THE PhD STUDENT HANDBOOK

PhD in Chemical Engineering
PhD in Materials Science
PhD in Petroleum Engineering

Mork Family Department of Chemical
Engineering and Materials Science
University of Southern
California
Los Angeles, CA
90089-1211

http://chems.usc.edu/

Revised: March 2026

All PhD students are subject to both the Viterbi School of Engineering rules and requirements described in the PhD Student Handbook as well as the University of Southern California's catalog. It is expected that all PhD students familiarize themselves with these rules and policies and abide by them.

General Requirements for the Doctor of Philosophy

This degree is granted under the jurisdiction of the USC Graduate School. Students should also refer to the **Requirements for Graduation** section and the **Graduate School** section of the University Catalogue for general regulations. All courses applied toward the degree must be courses accepted by the Graduate School. Courses below the 400 level cannot be taken for credit towards any graduate degree.

Enrollment Status

PhD Students must remain enrolled full-time. All PhD students are required to be enrolled in coursework counting towards their degree every Fall and Spring term, from the beginning through the end of the PhD program. Summer enrollment is not required with the exception of students admitted in the summer semester.

International PhD students and all PhD students receiving funding through a fellowship or graduate assistantship are required to be enrolled full-time, which is six (6) units during each Fall and Spring semester.

794 series Doctoral Dissertation and GRSC 800 Studies for the Qualifying Exam fulfill this full -time requirement. Upon passing the qualifying exam, the student must enroll in the 794 series continuously until the dissertation has been successfully uploaded. Failure to remain in continuous enrollment may result in the delay of the degree.

Courses may not be taken for audit or pass/no pass with the exception of the CHE 550A and CHE 550B, MASC 598, directed research courses, ENGR 596 and the 794 series.

Course Requirements

Satisfactory completion of at least 60 units of approved graduate-level coursework beyond the baccalaureate, with a cumulative grade point average of at least 3.0 is required of all PhD students in engineering. The 60 units minimum include research courses (590, 690, 790) and four units of 794a and 794b Doctoral Dissertation. PhD students must also complete the core requirement for their major as listed below. The core courses make up a part of the 60 units requirement. The number of units taken at USC can be reduced by transferring graduate credits from another institution (see Transfer Credit Limit section below). Transfer/Waiver units are subject to approval by the Degree Progress Department (for coursework taken at institutions in the U.S.) or by International Admission (for coursework taken at institutions outside the U.S.), by the faculty advisor, and by each degree's respective department directors. Faculty advisors may also request students to take additional courses outside of the core requirements including specific elective courses.

Seminars
All PhD students have some required seminar attendance. Exemptions are made for students who are TAs for a course that conflicts with the seminar, for students that are taking a course that overlaps with the seminar or are already enrolled in 12 units of coursework that does not include directed research units.

Chemical Engineering Course Requirements:

Seminar Courses
CHE 550A/B (two semesters total).

Core Courses: 16 units

- CHE 501 Modeling and Analysis of Chemical Engineering Systems
  OR
  CHE 520 Mathematical Methods for Deep Leaming
- CHE 530 Thermodynamics for Chemical Engineers
- CHE 538 Transport Processes I
- CHE 542 Chemical Engineering Kinetics

Elective Courses: 12 units
Qualifying courses include all 500-level courses offered by the department (including the Chemical Engineering, Materials Science, or Petroleum Engineering programs). 400-level courses offered by the department can qualify for up to four units of this requirement. Courses from outside of the department are eligible for the elective requirement at the discretion of the student's faculty advisor.

Materials Science Course Requirements:

Seminar Courses
Two semesters of MASC 598.

Core Courses: 19-20 units
Students in consultation with their advisor must take at least 5 out of 6 core courses

- MASC 501 Solid State
- MASC 503 Thermodynamics of Materials
- MASC 504 Diffusion and Phase Equilibria
- MASC 505 Crystals and Anisotropy
- MASC 520 Mathematical Methods for Deep Learning
- MASC 551 Mechanical Behavior of Engineering Materials

Elective Courses: 7-8 units

Petroleum Engineering Course Requirements:

Seminar Courses
Two semesters of CHE 550A/B or MASC 598.

Core Courses or equivalent: 24 units

- PTE 507 Engineering and Economic Evaluation of Subsurface Reservoirs
- PTE 508 Numerical Simulation of Subsurface Flow and Transport Processes
- PTE 517 Testing of Wells and Aquifers

- PTE 531 Enhanced Oil Recovery
- PTE 555 Well Completion, Stimulation, and Damage Control
- PTE 582 Fluid Flow and Transport Processes in Porous Media

PhD Elective Courses (minimum of 30 units):
12 units course work plus 18 units of PTE 790
Potential elective courses include PTE 502, PTE 503, PTE 572, PTE 574, PTE 592 in addition to at least one elective course offered by a department other than the Mork Family Department.

Transfer Credit Limit

Students with a Master's degree from other institutions are allowed a maximum of 12 units of transfer credit to be applied to their degree program. *There is a minimum grade of "B" or better requirement for each course requested and a class equivalency requirement.* The courses must be approved by the department and the USC Graduate Transfer Credit process. Please contact the MFD student services team for further details.

Mandatory Teaching Assistant (TA) Assignment

PhD students are required to serve as TAs during their time in their graduate program. This supports the department's teaching mission and provides students with valuable instructional and mentoring experience. Assignments may vary in the number of weekly hours and tasks required (grading, office hours, assisting in lectures, labs, etc.).

The minimum requirement is for students to TA one semester. Students should be cognizant of this TA requirement as they approach the completion of their degree. While the Department does its best to accommodate TA requests, it is sometimes challenging to find TA assignments for students who leave this duty until the end of their time in the program.

International students required to take the ITA exam must take it during their first semester at USC (https://ali.usc.edu/ita/). This will ensure timely TA assignments.

Students with fully funded external fellowships should consult their advisor and the department about their fellowship requirements.

Filing for a Master's Degree

PhD students can file for the Master's degree after they have completed the Master's degree requirements. Approval from the program director/or the department chair is required for PhD students to file for Master's degree. PhD students require approval from the advising faculty to take elective courses or any courses outside of the required coursework for the PhD degree program. PhD students who wish to receive a Master's degree should consult the Mork Family Department student affairs office for more information and policies.

Faculty Advisor and Guidance Committee

PhD students admitted into the Mork Family Department must have a faculty member as their research advisor. Students cannot be admitted without an advisor in the department nor can they remain in the program without an advisor. Should a student be without an advisor or be in the process of looking for a new advisor, the student will be given one full semester to do so. The faculty advisor oversees and approves the selection of the research topic, appropriate course-work, monitors progress toward meeting degree requirements and approves when a student is ready for his or her qualifying exam and defense. The PhD student's program of study is supervised by the guidance committee, consisting of five USC faculty, three of whom must be from the major department, at least one of whom must be tenured, and one of whom must be an outside member from a different PhD granting department at USC. At least three members of the committee must be tenured or tenure-track. Research-track faculty are eligible to serve as members or chairs of the committee only with the approval of the Dean of the Viterbi School of Engineering. The guidance committee is formed, as described below, within six months of the student passing their screening exam. It may be reduced to a three-member committee, also as described below, subsequent to the student passing their qualifying exam. This committee as constituted following the student passing their qualifying exam will serve to supervise the dissertation defense.

Funding and Support

All PhD students in the department must be fully funded and work under the guidance of a faculty advisor in accordance with the Viterbi and Graduate School policy. The university, school and department award a limited number of Fellowships, Teaching Assistant (TA) positions and Research Assistant (RA) positions. The School's policy is that only PhD students are eligible for TA positions, but these positions are limited and not guaranteed. Students cannot be admitted as a TA. TA appointments are made subject to departmental needs, course enrollment numbers, and available funding. RA positions are at the discretion of each faculty member. PhD students can also be self-funded through government scholarships, employer support, or outside fellowships, with the approval of the Graduate Academic Services and Programs (GASP) Office. Self-funded students must provide documentation of funding to the Viterbi GASP office as well as the USC Graduate Admissions office. Students who are without an advisor or are in the process of looking for a new advisor must remain fully funded.

Screening Examination

A necessary condition for being a candidate for the PhD degree is that students must pass the PhD Screening Examination or be exempted. Students who fail the screening exam procedure cannot continue in the PhD program, but may petition for their completed graduate courses to count towards a Master's degree.

For PhD students in Chemical Engineering

The screening exam takes place at the end of the second semester. The student convenes a committee of three MFD faculty, including their research advisor, in consultation with their research adviser. The exam consists of an oral presentation of approximately 30 minutes summarizing the student's research work so far and their plans going forward. The committee evaluates whether the student passes the exam based on their judgment of whether the student has a clear understanding of the chemical engineering principles underlying their ongoing research work.

For PhD students in Materials Science

Students must complete five out of six core courses by the end of their third semester and will be evaluated based on their overall GPA. Students also must maintain a minimum GPA of 3.0 for each semester. If the student's GPA in core courses drops below 3.0 for a semester, or they do not complete the required core courses by the end of their third semester, they will be evaluated by a faculty committee to determine if the student will be permitted to continue in the PhD program.

PhD students in Materials Science may be exempt or required to take the Screening Examination depending on the following (where GPA refers to average GPA in core courses):

1. GPA $\geq 3.7 \rightarrow$ automatically approved (exempted from screening exam).
2. $3.3 >$ GPA $> 3.7 \rightarrow$ case to be decided by the materials group faculty, and may consider the total GPA, expectation of improvement in the total GPA in subsequent semesters and other factors.
3. GPA $< 3.3 \rightarrow$ automatic fail.

For PhD students in Petroleum Engineering

Petroleum Engineering PhD, students must pass the Petroleum Engineering screening exam a year after starting their PhD Studies. The exam consists of a written part and an oral section. The written part will be an open book exam and includes questions related to competencies in mathematics, PTE core courses and subjects related to geostatistics and geomechanics. The oral exam is on the research proposal of the PhD thesis and progress of the student.

Qualifying Examination

Within six months of passing the screening exam, the student will form their qualifying exam guidance committee consisting of 5 faculty members as described above. Within three months of being formed, this committee will meet with the student and the student will provide a brief summary of their plans to prepare for the qualifying examination. In the Petroleum Engineering program, this meeting will take the form of a Pre-Qualifying exam. This committee will thereafter hold annual planning meetings with the student until the student takes their qualifying exam. To be eligible to take the qualifying examination, the student must have completed at least 24 units toward the degree in residence at USC with a cumulative GPA of at least 3.0. Petroleum Engineering students are required to have an average GPA of at least 3.0 in their units of "Additional Required Coursework." The request to take the qualifying examination must be filed at least 30 days before the date of the examination. The examination, administered by the guidance committee, is intended to determine the extent of the student's knowledge in basic science and engineering areas as well as the ability to do original and scholarly research. The format of the qualifying exam in the department is determined by each faculty advisor with the approval of the rest of the faculty committee members. A student must have approval from his or her faculty advisor to take the qualifying exam.

After passing the qualifying examinations, the PhD student is admitted to candidacy by the Dean of Graduate Studies and the guidance committee becomes the dissertation committee. Following the admission to candidacy, continuous enrollment in CHE, MASC or PTE 794 (a, b, c, d, z) is required in subsequent semesters. CHE, MASC or PTE 794 a and b are required minimally to graduate.

Doctoral Dissertation

An acceptable dissertation based on original investigation and supervised directly by the dissertation committee is required. The dissertation must show mastery of a special field, capacity for independent research and a scholarly result. The dissertation committee may be reduced to three members from the previous qualifying exam committee members, with at least one member being a tenured faculty member in the student's home department, and one must be an outside member from a different PhD granting department at USC.

Defense of the Dissertation

After satisfactorily meeting all other requirements and after the research and writing of the dissertation are substantially complete, the PhD candidate must pass a final oral examination devoted to the major field and the topic of the dissertation. The examination will be conducted in such a manner as to determine to the satisfaction of the dissertation committee that the candidate has attained the stage of scholarly advancement and power of investigation demanded by the University for final recommendation to the doctorate degree. Members of the dissertation committee have the authority to recommend the acceptance of the dissertation. The recommendation must be unanimous, and all members of the dissertation committee (i.e. a minimum of three faculty members) must be present during the oral defense. The final defense is open to all members of the academic community, including other PhD students, who wish to attend. If the defense is satisfactory, the committee will approve the defense through the Thesis Center; if additional work is required, the committee may postpone this approval until the additional work is completed to the satisfaction of the committee. PhD students must also adhere to the upload instructions, deadlines, and guidelines set forth by the USC Graduate School through the Thesis Center.