

**CLARKSON UNIVERSITY**

**CHEMICAL AND**

**BIOMOLECULAR ENGINEERING**

**GRADUATE PROGRAM**

**2019 - 2020**

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# DEPARTMENT OF CHEMICAL and BIOMOLECULAR ENGINEERING

## General Information for New Graduate Students

### I. Introduction

Welcome to the Department of Chemical and Biomolecular Engineering. We hope that your stay will be enjoyable and rewarding. You will find information regarding the Chemical and Biomolecular Engineering graduate program at <https://www.clarkson.edu/graduate/chemical-engineering>. You can find helpful information for new graduate students at <https://www.clarkson.edu/academics/graduate-school/new-graduate-students>

A campus map can be found at <https://www.clarkson.edu/sites/default/files/2017-08/clarkson%20main%20campus%20map.pdf> and an academic calendar at <https://www.clarkson.edu/student-administrative-services-sas/academic-calendar>

### II. Courses

The Master Schedule of courses is available on the website for the Student Administrative Services (SAS) at Clarkson at <https://intranet.clarkson.edu/student-life/sas/classes-schedules/>

#### **M.S. Students**

All students who enter the graduate program without an M.S. degree will be initially enrolled as M.S. students. Students can be invited for Direct Entry to the PhD program during their first year in our program (see p. 12).

#### *First Semester*

M.S. students who are on a Teaching Assistant (TA) appointment should register for a total of 15 credits. This will consist of 1 credit of seminar, 5 credits of thesis, and 3 three-credit courses. Of these, two are required courses, and the third is an elective. M.S. students who are on a Research Assistant (RA) appointment should register for a total of between 12 and 15 credits in consultation with their advisor. The credits taken should include 1 credit of seminar, and a minimum of 2 credits of thesis, along with 3 three-credit courses. A list of required courses can be found on the following page.

Students on partial tuition scholarships should register for a minimum of 10 credits each semester until they have completed all requirements.

Individuals with an undergraduate degree in something other than chemical engineering have a different schedule which is outlined in Attachment 2. These students should see the Graduate Committee Chair to select their schedule.

#### *Second Semester*

The total number of credit hours is generally the same as in the first semester – 15 credits for students on a TA appointment, and 12 to 15 credits in consultation with the thesis advisor for those on an RA appointment.

### *Additional Semesters*

Students should register for the remaining credits of thesis, if any, in the third semester. If all credit requirements have been completed, you should register for one credit of thesis each semester until the thesis is completed. If you are continuing for a Ph.D., please see the section below on Ph.D. Students.

### **Ph.D. Students**

Students entering the Ph.D. program are usually on a Research Assistantship. They should register for 12 to 15 credit hours each semester until they satisfy the 90 credit hour requirement. After students have completed 90 credit hours, they must register for at least 1 credit hour of thesis each semester, and no more than 1 credit of seminar each semester until the required 6 credits of seminar have been completed. The Ph.D. Qualifying examination must be taken within eighteen months following completion of the requirements for the Master of Science degree or arrival at Clarkson, whichever is later. Details regarding the examination are provided in Attachment 6.

### **Required Courses**

Four courses are required for all graduate students. These are:

- CH560 Transport Phenomena (Fall)
- CH561 Chemical Engineering Analysis (Fall)
- CH571 Advanced Chemical Engineering Thermodynamics (Spring)
- CH546 Chemical Reactor Analysis II (Spring)

If you are uncertain about which elective course to take, you may wish to:

1. Seek advice from your thesis advisor or other faculty members.
2. Speak to the faculty member teaching a particular course to find out what will be covered in the course.
3. Sit in for a few class periods on courses that are of interest to you.
4. Consult with continuing graduate students.

Please note that, if you wish to add a different course to your program, this must be done during the first two weeks of classes.

### **Thesis Research and Seminar Program**

All students must begin thesis research as soon as they are assigned to a thesis advisor. **All students must attend all seminars, regardless of whether they are registered for seminar or not.** Each graduate student in the M.S. program is required to present one talk in the graduate student seminar program organized by a committee of senior graduate students. This is typically done during the third semester in residence. Each graduate student in the Ph.D. program is required to present a talk in the graduate student seminar program once a year, and give a full length departmental seminar during the student's final year in residence. For more details about the graduate student seminar program, please see Attachment 5.

### III. Desks and Laboratory Assignments

Desk and laboratory assignments will be made by your advisor. See Ms. Jean Gang in the Chemical & Biomolecular Engineering office (220 CAMP) to request building and lab keys. Note that students must attend the Lab Safety training seminar before they can receive laboratory keys.

### IV. Mail, etc.

Please give your laboratory assignment to Ms. Jean Gang (220 CAMP) as soon as possible. Mail sent to the department can be found in the "Graduate Students" mailbox in CAMP232. Keep an eye on bulletin boards around the building and check your Clarkson email regularly for notices of interest.

### V. Teaching Assistant Assignments

Students holding appointments as teaching assistants will be assigned duties during the first week of classes with details sent by email from the Graduate Committee. See the professor to whom you are assigned as soon as possible to discuss your responsibilities.

### VI. Thesis Research

Your work on thesis research must begin as soon as you are assigned a thesis advisor. You are expected to make suitable progress on your research as well as receive good grades in your courses. Students who enter the program with a degree in something other than chemical engineering will typically not select a thesis project until the spring semester.

### VII. Off-Campus Employment

The department discourages off-campus employment for full-time graduate students receiving financial support from the University. This includes temporary full-time employment off campus. Such situations create undesirable breaks in the progress towards a degree and are not in the students' best interests. They may also handicap thesis advisors who are dependent on research progress to meet proposal, contract, or grant deadlines. Additionally, hardships in course coverage or in other tasks related to the teaching function may be created by those on teaching assistant appointments.

Nevertheless, in a few cases off-campus employment may be desirable. The work should be at a professional level in keeping with the student's education, related to the student's thesis project, and capable of enhancing overall career development. In such cases, the graduate student and the thesis advisor must both agree and then the Graduate Committee should be involved to assure that the above criteria are met. The Graduate School must also be informed to assure that immigration laws and other regulations are satisfied.

If a graduate student takes off-campus employment without permission, the department is not obligated to allow the student to return to former status.

### VIII. Computing Facilities

The Multidisciplinary Engineering Computer and Design Laboratory contains many networked workstations and PC's, with a wide variety of software. Room 171 is available at all times. Rooms 163 and 172 are sometimes reserved for courses.

IX. Attachments

1. List of Chemical and Biomolecular Engineering Department Faculty & Staff
2. Requirements and Procedures for the Master of Science (M.S.) Degree
3. Requirements and Procedures for the Ph.D. Degree
4. Orientation, Registration Procedure, and ESL Requirements
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6. Ph.D. Qualifying Examination and Research Proposal Review
7. University and CSoE Requirements for the M.S. Degree
8. University and CSoE Requirements for the Ph.D. Degree

## ATTACHMENT 1

**1. List of Chemical and Biomolecular Engineering Department Faculty and Staff**

The area code for all telephone numbers is 315.

<b>Faculty</b>	<b>Office</b>	<b>Telephone No.</b>
Prof. S.V. Babu	CAMP 350	315-268-2336
Prof. Ruth E. Baltus	CAMP 226	315-268-2368
Prof. Yuncheng Du	CAMP 238	315-268-2284
Prof. Taeyoung Kim	CAMP 230	315-268-4166
Prof. Sitaraman Krishnan	CAMP 220	315-268-6661
Prof. Richard J. McCluskey ( <i>Professor Emeritus</i> )	CAMP 229	315-268-2303
Prof. John McLaughlin ( <i>Professor Emeritus</i> )	CAMP 218	315-268-6663
Prof. Shunsuke Nakao	CAMP 227	315-268-4471
Prof. Eunsu Paek	CAMP 233	315-268-6621
Prof. Elizabeth Podlaha-Murphy ( <i>Department Chair</i> )	CAMP 222A	315-268-4167
Prof. Ross Taylor	CAMP 244	315-268-6652
Prof. Selma M. Thagard	CAMP 243	315-268-4423
Prof. Zijie Yan (Research Professor)		
<b>Staff</b>		
Ms. Jean Gang	CAMP 220	315-268-6665
Ms. Carrie Hayes (CSOE staff)	CAMP 102	315-268-6446

## 2. Requirements and Procedures for the Master of Science (M.S.) Degree

The University and the Coulter School of Engineering have certain requirements for the Master of Science Degree. These can be found in Attachment 8. The requirements of the Department of Chemical and Biomolecular Engineering for the M.S. degree are listed below. Where applicable, these apply in addition to the University and CSoE requirements.

### CHEMICAL ENGINEERING M.S. REQUIREMENTS

**Prerequisites:** B.S. or B.E. in chemical engineering. Those with degrees in other science or engineering disciplines may also be admitted, but will be required to make up undergraduate course deficiencies.

**Prerequisite courses:** CH210, CH220, CH260, CH320, CH330, CH350, CH360, CH370, CH410, CH420, CH460 or equivalent

**Normal Program Length:** Twenty months for those with a B.S. or B.E. in chemical engineering

#### **Requirements with respect to degree completion:**

1. The following are required courses:
  - CH546 Chemical Reactor Analysis II
  - CH560 Transport Phenomena
  - CH561 Chemical Engineering Analysis
  - CH571 Advanced Chemical Engineering Thermodynamics
2. Two additional three-credit hour technical graduate courses selected in consultation with the student's advisor. School of Business courses cannot be taken to satisfy this requirement.
3. Two credit hours of CH610 (Seminar). (While in residence, all students are required to attend seminar, whether they are registered for CH610 or not.)
4. Ten credit hours of CH611 Thesis. All students are expected to start their thesis research at the beginning of their first semester in residence.
5. The M.S. thesis must be orally presented and defended before a committee of three or more faculty members; at least two must be from the Department.



A typical schedule follows. Individuals with an undergraduate degree in a discipline other than chemical engineering have a different schedule - refer to the information on the following page.

<b>First Semester</b>	<b>Credits</b>	<b>Second Semester</b>	<b>Credits</b>
CH560 Transport Phenomena	3	CH546 Chemical Reactor Analysis II	3
CH561 Chemical Engineering Analysis	3	CH571 Advanced Chemical Engineering Thermodynamics	3
1 graduate elective course	3	1 graduate elective course	3
CH611 Thesis	5	CH611 Thesis	5
CH610 seminar	1	CH610 seminar	1
<b>Third Semester</b>		<b>Fourth Semester (if necessary)</b>	
CH611 Thesis (1 credit)	1	CH611 Thesis (1 credit)	1

### **Financial Assistance**

Financial support for the M.S. degree, in the form of a tuition scholarship and a stipend, is offered to most incoming students. Continuation of this support is dependent upon remaining in good standing academically, performing thesis research and additional duties as required and making adequate progress in these areas. If it should become necessary to discontinue support, the student will receive prior written notification by the Graduate Committee. All students, whether supported as research or teaching assistants (except those in a special program for students who enter with an undergraduate degree in a discipline other than chemical engineering), are expected to complete degree requirements within 20 months of the date of entry. Requests for continued support beyond this time period must be made in writing to the Graduate Committee.

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## M.S. Degree in Chemical Engineering for students who do not have a B.S. degree in Chemical Engineering

A program is available for qualified students whose undergraduate degree is not in chemical engineering. These students can earn an M.S. in Chemical Engineering in four semesters. During the course of study, the student will take six required courses in the chemical engineering undergraduate curriculum, as well as the chemical engineering graduate level courses required for the M.S. program.

In consultation with the student's advisor and course instructors, the student should develop a curriculum plan. An example is illustrated below:

<b>First Semester</b>	Credits	<b>Second Semester</b>	Credits
CH501 Directed Study in Chemical Engineering Principles I (CH220, CH320, CH330)	3	CH502 Directed Study in Chemical Engineering Principles II (CH260, CH360, CH370)	3
CH561 Chemical Engineering Analysis OR CH611 Thesis	3	CH571 Advanced Chemical Engineering Thermodynamics OR CH611 Thesis	3
Graduate Elective	3	Graduate Elective	3
CH610 Seminar	1	CH610 Seminar	1
Total	10	Total	10
<b>Third Semester</b>		<b>Fourth Semester</b>	
CH560 Transport Phenomena	3	CH546 Chemical Reactor Analysis II	3
CH561 Chemical Engineering Analysis OR CH611 thesis	3	CH571 Advanced Chemical Engineering Thermodynamics OR CH611 Thesis	3 (CH571) or 1 (CH611)
CH611 Thesis	4		
Total	10	Total	6 or 4

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### 3. Requirements and Procedures for the Ph.D. Degree

The University and the Coulter School of Engineering have certain requirements for the Doctor of Philosophy Degree. These can be found in Attachment 8. The requirements of the Department of Chemical and Biomolecular Engineering for the Ph.D. degree are listed below. Where applicable, these apply in addition to the University and CSoE requirements.

#### CHEMICAL ENGINEERING Ph.D. REQUIREMENTS

**Prerequisites:** B.S. (or B.E.) or M.S. (or M.E.) in chemical engineering, materials science, chemistry, or other areas.

**Prerequisite courses:** CH210, CH220, CH260, CH320, CH330, CH350, CH360, CH370, CH410, CH420, CH460 or equivalent

**Normal Program Length:** Five calendar year (60 months) for those with a B.S. (or B.E.) in chemical engineering, materials science, chemistry, or other areas.

#### **Requirements with respect to degree completion:**

The following requirements apply exclusively to chemical engineering Ph.D. students.

1. The student must take the four courses required for the M.S. degree program or their equivalent:
  - CH546 Chemical Reactor Analysis II
  - CH560 Transport Phenomena
  - CH561 Chemical Engineering Analysis
  - CH571 Advanced Chemical Engineering Thermodynamics
2. Students entering the Ph.D. program should register for a minimum of 10 credit hours each semester until they satisfy the 90 credit hour requirement.
3. The student must take a minimum of 15 credit hours in the major field, a minimum of 9 credit hours in the minor field, and a minimum of 6 credit hours taken from a department other than Chemical Engineering.
4. The student must take a qualifying examination and adhere to the guidelines described in Attachment 6: Ph.D. Qualifying Examination and Research Proposal Review.
5. The student must take the Ph.D. qualifying examination no later than 18 months after completing the M.S. requirements. Students given direct entry into the Ph.D. program must take the qualifying exam no later than 18 months after being invited into the Ph.D. program. Students entering Clarkson University with a M.S. degree must take the qualifying exam no later than 18 months from the time they enter the graduate program.
6. Course work (minimum) = 30 credit hours (this is equivalent to 4 three-credit courses beyond M.S.). School of Business courses cannot be taken to satisfy this requirement.  
Seminar = 6 credit hours  
Thesis = 54 credit hours
7. While in residence, all students are required to attend all seminars.

### **Direct Entry into Ph.D. Program**

First year graduate students whose past academic and first semester records at Clarkson indicate outstanding research potential will be invited to enter directly into the Ph.D. program. The thesis required in the regular M.S. program will be bypassed.

The department will decide which students will be invited into this program at the beginning of the second semester of the student's residence on campus. The M.S. degree is awarded to the student upon completion of 40 credit hours and after passing the Ph.D. qualifying examination.

### **Financial Assistance**

Financial support for students enrolled in the Ph.D. program is usually in the form of research assistantships, and not teaching assistantships. Continuation of support is based on academic standing and research accomplishments, and may be terminated after written notification by the Graduate Committee for lack of acceptable progress in either area. Support will continue for no more than five years beyond the B.S. or three years beyond the M.S., whichever is longer. Requests for continued support must be made in writing to the Graduate Committee.

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#### **4. Orientation, Course Enrollment, and ESL Requirements**

Students will receive information via email about University Orientation for graduate students. It is important that students attend all sessions.

Details on how to enroll in classes can be found here: [http://internal.clarkson.edu/sas/ps\\_documentation/9.0enrolling\\_in\\_classes.pdf](http://internal.clarkson.edu/sas/ps_documentation/9.0enrolling_in_classes.pdf) Your thesis advisor, or the Chair of the Graduate Committee if you do not yet have a thesis advisor, will assist you in selecting courses.

Information and resources for international students can be found at <https://www.clarkson.edu/international-center/international-students-and-scholars> If you need a Social Security Number, you will need to provide Ms. Tess Casler, the Director of Clarkson's International Students and Scholars program with a local address where you will be living so that you can be registered in SEVIS. No application will be accepted by the Social Security office unless you have visited her office, located in 2302 Educational Resources Ctr. Transportation to Ogdensburg, where the Social Security office is located, will be arranged when the majority of the students have arrived. You cannot be paid without a social security number. Students are also advised to bring enough money to live on while waiting for their Social Security Card.

##### ESL Requirements

Clarkson requires all foreign students for whom English is a second language to take and pass an ESL placement examination, and complete any resulting requirements. Currently, the requirements may be as many as two Clarkson courses designed specifically to improve English skills.

## **5. Graduate Student Seminars**

Seminars given by graduate students will be organized according to the following rules.

1. Departmental seminars are generally held on Tuesdays; graduate student seminars are generally held on Thursdays. Each summer, the Graduate Committee Chair will appoint a seminar committee of three senior doctoral students to organize the graduate student seminar series for the academic year, under the guidance of the faculty member assigned to organize the departmental seminars.
2. Two graduate students will present talks during each seminar period; each seminar should last approximately 20 minutes. While faculty members will not routinely attend graduate student seminars, graduate students are encouraged to invite selected faculty members, such as those on their thesis committee, to their talk. The introduction of the speakers and moderation of the talks will be arranged by the seminar committee members.
3. Each doctoral student is required to give one seminar as part of the graduate student seminar series every academic year, with the exception of the final year in which the student expects to complete and defend the doctoral thesis. In that year, the doctoral student will, instead, present a full length departmental seminar organized by the faculty member in charge of departmental seminars.
4. Each Master's student is required to present one seminar, typically during the third semester in residence, as part of the graduate student seminar series.
5. Graduate students are required to attend all seminars, and are expected to participate actively in the discussion.

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## 6. Ph.D. Qualifying Examination and Research Proposal Review

Within eighteen months following completion of requirements for the Master of Science degree or arrival at Clarkson (whichever is later), the student must complete a “Doctoral Research Proposal” and submit this proposal to the Examining Committee. For students with a B.S. degree who, because of demonstrated exceptional abilities, are permitted to seek direct entry into the Ph.D. program, the proposal must be completed within eighteen months of entry into the Ph.D. program. The student must meet with the Examining Committee as early as possible after being admitted to the Ph.D. program to discuss plans for the Research Proposal. No earlier than one full week subsequent to submission of the Research Proposal, the committee members and the student will meet to conduct a Ph.D. qualifying examination. The student will formally present the contents of the proposal to the committee in the form of a seminar of approximately 30 minutes duration. The presentation will be followed by an oral defense of the proposed research and related topics.

The purpose of the preliminary meetings, presentation, and the defense is three-fold:

1. To determine whether or not the student is capable of and qualified for the Ph.D. program.
2. To acquaint the members of the Committee with the subject of the student’s research and to elicit their suggestions on and criticisms of the proposed approach.
3. To insure that adequate progress is being made throughout the 18 month period toward defining a Ph.D. research program.

Each of these items requires the student to have a comprehensive understanding of the Ph.D. project.

**A student who violates the eighteen month time limit will not be allowed to register for additional thesis credits during subsequent semesters until the qualifying examination is passed. The student must, however, maintain full-time status. Additionally, financial aid will not be renewed beyond the initial twelve month period unless the student has passed the examination.**

The Examining Committee, which will also serve as the student’s Doctoral Committee, will consist of a minimum of five members, including the student’s thesis advisor and at least one faculty member from a department other than Chemical and Biomolecular Engineering. At least three of the committee members must be from Chemical and Biomolecular Engineering. At least four of the committee members must be on the Clarkson faculty. One or more external examiners, holding the Ph.D. degree, may also serve on the Committee. The thesis advisor will recommend the names of prospective committee members to the Graduate Committee. The Graduate Committee, with the approval of the Graduate School, will appoint the Examining Committee. While the thesis advisor will serve as the Chair of the Doctoral Committee, the advisor will not be the Chair of the Examining Committee. Hence, the advisor should also recommend a Chair to the Graduate Committee.

The research proposal itself should represent roughly 18 months effort in defining a problem, reading pertinent literature, specifying plans for theoretical and/or experimental work and writing the report. A Master’s Thesis does not constitute a Doctoral Research Proposal, for which a

suggested outline is attached. In particular, the proposal should stress the definition, importance and uniqueness of the problem. The student should ask members of the Examining Committee if they prefer hard or electronic copy of the proposal; hard copies should be prepared and distributed to Committee members who request that format.

The Chair of the Examining Committee will be responsible for conducting the meeting and for reporting to the Graduate Committee the Examining Committee's recommendation on the entrance of the student into the Ph.D. program. The day following the examination, the Chair will receive from each person on the Committee her/his written vote on the student. The vote will be one of the following:

1. Pass. The student is clearly Ph.D. caliber.
2. Fail. The student is clearly not Ph.D. caliber.

The Chair of the Examining Committee will collect and summarize the vote for the other members of the Committee. The summary will be forwarded by the Chair to the Graduate Committee within two days. The Chair of the Graduate Committee will inform the student, in writing, of the decision of the Examining Committee. The student may retake the exam within one month if the final vote is "Fail".

If, subsequent to the qualifying examination and during the course of the doctoral research, the student or thesis advisor decides that a significant change in the direction of the research project is warranted, the student's Doctoral Committee should be so informed. A re-examination of the student will not be involved. In any event, it is recommended that annual meetings be held with the Doctoral Committee to review the student's progress and to agree on work remaining to be completed.



## Suggested Outline for Doctoral Research Proposal

Title Page

Table of Contents

Introduction

Statement of the problem

Importance of the problem

Specific objectives of the project\*

Previous Work Related to the Problem

Proposed Research

Theoretical

Experimental#

Data analysis and interpretation

Literature Cited

Nomenclature

Appendices

A. Proposed time-table for the project

B. Equipment needed and estimated costs

C. Anticipated waste-disposal and safety issues

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\* This section is extremely important. Some clear statement of the objective shall be included in each proposal. It should be noted that the objectives of the research are the goals of the work, in most cases a statement of what will be learned in the study. This is quite different from the approach, which shall be discussed at length in the "Proposed Research" section. The approach describes how the goals will be met.

Some examples of objectives might be:

- To determine the effect of Marangoni convection on mixing of molten glasses.
- To predict the extent of mechanical degradation of polymers.

The approach might be:

- To solve a set of coupled, nonlinear partial differential equations describing...
- To perform experiments on....

# It is not essential to include data from preliminary experiments in the proposal

## ATTACHMENT 7

### 7. University and CSoE requirements for the M.S. Degree

The Master of Science is a thesis-based degree; each student is required to complete and defend a research-based thesis.

The M.S. degree requirements defined by the University and modified for the CSoE include:

- 30 Credit hours
  - at least 18 credits of graduate coursework
  - at least 2 credits of seminar
  - at least 6 credits of thesis
- Up to 10 credit hours can be transferred (B or better); these can include distance learning courses taken from other Universities. The form for obtaining transfer credit is available here <http://internal.clarkson.edu/sas/forms/gradtransferfillable.pdf>
- A cumulative GPA  $\geq 3.0$  in coursework contributing to degree requirements
- At least two semesters in residence
- Preparation and oral defense of Master's thesis
- All accepted international students, for whom English is a second language, are required to take an English-as-a-Second-Language placement exam (LA005) upon their arrival on campus. Recommended ESL courses must be completed.
- All work must be completed within 5 years

### M.S. Thesis and Defense

Details describing the format and organization of an M.S. Thesis are available at:

<http://internal.clarkson.edu/engineering/pdffiles/MS%20thesis%20procedures.pdf> The M.S. Thesis defense serves two purposes: examination on specific aspects of the thesis in order to establish the student's depth of understanding of the subject, and an examination on the broader field of study to determine the general level of mastery. The M.S. thesis committee consists of at least three Clarkson faculty members approved by the Department and CSoE Dean. Prior to the defense, the committee will select a Chair whose duties are to ensure the smooth conduct of the examination procedure. At the conclusion of the defense and revision of the thesis, the Chair will facilitate completion of the Graduate Student Completion Notice, and will include any special requirements pertaining to the student and/or thesis. There is no limit to the number of times a thesis may be defended, provided the longevity requirement has not been exceeded.

The thesis must be submitted to the committee at least 10 working days before the scheduled defense. To be eligible to receive a degree during commencement exercises in May, final copies of signed theses must be submitted no later than 10 working days before graduation. For graduation in August, the completion deadline is usually the last day for Fall check-in. Deadlines for December, May and August graduation will be made available by the Dean's office

Once all corrections have been completed and the committee, departmental and school signatures obtained, two copies of the signed final thesis are to be submitted to the Graduate School for the

Graduate Dean's signature. The Department should also receive one copy of the final thesis to be kept in the Departmental library. The departmental thesis copy must be bound in an appropriate manner. The thesis must also be submitted on CD ROM. The CD should contain two files: (1) the complete thesis (title page through appendices), and (2) the title page and abstract only.

The following completed items are obtained from the Departmental office and are to be submitted with the final thesis copies:

A Graduate Student Completion Notice ([https://www.clarkson.edu/sites/default/files/2019-02/Graduate Completion Checklist 022019.pdf](https://www.clarkson.edu/sites/default/files/2019-02/Graduate%20Completion%20Checklist%202019.pdf))

Final degree program form

<http://internal.clarkson.edu/engineering/graduate/files/MSProgramForm.pdf>

Withdrawal Form (including International Withdrawal Form if an International student)

<http://internal.clarkson.edu/engineering/graduate/files/gradstudentwithdrawlform.pdf>

Forms and the CD can be submitted to Ms. Carrie Hayes in the CSOE office (CAMP102). Ms. Hayes can also answer completion questions.

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## 8. University and CSoE requirements for the Ph.D. Degree

For those interested in an academic or industrial research career, Clarkson's Ph.D. programs in engineering provide an opportunity to pursue leading-edge research and a high degree of specialization. In the CSoE, the minimum requirements for a Ph.D. degree are:

- 90 credit hours minimum (beyond B.S.)
  - Minimum of 24 credit hours of graduate course work
    - Minimum of 15 credit hours in the major field
    - Minimum of 9 credit hours in the minor field
    - Minimum of 6 credit hours from a department other than the one in which the student is housed
  - Minimum of 9 of the course work credit hours taken in residence (may include distance learning classes taken through Clarkson)
  - Minimum of 6 credit hours of seminar.
  - Maximum of 30 credit hours including research credits transferred from a Masters degree towards Ph.D. requirements (B grade or better) The form for obtaining transfer credit is available here:  
<http://internal.clarkson.edu/sas/forms/gradtransferfillable.pdf> To transfer credits for the required CH courses, student's faculty adviser should determine the eligibility for credit transfer. It is recommended that students take at least two of the four required CH courses even if they completed all the courses in their previous institutions.
- $\geq 3.0$  cumulative GPA in coursework contributing to degree requirements
- A minimum of three academic years of full time graduate study or the equivalent in part-time study. Two years of study must be in residence at Clarkson University. Students in the external Ph.D. program are exempt from this residency requirement.
- Satisfactory completion of the Ph.D. candidacy procedure within two years after matriculation into the Ph.D. program if a full-time student or before completing 66 credits for part time students
- A written dissertation must be submitted by each candidate and defended orally as part of the final examination
- All work must be completed within 7 years after the student is identified as a Ph.D. candidate
- All accepted international students, for whom English is a second language, are required to take an English-as-a-Second-Language placement exam (LA005) upon their arrival on campus and complete any recommended requirements.

Table 1 summarizes the milestones required for the Ph.D. degree, their time limits and forms required to confirm progress through these milestones.

**Table 1: CSoE required milestones for the Ph.D.**

<b>Milestones</b>	<b>Approvals required*</b>	<b>Time Limits (after matriculation as a PhD student)</b>	<b>Forms required</b>
Research advisor defined	Faculty Advisor Dept Chair	By start of second semester	Form A – Graduate Advisor <sup>a</sup>
Preliminary (Qualifying) examination (required for some departments)		Not required by CSoE; see departmental requirements	Only internal department forms
Ph.D. advisory committee defined	Dept. Chair Dean, CSoE Dean of Graduate School**	Before proposal defense	Form E – Graduate Committee Appointment <sup>b</sup>
Successful completion of Candidacy Examination (defense of Ph.D. research proposal)	Committee members Dept. Grad. Rep. Dept. Chair Dean, CSoE	Within 2 years of matriculation as a Ph.D. student (or 66 credit hours completed for part time students)	Form G – Ph.D. Candidacy Procedure <sup>c</sup>
Dissertation Defense / Approval of final dissertation	Committee members Dept. Chair Dean, CSoE Dean, Graduate School	At least 1 year after research proposal completed, but within 7 years of candidacy examination.	Form D – Completion Notice <sup>d</sup> Form H – Final degree form – Ph.D. <sup>e</sup>

\* or their designee

\*\* only needed if a committee member external to Clarkson is included

<sup>a</sup> <http://internal.clarkson.edu/engineering/graduate/files/graduateadvisorformfinal.pdf>

<sup>b</sup> <http://internal.clarkson.edu/engineering/graduate/files/graduatecommitteeappointmentform.pdf>

<sup>c</sup> [http://internal.clarkson.edu/engineering/graduate/files/Comprehensive\\_Comm\\_Procedure.pdf](http://internal.clarkson.edu/engineering/graduate/files/Comprehensive_Comm_Procedure.pdf)

<sup>d</sup> <https://www.clarkson.edu/graduate-admissions/current-students/completion-information>

<sup>e</sup> <http://internal.clarkson.edu/engineering/graduate/files/PhDprogram.pdf>

### **Ph.D. Advisory Committee**

The research advisor recommends the membership of the Ph.D. Advisory Committee to the Department Chair and the Dean of Engineering for their approval (Form E). The committee should

be appointed within twelve months after entry into the Ph.D. program. This committee must consist of five members qualified to serve on such a committee, at least one of whom must be from outside the candidate's department. With the approval of the Graduate School, an external examiner with appropriate credentials from another University or industry may also be appointed to serve as one of the committee members. The purpose of the committee is to provide guidance to the student in the project-related course work and research.

### **Candidacy Procedure**

The intent of the candidacy procedure is to ensure that the student has a solid foundation of knowledge and understanding in the discipline, is capable of pursuing significant independent and original research, and that the scope of the proposed research is appropriate for a Ph.D. degree.

At a minimum, the examination for admission to candidacy must include a written proposal on the student's Ph.D. research and its oral defense before the student's Ph.D. committee. ALL members of the Ph.D. committee must reach a consensus that the student is ready to be admitted to candidacy. The "Ph.D. Candidacy Procedure Completion Form" must be completed with all signatures and submitted to the Department. Departments may choose to also administer a preliminary exam (sometimes called a qualifying exam) as an earlier component of the overall candidacy procedure. Consult the individual graduate handbook for your department for additional details.

- After completion of the candidacy procedure, the students will be identified as a "Ph.D. Candidate."
- Students who fail the first time may make a second attempt within a limited time frame according to Department guidelines. The Ph.D. committee can be reconstituted for the second exam.
- A student who does not successfully complete the candidacy procedure within the time allowed may be dropped from the Ph.D. graduate program.

### **Ph.D. Dissertation and Defense Policies and Submission Guidelines**

#### **Preparation**

All Ph.D. dissertations are submitted to ProQuest/UMI<sup>®</sup> Dissertation Publishing and need to be formatted and prepared in a manner that meets their requirements. In addition, Clarkson has specific requirements for the title and signature pages of the dissertation.

Details summarizing the preparation of a Ph.D. dissertation can be found at:  
<http://internal.clarkson.edu/engineering/graduate/PreparingYourPhD.pdf>

These procedures should be reviewed carefully. Please note especially:

- General Format: 8.5 × 11 inch paper with 1.5" margins on the left and 1" margins on top, right and bottom. ALL figures, tables, footers, headers etc. must be contained within these margins

Page numbers must be 0.75” from the edge of the page, but do not need to be included within the margins.

- Double space all except the following, which should be single spaced: quotations as paragraphs, captions, items in tables, lists, graphs, footnotes/endnotes, bibliography.
- Black and white preferred (at least for ProQuest); color images will be reproduced as gray scale in microfiche or prints from microfiche.
- Graphics – at least 600 dpi resolution expected.
- Copyright (see also section VII below)–
  - The author of the dissertation must obtain permission to include any material previously published (including your own work) and adequately cite that permission per the copyright owner’s requirements.
  - The dissertation author automatically owns the copyright of materials in the dissertation (or has obtained permission to use the material by current copyright holders). However, registering the author’s claim as the copyright owner with the U.S. Copyright Office would provide the author with greater legal clout should you have any need to contest the copyright ownership. ProQuest/UMI® can complete the required paperwork to register the copyright.
- Open Access publishing - ProQuest/UMI® allows the author to make their dissertation freely available to others through the internet, thereby maximizing its potential dissemination and use. This option should be used only very carefully, however, if the results are also planned for publication as a book or through proceedings or journal papers. In that case, the copyright restrictions imposed by the journal generally do not allow internet publication. The author should check with the journals that he/she expects to publish the manuscripts in prior to choosing this option.
- Embargo – If the author is in the process of patenting or publishing material from the dissertation as journal manuscripts, he/she can select to embargo the dissertation for six months to two years, thereby putting the microfiche or open access dissemination of the dissertation on hold for the embargo period. This allows the author time to submit related patent applications or to finalize manuscript submission and acceptance without infringing on journal copyright requirements.

### **Defense of the Dissertation**

Each graduate student is responsible for working with his/her departmental Graduate Coordinator to make arrangements for a room and advertising the thesis defense at least one week before the scheduled date. Committee members should be provided a period of ten working days to examine the dissertation. Questioning during the defense will ascertain that the student has completed sufficient research work to be worthy of a Ph.D., that the student understands not only the subject matter to a sufficient depth, but also the broader implications and importance of the research, and that the research is original and was completed independently.

## **Submitting the Ph.D. Dissertation**

Detailed information on completion and submission requirements are available at:

<https://www.clarkson.edu/graduate-admissions/current-students/completion-information> Students must carefully adhere to the requirements specified at this website.

Once all corrections have been completed and committee and departmental signatures obtained, one hard copy of the dissertation must be submitted, in loose form without holes drilled, for Provost review. The student may place folders around each copy for protection. Do not submit an additional copy to the Department. The copy submitted to the Provost will be sent to the department after the review is complete. One electronic copy of the dissertation must also be submitted on a CD to the CSoE office (CAMP 102). The CD should contain two files: (1) the complete dissertation (title page through appendices), and (2) the title page and abstract only. The title page and abstract will be posted on Clarkson's web site.

Submit an electronic copy of the dissertation to ProQuest following the instructions available at <http://www.etsdadmin.com/clarkson>

In addition to the dissertation, the following completed items obtained from the Department Secretary must be submitted to the Graduate Coordinator of the Coulter School of Engineering:

- A degree completion notice (Form D)
- ProQuest/UMI® Dissertation Submission Form
- Survey of Earned Doctorates (SED) form
- Final Degree Program form (Form H)
- Withdrawal form
- Laboratory Clearance Sign Off Form

Final copies of the dissertation must be received in the Graduate School no later than ten class days prior to a Commencement to qualify to receive the degree at that Commencement.

For dissertations completed at the beginning of a new semester, the final approval of the dissertation and related completion forms must be received in the Graduate School by the deadline for the new semester check-in or the student must register and pay tuition for one credit hour of thesis.

All completion paperwork must be submitted to the Graduate Coordinator's office no later than the noon of the Monday following final exams week. Deadlines for December, May and August graduation will be made available by the Dean's office. If the deadline for a given semester is not met, you will be moved to the next semester's graduation list.

## **Internship or Co-op**

The Graduate School may grant permission to a graduate student to participate in a Co-op experience. Eligibility for the Co-op is limited to those graduate students who have matriculated as full time student, have been in residence for at least one semester, and have maintained at least a 3.0 GPA for all graduate coursework. The graduate student's request for permission to participate in the Co-op experience must include (1) a written acknowledgement that she or he has discussed the program with the Career Center counselor; (2) documentation that indicates the Co-op experience is appropriate to the professional and educational objectives of the student, including



a statement from the student's graduate program advisor; and (3) a coursework and project/thesis plan that indicates the student's intended path to completing degree requirements. These materials should be routed by the advisor through the department and school for approval.