

## **Environmental Engineering PhD Qualifying Exam Format**

This document provides guidelines for administering and taking the pre-doctoral Qualifying Exam for the Environmental Engineering sub-specialty in the Department of Civil and Environmental Engineering at the University of Washington.

### **1. Qualifying Exam Purpose**

The purpose of the Qualifying Exam is to assess: 1) competence in core subject areas that underpin the student's intended research area, and 2) preparation to embark on a focused research project. The Ph.D. Qualifying Exam is a department requirement for all first-year doctoral students in order to continue on to the Ph.D. The exam is not a Graduate School requirement.

### **2. When Taken**

The qualifying exam should be taken within one year (but no later than two years) of starting the PhD track. With consultation with the PhD advisor and exam committee, exceptions to this timeline may be granted for medically related issues (e.g., COVID-19, physical and mental health difficulties, pregnancy, childcare and parental leave, etc.). However, it is in the prospective PhD candidate's best interest to stay on this timeline as much as possible.

### **3. Eligibility**

A cumulative UW GPA of 3.0 is required to take the exam. This is a Department requirement for all research areas. A 3.0 GPA is also required by the UW Graduate School for completion of PhDs.

### **4. Examination Committee**

The qualifying exam committee should be formed at least one month before the exam, and should consist of a minimum of three faculty. Two of the three faculty must be faculty members in the Environmental Engineering area who are members of the graduate faculty. The third (and even fourth) committee member may either come from within the Environmental Engineering faculty or from a faculty with another subject area expertise relevant to the PhD topic within or outside of CEE. The chair of the qualifying exam committee shall be the student's assigned advisor within CEE. The duties of the qualifying exam committee are to: (1) administer the written and oral exams; (2) determine the outcome of the exam and the competency of the prospective doctoral candidate; and, (3) provide recommendations to the thesis advisor and PhD student regarding coursework and review of fundamental research principles, literature, etc. The chair of the committee shall report the exam outcome to the Department Graduate Student Advisor.

### **5. Exam Format**

It is recommended that the thesis advisor and PhD student schedule the qualifying exam based on the timeline provided above. The Environmental Engineering Qualifying Exam will take

approximately 1-week to complete. On the day of the exam, the PhD student will be responsible for answering the committee members' questions regarding the written exam, and for giving an oral presentation of the critical review (see details below). Once the advisor, committee members and PhD student agree on the date, the exam will commence 1-week prior to this date.

5.1 Each committee will prepare 3 written questions for the student to solve over the course of two days. These questions will pertain to the courses the prospective candidate has completed at UW, and especially topics related to the prospective candidate's proposed research. This part of the qualifying exam will last 48 hours, and will be open book/notes. Once complete, the student will submit their written answers to their committee members via email.

5.2 After the 48-hour written exam period has concluded, the prospective candidate will be assigned a journal article for which they will prepare a critical review over a 48-hour period according to guidelines provided below. The critical review will be provided in a 3–5 page written report prepared and submitted 48-hour after the journal article was received by the PhD student. The PhD student will also summarize the findings of the critical review in a 30–40 min oral presentation to be given on the day of the qualifying exam to the qualifying exam faculty committee members.

The objective of the critical review is to provide an in-depth critique that identifies: (a) the scope and motivation of the article; (b) the experimental approaches used in the study; (c) the meaning and implications of the main findings in the study; and, (d) critical knowledge gaps and remaining questions not addressed in the study. All papers have both strengths and weaknesses, or at least areas that could be investigated more deeply. The student should not feel compelled to criticize every part of the paper, but should not hesitate to describe in detail any weaknesses the paper may have. The student should focus their analysis on substantive flaws relating to the main objectives, experimental design and conclusions of the paper; not on minor points like typos and grammatical errors. The student does not need to conduct an extensive literature survey to support their critique, but is encouraged to use outside information they are aware of (including other papers that they may have read during this part of the exam) that help to evaluate the paper they have been assigned.

The following notes may serve as a guideline to help the student structure their critique. This guideline does not need to be followed exactly, and the student is free to discuss other questions and other parts of the paper that are not mentioned explicitly in these guidelines.

Specific questions and issues that the student might consider:

- 1) Provide a brief abstract summarizing the key objectives, approaches, and findings of the study. This section should be no more than one-half page. Identify the authors' goals and decide whether they made appropriate choices for

analytical procedures and experimental conditions (i.e., choices that would allow them to achieve the study research objectives).

2) If the student feels that the authors should have chosen different procedures or conditions to study, they should explain why and suggest better alternatives. If the student feels that the authors chose appropriate procedures, they should state whether the experiments did indeed achieve the goals of the study, and justify their (the student's) conclusions.

3) The student is free to suggest that the authors should have carried out additional or different analyses and/or experiments. However, realistically, studies have limited time and budget. Avoid making a long, general list of additional things the authors should have done. If the student has some suggestions, they should be specific and limited.

4) For their critique of the data interpretation portion of the study, the student should carefully read the Results and Discussion section of the paper. They should comment on whether they think the authors' interpretations of the data are reasonable and plausible, and whether alternative explanations might (also) be plausible, taking into account the quality of the data. If they think other explanations are plausible, they should suggest how researchers might identify the correct interpretation.

5) Finally, the student should examine the statements of the authors concerning the practical significance/implications of their results and provide the student's own opinion on that subject. What "next steps" would the student recommend to build upon the findings of this investigation?

5.3 A day after the prospective candidate has completed and submitted the journal article critique to the committee members (via email), they then complete an oral exam. The first step of the oral exam will be an approximately 30-minute PowerPoint summary of the key points of the student's critique. After this, the student will be asked if they would like to suggest any oral amendments to the written exam. They are not required to do this if nothing comes to mind. Once the PowerPoint presentation has concluded, the next phase of the oral exam will be a Question & Answer discussion about any topics that pertain to the written exam, the journal article critique, PowerPoint presentation, and the student's proposed research topic.

## **6. Exam Grading**

Upon completion of the oral exam, the exam committee members shall immediately meet, discuss the student's exam performance (both written and oral) and render a grade for the qualifying exam. A dissenting minority opinion may be recorded but the majority opinion shall govern. The exam will be graded on a 1-5 scale (with 5 representing exceptional). In order to

pass the exam each question must have at least a grade of 3 and the overall average for all questions must  $\geq 4$ .

## **7. Outcomes**

The chair of the qualifying exam committee will provide a written report of the examination including a summary of the recommendation and supporting arguments. There are three potential outcomes of the qualifying exam:

**Pass.** The qualifying committee determines the student has demonstrated satisfactory core competency and research skills. This result shall be reported to the Department Graduate Student Advisor and no further action is required of the committee.

**Retake.** If the qualifying committee has determined the student has not demonstrated satisfactory core competency and research skills and this is student's first attempt of the qualifying exam (i.e., not a retake), the qualifying exam committee will recommend a retake to be taken within two months of the completed oral portion of the exam. Only one retake grade is allowed for the student. The results of a retake may only be pass or fail.

**Fail.** The qualifying exam committee has determined the student has demonstrated unsatisfactory core competency and research skill on the retake exam. This result shall be reported to the Department Graduate Student Advisor and no further action is required of the exam committee. A decision of fail on a retake will prevent the student from continuing to pursue a Ph.D.

## **8. Reexamination procedures**

The retake exam will have the same format as the initial exam, except a new set of questions will be asked and a different paper will be assigned.

## **9. Notification and record keeping**

After the examination, the qualifying exam committee shall notify the student of the exam decision. A record of the decision shall be signed by the committee and forwarded to the Graduate Student Advisor for retention in the student's permanent file.

## **10. Appeals and Grievances**

Any challenge to the decision of the Qualifying Exam Committee should be taken directly to the Graduate Program Coordinator for Environmental Engineering. If a formal appeal is made, a new committee of Environmental Engineering faculty including the student's assigned advisor shall review the student's permanent file, qualifying exam, record of decision and interview the student and make a recommendation to either: (1) let the decision stand, or (2) retake the qualifying exam.

## **11. Additional (area specific) notes**