The IMSE offers an interdisciplinary PhD program in Materials Science and Engineering designed to allow students to easily work across departmental boundaries. Students apply directly to the IMSE, pursue coursework offered by several of the member departments, and conduct their thesis research with the mentorship of interdisciplinary faculty teams. This allows our students to take advantage of the rich breadth of materials science expertise and facilities across the University.

Program Requirements for Candidates Entering the Program Fall 2017

To earn a PhD degree, students must complete the Graduate School requirements, along with specific program requirements.

Courses include:

4 IMSE Core Courses (12 academic credits)

- MEMS 5608, Introduction to Polymer Science and Engineering (3 units)
- Physics 537, Kinetics of Materials (3 units)
- EECE 502, Advanced Thermodynamics in EECE (3 units)
- Chem 465, Solid State and Materials Chemistry (3 units) or Physics 472, Solid State Physics (3 units)

Additional Courses

- IMSE 500 First-Year Research Rotation (3 academic credits)
- IMSE 501 IMSE Graduate Seminar (1 academic credit; 2 required, 3 allowed for credit)
- Three courses (9 credits) from a preapproved list of Materials Science & Engineering electives
- Additional free electives from participating departments to reach 36 academic credits (~9 academic credits, ~3 courses)
- A maximum of 3 credits of IMSE 502 Independent Study will be permitted toward the free electives requirement.
- A maximum of 12 credits of 400-level courses may be applied to the required 36 academic credits.
- 400-level courses not included on the preapproved list of Materials Science & Engineering electives must be approved by the Graduate Studies Committee.

Students must maintain an average grade of B (GPA 3.0) for all 72 credits. Additionally, the required courses must be completed with no more than one grade below a B-. Up to 24 graduate credits may be transferred with the approval of the Graduate Studies Committee.

In addition to fulfilling the course and research credit requirements, the student must:

- Complete a Research Rotation

- Identify an IMSE faculty member willing and able to support the student's thesis research on a materials-related topic
- Fulfill the Teaching Requirement
    - Attend 2+ Teaching Center Workshops
    - 15 units of teaching experience (basic and advanced levels)
- Successfully complete the Qualifying Examination (oral and written)
- Maintain satisfactory research progress, as determined by the student's thesis adviser and mentoring committee
- Successfully complete the Thesis Proposal and Presentation
- Successfully complete and defend a dissertation

Course Plan for IMSE PhD Candidates entering the program Fall 2017

Year 1

Fall Semester (13 credits)

- Solid-State and Materials Chemistry (Chem 465) or Elective
- Advanced Thermodynamics in EECE (EECE 502)
- Introduction to Polymer Science and Engineering (MEMS 5608)
- Elective
- IMSE Graduate Seminar (IMSE 501)

Spring Semester (13 credits)

- State Physics (Physics 472) or Elective
- Kinetics of Materials (Physics 537)
- Elective
- IMSE First-Year Research Rotation (IMSE 500)
- MSE Graduate Seminar (IMSE 501)

Summer

- Begin thesis research
- Prepare for Qualifying Exam (August)
- Written document and oral presentation on research rotation
- Oral exam on fundamentals from core courses

Years 2 and beyond

- 3 electives (discuss with PhD adviser)
- IMSE Graduate Seminar (once more for credit)

- IMSE PhD Research
- Teaching Requirement
- Attend 2+ Teaching Center Workshops
- 15 units of teaching experience (basic and advanced levels)
- Annual (or more frequent) meetings with Faculty Mentoring Committee
- Thesis proposal and presentation (fifth semester)
- Dissertation and oral defense

Teaching Requirements

The Graduate School requires all PhD students at Washington University to gain teaching experience. Students in the PhD program will receive formal pedagogical training by attending a minimum of two Teaching Workshops offered by the Washington University Teaching Center, and will be expected to fulfill a total of at least 15 units of teaching experience with at least 5 units at the basic level and 5 units at the advanced level. A unit of teaching is broadly defined as an hour spent communicating with a group of students or scholars. The teaching requirements must be completed before the student submits his/her doctoral dissertation to the graduate school.

For the basic-level teaching requirement, the following experiences qualify for one unit of teaching per event:

- Teach or co-teach a laboratory session
- Conduct an organized recitation or review section of a course
- Deliver a lecture in class using notes provided by the professor of the course
- Lead a journal club session
- Host an outreach activity such as preparing and presenting a lecture and/or demonstration in science at a middle or high school

For the advanced-level teaching requirement, the following experiences qualify for one unit of teaching per event:

- Prepare from scratch and deliver a lecture in an IMSE class
- Present a seminar giving the results of the student's own research at an IMSE-wide seminar or at a national meeting. At least one unit must but no more than five units may be qualified in this fashion.

Five units of teaching at the basic level is a minimum. However, if possible, students are encouraged to have additional teaching units at this level, with ten units being most desirable for teaching development. Each student must submit to the Graduate Studies Committee a form detailing how the teaching requirement was completed.

Research Rotations

During their first year, students are required to register for and complete one research rotations with IMSE faculty mentors (Core or Affiliate Faculty). A presentation and report on one of the

research rotations will be an integral component of the qualifying exam. The rotations are chosen in consultation with the Associate Director of the IMSE (Director of Graduate Studies) and must be mutually agreeable to both the student and the mentor. At the completion of the rotation, the student must submit to the Associate Director a written report approved by the mentor.