

# GRADUATE PROGRAM

Department of Materials Science and Engineering,  
Drexel University  
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- The policies listed herein are applicable to all students who entered the Drexel MSE Graduate Program on or after the Fall of 2008. For the purposes of interpreting this policy, the date of entry shall be the first academic quarter in which the student was registered.
- Ph.D. students who entered prior to the Fall of 2008 and who have not taken the candidacy **MUST** take the candidacy examination in Fall 2009.
- Pre-2008 Ph.D. students who have passed the candidacy examination but have not presented their thesis proposal must do so by the end of March 2010.

## I. GENERAL INFORMATION:

The rules and regulations described herein pertain to the Master of Science (M.S.) and Doctor of Philosophy (Ph.D.) degree programs in the Department of Materials Science and Engineering (MSE) as of the Fall Quarter 2009. In addition to these departmental rules, students must fulfill the requirements of the Office of Graduate Studies of Drexel University as described in the current Graduate Curricula (<http://www.drexel.edu/provost/graduatestudies/policies.asp>).

## II. REQUIREMENTS FOR THE M.S. DEGREE:

### *2.1 Faculty Advisors*

By the end of their second academic quarter of matriculation, as documented by Form D-1, (Plan of Study), each student **must** establish himself/herself with a permanent Faculty Advisor who has agreed to serve as the student's Supervising Professor. The Form MSE M.S. SUPERVISING PROFESSOR APPOINTMENT shall be filed with the MSE Department through the Graduate Advisor no later than the end of the second term of study, to formalize this appointment.

### *2.1 Plan of Study*

Students in the M.S. Program must file an MSE M.S. DEGREE PLAN OF STUDY form with the MSE department Graduate Advisor for approval prior to their third term of study. Changes or deviations from this Plan of Study must be approved in writing and in advance by the Graduate Advisor, by filling out and filing a new Plan of Study form. Students entering the program with a degree in a field other than Materials Science and Engineering should also follow the requirements outlined in Section V. *It is strongly recommended that a Plan of Study be filed as early as possible, as the requirements for graduation will be those in effect at the time of filing. Failure to file a Plan of Study and failure to obtain prior written approval for changes in the Plan of Study may result in non-acceptance of the unapproved courses as fulfilling degree requirements.*

### 2.3 M.S. Requirements

The minimum course requirement for the M.S. Degree is 45 credits. These 45 credits consist of 6 credits of core courses and 12 credits of selective core courses, 18 credits of Technical Electives (see the course lists in the Appendix). The remaining 9 credits shall depend on whether the student selects an M.S. thesis, an M.S. research proposal or the non-thesis option.

	<b>M.S. Degree Requirements</b>
Core Courses	6 credits
Non-core Courses	12 credits
Tech Electives Courses	18 credits (minimum 9 credits of MSE courses, or research for an MSE or MSE affiliated faculty)
Thesis and alternatives	9 credits of MS thesis <i>or</i> 6 credits of thesis proposal (literature review) + 3 credit course <i>or</i> 9 credits of courses

Of the 18 technical elective credits, at least 9 must be taken within the MSE Department, while the rest may be taken within the College of Engineering, College of Arts and Sciences, or at other colleges, if consistent with the student's Plan of Study and given advance written approval by his/her Advisor. At least 9 of these 18 elective credits must be exclusive of Independent Study courses or Research credits.

Students may transfer no more than 15 credits (equivalent to 10 semester-credits) from approved institutions, provided they follow the rules and regulations described in the Drexel University's Graduate Curricula.

There is no general exam required for M.S. students. If an M.S. student wants to continue for a Ph.D. then: (a) s/he must be admitted to the Ph.D. program (there is no guarantee that an M.S. student will be admitted to the Ph.D. program), and (b) s/he must take the Candidacy Exam during the first term in which s/he admitted to the Ph.D. program.

### 2.5 M.S. Thesis vs. Non-Thesis Option

To fulfill the M.S. degree requirements, students need to take nine (9) additional credits, following one of the following three options:

#### 2.5.1 M.S. Thesis:

An M.S. Thesis (9 credits) is strongly recommended for full-time M.S. students. B.S.-M.S. students who do their B.S. in the MSE Department are required to complete an M.S. Thesis *in lieu* of Senior Design. M.S. students shall, however, give ~15 minute oral progress reports/presentations at the end of the Fall and Winter terms as part of the regular B.S. program Senior Design oral presentations. A student's M.S. thesis must be approved by an M.S. Thesis Committee. The M.S. Thesis Committee shall consist of at least three (3) members, including the student's Thesis Advisor and at least one (1) more tenured or tenure-track or full-time teaching MSE Faculty. The composition of this committee must be reported to the Department, through

the Graduate Advisor, using the MSE M.S. FINAL ORAL DEFENSE COMMITTEE APPOINTMENT AND SCHEDULE form.

The M.S. Thesis must be defended during a Final Oral Defense, which shall consist of a 40-minute presentation and a follow-up closed discussion session with the M.S. Final Oral Defense Committee on thesis-related questions (no time limit). For thesis submission and scheduling requirements, please see Section IV.

**Outcomes:** The M.S. Final Oral Defense Committee shall examine the Thesis and the presentation in deciding whether the candidate passes the defense. There are two possible outcomes of the defense: Pass or Fail. Should a Fail have been given to a student, he/she is eligible to re-present the Final Oral Defense ONCE within ONE (1) calendar year of the first Defense. Students who fail in both defenses shall receive an F for the credits associated with the thesis. The results of the Final Oral Defense must be reported to the Department by the Graduate Advisor or the Thesis Advisor within 48 hours of the examination, on form MSE REPORT OF M.S. THESIS COMMITTEE.

### ***2.5.2 Non-Thesis Option #2: Coursework Only***

If neither the M.S. Thesis nor M.S. Research Proposal are possible, the student can fulfill the M.S. requirements by taking 9 additional credits of coursework.

The research proposal and course only non-thesis options are alternatives for students who are unable to conduct research (e.g., part-time students) or to B.S.-M.S. students who take their B.S. in a department that also requires completion of Senior Design (e.g., Chemical and Biological Engineering or Biomedical Engineering).

*Note: The Thesis Proposal Option (Literature Review) that was available in the past can be accommodated in the context of a non-thesis option, where some of the credits can be allocated to a research activity related to a literature review of a specific topic.*

## **2.6 Clearance of M.S. Candidates for Graduation**

The M.S. Candidate must complete and submit the THESIS APPROVAL and COMPLETION FORM with the Office of Graduate Studies. For students who choose the thesis option, submission of the Thesis to the Drexel University Library is a prerequisite for completing this form. The COMPLETION FORM should be filed as early as possible, but no later than two (2) days before the day of Commencement.

## **III. REQUIREMENTS FOR THE Ph.D. DEGREE**

A student admitted into the Ph.D. Program shall be classified as a “Ph.D. Student”. After successful completion of the Ph.D. Candidacy Examination (described below) and the required number of credits, the classification of the student shall change to “Ph.D. Candidate”. The rules, regulations, and procedures pertaining to the required credits and the governance of the Ph.D. Candidacy Examinations are described in Section 3.4.

### **3.1 Plan of Study**

All students entering the MSE Department at Drexel University must file an approved Plan of Study. Students in the Ph.D. Program must file a Ph.D. PLAN OF STUDY (D-1) form with

the MSE department Graduate Advisor prior to their second term of study. Changes or deviations from this Plan of Study must be approved in advance and in writing by the Graduate Advisor, by filling out a new Plan of Study form. Students entering the program with a degree in a field other than Materials Science and Engineering should also follow the requirements outlined in Section V. *It is strongly recommended that a Plan of Study be filed as early as possible, as the requirements for graduation will be those in effect at the time of filing. Failure to file a Plan of Study and failure to obtain prior written approval for changes in the Plan of Study may result in non-acceptance of the unapproved courses as fulfilling degree requirements.*

### 3.2 Faculty Advisors

Upon admission into the Ph.D. Program, each student is required to establish himself/herself with a permanent Faculty Advisor who has agreed to serve as the student's Supervising Professor. The Form D-2 Ph.D. SUPERVISING PROFESSOR APPOINTMENT shall be filed with the Office of Graduate Studies through the Graduate Advisor, to formalize this appointment. The Form D-2 should be filed no later than the end of the second term of study. Students are allowed to change Supervising Professor. Should a student have decided to change his/her advisor, he/she must resubmit the D-2 form.

### 3.3 Ph.D. Courses

The Office of Graduate Studies requires at least 90 credits for the Ph.D. Degree for post-Bachelors students and 45 credits for post-Master's students. Students may transfer not more than 18 credits (equivalent to 12 semester-credits) from approved institutions, provided they follow the rules and regulations described in the Drexel University's Graduate Curricula. The 90 credits consist of the 45 credits normally taken for an M.S. degree plus 45 additional credits for the Ph.D. degree. Of the 45 additional credits for the Ph.D. degree, 18 must be from regular course work (exclusive of Independent Study and Research credits). The remaining 27 credits may consist of Research, Independent Study, or additional advanced course work consistent with the approved Plan of Study. Hence, beginning with a B.S. degree, the required 90 credits for a Ph.D. degree are tabulated below:

Core courses*	6 Credits
Selective core course*	12 Credits
Technical elective courses/Research*	63 Credits
Thesis	9 Credits
<b>TOTAL</b>	<b>90 Credits</b>

\* For definitions of core, selective core and technical elective courses please see the Appendix.

### 3.4 Ph.D. Candidacy Examinations – *may be repeated once.*

The exam is designed to improve and assess the communication skills and the analytical abilities of the student. The following procedures should be followed to complete the Ph.D. candidacy exam:

- Requirement: All MSE Ph.D. students are required to take the Ph.D. Candidacy Examinations administered by the MSE Department.

- **Candidacy Examination Committee:** The Candidacy Examination Committee shall consist of no fewer than five (5) faculty members, all of whom should be tenured or tenure-track or full-time Drexel teaching faculty, and at least three of whom should be MSE core or affiliated faculty (one shall be the Thesis Adviser). The Candidacy Examination Committee members should be selected by the Candidate and approved in advance by the Thesis Advisor. The Chair of the Candidacy Examination Committee should be one of the committee members other than the student's Thesis Advisor. The constituency of the Candidacy Examination Committee and the schedule of the examination must be reported to the Office of Graduate Studies by filing Form D-3 Ph.D. CANDIDACY COMMITTEE APPOINTMENT AND EXAMINATION SCHEDULE with the Office of Graduate Studies by the Supervising Professor or Department Graduate Advisor. This must be done at least four (4) weeks prior to the scheduled date of the examination.
- **Timing and Other Policies:**
  - Each student must take the Candidacy Examination prior to the end of the 6<sup>th</sup> quarter from "entry" into the program; the date of "entry" into the program is to be taken as the first academic quarter in which the student is fully or provisionally matriculated in the MSE Ph.D. program;
  - A student who does not complete the Candidacy Examination within the above time limits will be dropped from the program automatically (terminal M.S.);
  - Requests for exceptions to the time limits will be considered under extenuating circumstances (e.g. maternity leave, medical disability, family issues, etc.), that are usually accompanied by a leave-of-absence from Drexel; requests for an extension should be submitted in writing to the Graduate Program Advisor with a cc to the Department Head in advance of the deadline identified above.
- **Format:**
  - The Candidacy Examination shall consist of an oral presentation that shall be a review of a selected topic that focuses on a broad area that is close, but not identical, to the student's Ph.D. thesis topic;
  - No preliminary results from the student's research are required to be included in the presentation; inclusion of preliminary results from the student will not be a basis for evaluation;
  - Students must submit a title and abstract (300 words or less), to the MSE department Graduate Program Advisor via email at least three (3) weeks in advance of the Candidacy Exam for review and approval. The email must contain "Candidacy Exam" in the subject line; late submissions will result in a need to reschedule the Candidacy Exam to a later date. A copy of the email correspondence documenting the date of request for review and approval/denial will be placed in the student's file.
- **Date:** Once the Candidacy Examination Committee and the exam subject have been approved, the student should consult with their committee members and announce the date and time of the seminar to the department.
- **Outcomes:** There are two possible outcomes of the exam: Pass (resulting in Ph.D. Candidate status) and Fail. Should a Fail be given to a student, he/she is eligible to retake the candidacy exam ONCE, within ONE (1) quarter of the first exam. Students who fail

twice shall enter a terminal M.S. degree program. Upon satisfactory performance in the Candidacy Examination and completion of the required number of credits, the student shall become a “Ph.D. Candidate”, and his/her registration will change to that status. The results of the Candidacy Examination will be reported to the Office of Graduate Studies, through the Graduate Advisor, on Forms D-4 REPORT OF Ph.D. CANDIDACY REQUIREMENTS and D-4a CANDIDACY EXAMINATION COMMITTEE MEMBER REPORT within 48 hours of the examination. The Office of Graduate Studies requires that all relevant information (e.g., recommendations for additional course work, etc.) appear on Form D-4 and/or its attachments. The same procedure applies in the event of unsatisfactory performance in the candidacy examination.

### **3.5 Ph.D. Thesis**

A formal submission of the Ph.D. Thesis with the Drexel University Library is required for the graduation of a Ph.D. Candidate. Prior to this, the approval of the thesis topic and the supervision of the candidate’s research will be conducted by his/her Thesis Advisory Committee, followed by a public defense of the dissertation. The following procedures should be followed to complete a Ph.D. thesis:

#### ***3.5.1 Ph.D. Thesis Proposal***

The Ph.D. thesis proposal is designed to assess the feasibility of a Ph.D. candidate’s thesis work.

- Requirement: All Ph.D. candidates are required to take the Ph.D. Thesis Proposal administered by the MSE Department. Students must have taken three (3) out of the required six (6) core courses, receiving a minimum of two “B-” grades in order to proceed to his/her Ph.D. Thesis Proposal.
- Registration: Students planning to take the Thesis Proposal must fill out the MSE THESIS PROPOSAL REGISTRATION and submit it to the Graduate Committee two (2) weeks prior to the planned Thesis Proposal.
- Must be done within six (6) months from the date of completion of the Candidacy Exam.
- Possible outcomes: Pass, Repeat, or Terminal M.S.
- May be repeated ONCE, and must be repeated within six (6) months of the original date of the presentation of the Thesis Proposal.
- Any major change of project after the proposal needs be approved by the entire Thesis Committee in writing (email is acceptable); questions regarding whether or not a proposed change in project constitutes a “major change” should be addressed to the MSE department Graduate Advisor.
- Requests for exceptions to the time limits will be considered under extenuating circumstances (e.g. maternity leave, medical disability, family issues, etc.), that are usually accompanied by a leave-of-absence from Drexel; requests for an extension should be submitted in writing to the MSE department Graduate Advisor with cc to the Department Head (DH) in advance of the deadline identified above;
- Extenuating circumstances (children, family issues etc) will be taken into account – but requests for an extension must be submitted in writing to the graduate program director with cc to DH. **Students are urged to plan and schedule ahead of time!**

- Composition of the Ph.D. Thesis Committee: a minimum of five (5) members: a minimum of three (3) members must be either core or affiliated tenured or tenure-track or full-time teaching faculty members of MSE (as listed on the MSE website); one (1) member must be from outside the field, and one (1) member must be from outside Drexel University; (*N.B.: University rules for Committee: “committee must consist of at least 5 members, at least 3 of whom must be currently tenured or tenure-track Drexel faculty members. At least 2 of the committee members must be from outside the student's primary specialization area. At least one of the committee members must be from outside the student's department, preferably from outside the university”.*) Committee members should have Ph.D. or terminal degree in their field; MSE encourages Ph.D. and M.S. Candidates to assemble a gender diverse committee.
- **Date:** Once the Thesis Proposal Committee has been approved, the student should consult with their committee members and announce the date and time of the thesis proposal seminar to the department.
- **Format:** The exam comprises a written research proposal and an oral presentation on his/her research project. The proposal should be written in the NSF format (single space, 1 inch margins on all sides, 12 point Times New Roman font, 15 pages in total excluding references). The proposal should NOT be edited by the student’s Thesis Advisor although the Thesis Advisor may provide guidance regarding the proposal format and writing style. The candidate must submit the finalized proposal to the Graduate Committee **two (2) weeks** prior to the scheduled oral presentation. The oral presentation shall consist of a 45-min presentation and a follow-up closed session with the Thesis Proposal Committee on proposal-related questions (no time limit).
- **Outcomes:** The Ph.D. Thesis Proposal Committee will evaluate both the written proposal and the student’s performance in the oral presentation in deciding whether the candidate passes the exam. There are two possible outcomes of the exam: Pass or Fail. Should a Fail have been given to a student, he/she is eligible to re-present the Thesis Proposal ONCE within six (6) months of the first exam. Students who fail in both exams shall enter a terminal M.S. program. The results of the Thesis Proposal should be reported to the MSE department by filling a MSE THESIS PROPOSAL EVALUATION FORM.

### ***3.5.2 Thesis Advisory Committee***

Upon successful completion of the Ph.D. Thesis Proposal, the student’s Thesis Advisor shall form a Thesis Advisory Committee for the student. The composition of the committee shall consistent with the research program of the student and shall be reported to the Office of Graduate Studies, through the Graduate Advisor, on Form D-5 Ph.D. THESIS ADVISORY COMMITTEE.

### ***3.5.3 Thesis Pre-defense***

All Ph.D. Candidates are required to give a closed presentation to their Thesis Advisory Committee six (6) months prior to the formal defense. This is designed to allow the committee to assess the candidate’s work and/or provide advice in order for the Ph.D. Candidate to finish the thesis work on time. The pre-defense shall consist of a 45-min oral presentation and a follow-up closed-session discussion with the Dissertation Advisory Committee on thesis-related questions/concerns (no time limit).

### **3.5.4 Final Oral Defense**

Upon completion of the Thesis, a final public defense of the Thesis shall be given by the Ph.D. Candidate.

- Live electronic participation of committee members is acceptable (live audio/video of the presentation). Substitution of a single Thesis Committee member can be made by the Thesis Advisor in the event that the original Thesis Committee member is unavailable.
- **Requirements:** A Final Oral Defense is required for all Ph.D. students. The candidate shall submit his/her thesis to the Final Oral Defense Committee at least two (2) weeks prior to the Final Oral Defense. Scheduling and document submission requirements are discussed in Section IV.
- **Final Oral Defense Committee:** The Final Oral Defense Committee shall consist of at least five (5) members, with at least one (1) member from outside the MSE Department and three (3) tenured or tenure track MSE Faculty. The composition of this committee is reported to the Office of Graduate Studies, through the MSE department Graduate Advisor, on Form D-6 Ph.D. FINAL ORAL DEFENSE COMMITTEE APPOINTMENT AND SCHEDULE, at least four (4) weeks prior to the scheduled date of defense.
- **Format:** The defense shall consist of a 45-min presentation and a follow-up closed session with the Final Oral Defense Committee on thesis-related questions (no time limit).
- **Outcomes:** The Final Oral Defense Committee will examine the Thesis and the presentation in deciding whether the candidate passes the defense. There are two possible outcomes of the defense: Pass or Fail. Should a Fail have been given to a student, he/she is eligible to re-present the Final Oral Defense ONCE within ONE year (1) of the first Defense. Students who fail in both defenses shall receive a terminal M.S. degree. Within 48 hours of the examination, its results must be reported to the Office of the Graduate Studies by the MSE department Graduate Advisor or by the Thesis Advisor, on Form D-7 REPORT OF Ph.D. FINAL ORAL DEFENSE COMMITTEE.

### **3.6 Other Requirements**

All Ph.D. Candidates are expected to teach and participate in other educational activities of the MSE Department, such as the Departmental Seminar Series, recruitment and outreach activities.

### **3.7 Clearance of Ph.D. Candidate for Graduation**

The Ph.D. Candidate must complete the required THESIS APPROVAL and COMPLETION FORM documents with the Office of Graduate Studies. Submission of the Thesis with the Drexel University Library is a prerequisite for completing this form. The COMPLETION FORM should be filed as soon as possible after the final oral defense, but no later than two (2) days before the day of Commencement.

## **IV. Scheduling and Document Submission Requirements**

M.S. Thesis, Ph.D. Thesis Proposal write-up and Ph.D. thesis drafts must be submitted to the MSE main office via email in electronic form (e.g. .pdf file) to Ms. Keiko Nakazawa (or other staff member as designated by the Graduate Advisor or Department Head) and the MSE department Graduate Advisor, indicating the names of the Committee members for distribution to the Thesis Committee at least **two (2) weeks prior to the Thesis Proposal or Final Oral Defense presentations**. Candidates should identify which Committee members may require a hard copy of the thesis in advance, and produce these early enough to ensure that this two-week requirement is satisfied. **If these documents are not distributed two weeks prior to the Defense date, the Defense will need to be rescheduled.**

It is the student's responsibility to schedule the room in consultation with MSE staff, and to confirm the availability of all committee members. **Students are urged to plan and schedule ahead of time**

Live electronic participation of committee members is acceptable (live audio/video of the student's presentation).

Substitution of a single Committee member can be made by the Thesis Advisor in the event that an original Committee member is unavailable.

#### **V. Requirements for students entering the M.S. and/or Ph.D. program with a B.S. degree other than Materials Science and Engineering.**

Students holding a Bachelor's degree in a Science or Engineering field other than MSE are required to take, or sit in on, one or several undergraduate courses as preparation for graduate studies in the MSE Department. The selected courses shall be determined by the student's Faculty Advisor and the MSE Department's Graduate Advisor. These arrangements should be explicitly included in the Plan of Study of each student.

Ph.D. students who had received an undergraduate degree in a non-engineering major and have not completed (with a grade of at least A-, as documented on the undergraduate transcript on file) an introductory materials science & engineering course (e.g. similar to ENGR 220) should sit in on the course, take the quizzes and exams and receive an A- or A grade. Alternately, such students may arrange, at the discretion of the ENGR 220 instructor(s), to take a final examination *in lieu* of sitting in on the course, etc. In either case, it is the Ph.D. student's responsibility to ensure compliance, and that the result is communicated via email or hardcopy statement to MSE Staff responsible for maintaining Graduate files, who will place this in the student's record. Decisions about the suitability of substituting another undergraduate course shall be left at the discretion of an ENGR 220 faculty instructor; it is recommended that the student furnish the faculty member with a syllabus from this course.

## VI. SUMMARY

M.S.		Ph.D.	
Exams/Events	Timeline	Exams/Events	Timeline
Advisor Selection Plan of Study	End of 2 <sup>nd</sup> term End of 3 <sup>rd</sup> term	Plan of Study	End of 2 <sup>nd</sup> term
Thesis Defense or Research proposal <i>or</i> Non-thesis/course only option.	End of the M.S. Study	Candidacy Exam	End of 6 <sup>th</sup> quarter from entering the program
		Thesis Proposal	6 months after passing Candidacy Exam.
		Thesis Pre-defense	6 months prior to the final oral defense
		Final Oral Defense	End of the Ph.D. study

### Forms for M.S. Students:

- MSE-M.S. DEGREE PLAN OF STUDY
- MSE M.S. SUPERVISING PROFESSOR APPOINTMENT
- MSE M.S. FINAL ORAL EXAMINATION COMMITTEE APPOINTMENT AND SCHEDULE.
- MSE REPORT OF M.S. FINAL ORAL EXAMINING COMMITTEE
- MSE REPORT OF M.S. THESIS PROPOSAL
- THESIS APPROVAL
- COMPLETION FORM

### Forms for Ph.D. Students:

- D-1. Ph.D. PLAN OF STUDY
- D-2. Ph.D. SUPERVISING PROFESSOR APPOINTMENT
- D-3. Ph.D. CANDIDACY COMMITTEE APPOINTMENT AND EXAMINATION SCHEDULE
- MSE CANDIDACY EXAM SUBJECT SELECTION FORM
- D-4. REPORT OF PH.D. CANDIDACY EXAMINATION COMMITTEE
- MSE THESIS PROPOSAL EVALUATION FORM
- D-5. Ph.D. THESIS ADVISORY COMMITTEE
- D-6. Ph.D. FINAL ORAL DEFENSE COMMITTEE APPOINTMENT AND SCHEDULE
- D-7 REPORT OF Ph.D. FINAL ORAL EXAMINING COMMITTEE
- THESIS APPROVAL
- COMPLETION FORM

## APPENDIX

### MSE Courses (Ph.D., M.S., B.S.-M.S.)

Introductory course (ENGR 220) required for students without an undergraduate materials degree; audit without registering; must receive an A or A- grade from the instructor (see Section 3.9).

#### *Two (2) Mandatory Core Courses:*

- Materials at Equilibrium or Thermodynamics of Solids
- Solid State Materials I: Structure, Thermal and Electronic Properties

#### *Four (4) Selected Core Courses from the following:*

- Mechanical Properties
- Solid State Materials II: Optical and Magnetic Properties
- Experimental Techniques
- Kinetics in Materials
- Numerical Methods
- Biomaterials
- Structure and Properties of Polymers
- Related courses as approved by the Graduate Advisor/Thesis Advisor

Ph.D. students must achieve a minimum “B-” grade in each of the core courses.

Waiver of any of the six (6) core courses must be approved by the MSE Department Graduate Advisor and the student’s Thesis Advisor in advance.

#### *Optional Courses:*

- Biosurfaces
- Design of Microstructure
- Carbon Materials I and II
- Advanced Ceramic Processing
- High Temperature Materials
- Natural Polymers
- Smart Materials and Sensors
- Thermal Spray
- Nanostructured Polymers
- Particulate Materials
- Soft Materials: Fundamentals and Applications
- NanoMetrology Laboratory
- Other MSE courses that may be available
- Out-of-department courses, as approved by the Graduate Advisor/Thesis Advisor