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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.

[How to Apply & Financial Support](#)

Program Requirements for Candidates Entering the Program Fall 2019 or Later

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

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)
- Three courses (9 credits) from a preapproved list of Materials Science & Engineering electives
- A minimum of 12 credits of graduate-level technical elective courses in Mathematics or any science or engineering department, to reach a total of at least 36 academic credits
 - A maximum of 3 credits of IMSE 502 Independent Study, will be permitted toward the free electives requirement
 - A maximum of 3 credits of IMSE 505 Materials Science Journal Club, will be permitted toward this requirement
 - 400-level courses not included on the preapproved list of Materials Science & Engineering electives must be approved by the Graduate Studies Committee
- A maximum of 12 credits of 400-level courses may be applied to the required 36 academic credits. Undergraduate-only courses (below the 400 level) are generally not permitted by the Graduate School and may not be used to fulfill this requirement
- Enroll in and satisfactorily complete IMSE 501, IMSE Graduate Seminar every semester
- Successfully complete 18-36 credits of IMSE 600, Doctoral Research
- Complete research ethics training by the end of the 3rd semester
- Maintain a GPA of at least 3.0 for all graded coursework
 - Have no more than one grade of B- or below in a core course or Materials Science and Engineering elective
- Successfully complete teaching requirement
 - Attend 2+ Teaching Center Workshops
 - Have 15 units of teaching experience
- Pass the IMSE Qualifying Examination (oral & written)
- Identify an IMSE faculty member willing and able to support their thesis research on a materials-related topic
- Maintain satisfactory research progress on a topic in materials science, as determined by the Thesis Advisor and Mentoring Committee
- Successfully complete the Thesis Proposal and Presentation, with approval from the Thesis Examination Committee
- Successfully complete and defend a Ph.D. Dissertation, with final approval from Thesis Examination Committee

Failure to meet these requirements will result in dismissal from the program.

Course Plan for IMSE PhD Candidates entering the program beginning Fall 2019

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 (optional)
- IMSE Graduate Seminar (IMSE 501)

Spring Semester (13 credits)

- State Physics (Physics 472) or Elective
- Kinetics of Materials (Physics 537)
- Elective (optional)
- 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

- Electives (discuss with PhD adviser)
- IMSE Graduate Seminar (IMSE 501)
- IMSE PhD Research (IMSE 600)
- Teaching Requirement
 - Attend 2+ Teaching Center Workshops
 - 15 units of Mentored Teaching Experience
- 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. 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. There are two paths that an IMSE student could follow to meet the 15 units of teaching requirement:

"Traditional" Mentored Teaching Experience (MTE)

For students pursuing a "traditional" MTE path, the required 15 units could be completed by assisting with 1-2 courses. IMSE students who choose to follow the MTE path will be assigned to assist with courses where they will engage with the students in recitation/discussion sections, small groups, or laboratory settings. They may also be asked to prepare and present guest lectures. The course instructor will be expected to provide the appropriate mentoring during the MTE, and will provide a summary of the teaching activities and expectations required successful completion of the MTE, prior to the IMSE student being assigned to the course. The mentor will also indicate the total number of teaching units (hours) completed and provide feedback to the student and IMSE Graduate Studies Director at the end of the course.

"Outreach" Mentored Teaching Experience

IMSE students who choose to follow an "outreach" focused MTE path will gain experience working on K-12 or public outreach activities focusing on science, technology, engineering, or math (STEM) and organized by their research advisor, the IMSE, or other campus organizations. Credit will be given for time spent preparing and presenting these activities. Again, the student's advisor or a representative from the lead organization will be expected to provide the appropriate mentoring during the MTE, and will provide a summary of the teaching activities and expectations required successful completion of the MTE. The mentor will also indicate the total number of teaching units (hours) completed and provide feedback to the student and IMSE Graduate Studies Director at the end of the experience.

Additional Teaching Opportunities

In addition to the above opportunities, IMSE students may use the following activities to complete up to 5 units of the teaching requirement:

- Leading a journal club session
- Presenting their research in the IMSE or other departmental seminar attended by students and faculty (max 2 units)
- Presenting their research as a speaker at a professional society or similar national meeting (max 2 units)

Other activities similar to those listed here will be considered for inclusion by the IMSE Graduate Studies Director on a case-by-case basis.

Research Rotations

During their first year, students are required to register for and complete one research rotation with IMSE Graduate Faculty mentors. 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 Director of Graduate Studies (DGS) and must be mutually agreeable to both the student and the mentor. At the completion of the rotation, the student must submit to the DGS a written report approved by the mentor.
