 or better in the GPAs listed above by the time the next nine hours are completed. Independent study courses such as research, thesis, dissertation that are normally given grades of Z or Y cannot be included in these (9) hours.

c. A student may be recommended for dismissal from the graduate program if the student fails to increase all of the GPAs listed above to 3.0 better by the time the student completes at least nine (9) credit hours as defined in Section B.

Students who wish to appeal actions concerning dismissal from the graduate program for lack of satisfactory progress must follow an appeal protocol. An appeal must first be made to the graduate program chair. Further appeals are made to the Fulton Schools of Engineering and the Graduate College, respectively.

14. Registration and Enrollment

Graduate College policies on registration and enrollment can be found on their web site at: [http://graduate.asu.edu/sites/default/files/Grad_Policies.pdf](http://graduate.asu.edu/sites/default/files/Grad_Policies.pdf) (page 7-9). These policies address

- Enrollment verification guidelines
- Maximum course load
15. Program Policy on Maximum Course Load

Per the Graduate College, nine (9) credits are considered a full-time load for graduate students. Research and teaching assistants in the Fulton Schools of Engineering must register for 12 credits. Students who are paid by non-engineering departments, such as Chemistry and Physics, are exempt from this rule, and should check with their funding department regarding any registration requirements. The Graduate College allows research and teaching assistants to take six (6) credits for full-time status. International students with F-1 and J-1 visas must be enrolled full-time to maintain their visas.

Students a part of the Ira A. Fulton Schools for Engineering are allowed to register for no more than 15 credits each semester. Should a student wish to take more than 15 credits in a given semester, the student must receive approval from their Faculty Advisor, Program Chair, and the Dean’s Office. Please see Graduate Advisor for the petition form.

16. Plan of Study

The Plan of Study (iPOS) is an interactive web based form that the graduate student completes which outlines all the coursework (including independent study courses such as thesis, dissertation, and applied project) that the student will complete to meet their degree requirements. Master’s students must complete the iPOS in their first semester and no later than when they reach 50% of their degree requirements. Doctoral students should file the iPOS at the end of their first year and no later than when they reach 50% of their degree requirements. The plan of study is a contract with the multiple levels in the university that states that the student will complete the courses listed on the iPOS in order to meet the degree requirements. Once the student submits the iPOS, the faculty chair will need to approve the iPOS either with a physical signature on a paper copy or electronically by approving either a PDF or screen shot of the entire iPOS (courses listed out) to the graduate coordinator. The iPOS may be filled with only the chair listed. The committee members, when added to the iPOS via a committee change petition accessed through the MyASU, must also provide documented confirmation that they are willing to serve either with a physical signature on the iPOS or by sending an email to the graduate coordinator. The iPOS must also be approved by the chair of the school and the Graduate College. With the exception of six (6) credits of allowable 400 level courses, all courses on the Plan of Study must be graduate level courses (500+). The Graduate College policies also state that "Courses with grades of “I,” “W,” "D," or "E" cannot be included on the POS. Student may not include on their Plan of Study any credit hours that have
been used towards a previously awarded degree, with the exception of 4+1 students. Please read the Graduate College Policies on the Plan of Study requirements at Graduate College policies: http://graduate.asu.edu/sites/default/files/Grad_Policies.pdf (page 9).

Effective fall 2012 and forward, all incoming SEMTE graduate students will be required to submit and have their Plan of Student (iPOS) approved, prior to being eligible for registration of third semester classes. This means students who begin in one semester, will have a hold placed on their account before they begin their third semester, including summer. To prepare for this, students are expected to make use of their first semester in the program by getting to know faculty, selecting a faculty advisor, and creating their Plan of Study to demonstrate their intended path to graduate from the program. Should a student fail to meet this requirement, the student is at risk of being removed from the program.

17. Pre-Admission and Transfer Credits

The Graduate College policies on pre-admission and transfer credit can be found on the GC policies web site at: http://graduate.asu.edu/sites/default/files/Grad_Policies.pdf. Because of the numerous questions that the program receives on preadmission credits, the text of those policies is included in this section.

17.1 Pre-Admission Credit


"Credit hours completed before the semester and year of admission to an ASU graduate degree program are considered pre-admission credits. With an approval of the degree program and the Graduate College, a maximum of nine (9) credit hours of pre-admission credits may be included on the POS for a master's degree and a maximum of twelve (12) credits for the doctoral degree provided the credits have not been used in a previously awarded degree program. Only pre-admission credits earned in graduate level courses with a grade of "B" (3.00) or higher may be used towards a graduate degree."

17.2 Using Graduate Credits Earned by Undergraduate Students towards a Graduate Degree


"Credit hours earned in graduate level courses (per Graduate College policy) by undergraduate students can count towards their graduate degree at ASU as long as these credit hours have not been used towards a previously awarded degree. These credit hours are classified as "pre-admission credits" (see above). At ASU, prior to awarding of their bachelor's degree, undergraduate students must contact their undergraduate advisor to set aside any graduate courses for use
towards a future graduate degree so that these courses do not count towards their undergraduate degree."

17.3 Transfer Credits

"Transfer credits are those accepted from another university for inclusion on an ASU Plan of Study. Official transcripts of any potential transfer credit for a POS must be sent directly to the Graduate Admissions Office from the Office of the Registrar at the institution where the credit was earned.

Transfer hours may not exceed 20% of the total credit hours for a master's degree, and 12 credit hours for doctoral degrees. Only graduate level courses with grades of "A" (4.00) or "B" (3.00) may be transferred. Transfer credits may not be applied toward the minimum degree requirements for an ASU degree if they have been counted toward the minimum requirements for a previously-awarded degree.

Certain types of graduate credits cannot be transferred to ASU, including credits awarded (as follows):
1) By post-secondary institutions that lack candidate status or accreditation by a regional accrediting association.
2) For life experience
3) For courses taken at non-collegiate institution (e.g., government agencies, corporations, and industrial firms).
4) For courses, workshops, and seminars offered by other postsecondary institutions as part of continuing education programs.
5) For extension courses.

Academic credits earned at other institutions that based their credit calculation on different scale from ASU's are subject to conversion before inclusion on a Plan of Study. In all cases, the inclusion of transfer courses on a Plan of Study is subject to approval by the degree program and the Graduate College Dean."

17.4 Repeating Courses

"Graduate students (degree or non-degree) may retake any course at ASU, but all grades remain on the student transcript as well as in all GPA calculations."
18. Graduate Foreign Language Examination

A foreign language requirement is not required for students in the materials graduate program.

19. Financial Support for Graduate Students

To the extent possible, the Materials Graduate Program desires to provide financial support for as many students as possible. Financial resources are, however, limited. For this reason, only a limited number of students receive written offers of financial aid prior to entering the program. Students who elect to enter the program without a written commitment of financial aid are responsible for providing their own financial support. Although it is the desire of the faculty to assist students by the aggressive pursuit of research grants, faculty members are not responsible for providing funding when a student enrolls in the program. All supported students are expected to complete their work assignments in a satisfactory manner as judged by the faculty. Additionally, supported students are required to register for at least 12 semester hours of coursework during each semester of residence, which may include independent study hours (research, thesis, dissertation, applied project). Any suspension from the Graduate Program results in the loss of financial support.

19.1 Types of Financial Support

The most common types of financial support for graduate students are: Teaching Assistantships, Research Assistantships, Fellowships, and Scholarships.

19.1.1 Teaching Assistantships

Some teaching assistantships may be available to qualified individuals. All teaching assistants whose native language is not English must take the ASU Speak Test, which is the local version of the Test of Spoken English (TSE). International student must achieve a passing score of 55 (full teaching capacity) or 50 (for limited teaching capacity such as a laboratory assistant, tutor, etc.). Registration for the SPEAK test begins one week before each testing date. Results are sent to the academic department within five working days after the test date. Students must register for the ASU Speak test in person at the American Language and Culture Program (Engineering Center Annex, (480) 965-2161). Students receiving teaching assistantships may be assigned appointments which are half-time (20 hours per week) or quarter-time (10 hours per week). Assignments may include sole responsibility for the teaching of undergraduate laboratories, assistance in the teaching of undergraduate laboratory recitations, and assistance in grading of undergraduate homework. Students may additionally be asked to prepare lectures in undergraduate courses and administer examinations. Teaching responsibilities are in addition to the time spent on research for the graduate degree. Teaching assistantships generally include resident/non-resident tuition waiver and a stipend. However, only full tuition waivers are given to those students who hold half-time (50%) teaching assistantships. In addition to the stipend and full tuition waiver, 50% time TA’s also receive
health insurance benefits. Quarter-time (25%) assistantship holders receive only a half tuition waiver.

**19.1.2 Research Assistantships**

Research assistantship appointments pay the student a stipend for involvement in a particular faculty research project—this project usually also serves as the student’s dissertation research topic. In addition to a stipend, students receiving a research assistantship are generally given a resident/non-resident tuition waiver. The amount of the tuition waiver depends upon whether the student is appointed as a 50% time (20 hours per week) RA or a 25% time (10 hours per week) RA. Students given 50% time RA appointments additionally receive health insurance benefits. Students receiving stipends for research activity, which also constitutes the dissertation research, spend considerably more time each week working on the project than is otherwise expected by the assistantship.

For more information regarding Teaching/Research Assistantship policies, please view the following link: [http://graduate.asu.edu/faculty_staff/tara](http://graduate.asu.edu/faculty_staff/tara).

**19.1.3. Fellowships and Scholarships**

Competitive fellowships are offered by several university units including the Graduate College and the Ira A. Fulton Schools of Engineering. Students are also urged to apply for external fellowships such as the National Science Foundation Fellowship and the Ford Fellowship. Information on fellowships can be found at:

- Graduate College Fellowships: [http://graduate-dev.asu.edu/financing/fellowships/graduate-college-fellowships](http://graduate-dev.asu.edu/financing/fellowships/graduate-college-fellowships)
- National Fellowship Resources: [http://graduate-dev.asu.edu/fellowship_workshops](http://graduate-dev.asu.edu/fellowship_workshops)
- Ira A. Fulton Schools of Engineering Fellowships: [http://engineering.asu.edu/graduate/finance](http://engineering.asu.edu/graduate/finance)

Some fellowships can be applied to directly by the student and other fellowships require nominations from the department. Fellowships are competitive and each fellowship comes with their own distinct eligibility requirements.

**20. Graduation**

Graduation procedures and deadlines can be found on a these web sites. In addition, the graduate advisor provides graduating students with a graduation checklist.

- Graduation Deadlines - [http://graduate.asu.edu/progress/graduation_deadlines](http://graduate.asu.edu/progress/graduation_deadlines)
- Graduation Procedures - [http://graduate.asu.edu/progress/graduation_procedures](http://graduate.asu.edu/progress/graduation_procedures)
- How to Apply for Graduation - [http://students.asu.edu/graduation](http://students.asu.edu/graduation)
- Graduation Ceremonies - [http://graduation.asu.edu/node/1](http://graduation.asu.edu/node/1)
21. Graduate Faculty

A list and description of the graduate faculty can be found on the Graduate College Graduate Faculty web site: http://graduate.asu.edu/graduate_faculty. The site includes faculty from other disciplines, such as chemical engineering, mechanical engineering, electrical engineering, physics and chemistry, and the Biodesign Institute that are affiliated with the Materials Science and Engineering Program. Faculty members listed on the graduate faculty page may serve as chair or committee members.

22. Access to School Staff and Facilities

22.1 Room and Building Access

Keys for offices and laboratories in the Fulton Schools of Engineering, Engineering Research Center (ERC), J.W. Schwada Classroom Office Building (SCOB), and Goldwater Center (GWC) are obtained by completing an "Authorization for Key Request" form available in the school office, ECG 301 and must be approved by the faculty member overseeing that lab. All keys must be returned before graduation to the school office.

22.2 ISAAC Access

Depending on the room or building students need access to, a student will need to complete either an ISAAC access form or Key form (see above). ISAAC access is operated through a microchip in the ASU Sun Card. The student swipes his Sun Card at the entry of a room or building to which the student has access. In order to receive access, students should complete an ISAAC access form available in ECG 301 and have their faculty advisor approve it.

22.3 Office Equipment

Students may use equipment, such as a paper cutter, with permission of the school staff. Laptops may be reserved for a limited time and can be checked out in ECG 301.

22.4 Copier

The departmental copier is for faculty and staff use. Faculty may authorize their students to use the copier for teaching duties or for research by issuing their copier access code (if applicable) to their students. Large jobs (greater than 100 copies) require approval by the department Business Operations Manager. Of course, no personal copying can be done on the departmental machine. Pay copiers are available at many locations on and off campus.

23. Forms
Graduate students utilize a number of various forms, both for internal school purposes and for graduate procedures. Below is a listing of where the majority of the forms may be found:

Program and School forms- http://engineering.asu.edu/semte/GradForms.html
Graduate College forms – http://graduate.asu.edu/forms/index.html
Registration forms - http://students.asu.edu/forms/registration