



Chemical & Biological Engineering

UNIVERSITY OF COLORADO **BOULDER**

ADVISING HANDBOOK FOR GRADUATE STUDIES IN:

Biological Engineering

BIEN-PHD

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2 INTRODUCTION

The Graduate School of the University of Colorado Boulder offers advanced instruction leading to the following degrees in the Department of Chemical and Biological Engineering:

- Doctor of Philosophy (PhD) in Biological Engineering
- Doctor of Philosophy (PhD) in Chemical Engineering
- Master of Science (MS) in Chemical Engineering

This guide is intended for graduate students in Biological Engineering and Chemical Engineering, as a supplement to the information contained in the [Graduate School Rules](#). In some areas, the Department of Chemical and Biological Engineering has more specific requirements than the Graduate School and the regulations herein should be used. However, the department is subject to all minimum requirements of the Graduate School. This guide is to be used as a general guideline. The guide may be corrected or updated at any time.

Please note that each graduate student holds complete responsibility for his/her own program. Therefore, it is expected that the student will become familiar with the contents of this guide, as well as the general rules of the [Graduate School](#) and the [University of Colorado Boulder](#).

3 ADMISSION REQUIREMENTS

3.1 General Admission Requirements

General criteria for admission to the graduate program are:

- a) Hold a baccalaureate degree or its equivalent from an accredited college or university.
- b) Promise of ability to pursue advanced study and research, as judged by previous scholastic record or otherwise; and
- c) Adequate preparation to enter graduate study in the chosen field.
- d) All supported graduate students in the department are admitted directly to the PhD degree. However, those without a Master's degree in Chemical and Biological Engineering have the option of receiving an MS degree (Plan I or Plan II) on the way to a PhD degree

3.2 Classification of Students

Depending on the degree to which the applicants satisfies the requirements, admission may be either as a Regular Degree Student or as a Provisional Degree Student

3.2.1 Regular Degree Student

A student can be admitted as a Regular Degree Student if they meet all admission requirements and have an overall 3.00 undergraduate GPA. Even with an undergraduate grade-point average below 3.00, the student may be admitted as a regular degree student upon recommendation of the Department of Chemical and Biological Engineering.

Privileges: the regular degree student may take courses, for which the appropriate specific prerequisites are met, on any of the four campuses of the University of Colorado.

Restrictions: Regular degree students must maintain an overall 3.00 grade-point average for all work taken, whether it is to be applied toward the advanced degree or not. If the student fails to maintain this standard of performance, he/she may be dropped from the academic program after receiving warning from the Department or Graduate School.

3.2.2 Provisional Degree Student

If a student does not satisfy the requirements for a regular degree student, but in the opinion of the Department of Chemical and Biological Engineering, he/she merits a trial in graduate work despite a low

undergraduate grade-point average or deficiencies in preparation, the student may be admitted as a Provisional Degree Student.

Ordinarily, a student admitted as a provisional student will not be eligible for a change of status to a regular degree student until at least 12 semester hours of graduate work, with an overall GPA average of 3.25 or higher in all courses attempted, have been completed. At the time of admission to provisional degree status, the student will be informed by the Department, in writing, of the performance expected before the department will recommend admission as a regular degree student. A student may not remain at provisional degree status for more than 18 semester hours. By that time, the department must decide whether to recommend admission to regular degree status or not.

Privileges: The provisional degree student has all the privileges of a regular degree student in terms of taking courses and working toward an advanced degree.

Restrictions: A provisional degree student is required to maintain a 3.0 grade-point average on all work taken, whether or not it is to be applied toward the advanced degree sought. If the student fails to maintain such a standard performance, he/she may be dropped from the academic program. A provisional degree student is not eligible for fellowship or scholarship support from the Graduate School and usually is not considered for teaching or research assistantships by the department.

4 GENERAL INFORMATION

The following sections contain general information that is applicable to both Master's and Doctoral students.

4.1 Full-time status

For purposes of deciding full-time registration status, a student must meet one of the following criteria:

Doctoral students

- Minimum of 5 credits of graduate level course work prior to passing the comprehensive exam
- Less than 5 credits of graduate level course work plus 1 Doctor Thesis prior to passing the comprehensive exam
- At least 1 Doctor Thesis hour prior to passing the comprehensive exam
- A minimum of 5 Doctor Thesis hours after passing the comprehensive exam

Students must have full-time status during the semester in which they take their comprehensive exam or defend their thesis (including summer). In addition, students must be considered full-time in each semester used to meet Graduate School Residence requirements.

If the student is deferring loans through the Financial Aid Office, the student must be registered for a minimum of 4 credit hours for either the Fall or Spring semesters.

4.2 Grades and Quality of Work

Grade Point Average: A student is required to maintain at least a B (3.0) average in all work attempted while enrolled in the Graduate School, and a student must have at least a 3.0 overall average GPA to receive a graduate degree.

Grades Below B:

- a) A student who receives a C, D, or F in a course may repeat that course once, upon written recommendation by the department chair/graduate director and approval by the Dean of the Graduate School, provided the course has not been previously applied toward a degree. The grade received in a repeated course substitutes for the original grade and only the later grade is used in the Graduate School's manual calculation of the grade point average. However, all grades received appear on the student's transcript and are calculated in the official overall GPA.
- b) Courses in which grades below B- (2.7) are received are not accepted for doctoral programs.
- c) Courses in which grades below B- (2.7) are received are not accepted for Master's degree programs or for the removal of academic deficiencies.
- d) Courses taken toward the fulfillment of requirements for graduate degrees may not be taken pass/fail.

- e) Grades received in courses transferred from another institution and/or grades earned while a student was classified as a non-degree student are not included in the calculation of grade point average.
- f) Graduate students may not register for more than 15 credits during any one semester.
- g) Students whose cumulative grade point average falls below a 3.0 at any time during their graduate career will be placed on probation and may be dismissed from their program.

Probation and Suspension: See Section 5 of the [Graduate School Rules](#) regarding probation and suspension specifics.

4.3 Time Limits for Completion of Degrees

Academic PhD Degree Time Limit: Doctoral students have six years from the commencement of course work in their PhD graduate program at the University of Colorado, to complete all requirements, including the filing of the dissertation, with the Graduate School. Students who fail to complete the degree in this six-year period may be dismissed from the program with the concurrence of the major advisor and/or appropriate departmental personnel. To continue, the student must file a petition for an extension of the time limit with the Dean of the Graduate School and the department chair. Such petitions must be endorsed by the student's major advisor and /or other appropriate departmental personnel and may be granted for up to one year. This six-year rule is applicable regardless of when the student passes the comprehensive examination (example: taking or retaking the comprehensive examination does not entitle a student automatically to additional time to complete the degree).

Funding PhD Degree Time Limit: Most doctoral students receive five years of department funding as long as the student is making satisfactory academic and research progress (see your original offer letter for details).

At the beginning of the student's sixth year, there will be a review of the student's progress. In order to have funding continue into the sixth year, the department will request input from the student and Faculty advisor(s). This information will be submitted to the department leadership for review. Based on the information provided, the department will either approve or deny funding for the sixth year.

Additional information can be found in section 5.5.

4.4 Transfer Credits

See Section 3 of the [Graduate School Rules](#) regarding transfer credits.

Resident graduate work of high quality done in a recognized graduate school elsewhere and coming within the time limit may be accepted up to a maximum of twenty-one (21) semester hours for the PhD degree, provided it is recommended by the Department of Chemical and Biological Engineering and approved by the Dean of the Graduate School. Such credits will be transferred to the Graduate School only after the student has established a satisfactory record in residence here for at least one semester and has completed at least six credit hours with a minimum GPA of 3.00.

PhD: Course work previously applied toward a Master's degree may be transferred for the PhD degree.

Transferred credit will not reduce the residence requirements at the university but may reduce the amount of work to be done in formal courses. Request for transfer of credit must be initiated by the student by the beginning of the semester prior to that in which the PhD degree is expected.

4.5 In-State Residency

Similar to most universities, the University of Colorado Boulder has a large discrepancy between resident and non-resident tuition. It is possible for U.S Citizen and permanent resident students arriving from out-of-state to acquire resident status after one calendar year. To begin the one-year waiting period, the student must establish as many connections with the State of Colorado as possible in the individual circumstances. Examples include: being physically present in the state with the intent to make your permanent home in Colorado; payment of Colorado state income tax; application to the state for a Colorado driver's license or Colorado identification card; registration of a motor vehicle in the State of Colorado; registration to vote in Colorado.

These connections should be established as soon as possible, ideally within 30 days after moving to the state. Eligibility for a change to resident status is determined from a written petition with documentation. Information regarding residency, petition deadlines, required workshop, and the required paperwork, please visit the [Tuition Classification Office](#).

4.6 Graduate School Grievance Process and Procedures

The Graduate School Grievance Process and Procedure (“the Grievance P&P” or “P&P”) establishes and describes the process through which graduate students can communicate concerns related to academic issues or academic conflicts, with the goal of ensuring that the student filing a grievance is better able to achieve academic success. This is a non-adversarial, non-judicial process. The rules of evidence, and any other rules that typically govern a criminal or civil court, are not applicable to the Grievance Procedure.

Matters Covered. Grievances covered by the Grievance P&P include problems related to academic issues, such as arbitrary, inconsistent, or capricious actions taken against a graduate student; deviations from stated grading and examination policies as they appear on syllabi, on assignments, or in departmental guidelines for graduate study; failure to provide in writing reasons behind termination or dismissal, either from the program or from employment or other support; unfair treatment related to graduate student appointments; unfairness in the application of graduate requirements or regulations; and in general any actions taken by a program that relate to graduate students and that hinder the student’s ability to make normal progress toward the degree. Individuals named in a grievance must be teaching or research faculty directly involved in the student’s program of study. In those instances where a graduate student has a complaint against faculty in a campus research institute, a national laboratory, or in a setting governed by a federal grant whether on or off campus, the student’s home academic department (the unit awarding the degree) is responsible for helping to identify a resolution. Nothing in this document is intended to create an appeal right to an employment termination decision or otherwise undermine at-will appointments.

Matters Not Covered. The following issues *do not* fall under the jurisdiction of the Graduate School Grievance P&P:

1. **Grade appeals** must be filed in accordance with the grade appeal procedures of the school or college in which the degree-granting unit is housed. Although the Grievance P&P does not cover appeals based on the academic (content-specific) grounds on which a grade was assigned, as noted above, the Grievance P&P does cover deviations from stated grading and examination policies as they appear on syllabi, on assignments, or in departmental guidelines for graduate study.
2. **Academic decisions rendered by a program that can be properly judged only by specialists with content-area expertise** will not be considered. Such decisions may include dismissal from a graduate program based on failure to maintain the requisite GPA; dismissal from a graduate program based on two failed attempts at comprehensive or final examinations; and denial of admission to candidacy based on the graduate program’s rules for qualification.
3. **Allegations of sexual misconduct, protected class discrimination or harassment, or retaliation and/or conflict of interest in cases of amorous relationship** will be reported to the [Office of Institutional Equity and Compliance \(OIEC\)](#) and are not under the jurisdiction of the Graduate School Grievance P&P.
4. Allegations of **research misconduct, including unfair treatment in assigning joint authorship**, should be filed with the Standing Committee on [Research Misconduct \(SCRM\)](#).
5. **Allegations of unprofessional conduct on the part of teaching or research faculty** should be reported to the supervising administrator of the faculty member, as addressed in the Academic Affairs Policy [Professional Rights and Duties of Faculty Members and Roles and Professional Responsibilities of Department Chairs](#).
6. **Issues of Student Conduct** which fall under the jurisdiction of the [Office of Student Conduct and Conflict Resolution \(OSCCR\)](#) shall be covered by related policies and processes.
7. Any other allegations or issues that **fall under the scope of a separate, specialized process outside of graduate programs and the Graduate School**.

The Graduate School Grievance Process and Procedures can be found on the Graduate School website:

<https://www.colorado.edu/graduateschool/graduate-school-policies-procedures>

5 DOCTOR OF PHILOSOPHY DEGREE

5.1 Admission Requirements

The general admissions requirements for the Doctoral program are outlined in section 3. Admission to the doctoral program does not follow automatically with the conferring of the MS degree. The student must apply to our doctoral program and must be recommended by the Department of Chemical and Biological Engineering.

5.2 Research

Each student entering the graduate program without a Master's degree must demonstrate research ability prior to continuing to the PhD degree by (a) completing a Plan I (thesis option) MS degree or submitting an "MS Bypass" paper in the style of a journal article and judged acceptable by the student's research advisor and the Department Chair. This requirement must be met within the first two years of the program if funding is to continue.

The Master's dissertation must be separate from any PhD research. A student's PhD dissertation cannot be an extension of his/her Master's dissertation.

5.2.1 MS Bypass

Each student entering the graduate program without a Master's degree must demonstrate research ability prior to continuing to the Ph.D. degree by (a) completing a Plan I (thesis option) M.S. degree, or (b) submitting a 'M.S. bypass' paper in the style of a journal article and judged acceptable by the student's research advisor and Department Chair. Published first or second authored papers will be accepted. *This requirement must be met within the first two years of the program if funding is to continue.*

5.2.2 First Year Research Project Presentations of Mutual Selection

During the Fall semester, research advisor will announce the availability of projects by making a brief oral presentation about the project(s). The students are then given several weeks to meet with potential advisors, learn more about the projects and decide on their preferences. Students will be assigned to a lab by reaching an agreement with a faculty member to work in his/her research group. Agreements between students and advisors may be made formal during the "Advisor Selection Window". Agreement is finalized with an email to the Graduate Program Advisor (chbegrad@colorado.edu) with the advisor or co-advisors' name. The Graduate Program Advisor will confirm the agreement with the Faculty Advisor and then obtain approval from the ChBE Graduate Director and the Department Chair.

It is extremely important that students with a potential interest in a particular project contact the advisor and meet with him or her to talk about the project and the selection process. Generally, an interested student will follow-up with additional meetings as he or she narrows down his or her choices. If a student does not meet with an advisor, or does not express interest, the advisor may take that as an indication of lack of enthusiasm, which may sway him or her against accepting that student as an advisee.

5.2.3 Research Advisor and Committee

As soon as a student is ready to begin research work for the PhD dissertation, a regular graduate faculty member of the department (normally the student's faculty advisor) must be designated to serve as Chair of the student's Dissertation Committee. The PhD dissertation committee must be approved by the Department Chair and consist of five members, at least three of whom are regular faculty members from the Department of Chemical and Biological Engineering. At least two of the three ChBE faculty members must have regular appointments and may not be considered retired or research faculty. At least one member must be a regular faculty member in a different department at the University of Colorado. All members of the committee must have graduate faculty appointments (see Graduate Coordinator, chbegrad@colorado.edu, for faculty status). Students must meet with their committee once each year to review their research progress.

IMPORTANT: The ability to perform significant and independent research is a prime requisite for the PhD degree. This research must be under the supervision of a graduate faculty member, and it is the student's responsibility to choose a topic and find a faculty member who will act as Research Advisor. This is an important step and should be done early in the program to ensure the probability of timely completion.

Non-Chemical and Biological Engineering Faculty Advisors

It is possible for graduate students to seek a faculty advisor from another department, but there are restrictions. If you are considering a faculty advisor from another department, you will need to make an appointment with our department Graduate Director to discuss your options. If an agreement is reached with the Department of Chemical and Biological Engineering, then a Memorandum of Understanding (MOU) must be completed. Contact the ChBE Graduate Program Coordinator (chbegrad@colorado.edu) for the MOU and additional paperwork.

5.3 Academic Plan and Course Requirements

The student must work out an informal degree plan early in the PhD program with the aid of a Research committee, when selected. This program will reflect specific areas of academic interest and should represent a coordinated approach to the attainment of the student's ultimate goals. This degree plan may include the courses previously applied toward the Master's degree, which should be so indicated, and should total at least 30 semester hours of 5000-level or above courses, not including pass/fail courses, and including up to five hours of "Special Topics in ChBE."

NOTE: all courses must be taught by faculty who are members of the Graduate School. Contact the ChBE Graduate Coordinator (chbegrad@colorado.edu) to verify the instructor's Faculty appointment to the Graduate School for courses taken outside the department.

5.3.1 Biological Engineering Courses Required

The following courses are required for the PhD degree:

- GRAD 5000: Responsible Conduct of Research (required, letter grade)
- CHEN 5150: Biomolecular Kinetics, Transport, and Thermodynamics (CORE - Fall)
- CHEN 5160: Systems Analysis of Cells and Tissues (CORE - Spring)

PhD Students must complete all courses, with grades of B- or better

It is expected that students will register one time for GRAD 5000: Responsible Conduct of Research (RCR) within the first three semesters of their graduate program. GRAD 500 is offered only in the Fall semester.

The department has a seminar series during the academic year (Fall and Spring semesters). Seminar is on Tuesdays and Thursdays from 2:50-4:05pm, but not every Tu/Th. A schedule of seminars will be sent to the entire department at the beginning of the semester and updated as seminars are added. During the first academic year, it is expected that first year graduates are required to attend at least 75% (each semester) of the seminars. Attendance will be taken using the students' BuffOne Card. If you are absent for a seminar, please send an email to the Graduate Program Coordinator at chbegrad@colorado.edu.

Registration for credit in the summer should be kept to a minimum to keep total tuition payments as low as possible. Students registering for extra courses not required for the degree program must have approval of their research advisors. In general, the department will pay tuition only for those courses required for the degree.

BIEN: In addition, all students entering the program without a degree closely related to Biological Engineering must have completed undergraduate courses, with a grade of "B" or better, related to Kinetics, Transport, and Thermodynamics. The Graduate Director or Department Chair will make assessments as to whether a degree is closely related to our Biological Engineering degree.

The department must approve any deviations from this plan; otherwise, funding will be reduced proportionately. After the first semester the student's research advisor must approve course work and thesis registration. If a student is not going to be registered for a semester, the Chair of the Department of Chemical and Biological Engineering must be informed in writing, and the student is required to return lab keys and building access will be removed from Buff OneCards. The student will need to enroll in the [Leave of Absence Program](#) in order to save his/her enrollment space or withdraw from the University.

5.3.2 Quality of Work

Students are expected to compete with distinction all work in the formal courses that apply toward the degree, and achieve a grade point average of 3.0 or better. A course grade below B- will not be counted

toward the minimum requirements for the PhD degree, but it will be considered in the overall grade point average.

5.4 Registration Requirements

All graduate students must be registered for enough credits each fall and spring semester to reach full time status. Students must only register during the summer semester if they are taking their Comprehensive Exam or defending their dissertation.

5.4.1 Pre-Comp Exam Status

Students must be registered for a minimum of 5 course hours or 1-3 thesis hours. If the student is registered for less than 5 course hours he/she **MUST** also register for 1 thesis hour to be full time. Students can register for a maximum load of 15 credit hours each semester while in pre-comp exam status.

You should have at least 10 thesis hours before or during the semester you take your comprehensive exam.

5.4.2 Comprehensive Exam Semester

Students must be enrolled in 1-3 thesis hours or up to a maximum of 10 thesis hours for this particular semester. Students must be registered for thesis hours during the semester in which the Comprehensive Exam is completed (Fall, Spring, or Summer).

5.4.3 Post-Comprehensive Exam Status

Students must be enrolled in a minimum of 5 thesis hours and a maximum of 10 thesis hours during this student status. Students must be registered for thesis hours during the semester in which the final defense is completed (Fall, Spring, or Summer). Once the student has confirmed a defense date, the Graduate Program Assistant will review the student's transcript to determine if any thesis hours need to be retroactively added to previous semesters. The goal is to reach the required 30 thesis hours without going over.

Additional Information:

- Thesis hours from a previous semester can be dropped, but tuition payments will **NOT** be refunded.
- Courses taken in a previous semester **CANNOT** be transferred to another semester in order to fulfill thesis hour requirements.
- Additional thesis hours can be added to a previous semester at a later date in order to more accurately reflect course efforts. If thesis hours are retroactively allotted to a previous semester, the total hours of the semester may **NOT** exceed the maximum hours permitted for full time status. Please be advised: when retroactively adding thesis hours, additional tuition and fees will subsequently be charged by the Provost and Bursar's Office.
- **ADDITIONAL** retroactively added thesis hours for international students will result in **FULL** out-of-state tuition not being covered by a previous semester RA/TA waiver. This additional out-of-state tuition will be the responsibility of the graduate student or the faculty advisor.
- Thesis credit hours will be listed as "IP" (in progress) on the student's transcript before the dissertation defense. Once the student has defended his/her dissertation, the Faculty Advisor will submit a final grade for all thesis credits on the student's transcript.

5.5 PhD Degree Funding Limits

Progress of each PhD student will be reviewed after three, four, and five years (after entering the Department with a Bachelor's degree). Funding is not guaranteed for these durations, and continued funding will only be granted for satisfactory progress in research, coursework, and teaching assistance. Funding beyond five years will be granted only under special circumstances.

Students who enter the department with a Master's degree will have their progress reviewed after one, two, three, and four years. Continued funding will only be granted for satisfactory progress in research, coursework, and teaching assistance. Funding beyond four years will be granted only under special circumstances.

5.6 Teaching Assistantships

PhD students are required to complete two teaching assistantships (TA) during their PhD career in the department. The Graduate TA will occur during the Fall or Spring semester of their first year and an Advanced TA (ATA) will occur during the third year of their PhD.

5.6.1 Graduate TA

The expected workload is an average of 10-12 hours/week. This can vary during the semester, due to the time constraints of the course. It is recommended that the instructor and TA discuss specific expectations at the beginning of the semester and that regular follow-up conversations are held to confirm that the expectations are reasonable and/or being met.

Any of the following is appropriate for a first year graduate student TAs:

- Grading homework assignments and exams
- Making up homework solutions
- Attending class
- Holding office hours
- Running a recitation
- Taking and critiquing exams
- Keeping grade book, including clicker grades, reading quiz grades, HW grades, and exam grades
- Adding information to D2L
- Grading final exams (taking into consideration the first year graduate student's final exam schedule)

The following should NOT be expected of first year graduate student TAs:

- Giving class
- Writing exam problems
- Grading exams without faculty member guidance
- Assigning final grades (Chemistry TA's may need to assign recitation grades for their students)

5.6.2 Advanced TA (ATA)

The expected workload is an average of 10-12 hours/week. This can vary during the semester due to the demands of the course. An Advanced TA is not a grader – grading homework should be a small part of his/her responsibilities. It is recommended that the instructor and TA discuss specific expectations at the beginning of the semester and that regular follow-up conversations are held to confirm that the expectations are reasonable and/or being met.

Any of the following is appropriate for an Advanced TA:

- Grading exams
- Making up homework solutions
- Attending class
- Holding office hours
- Running a recitation
- Taking and critiquing exams
- Proctoring exams
- Keeping grade book, including clicker grades, reading quiz grades, HW grades, and exam grades.
- Adding information to D2L

Advanced TAs should teach a total of approximately one week-equivalent of classes (e.g., 2-4 classes for a 50 minute class or 2-3 classes for a 75-minute class), the majority of which should be attended by the faculty member. In addition, Advanced TAs must contribute problems to at least one exam during the semester. Advanced TAs must not assign final grades, but can offer comments when asked by the instructor.

5.7 Preliminary Examination

A preliminary examination is required of all PhD candidates. This examination consists of an oral and written component to be completed in the second semester for candidates entering with an MS or during the third semester for students entering with a Bachelor's degree (details follow).

5.7.1 Objective

To assess the research skills of a student (appropriate to his/her academic level) via examination of his/her thesis research topic (Appendix B). Special emphasis will be given to the following evaluated criteria:

- Knowledge of the scientific basis of experimental and/or theoretical approaches employed by the student;
- Depth and breadth of knowledge of the relevant literature;
- Demonstration of progress appropriate for the specific project;
- Presentation of the specific research plan and overall project significance; and
- Demonstration of written and oral communication skills for all of the above.

5.7.2 Timing

Each student in the PhD program will take the examination for the first time during his/her second semester if entering the program with a Master's degree or third semester for students entering the program with a Bachelor's degree.

5.7.3 Outcome

Two outcomes are possible: pass or fail. A majority committee vote will be required to pass. Students will be informed of the examination results the day following the completion of the final exam in the topical area. If a student fails his/her first attempt, then she/he will have an opportunity to retake the exam during the following semester. For a re-taken examination, at least one committee member from the Fall examination must be present. Improvement between examinations will be utilized as an additional factor in the voting, including student responses to specific feedback from the original examination. Two successive failures will result in the student leaving the ChBE graduate PhD program. A terminal Master's degree would be the highest possible degree.

Following the examination, the committee will prepare a report discussing the student's performance. The Chair will send the report directly to the Department Graduate Advisor. The report will then be sent to the student and his/her faculty advisor(s)

5.7.4 Written Component

The written component of the exam is a six-page typed report (12-point font, single spaced, one inch margins) including figures that describes the student's research project, as well as the following:

- Hypothesis and/or objective statement (0.5 page)
- Significance (0.5 page)
- Background and related, relevant literature (1.5 ± 0.5 pages)
- Methods (1.5 ± 0.5 pages)
- Progress to date (1.5 ± 0.5 pages)
- Research plan (0.5 page)

The reference list should be placed *after* six pages of text and figures. A PDF of the written report must be electronically submitted at least one week prior to the oral exam date (by 5:00pm) to the department's Graduate Program Assistant (GPA) (chbegrad@colorado.edu). **DO NOT** submit the preliminary exam report directly to your committee members.

Additional hints for the written component:

- Use spelling and grammar check.
- Follow directions.
- Be prepared to answer questions on any information contained within your paper.
- Make sure to provide citations appropriately. Citations and/or quotations are required for figures as well as language not generated by the student.

- Know your target audience.

5.7.5 Authorship

The student is the sole author of the report; everything which is not the student's own creative work must be appropriately referenced. Inclusion of uncited text and figures will be considered plagiarism

The written report should be prepared without feedback from the student's advisor or fellow graduate students, though the advisor can discuss an "outline" with the student (i.e., agree on important topics to cover) prior to the report being written. The advisor may discuss the final report with the student prior to the oral exam, but only after the written report has been submitted to the GPA.

5.7.6 Oral Component

The oral component of the exam consists of a 20-minute presentation (maximum time limit will be upheld), followed by 30 minutes of questioning by the examination committee. The structure/content of the presentation should be analogous to that of the written report. Questions will follow from material presented in the written report and oral presentation. Students should be prepared to answer questions on any technical aspect of his/her research topic. Students are also expected to have an understanding of the related literature.

The student is permitted and encouraged to practice his/her oral presentation prior to the exam, with input from the advisor and research group. The student's advisor(s) may not be present at the exam.

Additional hints for the oral component:

- State the objective of the overall project and specific aims of the student's project.
- Be able to explain the rationale behind the project and approach chosen.
- Use problem statements to demonstrate the significance of not only the overall objective but also the specific approaches/tools being developed and/or applied.
- Explain why specific techniques were chosen and what alternative were considered and why eliminated.
- Describe future plans and include some examples of how the plans might be accomplished as well as the advantages and disadvantages of any proposed approaches and relevant alternatives.
- Be prepared to explain all information presented in your slides (equations, constants, tools, etc.).
- Know your target audience.

5.7.7 Question and Answer Component

The student's ability to answer relevant questions will also be a substantial part of the overall grade. The primary goal of the question and answer session is to explore the depth of the student's understanding of the issues outlined under the written and oral component guidelines listed above. Students should be able to answer questions of "Why" and "How" for the overall objectives and specific approaches employed. Students are encouraged to make it clear to the committee when they do not know the answer to a question and to explain why this is so (i.e., that subject area is tangential to my research focus, that subject is something I will explore in the future but is not as large of a priority for my current efforts, etc.). Students are allowed to prepare additional "back-up" slides that contain information to help answer anticipated questions.

5.7.8 Audience

Both written and oral components should be targeted at an audience with a broad engineering background (rather than to an expert in research field being pursued), as members of the exam committee (Chemical and Biological Engineering Faculty) are likely to have various areas of expertise.

The examination committee is made up of three ChBE Faculty members. One faculty will serve the role of Chair. Where possible, all three faculty will have at least tangential knowledge of the student's field of research. The student's faculty advisor(s) is not allowed to be one of the committee members. Instead, the advisor will submit a form in which she/he can rate the student and add any comments that the committee may wish to take under consideration. This form will be due to the Department's Graduate Advisor one week before the preliminary exam. This report will NOT become part of the student's record and is not to be

shared with the student. The committee is chosen by the department and its members will be communicated to the student two or three weeks before the exam date. The examination committee members are subject to change at any time.

The committee will be selected based on topical area (e.g., catalysis and energy, nanomaterials and nanotechnology, biological engineering, soft materials, computational science and engineering). For each area, there will be 4-5 standing committee members that will rotate as necessary.

All of the exams for the students in a given topical area will ideally be administered on the same day. If this is not possible due to availability of the standing committee members, the exams will be spread over two consecutive days.

5.8 Communication Requirement

There is no international language requirement in Chemical and Biological Engineering. However, the student's comprehensive exam and the research portions of the preliminary exam will be judged on written and oral presentation skills as well as content.

5.9 Comprehensive Examination and Admission to Candidacy

At least two weeks before the comprehensive examination is attempted, the student must apply for admission to candidacy for the PhD degree. The necessary forms can be obtained from the department's Graduate Program Advisor (chbegrad@colorado.edu). The student must be registered for the semester (including summer) in which the examination is to take place.

A written proposal, not to exceed 15 pages (1.5 spaced), must be distributed to the student's faculty committee two weeks before the exam. Either a PDF file or a paper version should be submitted, depending on which format each committee member prefers. The paper copy should be double-sided to save paper. The comprehensive examination committee shall consist of five members as described in section 5.3.3. The comprehensive exam is closed to the public.

The proposal is limited to 15 pages and should include:

- Discussion of the state of the project
- Details of the proposed study
- Progress to date
- Budget estimate for the time remaining
- Time estimate for completion of the research and dissertation
- Complete consideration of safety aspects of experiments

The student is expected to deliver a 40-45 minute summary of the research proposal, after which the student will be questioned by the Examination Committee. The student must be able to demonstrate through knowledge of the fundamentals and application of the research field, define an original research problem and show the scientific and engineering basis for a creative, intelligent solution to the proposed research problem. In order to pass, the student must receive a majority passing vote of the Examination Committee. The comprehensive examination may be attempted a maximum of two separate times. A second examination should only be attempted in the event that the initial examination results in an unsatisfactory decision.

The comprehensive examination can result in one of three decisions.

- **Satisfactory** – student passes the comprehensive examination and moves onto candidacy
- **Conditions placed** – student has neither passed nor failed the examination. The Examination Committee will make a list of conditions that must be met by the student in a set period of time. Once the student has met those conditions and the Chair of the Examination Committee agrees, then the student will pass the comprehensive examination and moves onto candidacy.
- **Unsatisfactory** – the student fails the comprehensive examination and will need to retake the exam the following semester.

The student shall have earned a least four semesters of residence, and shall have passed the comprehensive examination before being admitted to candidacy for the degree.

5.10 Dissertation and Final Examination

A dissertation based upon the research work done with consulting advice from the student's research committee should be finished and submitted electronically as a PDF file for inspection by the Dissertation Committee at least two weeks before the student takes his/her final examination. If a faculty member requests a typewritten form, it should be printed double-sided. The dissertation must comply in mechanical features with the University of Colorado Graduate School [Format Requirements](#).

The necessary forms can be obtained from the department's Graduate Program Advisor (chbegrad@colorado.edu). The student must be registered for the semester (including summer) in which the examination is to take place.

A student who fails the final examination on his/her first attempt may attempt it one additional time upon recommendation of his/her committee. More than one dissenting vote constitutes failure of the final examination.

5.10.1 Dissertation Examination Committee

This will be the same committee the student used for their comprehensive examination. The Dissertation Examination Committee shall consist of five faculty members as described in section 5.3.3.

5.10.2 Final Oral Examination

The final examination is an oral defense of the student's dissertation followed by a Q&A period with the Dissertation Examination Committee.

5.10.3 Dissertation Submission to the Graduate School

An electronic copy of an acceptable PhD thesis, along with the Thesis Approval Form (TAF) must be uploaded to the Graduate School by the posted deadline for the semester in which the degree is to be conferred. The specific thesis requirements and submission process can be found on the [Graduate School website](#). In addition to the thesis and TAF, the student must also complete the Survey of Earned Doctorates (SED). This form/survey can be found online at the [National Science Foundation](#) website.

In addition to the electronic copy submitted to the Graduate School, each graduate must submit one hardcopy of their thesis to the department for binding. The copy will be for the student's faculty advisor. The department will send the hardcopy to be bound by the University Libraries and distribute the thesis when it returns to the department.

5.11 [Graduate Student Pregnancy & Parenting-related Policy](#) (updated 07/01/20)

Title IX of the Education Amendments of 1972 states that, "No person in the United States shall, on the basis of sex, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any education program or activity receiving federal financial assistance." The University of Colorado Boulder is committed to providing its graduate students who may become pregnant, are pregnant, who gave birth, or who are parents with the same access to school programs and educational opportunities that other students have access to. It is the policy of the University of Colorado Boulder (CU Boulder) to support to the greatest extent possible, and in a manner consistent with the effective and efficient operation of CU Boulder, graduate students with a need for Academic Adjustment and/or Paid Parental Leave for Students on Appointment due to childbirth or adoption.

Additional information on this policy can be found on the [Graduate School Website](#).

5.12 [Graduate Student Leave Policy](#) (updated 10/30/2019)

Current Policy: At present, supported ChBE graduate students may take two weeks (10 days) of personal, paid leave each academic year (15 August – 14 August), including fall, winter and spring breaks but in addition to official holidays/dates when the University is closed. A student should request this leave by writing (email is sufficient) in advance to her or his advisor, and the student and advisor should track this leave. There currently is not a formal policy at the departmental, college or campus level for family or medical leave (an exception is that there is a Leave of Absence Program for family and medical leave without pay for graduate students). Thus, the Department of Chemical & Biological Engineering is proposing an interim policy, while there are ongoing discussions in the college and on campus.

Interim Policy:

This policy applies to extended family/medical leaves of one week or more, related to injury, illness, funeral, or caring for an immediate family member. The student should send a request to the Graduate Program Coordinator (Dom de Vangel) in advance or as soon as feasible. The request should be in writing (email is sufficient) and describe the reasons or circumstances necessitating the leave, and the start and estimated end dates of the leave. The student's advisor should write a short statement in support of the leave and send it to the Graduate Program Coordinator (email is sufficient). The Graduate Associate Chair (Joel Kaar) will consult with the Department Chair and the student's advisor, before deciding to grant the leave and what accommodations to make regarding the student's academic program and teaching and/or research duties. The ChBE Department will pay the student's stipend during the leave period, but not the tuition (which is paid by the student's original appointment, unless the student takes a leave of absence and is not enrolled). The maximum amount of paid family and medical leave under this policy is 12 weeks, cumulative over the duration of the student's graduate study. In addition, the student may apply unused personal leave for the current academic year toward family/medical leave.

If a student needs to take more family/medical leave than allowable by the cumulative limit of 12 weeks, it will be as leave without pay. The student should follow the procedures above for requesting leave, and follow university procedures for requesting a *Leave of Absence* (if needed).

If a student needs to take family/medical leave of less than five days, such as for a short illness or to attend a funeral, they should inform their advisor and take the leave from the 10 days of paid personal leave or make alternative arrangements approved by the advisor. If the total of personal and family/medical leaves exceeds 15 days in any academic year (15 Aug – 14 Aug), then the leave request policy described above is to be used or the leave is to be without pay.

5.13 [Leave of Absence](#) (LOA)

The Leave of Absence Program provides an opportunity for students to take a leave from the university for a semester or a year without losing his/her place in his/her current college or school. Returning to the same research group is not guaranteed. The following guidelines are used to determine eligibility:

- Graduate students must have a minimum 3.0 GPA
- Doctoral candidates who have passed their comprehensive examinations and concurrent degree students (BAM – Bachelor's accelerated Master's program) are not eligible for LOA.

The application can be found on the [Registrar's website](#). The LOA requires a \$50 application fee upon submittal. LOA students are guaranteed a place in his/her current college or school and major, provided that registration and deposit deadlines are followed.

If a student is not going to be registered for a semester, the Chair of the Department of Chemical and Biological Engineering must be informed in writing, and the student is required to return lab keys and building access.

5.14 Termination

If a student is not making satisfactory progress, then termination from an appointment or a research project prior to the allowable time limit for completing the MS or PhD degree will be considered. In such cases, the student's advisor or supervisor must notify the student in writing that termination is being considered; the notification should specify the reasons for potential termination, the corrective action(s) which must be taken, and the time frame (at least two weeks, unless the Department Chair determines that the course for termination is especially serious) in which a decision will be made. If, at the end of this time, the advisor or supervisor decides that cause exists for the termination of the student from the project or appointment, then the department faculty shall be consulted to determine whether the student will be provided with the opportunity for another project and appointment, or dismissed from the program. Further information on termination and grievance procedures is provided in the [Graduate School Rules](#).

5.15 Records

All graduate records are kept in the Chemical and Biological Engineering Graduate Program Assistant's office, and questions involving a student's program should be directed there. Deviations from the general rules and procedures

listed in this booklet or in the graduate catalog may be made only through the use of a properly executed petition to the Chair of the Department of Chemical and Biological Engineering.

5.16 PhD Final Check List

The final PhD Check List (Appendix A) describes the sequence of events leading up to the conferment of the PhD degree. The student is responsible for his/her program and for making certain that each step is completed within the indicated time schedule.

6 MD/PhD PROGRAM

Chemical and Biological Engineering offers training for the PhD component of the MD/PhD program administered by the University of Colorado Health Sciences Center (UCHSC), [Medical Scientist Training Program \(MSTP\)](#). Admission to the program is handled by MSTP and questions concerning the program should be directed to [MSTP](#).

7 ADDITIONAL INFORMATION

7.1 Support Eligibility Time Limits

The department tries to provide financial support to all qualified PhD graduate research students whom we admit. Since degree and career goals of a student are best served by accomplish work in a reasonable period of time and more students can receive support when the term is limited, time limits have been established. If a student's own funding is used for part of his/her residence, the length of continued support from the department will be decided by the faculty.

7.2 Supplemental Funding

In order to recognize outstanding ability and to encourage students to apply for fellowship support, the Department of Chemical and Biological Engineering will permit those students receiving individual fellowship support from sources outside the Department to receive supplemental support over and above the standard monthly graduate stipend and benefits permitted by the Department. The exact amount of the supplement permitted to any student receiving a fellowship award will be determined by the Department Chair and approved by the faculty. The awarding of any such supplemental funds by the department is contingent on the available of funds.

7.3 Student Appointments/Vacation Time

The full calendar year appointment is meant to be for the equivalent of a full time position working toward the degree. Thus, the appointment continues directly through all University break periods such as Winter Break, Spring Break, and Pre- and Post- Summer Break, and the Department expects students to be at work on research or courses and making progress toward the degree at all of those times unless a *leave-without-pay* break is taken.

At present, supported ChBE graduate students may take two weeks (10 days) of personal, paid leave each academic year (15 August – 14 August), including fall, winter and spring breaks but in addition to [official holidays/dates](#) when the University is closed. A student should request this leave by writing (email is sufficient) in advance to her or his advisor, and the student and advisor should track this leave. **Any time off must be taken with full knowledge and approval of the student's faculty advisor.**

APPENDIX A

Department of Chemical and Biological Engineering

PhD Final Exam Checklist

- **IMPORTANT:** Check Graduate School deadlines prior to semester start
- The following forms must be submitted to ChBE department for approval unless stated otherwise.
- Students must be registered during the semester in which the defense is taken (this includes the Summer term).

PRE- Defense Requirements

- **Application for Diploma/Title of Dissertation** (*See Grad School deadlines*)
 - Students must [apply online to graduate](#) through [buff portal](#) on the “apply for graduation” card in order to have the degree awarded. This notifies the Graduate School and your department that you intend to graduate and it provides necessary information to the Registrar's Office for ordering and shipping diplomas. If you do not complete requirements for the graduation, you indicate on the online application, you must apply online to graduate for the new graduation date. You must apply to graduate online whether or not you plan to attend the ceremony.
 - Detailed instructions for applying to graduate can be found at <http://www.colorado.edu/registrar/students/graduation/apply>. PhD students must enter their **dissertation title** as part of the online graduation application. This title will appear in the commencement program and on your transcript. You may update the title through your portal until the deadline to cancel/update.
- **Confirm Committee Members and Defense Date with Graduate Coordinator** (*At least 3 weeks prior to exam*)
 - Email Dom (devangel@colorado.edu) the list of your committee members and your defense date/time
- **Submit Dissertation Defense Information Form** (*to devangel@colorado.edu 2 weeks prior to exam*)
- **Doctoral Final Examination Form** (*complete at least 2 weeks prior to exam*)

GOTO: <https://www.colorado.edu/graduateschool/content/doctoral-final-examination-form>

At least **two weeks before** your defense or exam, **complete the landing page with your name, program, and the names and colorado.edu e-mail addresses of the committee chair and the other committee members. Click “submit.”**

On the form, **add the date of your examination/defense and student ID number. Read and acknowledge the information on the form and select “finish” to route the form through the following process:**

1. The form will be sent to the Graduate School for review of your committee.
2. Following Graduate School committee approval, the form will be routed to your program for review in advance of the exam.
3. After the exam/defense has been conducted, work with your graduate program assistant to route the form to your committee members.
4. Committee members will receive the form simultaneously and all members must sign the form. More than one dissenting vote disqualifies the candidate in the final examination.
5. When all members have signed and the form is complete, you will receive a pdf version of the form with signatures via e-mail. The form will also be forwarded to your program, committee members, and to the Graduate School.

- **Submit Dissertation** (*To your thesis committee at least 2 weeks prior to exam*)

Defense

- **Successfully Defend Thesis**

POST - Defense Requirements

- **Final Grade Card** (*Submitted by ChBE, NO graduate student action required*)
- **Thesis Approval Form (TAF)** (*Uploaded with electronic copy of your thesis to Grad School – <https://www.colorado.edu/graduateschool/content/thesis-approval-form>*)
- **Final Copy of Dissertation** (*Electronic copy to Grad School – See Grad School deadlines/rules*)
- **Survey of Earned Doctorates (SED)** (*See Grad School deadlines*): This form can be filled out online at [National Science Foundation](#).

AFTER – Graduate School Requirements met

- **Final Copy of Dissertation**
 - Provide one hardcopy of your thesis to Dom for your advisor. The Department will send the hardcopy to be bound and then give it your advisor.
- **Complete Departmental Check-Out Sheet** (attached)

Updated March 2022

APPENDIX B

Department of Chemical and Biological Engineering

Comprehensive Exam Checklist

The following items must be submitted to the department (devangel@colorado.edu) for approval unless stated otherwise.

1. **Confirm Committee Members and Exam Date with Graduate Coordinator** (*At least 3 weeks prior to exam*)
 - Email Dom (devangel@colorado.edu) the list of your committee members and your exam date/time
2. **Confirm Online forms are complete** (*At least 2 weeks prior to exam*)
 - Email Dom (devangel@colorado.edu) letting him know that you have completed the following Candidacy Application and Doctoral Comprehensive Exam Form online
3. **Comprehensive proposal** (*To thesis committee at least 2 weeks prior to exam*)
4. **Candidacy Application for an Advanced Degree** (*At least 2 weeks prior to exam*)
 - <https://www.colorado.edu/graduateschool/academics/forms-current-students>

At least **two weeks before** your exam, complete the online *Candidacy Application for an Advanced degree* at the link above.

A Student instruction guide on how to complete this online form is found at the link above.

5. **Doctoral Comprehensive Exam Form** (*At least 2 weeks prior to exam*)
 - <https://www.colorado.edu/graduateschool/content/doctoral-comprehensive-exam>

At least **two weeks before** your exam, complete the landing page with your name, program, and the names and colorado.edu e-mail addresses of the committee chair and the other committee members. Click “submit.”

On the form, add the date of your examination and student ID number. Read and acknowledge the information on the form and select “finish” to route the form through the following process:

- The form will be sent to the Graduate School for review of your committee.
- Following Graduate School committee approval, the form will be routed to your program for review in advance of the exam.
- After the exam has been conducted, work with your graduate program assistant to route the form to your committee members.
- The chair of committee will receive the form first, and the remaining committee members will receive the form simultaneously; all members must sign the form.
- Successful candidates must receive affirmative votes from a majority of the members. The examination may be passed conditionally, whereby conditions must be met before the exam is considered to be passed.
- When all members have signed and the form is complete, you will receive a pdf version of the form with signatures via e-mail. The form will also be forwarded to your program, committee members, and to the Graduate School.

****Students must be registered during the semester in which the comprehensive exam is passed (this includes the Summer term)**

Updated May 2022

APPENDIX C

Preliminary Exam Evaluation Form

(The 3 P's)

PREPARATION

Understanding of relevant Chemical and Biological Engineering concepts

Technical quality of the written report

- Writing style, grammar, spelling, clarity, correctness, format, etc.

Technical quality of the oral presentation!

- Clarity, enthusiasm, visual aids, etc.

Presentation and understanding of the relevant

Scientific/engineering background

Presentation and understanding of the significance of and rationale for the project

PLAN (FOR RESEARCH)

Presentation and understanding of hypotheses and/or objectives

- Can the student clearly explain and answer questions related to how the objectives will be achieved and how the hypotheses will be tested?
- Can the student explain and answer questions related to the rationale for the hypotheses and objectives?

Presentation and understanding of a detailed research plan

- Are the methods appropriate, described well, and understood at an appropriate level?
- Are experiments described in adequate detail?
- Will the results of the experiments meet the objectives?
- Are appropriate control experiments described?

PROGRESS

Amount of progress/results

- Has the student made appropriate progress given the constraints of the particular project?

Presentation and understanding of preliminary results

- Are results presented appropriately, with realistic uncertainties?
- Are the results valid?
- Do they relate to the objectives?
- Are interpretations of the results valid?

Students MUST be proficient in ALL 3P's to pass the Ph.D. preliminary exam.

APPENDIX D

Department of Chemical and Biological Engineering

Check-out List for Graduate Students

Gather signatures of persons listed that are responsible for approving the final checkout.
If an item does not pertain to you, please place an 'X' in the N/A column.

| | Item | Responsible Party | Signature of Responsible Party | Date | N/A |
|-----|--|--|--|------|-----|
| 1. | Procurement/Travel Card Returned | Kelly Sloan, Kristin Bruner, or Anna Gonzales | | | |
| 2. | Office and/or Lab Space Cleaned Out | Faculty Advisor | | | |
| 3. | Chemicals Disposed Of | Faculty Advisor | | | |
| 4. | No Unlabeled Chemicals | Faculty Advisor | | | |
| 5. | Electronic Equipment Returned | Dragan Mejic | | | |
| 6. | Tools Returned | Dragan Mejic | | | |
| 7. | Cylinders Returned | Dragan Mejic | | | |
| 9. | Turn in JSCBB Keys | Employee | Return key(s) to drop box outside JSCBB A170 | | |
| 10. | Turn in Engineering Center Keys to Access Services | Employee | Employee Responsibility | | |
| 11. | Turn in Parking Pass to CU's Parking Services | Employee | Employee Responsibility | | |
| 12. | Payroll Termination | Dominique de Vangel | | | |
| 13. | Hardcopy of thesis to Department for binding (1 Copy for student's faculty advisor) | Dominique de Vangel | | | |
| 14. | Apply for TIAA Retirement Refund/Transfer* | Employee | Employee Responsibility | | |
| 15. | Completed Check-Out form to Department | Dominique de Vangel | | | |

Forwarding Address:

Name: _____

Home Address: _____

Home Phone: _____

Cell Phone: _____

E-mail: _____

*Graduate Students should contact CU's Employee Services regarding the refund or transfer of their Student Retirement (EVERYONE HAS THIS) funds. Employee Services can be reached at 303-860-4200, option 3 or you can email E.S. at benefits@cu.edu. You can also see student retirement information online at <https://www.cu.edu/employee-services/benefits-wellness/student-employee/student-employee-retirement-program>.

** Call CU Benefits (Employee Services) at 303-860-4200 (option 3) or e-mail benefits@cu.edu.

Updated: May 2022