

## Rules and Procedures of the Chemical Engineering Department Doctoral Candidacy Exam (DCE)

The faculty as a whole will assess the likelihood that each student in the PhD program will complete a high-quality PhD dissertation. This assessment will consider the student's performance in an oral and written research examination, grades in core ChE courses, and evaluations by individual faculty. These three components constitute the Doctoral Candidacy Exam (DCE). The faculty as a whole will determine the students who pass this DCE.

1. Students must obtain at least a B (3.0) averaged over the required courses (ChE 505, 527, 528, 538 and 542) offered in the fall and winter terms to take the research examination.
2. Students who enter with an MS degree or transfer in credit for required courses can petition the graduate program to substitute equivalent courses for one or more of the ChE courses. These students may be required to take the final exam of the required courses and receive a passing score as determined by the instructor.
3. The research examination will be conducted on the 3<sup>rd</sup> Wednesday in May in the graduate student's first year. Students who enter the graduate program in January or later will be eligible to take the research examination in their second year, or in December of their first calendar year, if offered then.
4. Students will be notified of the date of the Research Exam at least 90 days in advance and they must apply to take the DCE by April 1 for the May exam, and November 15, for the December exam, if offered then.
5. The content of the research exam will be a critical discussion of a research topic chosen by the student together with the advisor. The critical discussion will include the following three items: (1) a review of the significant literature relevant to the research exam topic; (2) a demonstration of understanding of that literature (for example, either by an in-depth analysis of some aspect of it or a description of a potential new research direction); (3) a modest research product (for example, a theoretical calculation, computer simulation, or experiment) and a description of how it contributes to the further progress of the field.
6. The advisor will provide a brief written evaluation of the student's performance in research and the written report. The evaluation should be given to the Graduate Chair prior to the exam without the disclosure to the research examination committee.
7. The typical involvement of the advisor in helping the student to prepare for the research exam includes general assessment and advice as the written report and the

presentation are prepared, with critical feedback where necessary. The actual level of involvement must be described in the advisor's evaluation.

8. The written report will be a maximum of 12 double-spaced pages (12 pt Times or Times New Roman font, 1" margins) inclusive of figures, exclusive of bibliography. A one page biographical sketch (a paragraph, not a CV, describing your educational and hometown background) must be appended to the document. The written report must be submitted electronically to the graduate office at least one week in advance of the oral presentation date.

9. The oral presentation will be 15 minutes long (uninterrupted and strictly enforced), followed by a 10 to 15 minute question and discussion period.

10. The student's examining committee will consist of at least three faculty members, none of whom is the student's advisor(s). The advisor(s) may observe the examination but not participate in the committee's evaluation.

11. The research examination committee will determine each student's performance in the oral examination and written report by evaluating his/her written and oral presentation skills, technical understanding, ability to analyze the literature critically, potential to conduct original research, and ability to answer questions. The committee's overall assessment of the student's promise to carry out independent PhD-level research will be communicated to the faculty as a whole by adhering to the grading scheme below:

20% - Completeness and relevance of literature review

30% - Comprehension of research topic

30% - Research product (e.g., significance, difficulty, thoroughness)

20% - Clarity and organization (oral and written reports)

12. The faculty as a whole will determine the students who pass the DCE by considering their performance in the research examination, their grades in the core courses, and their evaluations by the faculty. Students will receive written feedback on their DCE performance from the graduate chair.

13. Though second opportunities to take the DCE exam will be rare, any student may petition the faculty, via a written request to the graduate chair copied to the advisor, to retake the exam. The DCE should be retaken within 6 months of the original DCE date.

## Research Exam Guidance

Overview: You are reporting on the research you did in a roughly semester-long project. You are *not* describing a plan for your entire thesis.

### Suggested Format of Written and Oral Reports

#### 1.) Topic area and significance ( $\leq 1$ page) (1-2 slides)

In 1-2 paragraphs, explain the big picture for your topic area and why others should care. Indicate where your topic fits into the big picture.

#### 2.) Background/literature review (3-5 pp or slides)

Explain in more detail what your topic is. With regard to your topic, what has been done in this area? What are the advantages or limitations of these approaches?

#### 3.) Analysis and/or future directions (2-4 pp or slides)

This section can take a variety of forms, e.g., a description of how several available tools/techniques might be combined to solve a problem or an in-depth analysis of some aspect of the literature to reveal flaws in current approaches. The goal here is to take your fairly standard literature review of section 2 and demonstrate that you have not only read the literature but that you have read it critically with an eye toward the strengths/weaknesses/gaps/needs.

#### 4.) Results and discussion (3-5 pp or slides)

Building on your perspective/analysis from Section 3, describe the area in which you made a contribution over the term. Describe the calculations, simulations, or experiments that you actually performed. Interpret the results. If something was tried but didn't work, give possible reasons why. Indicate what might be the logical next steps (over the course of the next month or so – NOT over the course of your thesis.)

## **Helpful hints**

1. Don't assume that the faculty members are intimately familiar with your topic area and all the abbreviations and acronyms of the field. A good rule of thumb would be that if you did not know what something meant a few months ago, don't assume the faculty will know.
2. Be clear about what was actually done vs. what might be done. Be clear about what you think vs. what someone in the literature thinks, and give references for ideas from the literature.
3. Explain why the research is important, and connect the "big picture" to what you are doing in a concrete way. At that same time, don't overdo the big picture. Explain in a paragraph or two and then move on.
4. Include figures and/or tables in your written document. Don't make the figures too small to be read.
5. Be consistent in your notation and abbreviations. Have all references in a similar format.

## **General comments about passing the DCE**

Pass/fail decisions are made by the faculty as a whole, by majority vote.

The best way to ensure passing the DCE is to do outstanding research so your advisor gives a strong evaluation, to do a spectacular job on the Research Exam so the examining committee gives high scores, and to get A+ grades in each of the five core courses.

Simply meeting the minimum standards in each individual area of the DCE is not likely to result in a student passing the DCE. For example, a student with a 5.0 GPA is eligible to take the DCE, but the student will need a very strong performance on the Research Exam and a strong advisor evaluation to pass the DCE. Likewise, a student with a poor performance on the Research Exam will need a reasonably high GPA and a strong advisor evaluation to pass. Thus, a weakness in one area of the DCE can be offset by strong showings in the other two areas.

## Grading Sheet for Chemical Engineering Research Exam

**STUDENT NAME** \_\_\_\_\_

**Faculty Member Name** \_\_\_\_\_

Time started: \_\_\_\_\_

Time finished: \_\_\_\_\_

**POINTS** 1-10 for each category, 6 is lowest passing score

Completeness and relevance of literature review.....

Comprehension of research topic .....

Research product (e.g., significance, difficulty, thoroughness) .....

Clarity and organization (oral and written reports).....

**Overall Score** \_\_\_\_\_

Composition of the final overall score

20% - Completeness and relevance of literature review

30% - Comprehension of research topic

30% - Research product (e.g., significance, difficulty, thoroughness)

20% - Clarity and organization (oral and written reports)