Chemical Engineering, PhD (Boston)

Each student admitted to the PhD program in chemical engineering will initially be designated a doctoral student. Upon successful completion of the requirements for doctoral candidacy as described below, a student is reclassified as a doctoral candidate. After establishing candidacy, a student must complete a dissertation under the direction of a dissertation advisor. All doctoral candidates must also pass a final written and oral examination.

Doctoral Candidacy for Direct Entry

To qualify for doctoral candidacy, the student must demonstrate mastery of four core courses of chemical engineering (thermodynamics or statistical thermodynamics, kinetics, transport, and mathematics). To become a doctoral candidate, students must maintain a grade-point average of 3.250 or above in the four core courses and have no individual grade below a B– in the four core courses. Mastery of the four core courses must be demonstrated within the first year, unless an extension is granted by the department graduate committee.

In addition, each student must complete 4 semester hours of Research (CHME 9984) and demonstrate critical thinking, analysis, and experimental planning skills related to their dissertation research topic through a written candidacy proposal and an oral defense of this proposal. The student must pass, as determined by the student's dissertation committee, this candidacy proposal defense in order to advance to doctoral candidacy. If the student fails, they may resubmit their proposal and retake the defense one time within four months, unless an extension is granted by the primary research advisor and the department graduate committee. The student earns the classification of doctoral candidate upon successful completion of these requirements.

Doctoral Candidacy for Advanced Entry

To become a doctoral candidate, advanced-entry students who have already completed a graduate degree in chemical engineering or a closely related discipline must petition the graduate committee of the Department of Chemical Engineering and demonstrate that the mastery has been attained through coursework either at Northeastern University or during a previous graduate degree from another institution (typically granted when the student has achieved a grade of at least A– in an equivalent course; an official transcript and relevant course syllabus from the previous degree will be required for verification). The student must demonstrate mastery of the four core areas of chemical engineering (thermodynamics or statistical thermodynamics, kinetics, transport, and mathematics) through course performance.

The graduate committee may require a student to take or retake any or all of the core courses before achieving doctoral candidacy. Incoming advanced-entry students should form a plan of coursework in consultation with the associate chair for graduate studies and have this approved by the graduate committee. For the core courses taken at Northeastern, students should maintain a GPA of 3.250 or above and have no individual grade below a B–.

In addition, each student must complete 4 semester hours of Research (CHME 9984) and demonstrate critical thinking, analysis, and experimental planning skills related to their dissertation research topic through a written candidacy proposal and an oral defense of this proposal. The student must pass, as determined by the student's dissertation committee, this candidacy proposal defense in order to advance to doctoral candidacy. If the student fails, they may resubmit their proposal and retake the defense one time within four months, unless an extension is granted by the primary research advisor and the department graduate committee. The student earns the classification of doctoral candidate upon successful completion of these requirements.

Course Requirements

DIRECT ENTRY

A minimum of 32 semester hours of academic coursework, **not including any directed study credits,** beyond the bachelor's degree is required. The 32 semester hours must include at least 24 semester hours of academic coursework (exclusive of thesis or dissertation) taken at Northeastern. All four of the core courses (see table under Program Requirements), the 4 semester hours of research, and the 4 semester hours of professional development courses must be included in the student's academic graduate coursework.

ADVANCED ENTRY

A **minimum** of 20 semester hours of academic coursework, **not including any directed study credits,** beyond the master's degree is required. At least 16 semester hours of academic coursework (exclusive of thesis or dissertation) must be taken at Northeastern. At least one of the core courses (see table under Program Requirements), 4 semester hours of Research (CHME 9984), and 4 semester hours of professional development courses must be included in the student's academic graduate coursework. At least 8 semester hours of noncore electives must also be included. If the graduate committee requires additional core courses to achieve doctoral candidacy, these are in addition to the 20-semester-hour minimum.

GENERAL REQUIREMENTS

PhD students who have completed the majority of their coursework and not yet reached PhD candidacy should register for Research (CHME 9986), in a section for which their dissertation research advisor is listed as the instructor in the online registration system. The semester they plan to defend their proposal, they should register for Candidacy Preparation for Candidacy Preparation—Doctoral (CHME 8960) and for 4 semester hours of Research (CHME 9984).

After obtaining PhD candidacy, students are required to register for Dissertation Term 1 (CHME 9990) and Dissertation Term 2 (CHME 9991) for two consecutive semesters. This is then followed by registration for Dissertation Continuation (CHME 9996) in each semester thereafter until the

dissertation has been completed and defended. Note: No course credits are awarded for Dissertation Term 1 (CHME 9990), Dissertation Term 2 (CHME 9991), or Dissertation Continuation (CHME 9996); however, a student is considered full time if registered for these courses.

All students pursuing a doctoral degree must enroll in the department's Seminar (CHME 7390) course for each semester they are working toward their degree.

Students will be advised on their courses for the first semester by the associate chair for graduate studies. After the first semester, students will work with their dissertation advisor to determine appropriate courses and course schedule to meet their educational needs and aspirations. Upon consultation with the dissertation advisor, a student may take up to 44 semester hours of course credit without additional financial penalty. Students and dissertation advisors should keep in mind that the university residency requirement requires two semesters of academic studies after becoming a doctoral candidate.

Language Requirement

There is no foreign language requirement for the PhD degree. However, each candidate must be proficient in technical writing and oral presentation in the English language. The graduate committee may require additional coursework to improve language proficiency, if necessary.

Residence Requirement

A student satisfies the residence requirement by completing one academic year of full-time graduate studies during two consecutive academic semesters after qualifying for doctoral candidacy. Additional required coursework (exclusive of seminars) may be completed during this period. Students are required to be continually enrolled while pursuing the completion of the dissertation.

Dissertation

After a student establishes doctoral candidacy, they must complete a dissertation that embodies the results of extended original research and includes material suitable for publication. The student is responsible for proposing a dissertation committee to be approved by the dissertation advisor at least one month prior to the dissertation defense. The committee must have a minimum of four members, including the primary advisor. At least two committee members must be faculty members in the Department of Chemical Engineering (with a greater than 0% appointment). Additionally, one of the committee members must be external to the Department of Chemical Engineering. Committee membership is not limited to faculty at Northeastern or to engineering faculty. The student is encouraged to consider experts in the dissertation topic and to work with the dissertation advisor to create a meaningful and helpful committee. The dissertation committee will approve the dissertation in its final form.
The graduate school requirements for dissertation formatting and electronic submittal instructions can be found on the College of Engineering's webpage (https://coe.northeastern.edu/academics-experiential-learning/graduate-school-of-engineering/graduate-student-services/dissertation-thesis-instructions/). Students are responsible for contacting the Graduate School of Engineering for any updates to dissertation requirements and appropriate deadlines.

Dissertation Defense and Final Oral Examination

This comprehensive examination includes the public dissertation defense as well as a final oral examination to include the subject matter of the doctoral dissertation and significant developments in the field of the dissertation work. The oral presentation will be open to the public, including students, faculty, and the student's committee.

Program Requirements

Complete all courses and requirements listed below unless otherwise indicated.

Milestones

Annual review
Dissertation committee
Dissertation proposal
Dissertation defense

Core Requirements

A minimum of 32 semester hours of academic coursework is required, plus 2 optional semester hours for cooperative education and mentoring in chemical engineering. Independent study credits do not count toward the 32 required semester hours.

Code	Title	Hours
Core Courses		
A cumulative 3.250 GPA, with no individual class lower than a B–, is required for the following:		
CHME 7320	Chemical Engineering Mathematics	4
or ME 6200	Mathematical Methods for Mechanical Engineers 1	
CHME 7330	Chemical Engineering Thermodynamics	4
CHME 7340	Chemical Engineering Kinetics	4
CHME 7350	Transport Phenomena	4
Research		
CHME 9984	Research	4

Professional Development		
CHME 7391	Professional Development and Communication in Chemical Engineering 1	1
CHME 7392	Professional Development and Communication in Chemical Engineering 2	1
CHME 7393	Professional Development and Communication in Chemical Engineering 3	1
CHME 7394	Professional Development and Communication in Chemical Engineering 4	1
Seminar		
Complete the following (repeatable) course each semester:		
CHME 7390	Seminar	
Recommended but optional:		
CHME 7395	Mentoring in Chemical Engineering	
ENCP 6100	Introduction to Cooperative Education	

Electives

Code	Title	Hours
Complete 8 semester hours. Consult your faculty advisor for acceptable courses:		8
BIOE 5410	Molecular Bioengineering	
CHME 5101	Fundamentals of Chemical Engineering: Fluid, Heat, and Mass Transfer	
CHME 5105	Materials Characterization Techniques	
CHME 5137	Computational Modeling in Chemical Engineering	
CHME 5160	Drug Delivery: Engineering Analysis	
CHME 5179	Complex Fluids and Everyday Materials	
CHME 5185	Design of Experiments and Ethical Research (DOEER)	
CHME 5510	Fundamentals in Process Safety Engineering	
CHME 5520	Designing for Process Safety	
CHME 5621	Electrochemical Engineering	
CHME 5630	Biochemical Engineering	
CHME 5631	Biomaterials Principles and Applications	
CHME 5632	Advanced Topics in Biomaterials	
CHME 5683	Introduction to Polymer Science	
CHME 5699	Special Topics in Chemical Engineering	
CHME 7600	Pharmaceutical Engineering I	
CHME 7601	Pharmaceutical Engineering II	
CHME 7602	Pharmaceutical Engineering Laboratory	
CHME 7973	Special Topics in Chemical Engineering	
EMGT 5220	Engineering Project Management	
EMGT 6225	Economic Decision Making	
EMGT 6305	Financial Management for Engineers	
ME 5620	Fundamentals of Advanced Materials	
NNMD 5270	Foundations in Nanomedicine: Therapeutics	
NNMD 5370	Nanomedicine Research Techniques	
NNMD 5470	Nano/Biomedical Commercialization: Concept to Market	

Dissertation

Code	Title	Hours
CHME 9990	Dissertation Term 1	
CHME 9991	Dissertation Term 2	

Program Credit/GPA Requirements

32 total semester hours required

Minimum 3.000 GPA overall required

Advanced Entry Program Requirements

Complete all courses and requirements listed below unless otherwise indicated.

Milestones

Annual review
Dissertation committee
Dissertation proposal
Dissertation defense

Core Requirements

A minimum of 20 semester hours (SH) of academic coursework is required, plus 2 optional semester hours for cooperative education and mentoring in chemical engineering. Independent study credits do not count toward the 20 required semester hours.

Code	Title	Hours
Core Courses		
Complete at least one of the four core classes. A cumulative 3.250 GPA—with no individual class below a B minus—is required for core classes taken: [1]		4
CHME 7320	Chemical Engineering Mathematics	
or ME 6200	Mathematical Methods for Mechanical Engineers 1	
CHME 7330	Chemical Engineering Thermodynamics	
CHME 7340	Chemical Engineering Kinetics	
CHME 7350	Transport Phenomena	
Research		
CHME 9984	Research	4
Seminar and Professional Development		
CHME 7391	Professional Development and Communication in Chemical Engineering 1	1
CHME 7392	Professional Development and Communication in Chemical Engineering 2	1
CHME 7393	Professional Development and Communication in Chemical Engineering 3	1
CHME 7394	Professional Development and Communication in Chemical Engineering 4	1
Complete the following repeatable course each semester:		
CHME 7390	Seminar	
Recommended but optional:		
ENCP 6100	Introduction to Cooperative Education	
CHME 7395	Mentoring in Chemical Engineering	

Electives

Code	Title	Hours
Complete a minimum of 8 semester hours. Consult your faculty advisor for acceptable courses:		8
BIOE 5410	Molecular Bioengineering	
CHME 5101	Fundamentals of Chemical Engineering: Fluid, Heat, and Mass Transfer	
CHME 5105	Materials Characterization Techniques	
CHME 5137	Computational Modeling in Chemical Engineering	
CHME 5160	Drug Delivery: Engineering Analysis	
CHME 5179	Complex Fluids and Everyday Materials	
CHME 5185	Design of Experiments and Ethical Research (DOEER)	
CHME 5510	Fundamentals in Process Safety Engineering	
CHME 5520	Designing for Process Safety	
CHME 5621	Electrochemical Engineering	
CHME 5630	Biochemical Engineering	
CHME 5631	Biomaterials Principles and Applications	
CHME 5632	Advanced Topics in Biomaterials	
CHME 5683	Introduction to Polymer Science	
CHME 5699	Special Topics in Chemical Engineering	
CHME 7600	Pharmaceutical Engineering I	
CHME 7601	Pharmaceutical Engineering II	
CHME 7602	Pharmaceutical Engineering Laboratory	
CHME 7973	Special Topics in Chemical Engineering	
EMGT 5220	Engineering Project Management	

EMGT 6225	Economic Decision Making
EMGT 6305	Financial Management for Engineers
ME 5620	Fundamentals of Advanced Materials
NNMD 5270	Foundations in Nanomedicine: Therapeutics
NNMD 5370	Nanomedicine Research Techniques
NNMD 5470	Nano/Biomedical Commercialization: Concept to Market

Dissertation

Code	Title	Hours
Complete the following two courses:		
CHME 9990	Dissertation Term 1	
CHME 9991	Dissertation Term 2	

Program Credit/GPA Requirements

Minimum 20 total semester hours required
Minimum 3.000 GPA overall required

[1] Additional core classes may be required by the chemical engineering graduate committee to achieve PhD candidacy, which would not count toward the 20 SH minimum for the PhD.