# A Joint-PhD in Materials Science and Engineering (MSE)

*Definition:* A Joint-PhD is a single PhD earned at the overlap of two or more departments, where the degree reads, "A Joint PhD in [X] and Materials Science and Engineering" with [X] being the name of the home department. For example, a "Joint PhD in Computer Science and Materials Science and Engineering."

*Admission:* A potential student applies for admission to an existing program, once admitted they apply to joining the X-MSE program, where X is a traditional department. For example, a ME-MSE student would apply to the ME department for admission to their program and would be considered with the other ME applicants. In this case, the student's degree at the end would read "A Joint PhD in Mechanical Engineering and Material Science and Engineering." For other "home" departments, "Mechanical Engineering" would be replaced with the name of the other home department.

*Requirements:* To earn a Joint-PhD, the student must complete all of the requirements of the home department. This includes and qualifying exams and course requirements. Note: if a student fails to meet the requirements of their home department, they are expelled from the school through traditional mechanisms, their association with the joint-PhD program does not grant them special disposition. If a student fails to meet the added requirements of the joint-PhD program, they are still eligible to get the non-joint degree in their home department, if they are in good standing there. The following additional requirements must be met to receive a Joint-PhD from this program:

- *Courses:* Note: as long as these courses meet the home department's degree requirements, these courses can count towards both requirements. Fundamentally, the purpose of taking these courses is to establish a core competency in materials science as part of the joint PhD program.
  - A student must take the four MSE core courses (see next section below)
  - Four additional electives off the MSE approved course list, http://materialsscience.tufts.edu/education/course.htm, two of which must be from outside of their primary department.

- *Written PhD Qualifying Exam:* To continue in the program, students must have submitted at least two papers to topical materials conference (e.g. MRS), one by their 4th semester and another by their 6th. Papers must also be submitted to the steering committee for evaluation. Due to the variances in how different departments operate, students can delay this deadline by up to four semesters with permission of their advisor and the director of the program.

- *Oral PhD Qualifying Exam:* Within the first two years, the joint-PhD student must write and defend their research proposal in front of a panel of three faculty members to become a PhD Candidate. Due to the variances in how different departments operate, students can delay this deadline by up to four semesters with permission of their advisor and the director of the program.

- *Research Committee:* Once a candidate, the student will meet with a research committee, consisting of three faculty, once per year to assess their progress and determine if the student's needs are being met. One member of the committee, other than the advisor, must be from the MSE faculty list and another from the traditional department's faculty list.

- *Pre*-Defense: Once the student is 6-9 months away from being able to defend their dissertation, the student will meet with their research committee one last time for a pre-defense. With their permission to proceed, the student can then write and defend their dissertation.

**New MSE core courses (in development):**

- **MSE 101 – Materials Characterization:** A jointly offered course on materials characterization techniques, taught by experts on the tools. Potential substitutes: BME-251 or EE-214
- **MSE 102 – Thermodynamics of Materials Processes:** The thermodynamics of phase changes, solid phase changes, surfaces, crack/void formation, diffusion, polymer alloys and solutions. Potential substitutes: ChBe203, CHM131, or ME 116
- **MSE 103 – Materials Structure and Crystallography:** Atomic arrangements in crystalline and non-crystalline materials. Potential substitutes: Phys 173
- **MSE 104 – Materials Defects, Microstructure, and Deformation:** Advanced studies of deformation and failure in materials. Macroscopic and microscopic aspects of deformation. Elasticity and plasticity theories and problems in deformation processing. Potential substitutes: ME-120