Columbia University in the City of New York
Department of Chemical Engineering

Graduate Student Handbook

2020-21 Academic Year

General Information

This handbook provides Department-specific information concerning your academic program in the department. It is assumed that incoming students have obtained general information concerning housing, University-wide resources (*e.g.* library access, computer accounts, identification cards) from other sources during the reception period for new graduate students. The Departmental administrative staff, faculty, and established graduate students will be happy to address these issues in more detail, if need be. The following information is centered on the academic requirements and expectations of graduate students. Just ask!

Timely information is usually disseminated by e-mail. Each student is expected to establish his e-mail account promptly and to monitor his or her incoming mail. Each student is urged to visit the department reception area frequently and to observe principal departmental bulletin boards.

Students are generally assigned a desk in a central departmental area, in proximity to other students. The Department is relatively small and some communication is informal. Students are encouraged to form good working relationships and to communicate with each other through them.

Advising

Advising is the responsibility of the graduate coordinator, who is also chairman of the Department's Graduate Committee. The coordinator approves all courses for graduate students until they have been assigned to a research group. The graduate coordinator also provides general advice to all graduate students until they have joined a research group. Once assignment to a group is made, the research advisor assumes responsibility for the approval of courses.

Advising of MS students is currently the responsibility of the Masters Committee. Each incoming MS student will be assigned an advisor who will approve courses.

Requirements for the M.S Degree

The 4 core chemical engineering courses: (i) CHEN 4110, Transport Phenomena III; (ii) CHEN 4120, Statistical Mechanics **OR** CHEN4130 Advanced Chemical Engineering Thermodynamics; (iii) CHEN 4010, Mathematical Methods in Chemical Engineering **OR** APMA 4200, Partial Differential Equations; (iv) CHEN 4330, Advanced Chemical Kinetics.

In addition, 18 points of 4000 or 6000-level courses are required. Each of these courses must be approved by the graduate coordinator or research advisor, as appropriate. All approvals must be in writing and are filed with the student's Departmental records. Approvals are sought and obtained only by personal contact with the advisor. Only for part-time students who cannot easily schedule personal advising sessions can approvals

be made through e-mail. A significant fraction of the elected courses must have a ChE designation. The M.S. may be earned with or without a research component. Up to 6 points of M.S. Research (ChE 9400) may be used as part of the 18 point elective requirement.

Note: As with all degrees at Columbia, one must apply for a degree to receive it. The degree is *not* automatically awarded once requirements are fulfilled. Often M.S. students proceeding to doctoral studies will receive a grade for M.S. Research (ChE 9400) and subsequently apply for the degree only at the time of completion of the doctoral research proposal in year 2. At this time, students may also change their registration status from "MS/PhD" to "PhD," as instructed by the departmental administrator or the research advisor.

Scientist to Engineer Status

A student who is admitted to the MS program without an undergraduate degree that is equivalent to an ABET accredited chemical engineering baccalaureate degree is given Scientist to Engineer (S2E) status. These students must complete CHEN E4001, Essentials of Chemical Engineering A, and CHEN E4002, Essentials of Chemical Engineering B, in their first semester. These courses cover essentials from the entire undergraduate chemical engineering curriculum in an intensive, accelerated way in 6 credits. These 6 points of credit must be taken and passed in addition to the 30 points of graduate credit required for the MS itself, so that these students need a total of 36 credits to graduate. Typically this can be accomplished in 3 semesters.

After completing CHEN E4001 and CHEN E4002, students admitted with S2E status must also take CHEN E4010, Mathematical Methods in Chemical Engineering, as part of the core requirement, and a graduate-level chemical engineering course with substantial design content as one of their technical electives.

Financial Support of Graduate Students.

A doctoral-track student is one who has been admitted into either a doctoral program (if he or she already holds an MS) or into the MS/PhD program. All students that are supported by the department or research advisor receive equal stipend with equal benefits. However, students holding external fellowships may be compensated at a higher rate. Students initially admitted only as MS candidates must successfully petition the department for admission into the MS/PhD program to be eligible for departmental financial support.

Financial support is available from the Department and from individual research advisors in return for satisfaction of obligations imposed by the donor. First-year support for students enrolled in the MS/PhD program is provided by the Department from monies authorized by the School in order to obtain teaching assistants for (mostly required undergraduate) courses. Each first-year student is expected to serve as a teaching assistant for both semesters of the first year, under the direction of one or more faculty members.

This obligation may consume up to 17 hours per week, although the requirement is generally less. All MS/PhD students, regardless of the source of their support or their mode of entry into the Department, are expected to contribute to the Department's teaching effort in approximate equivalence to the normal first-year assignment at some time before graduation.

Students in research are generally supported with funds provided to their research advisors by research sponsors. These sponsors impose goals and expectations on faculty research directors. Research directors have a finite capacity to accept and guide students. While the Department solicits expressions of preference for particular research areas from students, and endeavors to satisfy these preferences, it is not always possible to match openings in particular research programs or with particular professors against student preferences. Thus, while each student who receives support and makes satisfactory progress will be supported on a project as near as possible to his or her preference, the department cannot guarantee assignment to a particular project or professor. The Department sponsors various events during the first semester to assist students in forming research preferences.

For a student to receive financial support, he or she must remain in "good standing," must fulfill all doctoral-degree requirements in a timely manner according to the schedule outlined below, and must demonstrate good progress toward the completion of his or her thesis.

To ensure that graduate studies are completed in a timely manner, students admitted in the Fall of 2002 or later cannot be financially supported by the department or advisor for more than five years. A one-month exception will be included for scheduling of the thesis defense. Thus full-time students must normally complete the doctoral degree not later than five years after entering Columbia.

Requirements for Doctoral Degrees (Beyond the M.S. requirements)

There are several milestones that must be completed in addition to course requirements. Two major examinations, the qualifying examination and the proposal presentation, are to be accomplished early in the students' residence. In the event that a student fails either of these examinations or the thesis defense, he or she is not permitted to continue the doctoral program. The milestones are intended not only to examine students but to monitor progress and to develop presentation skills. A timeline and further description of all requirements is given below:

Timeline for Major Requirements

Year 1. September: Meet with graduate advisor. Commence core courses. Become familiar with research programs.
October: Submit preferences for research groups. Join research group.
January: Continue research. Continue course work.
May: Apply for Qualifying Examination
Summer: Continue research; start preparation of Qualifier Presentation.

Year 2: September: Take Qualifying Examination.
Complete course requirements, continue research.
May: Proposal Presentation. Apply for MS degree.

Year 3: Continue research.
May: Present departmental seminar

Year 4: Continue research.

Year 5: Final thesis defense (must be completed by August.)

In addition to meeting the above milestones, all doctoral students will receive an annual letter from the Graduate Committee. The letter will inform each student whether his/her performance is satisfactory in the previous year.

The PhD (Doctor of Philosophy) and DES (Doctor of Engineering Science) have essentially identical requirements. The PhD is granted by GSAS (Graduate School of Arts and Sciences) and the DES by SEAS (School of Engineering and Applied Science). While the administration of course and residence requirements differs, the degree requirements are identical. Most students choose to pursue the PhD. The administrative requirements for this degree are described in the Bulletin of the Graduate School of Arts and Sciences (GSAS). PhD students are required to obtain an M.Phil. (Master of Philosophy) degree, which is granted when the residence unit requirements are completed and the proposal is defended (see below). Application for the M.Phil. must be completed in consultation with the departmental office. Administrative requirements for the DES are more straightforward and are described in the SEAS bulletin.

The identical requirements for the PhD and DES are:

1. ***Qualifying Examination.*** The student must pass the qualifying examination, given at the beginning of the 2nd year. The qualifying examination consists of a written report, and a 15-minute oral presentation. The oral presentation will be delivered on the first Friday of the Fall semester of the 2nd year. Each student's presentation will be followed by a 15-minute question-and-answer period by the exam committee on preliminary results and chemical engineering principles. Students should submit the written report one week before the oral presentation.

This report should be 10 pages long (not including cover page or cited references), and it should summarize literature search and provide preliminary results and analysis. The exam committee will be composed of all faculty members (plus co-advisors if they are from other departments).

All students must petition the graduate committee by the last day of the previous Spring semester to take the qualifying exam. A petition form is attached. Permission is generally granted if the student has accomplished a GPA of 3.2 or greater in graduate coursework.

In preparation for the qualifying exam, the student's advisor **should** have the opportunity to provide general comments on the overall contents and research directions of the written report, but **should not** re-write the report for students., In addition, the advisor **should not** participate in the practice talks; students should be able to independently prepare a 15-minute presentation based on the written report. Students who pass the Qualifying Examination are considered to be in good standing. Students who fail are normally asked promptly to complete the M.S. degree and are not permitted to continue in the doctoral track. Based on performance on the initial attempt, a student may be given a conditional pass. Such a student will be given one more chance at the end of the same Fall semester to the thesis committee of three faculty members. Failure to pass on the second attempt will result in dismissal from the doctoral track.

2. ***Research Proposal.*** Only students who have successfully taken the qualifying exam can submit a Research Proposal. The proposal consists of a twenty-minute oral presentation to a committee composed of the student's advisor plus two additional faculty members, on a topic chosen by the student in consultation with his or her research advisor. The presentation is open to the public and all graduate students are strongly encouraged to attend. *The candidate is expected to demonstrate thorough knowledge of the literature of his or her research field.* At least one week prior to the oral presentation: (i) a short report of no more than 15 pages (including figures, excluding bibliography) describing the proposed research must be provided to the committee, (ii) the title and abstract of the research proposal must be sent to the Chemical Engineering office so the event can be publicized. The report should include a survey of the field, identification of outstanding issues and how the proposed research will address some of these issues. Prominent in the report should be a clear plan of the proposed research including its relation to its broad field. The student should work with his/her advisor for detailed advice about the report's format. <u>It is a strict requirement that the proposal be defended before the end of the Spring semester of Year 2.</u>

3. ***Course Requirements.*** While the approval requirement and number of lecture and laboratory courses is identical for both the PhD and the DES, the crediting system, as noted above, is different. Details are given below:

PhD

1. Registration for the Chemical Engineering Colloquium (ChE 9000, 0 points) is required in every semester.

2. Four 'residence units' beyond the M. S. degree must be accumulated. One residence unit is given for each semester of full-time enrollment (up to 15 points).

> All full-time PhD students normally will register for a residence unit each semester until this requirement is fulfilled, unless instructed otherwise by his/her advisor. Registration for a residence unit allows (but does not require) the student to take up to 15 points of coursework without additional charge to the department.

3. Nine points of 4000-8000 level courses (courses must be completed before the four residence unit requirements are fulfilled).

4. Twenty one additional points of courses, any number of which can be Doctoral Research, CHEN 9500 (must be completed before the four residence unit requirements are fulfilled). Note: the 9 points of 4000-8000 level courses is a minimum requirement; the student, in consultation with his/her advisor, may take additional such courses (before the 4 residence unit requirement is fulfilled). In this case, the number of CHEN 9500 points taken should be such as to make the total points (4000-8000 level plus 9500) equal to thirty.

DES

1. Chemical Engineering Colloquium (every semester); (ChE 9000)

2. 12 points of ChE 9800 (Doctoral Research Instruction)

3. 30 additional points,
   which may include a *maximum* of
   15 points of ChE 9500 (Doctoral Research)
   6 points of ChE 8000 (Special Topics)
   and must include a *minimum* of
   9 points of 4000-6000 level courses

4. ***Required Seminar:*** All third-year graduate students are required to present a departmental seminar. All graduate students are required to attend. The event is held as a professional conference. A program is published on the web and posted. Speakers are asked to prepare an abstract, which is distributed. Talks are approximately 20 uninterrupted minutes with 5 minutes for questions.

5. ***Data Defense:*** Any chapters of the thesis that have already been written are presented to the Departmental members of the anticipated thesis-defense committee. The student then delivers a 20-minute presentation of his data to these members. The deadline for this presentation is December of Year 4. The committee provides input on any additional research needed to complete the thesis by August of year 5. The data defense is primarily a critical evaluation of the student's progress, and secondarily an examination of the student's knowledge of his or her subject.

6. ***Thesis Defense:*** The student must successfully defend his/her thesis to a committee of five faculty, three of whom are normally chosen from members of the Departmental faculty and two of whom are members of other departments of the University. The research presentation is public, and is followed by a private, detailed questioning by the committee. The committee is selected by the research advisor and must be approved by SEAS or GSAS. By the rules of these Schools, the thesis must be submitted to the committee at latest 3 weeks prior to the defense.

The student must apply for the PhD/DES dissertation defense. This must be done in consultation with the departmental office. Every year, filing deadlines to obtain a degree by a certain date are published in the academic calendar. In the semester of his or her defense, the student must register appropriately, depending on his or her status. The GSAS website provides explicit directions for this.

Resources on Campus

CU GRADUATE STUDENT SERVICES
Graduate Admissions and Student Affairs
524 S. W. Mudd, Mail Code 4708
500 West 120th Street
212-854-6438
Email: seasgradmit@columbia.edu

FINANCIAL AID AND EDUCATIONAL FINANCING
100 Hamilton Hall, Mail Code 2802
1130 Amsterdam Avenue
212-854-2931
Email: engradfinaid@clumbia.edu

CU HEALTH SERVICES - PRIMARY CARE
3rd and 4th Floors, John Jay Hall
519 West 114th Street
212-854-2284

CU HEALTH SERVICES - COUNSELING AND PSYCHOLOGICAL SERVICES

Alfred Lerner Hall, 8th Floor
2920 Broadway, Mail Code 2606
212-854-2468
212-854-2878

SAINT LUKE'S HOSPITAL EMERGENCY ROOM
1111 Amsterdam Avenue at 114th Street
212-523-3347

CU OFFICE OF THE REGISTRAR
205 Kent Hall, Mail Code 9209
1150 Amsterdam Avenue
212-854-4330

CU ID OFFICE
204 Kent Hall
212-854-4323

CU OFFICE OF INSTITUTIONAL REAL ESTATE
400 West 119th Street
212-854-9300

CU INT'L STUDENTS AND SCHOLARS OFFICE
524 Riverside Drive, Suite 200
212-854-3587

CU ACADEMIC INFORMATION SYSTEMS (for e-mail)
Computing Support Center
102 Philosophy Hall
Computing Helpline: 212-854-1919

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DEPARTMENT OF CHEMICAL ENGINEERING

Selection of Research Advisor

Preferences for research advisors must be submitted to the graduate coordinator by October 4th, 2019. Proof (Faculty/Student Research Interests Form) that you have spoken with at least four faculty members about potential research projects must also be supplied.

Student Name_____

My preferences for research advisors are:

1. Professor _____

2. Professor _____

3. Professor _____

Whenever possible, the department will match the student with his or her first choice.

500 West 120th Street 801 S. W. Mudd Mail Code 4721 New York, NY 10027
212-854-4453 Fax 212-854-3054 www.cheme.columbia.edu

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Faculty/Student Research Interests

This form demonstrates that the student whose signature appears below has met with at least four faculty member to discuss possible research topics. Please use this form to obtain the signature of each faculty member with whom you have discussed research interests. It is best to educate yourself as soon as possible on research activities available in the Department. ***This form must be returned to the graduate coordinator by October 4h, 2019.***

Faculty Signature	Date

Student Name_____

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Petition to take the Doctoral Qualifying Examination

The graduate committee must be petitioned on or before May 31 for permission to take the Doctoral Qualifying Examination. This form should be submitted to the graduate coordinator.

I, _____ (student), request permission to take the Doctoral Qualifying Examination in September _____ (year).

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