Department of Materials Science and Engineering

GRADUATE HANDBOOK

P. C. Rossin College of Engineering and Applied Science (07/08)
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LEHIGH UNIVERSITY
Department of Materials Science and Engineering

GRADUATE STUDENT HANDBOOK
This handbook is presented to familiarize a student with the Departmental rules and regulations only. For a complete description of University requirements and procedures, students should refer also to the current University Catalog and the College of Engineering and Applied Sciences Graduate Student Handbook.

I. INITIAL PROCEDURES

A. Starting Date
Students are expected to be on campus at least two weeks prior to the start of classes and in time for registration. International students should report to the Office of International Education, Coxe Hall, immediately upon arrival on campus. They are required to attend the International Student Orientation. For dates and locations please see the International Student and Scholars website at http://www.lehigh.edu/~intnl/students/orientation.html. Information on all orientations can be found in the MSEGRAD course in Blackboard under New Student Information.

B. Advisor
You must have a faculty member as an advisor before matriculating in the department. As soon as possible, inform your advisor that you are on campus. Your advisor will assist you in the development of your course program and direct your thesis work. If you have no advisor or if you change advisors, inform the Graduate Coordinator.

C. Forms
Several forms are required to be completed when entering the Graduate programs within the Materials Science and Engineering department. Most forms such as the Graduate Student Check-in Form: Personal and Academic Data, ID card and parking forms can be found in the MSEGRAD Blackboard course. For building keys please see the Graduate Coordinator.

D. Parking Regulations
You must have a parking permit to park in University parking areas. You are restricted to those areas indicated on your permit. Failure to follow traffic regulations will result in a fine.

E. Desk Assignment, Mailboxes, Coffee Club
Please see the Graduate Coordinator for your desk assignment. Mailboxes are in the department office, Whitaker 370. To foster interaction between students and faculty, there is a department coffee club that meets at about 10:30 a.m. each morning in the Student Lounge, Whitaker 349.

F. Health Insurance
University policy requires **ALL** resident graduate students to have health insurance. Links to this information can be found in the MSEGRAD course in Blackboard.

G. Safety Course

All incoming students must attend and pass CHEM 400, Laboratory Safety course to be permitted in labs.

II. **GENERAL ACADEMIC REGULATIONS**

The Department of Materials Science and Engineering offers the following degrees: Master of Science, Master of Engineering, and Doctor of Philosophy. Generally, the Master of Science degree requires a thesis, whereas the Master of Engineering requires an engineering project. In addition, the option of Master of Science degree without thesis is available to students who are working in and fully supported by industry. The Ph.D. requires completion of several specific items as noted later. Academic regulations specific to this department, in addition to those described in the University Catalog, are outlined below. These policies are administered by the Departmental Graduate Committee.

A. All Graduate Degree Programs

1. Minimum Entering Requirements

The recommended minimum prerequisite background for all students includes the equivalent of three credit hours of physical chemistry or thermodynamics (e.g. equivalent of CHEM 187 or MAT 205), three credit hours of advanced mathematics (i.e. beyond MATH 23 level), and six credit hours of materials science (e.g., equivalent of MAT 33, MAT 203 and 216). Please refer to the Lehigh course catalog at [http://www3.lehigh.edu/academics/catalog/default2.asp](http://www3.lehigh.edu/academics/catalog/default2.asp) for descriptions of these courses.

2. Diagnostic Test

All incoming graduate students (both MS and PhD) are required to take this placement exam. Its purpose is to determine, prior to selecting the first semester courses, the areas of MS&E in which a student may have deficiency. The exam is given at the Department’s sophomore level, MAT 33 course: Engineering Materials and Processes. The diagnostic test can have two outcomes, as determined by the Chair of Graduate Committee in coordination with the student’s adviser:

- Pass: The student may move on with graduate course work starting with the Foundation courses.

- Pass w/ deficiency: The student must remove deficiency by taking one or more of the prescribed undergraduate courses before, or concurrently with, registering for the Foundation courses.

3. Registration and Preregistration
All new graduate students must register, in consultation with their advisors, for their course work during the registration period. Pin numbers for registration will change every semester and can be obtained from either your adviser or the Graduate Coordinator. To maintain full time status Graduate Students must register for nine credits a semester or be certified full time by the Registrar’s office. Full time certification forms can be found in the MSEGRAD tab in Blackboard or picked up in the Graduate Coordinators office.

The current students must preregister each semester during the announced pre-registration period. Failure to pre-register will cost you a personal “late fee” of $100 by the Registrar.

4. Initial Course Selection

When a graduate student enters the department, particularly from a discipline other than materials science and engineering, the advisor will carefully review the student’s performance in the diagnostic test and previous courses to determine whether there is sufficient background to begin the department’s Foundation Courses or whether remedial courses are recommended. Students without a B.S. in materials science and engineering or an equivalent subject, may use up to six credits of 200-level MS&E courses to fulfill the total credit requirements. The GPA in such courses must be at least 2.75.

5. Core Courses and Other Courses

The three courses: (1) MAT 401 Thermodynamics and Kinetics, (2) MAT 403 Structure and Properties, and (3) MAT 405 Mathematical Methods in Materials Science and Engineering contain the minimum knowledge expected of graduate students for pursuit of research work and for graduation from the department. They may be used to fulfill total credit requirements for a specific degree.

By University rules, a student will not be allowed to continue as a graduate student if he or she accumulates more than four grades below B-. In addition, no credit is counted towards a degree for grades below C.

6. Safety Requirements

All incoming students must attend and pass CHEM 400, the Lab Safety course, during Orientation. If a student fails CHEM 400, the Graduate Coordinator will reschedule. Failure to pass on the second try may result in termination of graduate work in the Department.

Compliance with all safety regulations of the University and of specific laboratories is absolutely required of every student. Non-compliance could lead to expulsion from laboratory facilities. Handbooks on laboratory procedures, waste disposal, hazardous material, etc., are handed out at orientation. (The Graduate Coordinator also has copies). Each student is responsible for safety in the laboratory and should report all unsafe practices to his/her advisor, the laboratory Safety Officer listed outside the laboratory door, and Department Chair.

Eye Protection: The State of Pennsylvania requires that eye protection be worn in every laboratory. Safety glasses are required in every laboratory and side shields may be required in certain labs where chemicals are in use. Check the specific lab requirements.

English Speaking: All students MUST Speak English in the laboratory environment for safety reasons. Any student violating this requirement will be given a warning and a notice will be sent
to his/her advisor. A second offense may result in expulsion from the laboratory and a meeting among the Safety Officer, student, and laboratory supervisor will be held to correct the problem.

7. Departmental Seminars

All graduate students **MUST** attend departmental seminars. Attendance records are kept by the Department Chair. Exposure to a wide variety of research topics is an important aspect of graduate education. Student seminars are an opportunity for graduate students to present their research and gain technical insight from the collective experience of colleagues and faculty in the department. This will foster open discussion that can aid the students in generating new ideas as well as in dealing with obstacles in their research.

An essential part of graduate education is to effectively communicate to and share with peers the results of new research. For this reason, all full-time graduate students in the Department are required, before graduation, to present the results of their current research in the form of Graduate Student Seminar for each of the graduate degrees (M. Eng.; M.S.; Ph.D.), or at least once in two years if the duration of degree is longer than two years. Part-time graduate students may present one seminar for each graduate degree.

8. Research Notebooks

All graduate students shall record their research data and calculations in bound permanent notebooks with numbered pages. The Lehigh University Bookstore carries such notebooks with tear-out sheets. The tear-out sheets are for your personal file, but the research notebook itself must be given to the advisor when you leave. The research data are the property of the research advisor.

9. English Language Proficiency

A student for whom English is a second language, even U.S. citizens, must register for an English as a Second Language (ESL) course in his/her first semester (see below for *waiver from this requirement). At the end of the course the student should obtain a score of 230 or more in the SPEAK test, which is a Departmental requirement for graduation. Information on the test can be found at: http://www.lehigh.edu/~inesl/home/frameset.htm. If the student receives a score below 215, then the student must continue with ESL courses and/or seek tutoring (to be determined by ESL Office) with permission of advisor until a passing score of 230 is obtained. Failure to pass the speak test (score of 230) within the two-year time limit may result in denial of degree, loss of support and/or ineligibility for funding. Passing the Speak test is a graduation requirement for M.S. and Ph.D. (Note: Student Advisor with pay the ELLC lab fee the first semester. Thereafter the graduate student will be required to personally pay until obtaining a score of 230).

*Waiver requirement:
The above requirement for taking ESL courses may be waived for a student who has scored 230 or more on the "SPEAK Test" before the beginning of classes.

10. Petition

All graduate students have the right to petition the Departmental Graduate Committee for a review of their background, especially students with an M.S. from another institution. The Committee may waive some of the departmental degree requirements.
11. Departmental Check-out Procedures

Prior to receiving a terminal degree, and in addition to the general clearance requirements outlined in the Graduate Student Handbook, each graduate student must complete a departmental Graduate Student Check-out Form and return all keys. Departmental and University personnel must initial the form as indicated. The signed form should be returned to the Graduate Coordinator upon completion. Failure to do so will result in degree being withheld.

**IMPORTANT:** The Graduate Student Check-out Form includes the Hazardous Waste and Chemicals Clearance Form which must be signed by: (1) a representative of the University’s Environmental Health and Safety Office (x84251); (2) your advisor; and (3) the Department Graduate Coordinator before your degree can be awarded. **This must be done at least (7) days prior to leaving. A copy of your thesis must be submitted to the Graduate Coordinator in order to receive your degree.**

B. Master’s Degree Requirements

1. Program for Degree

The College of Engineering and Applied Science requires completion of a form entitled “Program for Master’s Degree.” The form summarizes the courses taken or to be taken for the Master’s Degree. The student usually submits the form after 15 credits have been earned, but at the latest by the end of the 3rd semester if a full-time graduate student.

2. Course Requirements

- Students must take a total of 30 credit hours of work, including at least 18 credits in the Materials and Science and Engineering department. At least 18 credits must be 400 level must be completed, of which 15 credits must be in the Materials Science and Engineering department (core courses MAT 401, 403, 405 and six thesis credits can be counted toward the 400 level courses in Materials Science and Engineering).
- Students without a B.S. in MS & E or equivalent, may use up to (6) credits at the MAT 2XX level to fulfill the 30 credit requirement pending that they have maintained a GPA of 2.75 or greater in these courses and did not count the courses toward the total amount of credits needed for their Undergraduate degree.
- A student with a B.S. in MS & E may use up to (6) credits of 200 level courses offered by others science and engineering departments pending that they have maintained a GPA of 275 or greater in these courses and did not apply the courses toward the total amount of credits needed for their Undergraduate degree.
- No credit is given for grades below a C-. A student will be ineligible for a Masters Degree if the student accumulates more than four grades below B-.

3. Thesis for the M.S. Degree

In general, an M.S. degree program in the department should include a Master’s Thesis and a publishable paper. Of the 30 total credits for the M.S. degree, 3-6 credits must be MAT 490, Thesis.
Use the format given in "Guidelines for the Preparation of Master's Thesis and Doctoral Dissertation." A draft of a paper suitable for submission to a peer-reviewed journal must be accepted by the Advisor prior to thesis approval by the Department Chair. **A copy of thesis must be submitted** to the Department Graduate Coordinator. Your degree will be withheld if a copy is not submitted to the Graduate Coordinator.

As mentioned above, a non-thesis M.S. degree option is available to a candidate who is working in industry, and for whom a company provides full tuition. Such students should replace the (6) thesis credits by other 400-level courses in the Department.

4. Engineering Project for the M.Eng. Degree

In the Masters in Engineering degree program the above requirement of Master’s thesis is fulfilled by MAT 460, Engineering Project 3 credits. A comprehensive engineering report is required in this course. A publishable paper is desirable but not required.

5. Time Limit

Normal full-time duration for an M.S. or M.E. is 1.5 to 2 years; however, all work must be completed within a maximum of 3 years for full-time students and 6 years for part-time students.

C. Ph.D. Degree Requirements

1. Qualifying Procedure

To qualify as a Ph.D. candidate, a student must pass the *PhD Qualifying Exam*. The exam will be given in August of each year and also given in January if there is demand. It must be taken by the end of the second year. A student must pass this exam in no more than two attempts and, if a full-time student, within three years from entering the graduate program.

The exam will be based on the core subject matter of materials science and engineering at the undergraduate level as well as the three graduate level foundation courses.

**Guide to the Ph.D. Qualifying Exam**

The Qualifying Exam will consist of two parts.

**Part 1. (written)**

The first part of the Qualifying Exam is designed to test, not only the student’s knowledge of the basics of materials science and engineering, but also their ability to integrate and apply this material. The exam will include, therefore, questions that involve bringing together elements that would usually be given in different courses. The exam is designed to test not only knowledge of the structure and properties of materials, but also of the way in which this knowledge is established. The exam will include, therefore, questions on experimental techniques.
The exam will call for a broad sweep of knowledge of the basics of materials science and engineering. Material from the three graduate foundation courses (MAT 401, MAT 403, and MAT 405) will be included. See below for details.

It is to be understood that the material to be covered and the level of the coverage are two separate issues. The material is defined in the previous paragraph and in a separate section below. However, the questions set will be of a complexity that goes beyond that of questions that might be asked in an undergraduate course on the same material. The aim of the exam is to establish that the student has problem solving abilities suitable to a doctoral student. Therefore the questions will not focus on memorization of complex material but, rather, on the ability of a student to handle basic ideas and to illuminate or solve difficult problems.

Part I of the Qualifying Exam will be in the form of an open-book, written exam paper. The exam will last four hours. There will be a limited choice of questions (for example 4 out of 5 to be answered).

More Detailed Syllabus for Part I

Students are required to have a broad familiarity with the basic phenomena of the field of materials science. The first 20 chapters of Callister, for example, present a clear guide to the phenomena and ideas with which the student must be able to work.

The material to be covered in crystallography, defects and mechanical properties will partly be defined by the material presented in MAT 403. However, MAT 403 may take the basics for granted and omit certain topics. Therefore, Chapters 1-5 and 12 of Hammond and Chapters 1-7 of Hertzberg may be taken as guides for other topics to be covered.

Part II. (oral)

Part II of the Qualifying Exam will be an oral exam.

The second part of the Qualifying Exam will have two aspects. First, questions may be asked on the material covered in the first part of the exam. Such questions will give the student the opportunity to expand on answers given in the written exam and to demonstrate their ability to argue a case. Second, questions will cover additional topics not covered in the first part.

The additional material will include the structure, properties and processing of polymers, ceramics, metals, electronic materials and composite materials. Questions may cover all of these topics but students will be expected to display a deeper understanding in general fields related to their thesis work. More detail is given below.

The oral exam will be held during the week following the written exam. The oral exam will last between one and two hours.

More Detailed Syllabus for Part II

The basic material on which questions may be asked in the oral exam (in addition to those questions that deal with the same material as Part I) is defined as the material covered in the following courses: MAT 204, MAT206, MAT 214 and MAT 302. The syllabi and text books for these courses will be made available to students. As noted above, in the field of
specialization of the student, further knowledge may be expected. The student’s advisor should provide a guide to what is required.

Grading

The questions in Part I of the exam will be graded pass/fail and a student will need to earn a pass on all but one of the number of questions required to have passed the paper. A student who fails more than two questions on Part I will have failed the exam as a whole. A student who fails two questions will be tested, in the oral exam, on areas related to the failed questions and may thus earn a pass on Part I. Part I of the exam will be graded prior to the oral exam and the examiners for the oral will have the results of Part I available to them at the time of the oral.

The examiners of the oral exam will separately assess the students on the responses to questions given and assign a pass or fail for the oral. A pass on both parts is needed to pass the qualifying exam as a whole.

Course Requirements for Ph.D.

- Students must complete 72 credit hours beyond the B.S. degree or 48 credits if they come with a M.S. degree in a relevant field from another recognized institute.

- 3 University 4XX courses must be taken in addition to the 3 Foundation (Core) courses.

- Students are expected to take additional courses beyond these minimum requirements. The specific course work is to be determined by the Adviser and the Ph.D. Committee and should reflect both breadth and depth.

2. Dissertation Proposal

**Doctoral Committee:** The prospective candidate shall consult the faculty Advisor, who, as chair of the committee, will help choose the Doctoral Committee that will direct the research. The committee must consist of at least four (preferably five) members. One member must be from outside the department. The departmental committee members should include at least one faculty member whose principal area of interest lies outside the area of specialization of the student. When appropriate, it is desirable to have a committee member from outside of the University, for example, from an industrial or governmental institution. The chair, and subsequently the committee as a whole, shall review the candidate’s proposed program in consultation with the candidate. This Committee must meet and evaluate the student’s progress at least on an annual basis until the dissertation defense.

**Written Dissertation Proposal:** The purpose of the dissertation proposal is to outline the research that will fulfill the requirements for the Ph.D. dissertation. It is to be written following NSF’s guidelines for a Single Investigator Proposal. The proposal should contain at least the following: (1) review of the pertinent literature, (2) preliminary research conducted on the topic, (3) detailed outline of the proposed investigation. Document length is limited to 15 pages single line spacing. This proposal is to be submitted to the prospective candidate’s Doctoral Committee no later than one year after passing the Qualifying Exam.
Coursework Summary. The student should list the following information with the dissertation proposal: (a) degrees earned including the names of schools and departments and the dates awarded, (b) all Lehigh courses completed showing course titles, credit hours, and grades, (c) date of passing the Qualifying Examination, and (d) additional coursework proposed.

4. Dissertation Proposal Defense and General Examination

The purpose of the dissertation proposal defense and general examination is to demonstrate the candidate’s expertise, knowledge and understanding in the Specialty Area related to the student’s research work. This examination will begin by the student defending his/her dissertation proposal before the doctoral committee, and then expand to cover the wider range of the specialty area from one of the following: Ceramics, Structural Characterization, Metals, Electronic Materials or Polymers. Questions in the oral examination may be from any area of MS&E, but will be in greater depth in the Specialty Area in order to certify the technical qualifications of the student.

If the student fails the general examination, the student may be permitted to take it one additional time no earlier than three months or later than six months after the first oral examination. If the results of the second examination are also unsatisfactory, no further examination will be given, and the candidate will not be permitted to continue towards the Ph.D.

Results of the General Examination shall be transmitted on the appropriate form to the Department Chair and to the office of the Dean of the Rossin College of the Engineering and Applied Science.

5. Admission to Candidacy

Upon acceptance of the proposal by the Doctoral Committee and successful completion of the dissertation proposal defense and general examination, the student shall submit the following items as a package to the office of the Dean of the College of Engineering and Applied Science:

a. Application for Admission to Doctoral Candidacy.

b. Departmental Cover Sheet including names of Doctoral Committee members with their signatures approving the course work summary, the written proposal, and the general examination.

c. Coursework Summary.

d. Written Proposal.

Notification of Admission to Doctoral Candidacy will come from the office of the Dean of the College of Engineering and Applied Science.

6. TA Requirement

Each Ph.D. candidate must serve as a Teaching Assistant for at least one semester in a technical course within department. This is a Departmental requirement for graduation.

7. Dissertation and Defense

Completion of the Doctoral Dissertation shall be scheduled to comply with the following requirements:

a. Dissertation: This document shall be prepared according to the instructions of the Graduate School and must have the format given in "Guidelines for the Preparation of Master's Thesis and Doctoral Dissertation".
b. **Rough Draft:** To satisfy graduation requirements a draft of the dissertation, bearing the signature of the dissertation advisor, must be presented to the office of the Dean of the College of Engineering and Applied Science before the submittal deadline given in the academic calendar.

c. **Defense:** After the draft of the dissertation has been approved by the Dean's Office, the candidate distributes copies of the draft dissertation to the members of the Doctoral Committee. The candidate then arranges a suitable date for the defense of the dissertation, allowing time for the Doctoral Committee to examine the draft. The date of the defense shall be posted on the departmental bulletin boards. *At least two weeks prior to the defense, a copy of the dissertation shall be placed in the department office for examination.* The presentation portion of the dissertation defense is open to the public.

d. **Required Final Copies:** *After the defense, but no later than two weeks before the degree is to be conferred, the candidate shall deposit with the Department Chair one copy of the dissertation* including one title page showing original signatures of approval by the Doctoral Committee. Final approval of the dissertation usually takes place at a scheduled exit interview with the Department Chair.

A **copy of the dissertation must be submitted** to the Department Graduate Coordinator for the Materials Science and Engineering in order to receive your degree.

8. **Draft of Publishable Paper**

A draft of an article for publication, based on the dissertation, shall be submitted to and accepted by the advisor prior to approval of the dissertation by the Department Chair.

9. **Residency Requirements**

All part-time and full-time graduate students are required to satisfy the University Residency Requirements as listed in the Graduate Student Handbook or University Catalog.

10. **Time Limit**

All full-time students are expected to complete the Ph.D. requirements within 3 years of obtaining an M.S. Degree and within 6 years of obtaining the B.S. degree. While the University has a 10-year limit for completion of the Ph.D. from matriculation to graduation, students entering Lehigh's Department of Materials Science and Engineering with a Master's Degree from another institution must complete their Ph.D. work within a five-year period.

**III. MISCELLANEOUS**

**A. Grievance Procedures**

If a student has a complaint about a faculty member, course, or other departmental matter for which redress has not been obtained, the complaint should be brought to the attention of Graduate Committee. A written response will be given to the student. If the student is not satisfied, petition then goes to a select committee of the faculty for decision.
B. Telephones

Telephones are available in most laboratories and offices for academic or business use. Local personal calls are permitted provided they do not interfere with business use. Long distance calls for business purposes can be completed only with the use of an appropriate research account (4 digit code number, which may be obtained from the student’s Advisor.

Computers and Software

The departmental computing facilities exist to provide the faculty, staff, and students of the department with computers, software, and associated equipment needed for course work and research. In order to foster an efficient and productive computing environment, it is incumbent upon all users to adhere to some basic guidelines that are listed below. Passwords shall be provided only to users who agree to:

1. Use the computing facilities with care in order to avoid damaging hardware and software.

2. Use only those programs for which the appropriate licenses have been obtained. You must not copy licensed software in an attempt to avoid purchasing a license.

3. Respect the rights and property of other users. In particular, a user’s files and password belong to him/her alone and should not be copied or used by others.

Note: Faculty and graduate students are not permitted to use support staff computers or printers.

D. Travel Policy –

For information on the following please go to http://www.lehigh.edu/~intransp/

- Auto Insurance
- Auto Transportation - Authorized Drivers
- University Vehicles
- Vehicle Rentals
- Auto Insurance Information
- Use of Personal Vehicles
- Auto Liability and Insurance
- Driving University Vehicles
- Personal Automobiles Used on University Business
- Rental Car or University Fleet Vehicle Used on University Business
- Accident Reporting Instructions, etc.