

MATERIALS PHYSICS AND ENGINEERING, PHD

Materials Physics and Engineering PhD Program

The Tulane University graduate program in Materials Physics and Engineering (MPEN) is an interdisciplinary program that focuses on the fundamentals of material structure, material properties, material processing, and material modeling that are required to solve the complex technological problems in the 21st century, especially in the focus areas of nanotechnology, energy, environment healthcare, and homeland security/defense. The Tulane MPEN program is unique and unlike other graduate programs in materials science and engineering in that this program is based on a core foundation of physics enabling a student to appreciate the aforementioned materials interplay found in every new functional material discovered or developed. Modeling will allow students to handle “big data”, find optimized materials for new applications, and design engineering materials where the goal is integration and synthesis within and across these domains.

Requirements

Course ID	Title	Credits
At least 48 credits of graduate courses must be completed.		
Required courses (30 credits, each course is 3 credits):		
MPEN 6350	Kinetics of Material Systems	3
MPEN 6360	Structure of Materials	3
MPEN 6760	Thermodynamics of Materials	3
or CENG 7110	Modern Thermodynamics	
MPEN 7910	Research I	3
MPEN 7920	Research II	3
MPEN 7930	Research III	3
MPEN 7940	Research IV	3
Students must take two of the following three “Core Physics” courses:		
PHYS 7130	Solid State Physics	3
PHYS 7170	Quantum Mechanics I	3
PHYS 7230	Electromagnetic Theory I	3
Students must take one of the following “Properties of Materials” courses:		
MPEN 6370	Processing of Biomaterials	3
MPEN 6560	Photonic Materials & Devices	3
MPEN 6720	Mechanic Behavior of Materials	3
PHYS 6210	Molec Biophysics & Polymer Phy	3
PHYS 6700	Electrnc Prop of Materls	3

Elective courses (18 credits): The remaining 18 credits should be graduate level physics or materials electives, or graduate level courses in a related field with approval of the research supervisor and graduate program advisor. One of the electives must be a computational course (PHYS 6170 Computational Physics and Engineering, MPEN 6290 Computational Materials Science and Engineering, or a computational course in another department approved by the graduate program advisor). Up to 6 credits may be fulfilled by Advanced Research I and II, with approval of the research supervisor and graduate program advisor. Advanced Research I and II may be taken at the same time as Research I-IV, with up to 6 credits of research allowed in one semester.

Grades:

Per the SSE Handbook: “A course in which a grade of C+ or less is earned cannot be counted toward a graduate degree. If a student receives one B- grade, the student is immediately considered for probation by the Associate Dean for Graduate Studies in consultation with the appropriate department/program. If a student receives two grades of B-, or one grade less than B-, during his/her tenure in the School of Science and Engineering, the student is placed on probation and considered for dismissal by the Associate Dean in consultation with the appropriate department/program.”

A student who does not maintain the minimum 3.0 GPA in graduate course work will be subject to disenrollment. To continue in the program, MPE students must have a minimum 3.2 GPA from a minimum 8 graduate courses by the end of the 4th semester, not including research courses.

Oral Qualifying Exam:

The Ph.D. oral qualifying exam is presented by the student to a committee of three materials faculty at Tulane, chosen in consultation with the research supervisor and the graduate program advisor. A student must choose three research articles in agreement with committee members, one approved by each committee member, with each representative of a different topic in MPE not including the student’s specific research area. The student must present a maximum 10 minute overview of the paper followed by about 20 minutes of questions on that topic. The exam duration is

1.5 to 2 hours total. The student must attempt the oral qualifying exam by the end of the 4th semester. A second attempt is allowed and must be completed by the end of the fifth week of the fifth semester (two total attempts allowed). The committee votes pass/fail on each paper topic, with unanimous agreement required to pass that topic. A student must pass all three topics. If one or more is failed, the student is allowed one additional chance to pass the failed topics, but with a different research article for each (again agreed between the student and committee). Passed topics do not need to be repeated in the 2nd attempt. Any student who has not passed the qualifying exam by the end of the fifth semester of graduate study will be disenrolled from the program.

Students who have met course and GPA requirements and have passed the qualifying exam become degree candidates. Those who have not are required to attend the weekly departmental colloquium.

Faculty Dissertation Committee:

Prior to the prospectus defense, the student and research supervisor form the faculty dissertation committee, which consists of the research supervisor (chair) and at least two other faculty members. One member may be from another Tulane department or other appropriate institution. The faculty dissertation committee (henceforth the committee) examines the student at the prospectus defense and oral dissertation defense, and approves the final written dissertation.

Prospectus Defense:

The prospectus defense demonstrates to the committee that the student has acquired sufficient knowledge in the specific research area and can effectively express that knowledge orally and in writing. A student must pass the oral qualifying exam before undertaking the prospectus defense. The prospectus defense consists of a written proposal and an oral defense:

The written research proposal (10-15 pages) contains an introduction, proposed research and justification, methods, preliminary results, and discussion. It must be reviewed and approved by the committee before the end of the sixth semester of graduate study.

The oral defense is a two-hour oral examination, including a research presentation (about 45 minutes) prepared by the student, given by the committee. The examination includes specific questions about the student's research as well as broadly focused questions on the general area of research. The oral defense must be attempted following approval of the written proposal, no later than the sixth semester of graduate study. If failed, the student is normally given a second attempt in the following semester. After two failures the student will be disenrolled from the program.

Students who are sufficiently prepared are strongly encouraged to take the prospectus defense before the end of the 4th semester of graduate study.

It is expected that, after completion of the oral prospectus defense, the Ph.D. candidate will obtain a Research Assistantship (RA) in the same research group. In order to encourage this, the faculty have adopted a policy for allocating graduate students on TA's to research groups.

Annual Report:

In April of each year, every Ph.D. student will submit a brief annual progress report (1-2 pages) to the research supervisor (and committee, when formed) summarizing research progress and accomplishments over the previous year, and future plans and milestones. This requirement is waived in the years when the prospectus and thesis defenses are completed.

Dissertation:

The final requirement for the Ph.D. degree is a written dissertation based on original research, approved by the committee, and its defense in an oral exam by the committee.

Master's Degree:

The master's degree is not a requirement for the Ph.D. in Materials Physics and Engineering. Admission with financial aid is only for doctoral students. However a graduate student may receive an M.S. in Physics based on 30 hours of approved graduate credit, or (if the research supervisor agrees to offer this option) an M.S. in Physics based on 24 hours of approved graduate credit plus a thesis deemed acceptable by the research supervisor. Research course credit does not count toward the M.S. in Physics degree.

Program Transfers:

Students in the Materials Physics and Engineering Ph.D. program cannot transfer to the Physics Ph.D. program without going through the regular admissions process.

Exceptions to the requirements, due to extenuating circumstances, may be granted by vote of the PEP faculty.

The Materials Physics and Engineering program requirements were last modified in Fall 2018. The requirements for students matriculating prior to Fall 2018 may be found here (<https://tulane.box.com/s/kolhmpfs9oxi9xh6lh5ro9e59hloeycs/>).

Prospective Graduate Student Admission Information

REMINDER: The annual application deadline for Graduate Study in Materials Physics and Engineering at Tulane is Feb. 1st.

Contact

For more information, contact the School of Science and Engineering (<https://sse.tulane.edu/contact-us/>).