Guide for Graduate Studies

Welcome to the Graduate Program in the Department of Chemical & Biomolecular Engineering at the University of Houston!

This description contains information that will help you plan your studies at the University of Houston. However, we realize that no single document can cover everything. Useful information for new graduate students is available on the departmental web page and in the current University of Houston Graduate Catalog. Additional information for admitted students can be obtained from the Organization of Chemical Engineering Graduate Students (OChEGS), and in the Dean's summary of policies and procedures. Current course offerings are listed in the UH academic schedule, found here, which is updated twice each year. In addition, the Director of Graduate Studies, vdonnelly [at] uh [dot] edu (Dr. Vincent Donnelly); the Department Chairman, mpharold [at] uh [dot] edu (Dr Michael Harold); or any faculty member will be happy to answer your questions or direct you to the right person.

This document contains information on the following topics:

- M.S. Program
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Graduate Degree? Programs

The department has M.S. and Ph.D. programs in Chemical Engineering. The department also offers a professionally-oriented Masters in Chemical Engineering (M.Ch.E.) program, directed by Dr. Peter Vekilov, as well as two Petroleum Engineering programs. The Petroleum Engineering programs include a M.S. in Petroleum
The M.S. Program

This program focuses on advanced engineering fundamentals. Students with a B.S. degree in Chemical Engineering or related field must obtain 30 credit hours (10 courses) of core and elective courses to obtain a course-based M.S. degree. No financial aid is offered for M.S. students.

DEGREE REQUIREMENTS

I. Coursework

Each candidate must complete the Four 3-credit hour core courses:

- CHEE 6331: Mathematical Methods in Chemical Engineering I ? Fall Term
- CHEE 6333: Transport Processes (Fluid Mechanics) ? Fall Term
- CHEE 6335: Classical & Statistical Thermodynamics ? Fall Term
- CHEE 6337: Advanced Reactor Engineering ? Spring Term

Six 3-credit hour graduate-level elective courses may be chosen from the department offerings. ONLY two elective graduate-level courses (6 credit hours) from other departments may be substituted for chemical electives. It is possible to cross-enroll to Rice or Baylor College of Medicine in some cases. Basic computer science (COSC) classes, as well as the finance and accounting courses offered in the MChE program (e.g. CHEE 6368, 6369 and 6383); need the Graduate Director approval before enrolling as electives.

II. Course-Based

Although our M.S. program is course-based and does not include a research component, it is possible, though uncommon, for admitted M.S. to carry out research in lieu of four elective courses. Students must have obtained a 3.3 average GPA in CHEE 6330, 6333 and 6335, with no grades lower than B to be considered for a research project. The student must also obtain approval from his or her perspective advisor before beginning M.S. research. Financial aid is typically not provided for M.S. research students. The thesis must be presented and satisfactorily defended in an oral examination. The thesis committee consists of your advisor, one other faculty member from the Chemical Engineering department, and one other Ph.D. scientist or engineer (most commonly a UH faculty member) from outside the department. The student's research advisor chairs the committee. The thesis corresponds to at least 12 credit hours toward the overall degree requirements, of which at least 6 are taken as research credits and 6 as thesis credits.

The Ph.D. Program

Candidates for the Ph.D. degree are given intensive exposure to a specific field of engineering research as well as continued study of a broad range of engineering fundamentals. The main focus is individual research, and students are expected to expand the frontiers of knowledge in their area of endeavor. Moreover, candidates learn, absorb, and otherwise experience the general philosophy, methods, and concepts of research and
scholarly inquiry so that after graduation they can approach significant problems that may or may not be related to their doctoral research.

DEGREE REQUIREMENTS

I. Coursework

Each candidate must complete a total of 30 credit hours of coursework including the following 4 core courses:

- CHEE 6331: Mathematical Methods in Chemical Engineering I ? Fall Term
- CHEE 6333: Transport Process ? Fall Term
- CHEE 6335: Classical & Statistical Thermodynamics ? Fall Term
- CHEE 6337: Advanced Reactor Engineering ? Spring Term

Each candidate must also take two out of the following Semi-Core Courses:

- CHEE 6300: Physics & Chemistry of Engineering Materials
- CHEE 6327: Experimental Methods in Chemical Engineering
- CHEE 6332: Mathematical Methods in Chemical Engineering II
- CHEE 6360: Biomolecular Engineering
- CHEE 6377: Introduction to Polymer Science

Of the remaining four (elective) courses, at least two must be Chemical Engineering graduate courses. Semi-Core Courses can also be used as electives. Graduate level courses from other departments may be approved on a case-by-case basis. It is possible to enroll in Rice graduate courses in some cases. Some basic computer science (COSC) classes, as well as the finance and accounting courses offered in the M.Ch.E program (CHEE 6350, 6368 and 6369) are not usable as M.S. or Ph.D. electives. Students are also expected to enroll for the departmental seminar series class (CHEE 6111) when permitted by their total hours limits. However, you must attend department seminars regularly, whether formally enrolled or not.

II. Admission to Candidacy for the Ph.D.

At the end of the first year Spring Term, the faculty decide whether a student belongs to one of the three following tracks:

- Track (i) goes for fast-track Ph.D.,
- Track (ii) works on removing coursework deficiency and then goes for Ph.D., or
- Track (iii) goes for a course-based MS degree and leaves.

This decision would be based on 5 required course instructor recommendations (positive or negative) and advisor recommendation.

- Track (i) would have students who have done well in courses (required core courses GPA>3.30). They must have positive recommendations from all instructors and their advisor. They would do a research-based Ph.D. qualifier by the end of the second year. (A one Term extension can be given in special situations.) A committee of 3 ChE faculty would judge, if they qualify. If they do not qualify, they complete and leave with a M.S. degree.
- Track (ii) would have the students who have not performed well in some required courses. They may be advised to repeat the required courses in which they performed poorly and/or obtain a thesis-based M.S. They must have a positive recommendation from the course instructor to
move on. If they succeed in these additional requirements, they proceed to the Ph.D. program. If they do not qualify, they complete and leave with a M.S. (Note: If an instructor finds weak performance, but with potential to improve, he/she can give an ?I? grade, allow the person to repeat the course (or do an extra project) and give a final grade within one year.)

- Track (iii) would have students who have required core courses GPA < 3.00 or get 3 (or more) negative recommendations from instructors and advisor. They would be advised to take the necessary classes and leave with a coursework M.S. by the end of their first calendar year. Alternatively, if the advisor is willing, they could do a thesis based terminal M.S. (but no Ph.D.).

This qualification process also includes the faculty evaluation of all first year students at the end of the first Fall Term. The weak students (2 or more B-) are advised to drop out of the Ph.D. program at that stage and do a coursework M.S.

**Research-based Ph.D. Qualifying Examination Format:** In the second year (preferably in the Spring Term), students would take their research-based qualifying examination. The examination would consist of a report (double-spaced, 12-font, approximately 20 pages: background, summary of research conducted, and directions for further research) and an oral presentation of the research to a committee of 3 professors (including the advisor). The committee would be appointed, with input from the advisor, by the Graduate Program Director and approved by the ChE chairman.

### III. Residency

All Ph.D. Students are required to satisfy a 1 year full-time residency before they can graduate. This means that you must be enrolled for the required nine (9) hours, which is considered full time, in two (2) consecutive long terms (Fall and Spring).

### IV. Research Dissertation

A Ph.D. candidate must complete a research project and a Ph.D. dissertation. The dissertation should contain a significant new contribution to knowledge in chemical engineering, and must be presented and satisfactorily defended in an oral examination. The dissertation committee is composed of the student's advisor, two other faculty members from the Chemical Engineering department and two faculty (most commonly UH faculty) from outside the department. The student's research advisor chairs the committee. The dissertation must provide at least 36 credit hours towards the overall degree requirements, of which at least 24 are taken as research credits and 12 as dissertation credits.

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**Ph.D. Dissertation Committee**

This committee seeks to provide input to the Ph.D. candidate's research goals and progress at a time early enough to accommodate any adjustments before defense of the dissertation. The time for assembling this committee is decided by the student and his/her advisor. For further information, please contact the Director of Graduate Studies.

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**Students with B.S. Degrees in Subjects Other than Chemical Engineering?**

Degree plans for full-time students seeking a Ph.D. in Chemical Engineering who have a B.S. degree in Chemistry, Physics, Materials Engineering or related branches of science and engineering are arranged on a case-by-case basis. In the first year, the student will usually take two of the required graduate courses per Term
together with pertinent undergraduate courses. If the student audits the other required courses and is making the transition to chemical engineering smoothly, they will be encouraged to take the Ph.D. qualifying exam at the end of the second year. In some cases, students will be required to complete an M.S. before proceeding.

Transfer Credit/Placement for Courses Previously Taken

Previous graduate-level coursework may allow for placement out of required graduate courses (the student takes more advanced courses, for the same total number of classes), or for transfer credit (as though the course had been taken for credit at UH; replaces a UH course). Only formal courses may be used for transfer credit or placement. Transfer credit can be granted for two courses, and these may not have been used in earning any previous degree. Classes used for either placement or transfer credit must be individually evaluated for comparability to UH courses (based on syllabus, notes, etc.) by the instructor of the most-related UH course, and courses offered for transfer credit must be clearly established as not having been used toward a previous degree, usually by analysis of transcripts and published degree requirements from the student's prior institution. Transfer credit requires the completion of a Graduate Petition. Contact the Graduate Advisor, grad-che [at] uh [dot] edu (Yolanda Thomas) about the form.

Students with Previous M.S. Degrees in Chemical Engineering

Seven to ten courses are required of students obtaining a Ph.D. after a previous M.S. degree. If you are doing a Ph.D. after an M.S., please inquire with the Graduate Director. Core ChE classes taken by students who have taken similar classes elsewhere may often be placed out of.

Stipends and Payment

With very rare exception, full-time Ph.D. students in the department are paid the current standard departmental rate. Some students receive additional fellowships. Variations in take-home pay are created by the complex Federal and University policies governing stipends and income, by international tax treaties, and by insurance and tax withholding (the last of these can be adjusted by filling out the a form. (http://www.uh.edu/finance/pages/tax_info.htm). Ph.D. students are very rarely admitted without support, as financial concerns usually prevent unsupported students from doing well. External fellowships arranged by the student (e.g., NSF Graduate Fellowships) lead to somewhat higher stipend levels.

Students are generally paid at the beginning of each month, for the month just ended. The first payment to new students is therefore October 1. It is essential to arrange for your Social Security Number to be entered into the university accounting system as soon as possible, to ensure that payment will occur on time.

Fellowships

Fellowships are intended to assist departments or programs in enhancing quality by providing funds to recruit outstanding students. The Fellowship program provides funds to match or exceed financial assistance packages offered by other institutions. Only students of exceptional caliber who represent extraordinary recruitment
opportunities will receive these fellowships. http://www.egr.uh.edu/academics/graduate-programs-policies/presidential-fellowships.

**Graduate Tuition Fellowships (GTF)**

The Graduate Tuition Fellowship provides funding to assist in defraying cost of in-state tuition of up to 12 credit hours per semester and up to 6 credit hours in the summer for qualified Ph.D. students, who are in good academic standing.

http://www.egr.uh.edu/academics/graduate-programs-policies/doctoral-student-tuition-fellowships

Assignment of Research Advisors

Research advisors are assigned at the start of the Spring Term. Several weeks before advisor-choices are to be submitted, each professor planning to take new students gives a 30-minute presentation on his/her work and the projects available for new students. Each student is then expected to meet further with at least three of the professors, as well as with students already involved with the groups of interest. Experience shows that these meetings are one of the main ways in which students learn about the research activities of the department, and this knowledge is often helpful in their research. The OChEGS symposium each Fall is another valuable source of information about current research in the department. Following these meetings, near the end of the Fall Term, each student submits their rank-ordered first, second, and third choice. The department earnestly attempts to assign students to the advisor of their choice, and the great majority of students get their first or second choice. Don't be out of touch during the week before second-term classes begin, as it is often necessary to consult with students regarding the assignment process.

Teaching Assistant Duties

In addition to their coursework and research activities, all full-time graduate students in the department are assigned some teaching assistant duties. Such duties usually include homework grading, tutoring students, or assisting in an instructional laboratory. This assignment is a worthwhile educational experience for all graduate students. Because all students participate, the burden on each individual is moderate. In recent years, no TA duties have been given to students during their first Term of graduate study, or to students who expect to graduate before the end of the Term.

OChEGS

The Organization of Chemical Engineering Graduate Students (OChEGS) is a useful, student-run organization in which many graduate students participate. OChEGS organizes a variety of social events each year, as well as a long-standing Fall symposium featuring research conducted by students in the department. OChEGS may be reached through their mailbox and at the events they sponsor.
Ethical Practices

The department's standards in this area are high and inflexible. Particularly avoid the following: collaboration on take-home exams, plagiarism of others' writings, and falsification of data. Any of these can potentially end your professional career. Any appropriate penalty may be imposed up to a maximum penalty of permanent suspension from the university. Seek advice if you find yourself in a situation in which you are uncertain.

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Department Safety

Much of the research conducted in the department involves the use of potentially-dangerous substances and equipment. None of the research conducted here outweighs serious injury to any member of the department. Be cautious when you first begin experimental work. Ask the members of your research group about hazards. Lab safety information from Environmental Health & Risk Management can be found at: http://www.uh.edu/ehls/.

You will be required to take the required Hazardous Material Safety course. Take the required radiation-safety course and laser safety course, if applicable to your research. Know the special disposal rules for organic and biohazardous wastes. Beware of gas cylinders, which must always be secured against falling, and leaks of toxic/flammable gases. Use eye protection. Know where the nearest eyewash and fire extinguisher are located (could you find them with your eyes closed or blinded?). Beware of glass tubing and vessels, and hot surfaces.

Finally, even the non-experimentalists should be aware that injuries associated with over/improper use of computers are real, and increasingly common.

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Duration of Financial Support

Support will continue as long as you are maintaining a 3.3/4.00 GPA and satisfactory progress in the core courses, dissertation, and other requirements for the completion of your Ph.D degree.

The department limits the duration of financial support in order to encourage students and their advisors to expedite the student's progress toward graduation. While anxiety-provoking at first glance, this policy has effectively eliminated the lengthy terms of graduate study still found in many other departments (e.g., 7-8 years!).

All full-time Ph.D. candidates are ideally expected to complete their degree requirements within four and a half years from the time they enter the department. In addition to the above guidelines, the State of Texas places a reasonable but firm upper limit on the duration of graduate studies, beyond which out-of-state tuition would have to be charged by the University for a student to continue his/her enrollment in the graduate program. Please make sure that you discuss this issue with your advisor.

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University Holidays

Note: A State employee is entitled to observe Rosh Hashanah, Yom Kippur or Good Friday in lieu of any holiday or holidays on which the employee's agency is required to be open or staffed to conduct public business. Other absences should be prearranged with the student's advisor. In practice, it is observed that students who are enthusiastic and committed to their studies and their research seem to have more fun, and do better when they get out.

Graduate Coursework and Seminar Series

A full-time student must enroll in 9-12 credit hours each term. The Department invites renowned speakers to address the faculty and the graduate students. Seminars are usually held from 10:30 - 11:30 a.m. on Fridays. A social with coffee and doughnuts precedes each lecture. All graduate students are required to be enrolled in this course every Fall and Spring Term where credit hour limits permit. Students are required to attend the graduate seminars whether formally enrolled in the seminar course or not (no exceptions).

Enrollment in Classes

The UH requirement for full time enrollment can change depending on policies of the higher administration and Federal government (it's generally 9 or 12 hours for full time M.S., and 9 for Ph.D. students, but check each term with the Graduate Advisor). Any student who is supported (TA, RA, fellowship, scholarship) is required by the College of Engineering to be full time. Any student who is on a temporary visa is required by federal law to be full time as it is defined by the university he/she is attending.

As of now, subject to change:

- Continuing students, classified as Ph.D. students and taking less than 9 hours of regular classes (lecture classes, not research units or seminar) - sign up for a total of 9 hours. This should include the seminar, any classes you are taking, and enough research or thesis/dissertation hours to make a total of 9.
- Continuing students, classified as Ph.D. students and taking 9 or more hours of regular classes (lecture classes, not research units or seminar) - sign up for a total of 12 hours. If you are taking 9, 10 or 11 hours of classes, take these plus the seminar and enough research to make 12 total (i.e., 2, 1 or 0 hours of research, respectively). If you are taking 12 hours of classes, take just these. Enrollment in the seminar class can be waived if you need to take 12 hours of classes, but you still are expected to go to the seminars.
- Continuing students, classified as M.S. student - the 9-hour rule does not apply. Sign up for 12 hours or whatever the Graduate Advisor says. This should include the seminar, and a mixture of classes and research hours to make 12. Students who have not finished an M.S. thesis or passed the Ph.D. qualifying exam should be classified as M.S. students.
- New students are initially classified as M.S. students. Sign up for the two or three courses (required Transport 1, and Thermodynamics and maybe Math), and 3 more hours. Take the seminar unless you take a fourth course for 3 hours. To the total 12 hours.
- New students who already have an M.S. degree and are taking three classes (Math 1, Transport, and
Thermodynamics), are eligible to take three more hours. Take a fourth course for 3 hours. Enrollment in the seminar class can be waived if you need to take 12 hours of classes, but you still are expected to attend the seminars.

- Some new students entering with an M.S. degree may have taken classes similar to our core classes. With permission of the instructor, a previous class may allow placement out of the corresponding University of Houston class. This should be done cautiously, as later classes and the qualifying exam assume the background provided by the University of Houston core classes. It may be prudent to audit (with the instructor's permission) any course that the student has placed out of. Students placing out of core classes should still enroll in at least 9 hours of Chemical Engineering classes. (See also the discussion of placement/transfer credit above.)
- If you get another fee statement during the Term, indicating that your enrollment has not been fully completed; please let the Graduate Advisor know immediately.
- It's important to sign up for research hours with the right advisor/faculty member? this means using the right section number.