

# **THE Ph.D. STUDENT HANDBOOK**

**Ph.D. in Chemical Engineering**  
**Ph.D. in Materials Science**  
**Ph.D. in Petroleum Engineering**

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and Materials Science  
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All Ph.D. students are subject to both the Viterbi School of Engineering rules and requirements described in the Ph.D. Student Handbook as well as the University of Southern California's catalog. It is expected that all Ph.D. 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**

Ph.D. Students must remain enrolled full time. All Ph.D. 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 Ph.D. Summer enrollment is not required with the exception of students admitted in the summer semester.

International Ph.D. students and all Ph.D. 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 Ph.D. students in engineering. The 60 units minimum include research courses (590, 690, 790) and four units of 794a and 794b Doctoral Dissertation. Ph.D. students must also complete the core requirement for their major as listed below. The core courses make a part of the 60 units requirement. The number of units taken at USC can be reduced by transferring graduate credits from another institution. Transfer/Waiver units are subject to approval by the Degree Progress Department (for course-work taken at institutions in the U.S.) or by International Admission (for course-work 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.

### **Seminar Requirement**

All Ph.D. students are required to take the seminar course for the spring and fall semesters until they pass the qualifying exam. Exemptions are made for students who are TA's for a course that conflicts with the seminar, for students taking courses that overlap with the seminar, or are already enrolled in 12 units of course work that does not include directed research units.

## **Chemical Engineering Required Core Courses:**

### Seminar Courses

MASC 598/CHE 550A/B until after passing the Qualifying Exam

### Core Courses: 18 units

CHE 501 Modeling and Analysis of Chemical Engineering Systems

CHE 530 Thermodynamics for Chemical Engineers

CHE 540 Viscous Flow

CHE 541 Mass Transfer

CHE 542 Chemical Engineering Kinetics

CHE 544 Heat Transmission

## **Materials Science Required Core Courses:**

### Seminar Courses

MASC 598/CHE 550A/B until after passing the Qualifying Exam

### Core Courses: 21 units

MASC(EE) 471 Applied Quantum Mechanics for Engineers

MASC 501 Solid State

MASC 503 Thermodynamics of Materials

MASC 504 Diffusion and Phase Equilibria

MASC 505 Crystals and Anisotropy

MASC 551 Mechanical Behavior of Engineering Materials

CHE 501 Modeling and Analysis of Chemical Engineering Systems

## **Petroleum Engineering Required Courses:**

### Seminar Courses

MASC 598/CHE 550A/B until after passing the Qualifying Exam

### Core Courses: 18 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

### Additional Required Coursework: 12 units

In Petroleum Engineering, Ph.D.-level courses to be chosen by the students, in consultation with their advisors, must include at least one course offered by a department other than the Mork Family Department.

## **Filing for a Master's Degree**

Ph.D. students can file for the Master's degree as soon as they have completed the Master's degree requirements. An approval from the faculty advisor and/or the department chair is required for Ph.D. students to file for Masters degree. The requirement for the M.S. degrees differs from the Ph.D. degree and requires taking additional electives or substantial amount of research, which can be summarized into a thesis to complete the unit requirements. Ph.D. students require approval from the advising faculty to take elective courses or any courses outside of the required course work for the Ph.D. degree program. Ph.D. 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**

Ph.D. 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 Ph.D. 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 is an outside member from a different Ph.D. 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 Ph.D. 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 Ph.D. 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. Ph.D. students can also be self-funded through government scholarships, employer support, or outside fellowships, with the approval of the GAPP Office. Self-funded students must provide documentation of funding to the Viterbi GAPP 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 Ph.D. program is for the students to pass the Ph.D. Screening Examination. The date of the exam varies depending on the major. Test formatting, test content, timing, and grading of the exam can be changed at the discretion of the Mork Family Department faculty committee. The screening exam must be taken within a student's first academic year enrolled as a Ph.D. student. Students enrolled in the Chemical Engineering or

Petroleum Engineering program who do not have an undergraduate degree in that major can petition to take the screening exam in their second year; such requests will be granted at the discretion of the Department Chair. Students who fail the screening exam procedure cannot continue in the Ph.D. program. Upon approval by the MFD, graduate courses beyond the MS degree requirements may be counted towards an Engineer Degree.

## **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 Ph.D. 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 Ph.D. 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 Ph.D. 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 Ph.D. 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. Ph.D. students must also adhere to the upload instructions, deadlines, and guidelines set forth by the USC Graduate School through the Thesis Center.