GRADUATE PROGRAM IN MATERIALS SCIENCE AND ENGINEERING

DEGREE REQUIREMENTS

Revised: November 2009, May 2010, October 2018
Graduate Council Approval: May 14, 2019

MASTER'S PROGRAMS

1) Admissions Requirements

Applicants for admission must meet the UC Davis minimum requirements for admission. Other requirements for admission include:

- Hold a Bachelor’s degree in a discipline relevant to Materials Science and Engineering.
- An online application through the Office of Graduate Studies.
- Scores from the Graduate Record Examination (General Test).
- English proficiency examination (TOEFL or IELTS) for international applicants who have not completed a Bachelor’s at an institution where English was the sole language of instruction. Minimum requirements include a TOEFL score of 100 or an IELTS score of 7.5.
- Three letters of recommendation.
- Statement of Purpose and Personal History and Diversity Statement (part of the Office of Graduate Studies online application).
- A minimum GPA of 3.0 overall on a 4.0 scale. The recommended GPA for admission is at least 3.25.

a) Prerequisites: Bachelor’s degree in Materials Science and Engineering or closely related field (e.g. Physics, Chemistry, Electrical Engineering, Chemical Engineering, Mechanical Engineering, Applied Physics or Chemistry, Applied Science)

b) Deficiencies: Any coursework deficiencies and insufficient training will be identified prior to admission and, if appropriate, addressed by the Graduate Advisor in the form of additional coursework, if the student is admitted.

Students with an undergraduate degree in a field other than Materials Science and Engineering should, in consultation with their Major Professor and Graduate Advisor, devise a strategy to ensure that they are sufficiently trained in the fundamentals of Materials Science and Engineering. This may include taking UC Davis upper-division undergraduate courses in Materials Science and Engineering (EMS 160, 162, 164, 172, and 174) prior to taking the graduate level core courses. None of courses taken to ensure adequate preparation can be counted toward the graduate program requirements.
2) Master of Science in Materials Science and Engineering (M.S.), Plan I (Thesis) and Master of Engineering (M.Eng.)

M.S., Plan I. This plan requires 33 units of graduate and upper-division undergraduate courses (the 100 and 200 series only) and a thesis. At least 25 of the 33 units must be the core courses in Materials Science and Engineering. This Plan requires more units than the UC Davis minimum, which are: 30 units of graduate and upper division courses (the 100 and 200 series only), at least 12 of which must be graduate work in the major field.

M.Eng. This plan requires 36 units of graduate and upper-division undergraduate courses (the 100 and 200 series only) and a capstone project. At least 20 of the 36 units must be core courses in Materials Science and Engineering.

3) Course Requirements - Core and Electives

a) M.S., Plan I

All courses must be completed on a letter grade basis with the exception of EMS 200 and EMS 290.

i) Core Courses (25 units):

The seven core courses in Materials Science and Engineering will constitute the requirement for 25 units of graduate courses in the major field.

- EMS 200: Preparing for Graduate Student Success (1 unit)
- EMS 260: Advanced Thermodynamics of Solids (4 units)
- EMS 262: Advanced Topics in Structure of Materials (4 units)
- EMS 264: Transport Phenomena in Materials Processes (4 units)
- EMS 268: Advanced Materials Characterization Methods (4 units)
- EMS 272: Advanced Functional Properties of Materials (4 units)
- EMS 274: Advanced Mechanical Properties of Materials (4 units)

ii) Elective Courses (8 units):

Six of the elective units should comprise an appropriate combination of upper-division undergraduate and/or graduate technical electives. These elective courses must be must be completed on a letter grade basis. The remaining two units must be fulfilled by completing 2 units of the seminar course (EMS 290). Thesis research units (EMS 299) are not included in the total of 8 elective units. All electives should be chosen in consultation with the Major Professor and Graduate Advisor, but students may choose to refer to a list of recommended electives on the Graduate Program website.
iii) **Summary:**
A Master of Science degree may be awarded upon completion of Plan I (thesis plan) in which a total of 33 upper-division undergraduate and graduate course units and a thesis are required. Of this total, 25 units must be Materials Science and Engineering graduate core courses. M.S. students must also complete 2 units of seminar courses (EMS 290). The remainder of the 33 unit requirement can comprise an appropriate combination of upper-division undergraduate or graduate technical electives. All courses must be completed on a letter grade basis with the exception of EMS 200 and EMS 290.

Any course that was used to meet the requirements for any other degree (e.g., B.S., M.S., M.Eng., Ph.D.) at any institution cannot be used to fulfill the M.S. coursework requirements. Six-quarter units of credit of upper-division undergraduate and/or graduate courses taken at an accredited institution and which were not required for another degree may be applied to the M.S. degree elective requirements.

A minimum course load is 12 units each academic quarter for full-time students. Per UC regulations, students cannot enroll in more than 12 units of graduate level courses (200) or more than 16 units of combined undergraduate and graduate level (100, 200, 300) courses per quarter, without approval of the Associate Dean for Students in the Office of Graduate Studies.

b) **M.Eng.**

i) **Core Courses (20 units):**
The five core courses in Materials Science and Engineering will constitute the requirement for 20 units of graduate courses in the major field. All core courses must be completed on a letter grade basis.

EMS 260: Advanced Thermodynamics of Solids (4 units)
EMS 262: Advanced Topics in Structure of Materials (4 units)
EMS 264: Transport Phenomena in Materials Processes (4 units)
EMS 272: Advanced Functional Properties of Materials (4 units)
EMS 274: Advanced Mechanical Properties of Materials (4 units)

ii) **Elective Courses**
Students will choose from two tracks to satisfy the elective component of their degree. All elective courses, with the exception of EMS 292, must be completed on a letter grade basis.

(1) **Track A (16 units)**
EMS 280A: Graduate Capstone Project (4 units)
EMS 280B: Graduate Capstone Project (4 units)
Two graduate or upper-division undergraduate (100 or 200 level) courses (other than EMS 290 or 299) chosen in consultation with the Graduate Advisor for a total of 8 units.

(2) **Track B (16 units)**
EMS 292: Internship (10 units)
Two graduate or upper-division undergraduate (100 or 200 level) courses
(other than EMS 290 or 299) chosen in consultation with the Graduate Advisor for a total of 6 units.

iii) **Summary:**
All Master of Engineering students will complete 36 units of upper-division undergraduate and graduate level courses. Of this total, 20 units must be Materials Science and Engineering graduate core courses. M.Eng. students must also complete 16 units of elective coursework. Students should choose either Track A (classroom project) or Track B (internship) to successfully fulfill their coursework requirements. All courses, with the exception of EMS 292, must be completed on a letter grade basis.

Any course that was used to meet the requirements of any other degree (e.g. B.S., M.S., M.Eng., Ph.D.) at any institution cannot be used to fulfill the M.Eng. coursework requirements. Six-quarter units of credit of upper-division undergraduate and/or graduate courses taken at an accredited institution and which were not required for any other degree may be applied to the M.Eng. degree requirements through both an internal review process and the Office of Graduate Studies.

A minimum course load is 12 units each academic quarter for full-time students. Per UC regulations, students cannot enroll in more than 12 units of graduate level courses (200) or more than 16 units of combined undergraduate and graduate level (100, 200, 300) courses per quarter, without approval of the Associate Dean for Students in the Office of Graduate Studies.

4) **Special Requirements**
Students who have neither obtained a previous degree at an approved English-medium institution nor demonstrated English-language proficiency through an appropriate exam (e.g. TOEFL) are required to complete appropriate English-language courses, as described in the policy Graduate Student Course Requirements – English as Second Language (GC2018-02). Courses taken in satisfaction of this requirement do not count towards the units required for graduation.

5) **Committees**
a) **Admission Committee**
For both M.S. Plan I and M.Eng. degree objectives, once the completed application, all supporting materials, and the application fee have been received, the application will be routed to the Graduate Affairs Committee (GAC). The GAC consists of graduate program faculty appointed by the Graduate Program Chair. Based on a holistic review of the entire application, a recommendation will be made to accept or decline an applicant’s request for admission. That recommendation will be forwarded to the Dean of Graduate Studies for approval of admission. Notification of admissions decisions will be sent by the Office of Graduate Studies. Applications are accepted through the posted application deadline for the following Fall Quarter. Application deadlines are posted annually on the Department website. Depending on space availability,
applications received until June 1 may also be reviewed.

b) Advising and Guidance

Upon entering the program, students are assigned a Graduate Advisor. The Advisor is a resource for all graduate students in the Graduate Program to provide information and advising on academic requirements, policies, and procedures (Graduate Studies, Graduate Council, Program).

For M.S. Plan I students, during the Winter Quarter of the first year, after the student has been paired with a Major Professor (thesis Advisor), the student, and two other thesis committee members develop a Program of Study. The Program of Study should be submitted to the Graduate Advisor for approval by end of the winter quarter of the first year.

For the M.Eng. degree objective, the Graduate Advisor will also serve in the role of the Major Professor to assist the student in selecting appropriate courses.

Full-time graduate students must register for a minimum of 12 units each academic quarter; these 12 units can be made up of required courses, electives, and EMS 290C/299 units. The technical interests of the student are considered, and the Program of Study is individually tailored in such a way that the student obtains a strong overall technical background.

c) Thesis Committee, M.S., Plan I:

The student, in consultation with his/her Major Professor and Graduate Advisor, nominates two additional faculty members to serve on the student’s Thesis Committee. These nominations are submitted to the Office of Graduate Studies for formal appointment in accordance with Graduate Council policy (DDB 80, Graduate Council B.1.). Master’s students will be matched with their Major Professor from among the members of the Materials Science and Engineering Graduate Program faculty. The Major Professor serves as Chair of the Thesis Committee and at least one other member must be a member of the Graduate Program faculty in Materials Science and Engineering.

d) Comprehensive Examination Committee, M.Eng.:

The Master of Engineering capstone project is reviewed and evaluated by the Comprehensive Examination Committee. This committee is comprised of the instructor(s) of EMS 280A and 280B for students selecting Track A and the Graduate Advisor, with a minimum of two members. For students selecting Track B The committee is comprised of the Major Professor and at least one additional member of the graduate group, with a minimum of two members.

6) Advising Structure and Mentoring

The Major Professor is the faculty member who supervises the student’s research and thesis for the Master of Science degree; this person serves as the Chair of the Thesis Committee. The Graduate Advisor, who is appointed by the Dean of Graduate Studies and assigned by the Chair of the Graduate Program, is a resource for information on academic requirements, policies and procedures, and registration information. The Graduate Advisor also serves in the role of Major Professor for M.Eng. students. The Mentoring Guidelines can be found on the
7) Advancement to Candidacy

Every student must file an official application for Candidacy for the Degree of Master of ___ after completion of at least one-half of the degree requirements and at least one quarter before completion of all degree requirements. For M.S. Plan I students, this will typically be in the 3rd quarter of the first year. For M.Eng. students, this will typically be at the end of the 2nd quarter of the first year. The Candidacy for the Degree of Master of ___ form can be found online at: http://www.gradstudies.ucdavis.edu/forms/. A completed form includes a list of courses the student will take to complete degree requirements. If changes must be made to the student’s Program of Study after s/he has advanced to candidacy, the Graduate Advisor must recommend these changes to the Office of Graduate Studies. Students must have their Graduate Advisor and Chair of the Thesis Committee sign the candidacy form before it can be submitted to the Office of Graduate Studies. If the candidacy is approved, the Office of Graduate Studies will send a copy to: the Chair of the Thesis Committee, the Graduate Program Coordinator, and the student. If the Office of Graduate Studies determines that a student is not eligible for advancement, the Graduate Program and the student will be told the reasons for the application’s deferral. Some reasons for deferring an application include: grade point average below 3.0, outstanding “I” grades in required courses, or insufficient units.

8) Thesis Requirements or Comprehensive Examination

a) Thesis (M.S. Plan I)

M.S. students are expected to begin work on their research immediately after they have chosen a topic and have been assigned a Major Professor. New students should begin consultations with individual faculty members during their first quarter to discuss research topics. It is critical that the M.S. student complete coursework and research in a timely manner in order to finish within six academic quarters.

The Thesis Committee and the Graduate Advisor advise each student to develop a meaningful sequence of courses. The technical interests of the student are considered and the program is individually tailored in such a way that the student obtains a strong overall technical background.

A written outline of the research project shall be submitted to the Thesis Committee. This outline will include critical evaluation of the methods and their limitations plus a full description of experimental design, protocols, and data analysis. Consultations should occur at reasonable time intervals between the candidate and the Thesis Committee meeting as a group. The M.S. thesis should be:

- A scholarly piece of experimental, theoretical or computational research.
- Rigorous in approach (design, methodology, and analysis), but not as extensive as a Ph.D. dissertation.
There are no specifications on length or the number of publications needed, however typical expectations for the thesis are 35-100 pages in length. For information on how to prepare and file your thesis, visit the Office of Graduate Studies Website: http://gradstudies.ucdavis.edu/students/filing.html

b. Comprehensive Evaluation (M.Eng.)

The comprehensive examination is administered in the form of successful completion of the capstone project courses (Track A) with a grade of B- or better or submission of a satisfactory final internship report (Track B).

For Track A, working either individually or in small groups (no more than 4 students), students will pursue design projects intended to provide advanced experience in the processing, selection, and evaluation of engineering materials. Projects will be selected from engineering applications of materials in a wide range of cutting-edge technologies where an understanding of structure - property - processing relationship is important in optimization of materials for improved functionalities. Students will consider the application of materials within multiple realistic constraints imposed by economic, manufacturing, ethical, intellectual property and safety considerations. Students will work under the guidance of the faculty member for the course and their Graduate Advisor/major professor. Each individual or group will generate an approach in arriving at a solution to the design problem. Students will design an experimental plan and will conduct any necessary experiments with the general assistance of the instructor or graduate Advisor/major professor. Deliverables for the project may range from optimization solution for materials and/or processing to fabrication of small devices with functionalities for specific applications. This course will culminate in a final capstone project detailing the results of their design project and the connections to the fundamentals of materials science and engineering learned in the core curriculum. Final grading will be based on the quality of the final capstone written report of approximately 15 to 30 pages, including the planning and execution of the project, the deliverables, and a final oral presentation. The students will deliver an interim report and presentation periodically throughout the two quarter-long series, at a minimum at the end of the first quarter. The individual student’s achievements and contributions will be evaluated by their contribution to oral presentations made by each group. In addition, each student will submit a report on their individual contributions to the overall project as well as peer evaluations of each other’s contributions.

For Track B, students are expected to provide an interim progress report at the midpoint of the internship quarter detailing progress and activities at the internship. At the conclusion of the second internship course, student will submit a final capstone report of approximately 15 to 30 pages on activities completed during internship and how activities relate to the broader field of Materials Science and Engineering. The on-site internship supervisor will also submit brief assessment of work completed. The committee will evaluate both reports to determine the final outcome.
The results of this examination must be reported to the Office of Graduate Studies using the Master’s Report Form, which can be found at: http://www.gradstudies.ucdavis.edu/forms/. Students must be registered or in a current filing fee status in order to take the exam.

i. **Timing:** The comprehensive examination consists of a final capstone activity and its fulfillment is the final requirement to receiving the M.Eng. degree. A student may complete the comprehensive examination capstone report once they have advanced to candidacy. However, it is important that the capstone be completed at or near the end of the coursework for the M.Eng. degree; for most students, the report is submitted by the end of the 3rd quarter of the first year.

ii) **Outcome:** If the student does not pass the exam, the Exam Committee may recommend that the student be allowed to retake EMS 280A/B for Track A or submit a revised report for Track B, but only if the Graduate Program Chair (or the Department Chair if the Graduate Program Chair is a member of the committee) concurs with the exam committee. The second exam must take place within 60 days of the original exam for students in Track B and 1 year for students in Track A. The format of the second exam is the same as the first. The examination may not be repeated more than twice. A students who does not pass on the second attempt is subject to disqualification from further work in the Graduate Program.

9) **Normative Time to Degree**

   a) **M.S. Plan I:** The normative time to degree is six academic quarters (not counting Summer) or two years. Normative time to advancement to candidacy is three quarters, and the normative time in candidacy is three quarters.

   b) **M.Eng., Plan II:** The normative time to degree is three academic quarters or one year. The normative time to advancement to candidacy is two quarters, and the normative time in candidacy is one quarter.

10) **Typical Time Line and Sequence of Events**

    **a. M.S., Plan I**

    | Year One | Fall | Winter | Spring (Advance to Candidacy) |
    |----------|------|--------|-----------------------------|
    |          | 200: Preparing for Grad Student Success (1 unit) | 290: Seminar (1 unit) | |
    |          | 290: Seminar (1 unit) | | |

    **Year Two**

    | Fall | Winter | Spring (File Thesis) |
    |------|--------|---------------------|
    | 299: Research (12 units) | 299: Research (12 units) | 299: Research (12 units) |
### b. M.Eng., Track A

<table>
<thead>
<tr>
<th>Year One</th>
<th>Fall</th>
<th>Winter (Advance to Candidacy)</th>
<th>Spring (Comprehensive Exam Completed)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>264: Transport Phenomena in Materials Processes (4 units)</td>
<td>280A: Graduate Capstone Project (4 units)</td>
<td>280B: Graduate Capstone Project (4 units)</td>
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</tbody>
</table>

### c. M.Eng., Track B

<table>
<thead>
<tr>
<th>Year One</th>
<th>Fall</th>
<th>Winter (Advance to Candidacy)</th>
<th>Spring (Comprehensive Exam Completed)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>264: Transport Phenomena in Materials Processes (4 units)</td>
<td>2XX: Elective (3 units)</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>292: Internship (1 unit)</td>
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### 11) Sources of Funding

The department does not guarantee funding for students seeking the Master of Science degree or the Master of Engineering degree. However, depending on each student’s individual interests and needs, some support may be available through Graduate Student Researcher (GSR), Teaching Assistantship (TA), and/or Readerships.

### 12) PELP, In Absentia and Filing Fee status

Information about PELP (Planned Educational Leave), In Absentia (reduced fees when researching out of state), and Filing Fee status can be found in the Graduate Student Guide: [http://www.gradstudies.ucdavis.edu/publications/](http://www.gradstudies.ucdavis.edu/publications/). Students considering PELP, In Absentia or Filing Fee status, should contact the Graduate Program Coordinator.
PH.D. PROGRAM

The awarding of a Ph.D. degree acknowledges an individual’s ability to perform original and creative research. A graduate student pursuing a Ph.D. degree should be cognizant of the fact that a Ph.D. degree is not simply a matter of following the daily instructions of a Major Professor. A candidate for a Ph.D. degree is expected to demonstrate the ability to make independent and critical assessments of research in his/her field of study, be capable of proposing original ideas and translating these ideas into hypotheses that can be tested through experiments, simulations or theory. The candidate for a Ph.D. degree is also expected to communicate his/her original research in written and oral forms in professional venues.

1) Admissions Requirements
Applicants for admission must meet the UC Davis minimum requirements for admission. Other requirements for admission include:

- Hold a Bachelor’s or Master’s degree in a discipline relevant to Materials Science and Engineering.
- An online application through the Office of Graduate Studies.
- Scores from the Graduate Record Examination (General Test).
- English proficiency examination (TOEFL or IELTS) for international applicants who have not completed a Bachelor’s at an institution where English was the sole language of instruction. Minimum requirements include a TOEFL score of 100 or an IELTS score of 7.5
- Three letters of recommendation.
- Statement of Purpose and Personal History and Diversity Statement (part of the Office of Graduate Studies online application).
- A minimum GPA of 3.0 overall on a 4.0 scale. The recommended GPA for admission is at least 3.25.

a) Prerequisites: Bachelor’s degree in Materials Science and Engineering or closely related field (e.g. Physics, Chemistry, Electrical Engineering, Chemical Engineering, Mechanical Engineering, Applied Physics or Chemistry, Applied Science).

b) Deficiencies: Any coursework deficiencies and insufficient training will be identified prior to admission and, if appropriate, addressed by the Graduate Advisor in the form of additional coursework, if the student is admitted.

2) Dissertation Plan B
Plan B specifies a three-member (minimum) Dissertation Committee, an optional final oral examination (required on an individual student basis by the Dissertation Committee), and an exit seminar required by the Graduate Program.

3) Course Requirements: 37 units
All courses must be completed on a letter grade basis with the exception of EMS 200 and EMS 290.

a) Core Courses: 25 units
The seven core courses in Materials Science and Engineering will constitute the requirement for 25 units of graduate courses in the major field:
EMS 200: Preparing for Graduate Student Success (1 unit)
EMS 260: Advanced Thermodynamics of Solids (4 units)
EMS 262: Advanced Topics in Structure of Materials (4 units)
EMS 264: Advanced Materials Kinetics (4 units)
EMS 268: Advanced Materials Characterization (4 units)
EMS 272: Advanced Functional Properties of Materials (4 units)
EMS 274: Transport Phenomena in Materials Processes (4 units)

b) Elective Courses: 12 units

Of the 12 units, at least 3 units should be comprised of EMS 290 which must be taken every quarter during the first year of graduate study. The remaining 9 elective units can be a combination of three upper-division undergraduate and/or graduate technical electives and may be selected from courses offered by the Materials Science and Engineering Graduate Program and/or from courses outside the program (e.g. other programs in Engineering, Mathematics, Physics, Chemistry, etc.). No more than one of these courses (3 to 4 units) may be an upper-division undergraduate course (100 level). A list of recommended electives may be found on the Graduate Program website. However, all elective courses must be chosen in consultation with the Major Professor and Graduate Advisor.

c) Summary

A Ph.D. degree requires completion of a total of 37 units (exclusive of research course work units), dissertation, and an exit seminar. 25 units of course work in the major (Materials Science and Engineering) and a minimum of 12 units of elective coursework.

Students with an undergraduate degree in a field other than Materials Science and Engineering should, in consultation with their Major Professor and Graduate Advisor, devise a strategy to ensure that they are sufficiently trained in the fundamentals of Materials Science and Engineering. This strategy may include taking UC Davis upper-division undergraduate core courses in Materials Science and Engineering (EMS 160, 162, 164, 172, 174). None of these courses taken to ensure adequate preparation may be counted toward the Ph.D. degree requirements.

Ordinarily, students entering the Graduate Program with a Bachelor’s degree will perform all work for the graduate degree in residence at UC Davis. However, it is recognized that some entering students have already completed advanced and graduate coursework beyond the requirements for their Bachelor’s degrees. Coursework taken at other academic institutions is not transferred to a Ph.D. student's UC Davis graduate record, although that coursework may be applied to the student’s Program of Study. Under normal circumstances, the department requires the doctoral student to complete a minimum of 30 units of coursework listed on the Program of Study at UC Davis. A limit of 8 units from another institution may be applied to the student’s Program of Study with permission of the student’s Graduate Advisor. Students transferring to Materials Science and Engineering Ph.D. Program from a Ph.D.
program of high standard who have performed coursework indicating superior scholarship may apply as many as 18 units with permission of the Graduate Advisor and the Chair of the Graduate Affairs Committee.

Units from another institution will not be accepted if they were used to satisfy the requirements of a Bachelor’s degree or if they constitute units from a core undergraduate Materials Science and Engineering program. In addition, a major consideration in application of units will be course content and mastery of the material. Therefore, the student should prepare a dossier of coursework and demonstrate understanding of the material (for example in discussion with a faculty currently teaching the course at UC Davis). If the content of the course is similar to a currently offered Materials Science and Engineering core course, as verified by the current instructor, the student may be excused from taking the core course and list the course from another institution on their Program of Study.

A minimum course load is 12 units each academic quarter for full-time students. Per UC regulations students, cannot enroll in more than 12 units of graduate level courses (200) or more than 16 units of combined undergraduate and graduate level (100, 200, 300) courses per quarter, without approval of the Associate Dean for Students in the Office of Graduate Studies.

4) **Special Requirements**

All doctoral students are required to serve as a 25% FTE Teaching Assistant at least three times over the course of their graduate career. One of these times may be as a Reader. During the first instance of serving as a Teaching Assistant, students must concurrently enroll in EMS 390: The Teaching of Materials Science.

Prior to the exit seminar, doctoral students should schedule a meeting with their Dissertation Committee to discuss their dissertation. This meeting should be no longer than an hour in length.

Students who have neither obtained a previous degree at an approved English-medium institution nor demonstrated English-language proficiency through an appropriate exam (e.g. TOEFL) are required to complete appropriate English-language courses, as described in the policy Graduate Student Course Requirements – English as Second Language (GC2018-02). Courses taken in satisfaction of this requirement do not count towards the units required for graduation. Doctoral students must fulfill this requirement prior to applying to take their qualifying examination.

5) **Committees**

a) **Admissions Committee**

Once the completed application, all supporting material, and the application fee have been received, the application will be submitted to the Graduate Affairs Committee (GAC). The GAC consists graduate program faculty appointed by the Graduate Program Chair. Based on a review of the entire application, a recommendation will be made to accept or decline an applicant’s request for admission. That recommendation will be forwarded to the Dean of Graduate Studies for final approval of admission. Notification of admissions decisions will be sent by the Office of Graduate Studies.
b) Advising and Guidance

Upon entering the program, students are assigned a Graduate Advisor. The Advisor(s) are a resource for all graduate students in the Graduate Program to provide information and advising on academic requirements, policies, and procedures (Graduate Studies, Graduate Council, Program).

During the Winter Quarter of the first year, after the student has been matched with a Major Professor (dissertation Advisor), the student, and two other prospective Dissertation Committee members (nominated in consultation with the Graduate Advisor) develop a Program of Study. The technical interests of the student are considered and the program is individually tailored in such a way that the student obtains a strong overall technical background. The Program of Study should be submitted to the Graduate Advisor for approval by the end of the winter quarter of the first year.

Full-time graduate students must register for a minimum of 12 units each academic quarter; these 12 units can be made up of required courses, electives, and EMS 290C/299 units.

c) Preliminary Examination Committee

The committee will be composed of at least five faculty members who are determined by the Materials Science and Engineering faculty. The Major Professor may be one of the committee members.

d) Dissertation Committee

The student, in consultation with his/her Major Professor and Graduate Advisor, nominates two additional faculty members to serve on the student’s Dissertation Committee. These nominations are submitted to the Office of Graduate Studies for formal appointment in accordance with Graduate Council policy (DDB 80, Graduate Council B.1.). Doctoral students must select their Major Professor from among the members of the Materials Science and Engineering Graduate Program faculty. The Major Professor serves as Chair of the Dissertation Committee and at least one other member must be a member of the Graduate Program in Materials Science and Engineering.

e) Ph.D. Qualifying Examination Committee

Qualifying Examination Committees consist of five members with a least one member being appointed from outside of the Materials Science and Engineering Graduate Program; the chair and two other members of the committee must be members of the Materials Science and Engineering Graduate Program. Students, in consultation with their Major Professor, suggest a list of faculty to the Graduate Advisor. The Graduate Advisor then recommends the members of the committee and areas of the examination to the Office of Graduate Studies for formal appointment in accordance with Graduate Council policy (DDB 80, Graduate Council B.1.). The Major Professor may not be a member of the Qualifying Examination Committee. Students must be registered during the quarter in which they take the Qualifying Examination.

6) Advising Structure and Mentoring

The Major Professor is the faculty member who supervises the student’s research and thesis; this person serves as the Chair of the Dissertation Committee. The
Graduate Advisor, who is appointed by the Chair of the program, is a resource for information on academic requirements, policies and procedures. The Mentoring Guidelines can be found on the department’s Web Site at: https://mse.engineering.ucdavis.edu/graduate/current/graduate-council-mentoring-guide/

7) **Advancement to Candidacy for the Degree of Doctor of Philosophy**

The student is eligible for Advancement to Candidacy after successful completion of all graduate degree requirements, and after passing the Qualifying Examination; this typically occurs in the 4th-5th quarter. The student must file the appropriate paperwork with the Office of Graduate Studies and pay the candidacy fee in order to be officially promoted to Ph.D. Candidacy. The Candidacy for the Degree of Doctor of Philosophy form can be found online at: http://www.gradstudies.ucdavis.edu/forms/.

8) **Preliminary Examination, Qualifying Examination and Dissertation Requirements:**

a) **Ph.D. Preliminary Examination**

- A GPA of at least 3.25 in all core courses is required for all Materials Science and Engineering Ph.D. students to take the Preliminary Examination.

- The Ph.D. Preliminary Examination is the first evaluation of prospective Ph.D. students by the Graduate Program faculty.

- The objective of this evaluation is to determine whether the student has mastered the subject matter in Materials Science and Engineering at a level appropriate for the Ph.D. degree and that the student has an ability to integrate basic concepts across subject areas.

- The Preliminary Examination is taken in the spring quarter of the first year (3rd quarter) following completion of all core courses. It consists of an oral examination during which the student must provide a critical literature review and answer questions from the faculty based on the presentation and relating to fundamental knowledge of Materials Science and Engineering topics. The duration of the presentation will be 15 minutes followed by 20 minutes of questions. During the exam, students are not allowed to include extraneous slides or access handouts and notes. For the critical literature review, students will select two to three papers to present on from a pre-determined list of 10-12 papers. The committee members will determine an outcome of the exam to be either “Excellent,” “Good,” “Fair” or “Poor.” This decision is then discussed and either confirmed or changed in a meeting of graduate program faculty members. If a student receives a score of “Fair,” they are required to retake the examination once prior to the start of the following quarter (usually Fall). The retake committee will be comprised of as many members of the original faculty committee members that are available for the time of the retake. Original members who are unable to participate in the retake will be replaced by other graduate program faculty members as availability allows. In order to receive a pass for the exam (either in the original exam or retake), the students must receive a grade of “Excellent” or “Good”. Students receiving a “Fair” on the original exam, or failing to achieve “Excellent” or “Good” on the retake, will be recommended for disqualification from the Ph.D. program. If appropriate, the
student may be allowed to transition to the M.Eng. or M.S. program.

b) **Qualifying Examination Eligibility:**

After passing the Ph.D. Preliminary Examination, the student should immediately begin preparing for the Qualifying Examination administered by a faculty committee appointed by the Office of Graduate Studies. Students are required to take the Qualifying Examination at the time they have completed all coursework listed in these degree requirements and their Program of Study, with the exception that they may be enrolled in no more than the final two courses during the quarter of the exam. Passing this exam makes the student eligible for advancement to candidacy.

The student must be in good academic standing in order to take the Qualifying Examination. Once a time and date have been agreed upon by the student and committee members (the student coordinates the scheduling), the student completes and submits the Application for the Qualifying Examination to the Graduate Program Coordinator, no later than four weeks prior to the Qualifying Examination. It takes approximately two weeks for the Office of Graduate Studies to process the application and to notify the committee members of their appointment. A student must not take the qualifying examination prior to receipt of the Notice of Admission to the Qualifying Examination from the Office of Graduate Studies.

The Qualifying Exam is normally taken by the end of the winter quarter of the second year (5th quarter), but no later than the end of the spring quarter of the second year (6th quarter).

The Qualifying Examination will consist of written and oral examinations.

1. **Written Portion of the Exam:** The written dissertation research proposal, (approved by the Major Professor), and bibliography should be provided to members of the qualifying examination committee at least 10 days before the qualifying exam. The dissertation proposal is typically 10 – 15 pages and of format similar to a NSF or NIH grant proposal containing the following sections: Objectives (Specific Aims), Background, Proposed Work, Schedule of Work, Preliminary Results (if any), and References.

2. **Oral Portion of the Exam:** The oral exam tests the student’s level of preparation to pursue Ph.D. research. Students are expected to have a thorough understanding of the context of their proposed research, relevant literature and the appropriate theoretical and experimental approaches to their research problem.

The Qualifying Examination will be limited to the areas listed on the Application for the Qualifying Examination and a critical evaluation of a dissertation proposal. Successful completion of the Ph.D. Preliminary Examination and an approved Ph.D. Program of Study will be considered by the Qualifying Examination Committee to represent successful completion of the comprehensive part of the Qualifying Examination. The format of the Qualifying Examination will consist of a 30 to 35 minute presentation by the student followed by proposal related questions, general questions in the exam areas, and feedback by the Committee. The normal examination time is three hours.
c) **Qualifying Examination Outcome**

Once the Qualifying Exam Committee has reached a unanimous decision, they will inform the student of its decision as “Pass” (no conditions may be appended to this decision), “Not Pass” (the Chair’s report should specify whether the student is required to retake all or part of the exam, list any additional requirements, and state the exact timeline for completion of requirements to achieve a “Pass”), or “Fail”. If a unanimous decision takes the form of “Not Pass” or “Fail”, the Chair of the Qualifying Exam Committee must include in its report a specific statement, agreed to by all members of the committee, explaining its decision and must inform the student of its decision. Having received a “Not Pass”, the student may attempt the qualifying exam one additional time. After a second exam, a vote of “Not Pass” is unacceptable; only “Pass” or “Fail” is recognized. Only one retake of the exam is allowed. A “Fail” results in a recommendation to the Dean of Graduate Studies for disqualification from the program.

Upon successful completion of the Qualifying Examination, the student must complete an Application for Advancement to Candidacy form, which lists the proposed members of the Dissertation Committee.

d) **The Dissertation**

Plan B specifies a three-member (minimum) Dissertation Committee, an optional final oral examination (required on an individual student basis by the Dissertation Committee), and an exit seminar.

A dissertation on a subject chosen by the candidate and Major Professor, bearing on the principal subject of study, and of such character as to show ability to pursue independent investigation, must be approved by the Dissertation Committee and by the Graduate Council before the degree will be recommended. The doctoral dissertation must be an original and substantial contribution to knowledge in the student's major field. It must demonstrate the ability to carry out a program of advanced and independent research and to report the results in accordance with standards observed in recognized peer reviewed scientific journals. Prior to submitting the dissertation to the Office of Graduate Studies, each student is expected to present the results of his or her dissertation research in a public seminar, which may be scheduled as part of the regular EMS 290 seminar.

There are no specifications on length or the number of publications needed. For information on how to prepare and file your dissertation, visit the Office of Graduate Studies Website: [http://gradstudies.ucdavis.edu/students/filing.html](http://gradstudies.ucdavis.edu/students/filing.html)

e) **Exit Seminar:** The program requires that each student present an exit seminar of his/her research to the graduate program faculty and students before filing the dissertation with the Office of Graduate Studies. Notification of the seminar to faculty and students must be given at least two weeks in advance; this is arranged through the Graduate Program Coordinator. The student must meet with the entire Dissertation Committee prior to the Exit Seminar to discuss and review the dissertation. At least two of the three Dissertation Committee members must be in attendance. Satisfaction of this requirement must be verified by the Dissertation Committee Chair.
9) Normative Time to Degree
The goal of the department is that each student should have the opportunity to complete all degree requirements (coursework and dissertation defense) within twelve academic quarters (not including summers) if they enter the graduate program with a B.S. degree in Materials Science and Engineering or nine academic quarters if they enter with an M.S. degree in Materials Science and Engineering. It is noted that individual time-to-degree goals may vary due to the nature of advanced research and this framework should serve as a guideline under which the Major Professor and the student can work together towards a timely completion of the dissertation requirements.

10) Typical Time Line and Sequence of Events
Course requirements and the Qualifying Exam are generally completed by the end of year two.

<table>
<thead>
<tr>
<th>Year One</th>
<th>Fall</th>
<th>Winter</th>
<th>Spring (Preliminary Examination)</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>200: Preparing for Graduate Student Success (1 unit)</td>
<td>290: Seminar (1 unit)</td>
<td>290: Seminar (1 unit)</td>
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<td></td>
<td>290: Seminar (1 unit)</td>
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<tr>
<td>Year Two</td>
<td>Fall</td>
<td>Winter (Advancement to Candidacy)</td>
<td>Spring</td>
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<td></td>
<td>2XX: Elective (3-4 units)</td>
<td>299: Research (12 units)</td>
<td>299: Research (12 units)</td>
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<td>299: Research (8-9 units)</td>
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<tr>
<td>Years Three and Four</td>
<td>Fall</td>
<td>Winter</td>
<td>Spring (File to Graduate)</td>
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<tr>
<td></td>
<td>299: Research (12 units)</td>
<td>299: Research (12 units)</td>
<td>299: Research (12 units)</td>
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11) Sources of Funding
The Graduate Program’s goal for doctoral student funding is to provide a stipend based on the amount in its approved compensation plan for up to four years for those students making satisfactory progress. The stipend can be paid as a GSR, Teaching Assistant, Work Study, or Fellowship.

12) PELP, In Absentia and Filing Fee Status
Information about PELP (Planned Educational Leave), In Absentia (reduced fees when researching out of state), and Filing Fee status can be found in the Graduate Student Guide: [http://www.gradstudies.ucdavis.edu/publications/](http://www.gradstudies.ucdavis.edu/publications/)
13) **Leaving the Program Prior to Completion of the Ph.D. Requirements**

Should a student leave the program prior to completing the requirements for the Ph.D. degree, they may still be eligible to receive a Master’s degree if they have fulfilled all the requirements for that degree (see Master’s section). Students should consult with their Graduate Advisor and can use the Change of Degree Objective form available from the Office of the Registrar:

[http://registrar.ucdavis.edu/PDFFiles/D065PetitionForChangeOfGraduateMajor.pdf](http://registrar.ucdavis.edu/PDFFiles/D065PetitionForChangeOfGraduateMajor.pdf)