

# A Guide to the CSE Doctoral Program

Department of Computer Science and Engineering Washington University

Version 1.8.3, released and effective as of: September 17, 2021

## **Foreword from the Department Chair**

Welcome to the Computer Science and Engineering (CSE) department at Washington University in Saint Louis.

You have picked both a great place and a great field in which to pursue your doctorate. As a field, CSE has experienced a phenomenal growth since its inception a few decades ago (the first computer science program began in 1953 at the University of Cambridge, and the first department of Computer Science in the US was established in 1962 at Purdue University), and there is nowadays hardly a discipline that does not rely on computing. Computer Science and Engineering is, however, far from having reached its full potential, and you are stepping into a vibrant and growing field and joining a department engaged in a wide range of exciting, high-impact research activities to which you will have the opportunity to contribute as you develop into independent researchers. You will face challenges in realizing your own potential, but will have the benefit of a supportive community of fellow students, faculty, and staff who will help you and want you to succeed.

You are about to embark onto what is possibly the most exciting phase of your education, and we are all looking forward to seeing you become successful researchers who will contribute to the continued growth and success of CSE. The road ahead may not always be easy, but it is often enjoyable and ultimately rewarding.

*Roch Guérin, department chair*

## **Foreword from Doctoral Program Director**

Greetings! You, our Ph.D. students, are critical to the success of our department. You contribute a huge fraction of the department's research output and you are the legacy each of us leaves for the future. I look forward to helping facilitate your progress through our program. While you will primarily work with your research advisor in your doctoral studies, you are welcome to contact the program administrator ([csegradcoordinator@gmail.com](mailto:csegradcoordinator@gmail.com)) or me ([brent@wustl.edu](mailto:brent@wustl.edu)) at any time if you have concerns or questions.

*Michael Brent, program director*

# Introduction to the CSE Doctoral Programs

This guide describes in detail the procedures and requirements for a Ph.D. in either Computer Science or Computer Engineering. The Department implements, and in some cases extends, the requirements imposed by the Graduate School on all students seeking Ph.D. degrees. The requirements imposed by the Graduate School are listed [here](#). We assume that current and prospective students will be the primary users of this guide. The guide often uses “you” and “your,” which are always addressed to the student.

## Overview of Program Requirements

A Ph.D. is primarily a *research degree*, certifying that the recipient is able to conceive and carry out a program of original research. A Ph.D. recipient must also be able to effectively communicate new research findings, both orally and in writing. Finally, the degree certifies a high level of competence and background knowledge in the recipient's subject area.

Ph.D. students learn to formulate and execute a research program with the mentorship and guidance of a research advisor, a faculty member who provides intensive mentoring and guidance throughout a student's doctoral career. The student's dissertation, a substantial original research contribution required to obtain the Ph.D., is typically carried out as part of this research program. Students enter our program without a predetermined research advisor and must find an advisor among the faculty with full or courtesy appointments in CSE during their first year.

At various points during our students' doctoral careers, they must pass milestones that demonstrate mastery of certain research skills and progress toward the dissertation. Our programs include three major milestones: an oral qualifying examination; a formal dissertation proposal; and completion and defense of the dissertation. In addition to these major milestones, students are expected to present their research regularly, both in external venues such as competitive academic conferences and internally through annual talks in our Doctoral Student Seminar.

In addition to performing research leading to a dissertation, CSE Ph.D. students must complete coursework requirements, including both graded courses and participation in research seminars. Courses include a set of breadth requirements designed to ensure that the student has a broad knowledge of CSE. All Ph.D. students must also satisfy a “mentored teaching experience” (MTE) requirement by assisting a faculty member in teaching a course for one semester (see Mentored Teaching Experience below for details).

The Department offers two doctoral degrees: Computer Science, which spans a broad range of subject areas unified by the study and use of computational methods, and Computer Engineering, which focuses on the design and implementation of physical computing systems such as processors, custom computing logic, and communication fabrics. A student's choice of degree program depends on their specific interests within CSE and the interests of the faculty member who serves as the student's advisor. Program requirements are the same for Computer Science and Computer Engineering students, except as noted below. Innovative research in computer science is increasingly happening at the interface between CSE and other disciplines such as biology, physics, art, social sciences, data science, and various kinds of engineering. As a department, we support interdisciplinary research agendas and the current requirements

reflect our efforts to be flexible, especially with regard to which courses are most appropriate and useful for each student.

## Getting Started: the First Year

During your first year in the CSE Doctoral Program, your most important task is to integrate yourself into the department's research activities by finding a home in one of our research groups. You will also take a full load of courses, including CSE 591, designed to orient you to graduate research in general and the current research opportunities in this department.

### CSE 591: Introduction to Graduate Study

Every new doctoral student must take CSE 591, "Introduction to Graduate Study," during their first fall semester. This course has two aims. First, it orients students to the breadth of research in the CSE Department. You will hear presentations from a number of faculty members about the work they do. Second, the course includes discussions and assignments to help develop critical research skills, such as selecting good problems, writing a research proposal, and time management.

An important function of CSE 591 is to help you narrow your choice of potential research areas, and to show potential advisors what kind of work you can do. To promote these ends, 591 includes two required one-month *rotations*, one each in October and November. During each rotation, you will work with a faculty member, your "host," on a short project that is representative of the kind of work done in that person's group. You will attend your host's group meetings and get to know the students in the group. At the end of each rotation, you will present the results of your project to the class.

### The Role of the Research Advisor

Every doctoral student must be mentored by a *research advisor*, a faculty member who is responsible for directing their research and academic program. It is difficult to overstate your research advisor's influence on your doctoral career. You will meet with this person more often than anyone else in the department, long after you have satisfied all course requirements. You will work closely with your advisor on research and will likely publish many joint papers. Your advisor will represent your interests to the department. Finally, your advisor will chair your dissertation committee and will ultimately certify your readiness to graduate.

### Finding a Research Advisor: Rules, Procedures, and Strategies

Incoming first year students are *unaffiliated*, meaning they do not have a research advisor, and they remain unaffiliated until they and a faculty member file an advisor affiliation form with the department. The most common mechanism by which students become affiliated with faculty members is through the two one-month rotations undertaken as part of CSE591 in the fall semester. Students and faculty are discouraged from committing to an advising relationship before the completion of the second rotation. If they do, the student must notify any other rotation host immediately. Faculty members may be reluctant to host a second rotation for a

student who has already committed to joining another lab. In this case, the best approach is often for the advisor to help recruit a second-rotation host in a research area related to her own.

### How to arrange a rotation with a prospective research advisor: fall

Information about rotation opportunities can be found at <https://rotations.cse.wustl.edu/>. This site includes information about a faculty member's research area, how many advisees they expect to take during the current academic year, how many students they have already committed to take for rotations, and how many new advisees they have already committed to. When choosing a rotation, you may want to consider the probability of being offered a position in the group. For example, if a faculty member expects to take at most one new graduate student and has already committed to four rotations, you may want to take that into account.

You should browse the rotations web site early in the fall semester and send email to faculty members with whom you would like to discuss a rotation. The first step is to arrange an in-person meeting. Before the meeting, do your homework by learning about the faculty member's research from their web pages and publications. Ideally, you want to have a rotation confirmed at least a week or two before it is supposed to start.

### How to arrange a rotation with a prospective research advisor: After fall

Typically, a majority of students will find an advisor during the fall semester, but others will not. If you have not filed a research lab affiliation form by the end of classes in the fall, it is time to start arranging additional rotations. You can negotiate the duration of additional rotations with the faculty member, but they should not exceed eight weeks. Ideally, you should be doing rotations almost back-to-back until you and an advisor have filed a lab affiliation form. For each additional rotation, the faculty member must notify the department by filling out [this form](#).

### Avoiding rotation spillover

Prospective advisors who have not yet affiliated with a student may not ask the student to do research work before or after a formal rotation. In the fall semester, a faculty member may provide extra research opportunities before October 1 or between December 1 and December 31, but only if asked to by a student. Between January 1 and August 31, each rotation is limited to at most eight weeks. Rotations are expected to fill all of the time a student has available for research, so faculty members may not ask a student to carry out research while rotating with another faculty member. If a student receives such a request, he or she must decline.

### Deadline for affiliating with a research advisor

**You must find a research advisor by August 31st of the summer after beginning the PhD program in order to continue in the program.** Students are strongly encouraged to acquire a research advisor as soon as possible after completing the second rotation. That is the natural time to discuss committing to a mentoring relationship with a faculty member. That commitment requires filing a form with the department. **If you and your prospective advisor have not filed the affiliation form, you do not have a research advisor.**

You may receive a letter naming a faculty member as your *academic advisor*. This person is temporarily assigned to help you select your courses but is **not** your research advisor.

## Changing Advisors

The advising relationship is established and continued only by the mutual consent of student and faculty member. You have the option at any time to seek a new research advisor. If you feel that switching research advisors is in your best interest, the faculty will do what we can to try to make the transition possible, beneficial, and amicable for all involved. Similarly, if the faculty member chooses to end the advising relationship, and if you are making adequate progress toward a Ph.D., we will help you find a new advisor if possible.

## What to do in case of student-advisor conflict

The relationship between an advisor and a student is normally one of mutual positive regard and respect. It is rare, but not unheard of, for a student to feel that their advisor is treating them unfairly or inappropriately. If that happens to you, you are encouraged to discuss the situation with the Doctoral Program Director or, if you prefer, the department chair or any member of the Doctoral Studies Committee. Whoever you confide in will make every effort to maintain your anonymity, although in some cases allegations must be reported to the DSC or department chair. The DSC and the department chair will protect any student who lodges a complaint from adverse consequences of reporting that complaint. Advisors are expected to maintain a professional and respectful relationship with students. This precludes, for example, asking a student to carry out tasks not directly related to their academic progress, asking about or commenting on a student's personal life outside the academic context, yelling at a student, using abusive or offensive language, or placing inappropriate conditions on the student's progress through the program. While students interested in academic careers are encouraged to participate in writing grant proposals, the ultimate responsibility for funding lies with the advisor. Writing grant proposals is not a requirement for progress in or completion of the doctoral program.

# Course and Credit Requirements

## Overall Credit Requirements

You need a total of **72** credits. Credits come from three kinds of work: regular courses, seminars, and research credit.

## Regular Courses

- At least **33** of your credits must be from regular (non-seminar) courses eligible for graduate credit.
- At least **18** of these credits must be from CSE courses, either taken at Washington University or approved by us for transfer credit.

- At least **9** of these credits must be from regular CSE courses taken at Washington University.
- At most **9** of your 33 course credits may be from 400-level courses.
- At most **9** of your 33 may be from graduate-level independent study (CSE 500 or 600).
- Any other credits for CSE courses must be from graded courses at 500 level or above.
- Courses taken at Washington University outside the CSE department may be counted for degree credit with your advisor's approval. Such courses must be relevant to your research area and at the 400-level or above.

## Seminars

At least **3** of your credits must come from *CSE research seminars*. These seminars, whose course numbers are of the form CSE 7xxx, entail both discussion and oral presentation by students of cutting-edge research. CSE doctoral students may receive only *one credit per semester* for any one research seminar, and that seminar grade should be one of "satisfactory" or "unsatisfactory," rather than a letter grade. You may, however, take multiple seminars per semester and may take a given seminar for as many semesters as you like, since the topics change each semester.

## Research Credits

At least **24** of your credits must be *research credit*, taken in the form of CSE 699 "Doctoral Research." Research credit must be arranged with your research advisor each semester. You may take up to **12** research credits per semester.

## Transferring Credits from Outside Washington University

Credits counted toward your Ph.D. requirements may include no more than **24** credits transferred from another institution. Transfer credit is granted only for regular courses (not seminars or research) that are appropriate substitutes for work that would have otherwise been done as part of our Ph.D. program. A course taken at another institution must meet all of the following requirements to be eligible for transfer credit:

1. The course must be considered acceptable for credit toward a PhD at the institution where it was taught.
2. The course must not have been used to satisfy an undergraduate degree requirement. Because this determination is often difficult for us to make, our usual rule is that you must have had graduate standing when you took the course. Courses taken as part of a master's or doctoral program, a graduate certification program, or as an SNCD (student not candidate for degree) are all eligible.
3. The CSE Department must approve the transfer after reviewing the course's content and your grade for the course. Generally, the decision to approve is made by a faculty member with expertise in the subject area of the course to be transferred.

## Applying for Transfer Credit

To request that credits from another institution be transferred, please fill out the form at

<https://forms.gle/qgiUeGBTjhdZiaew5> for each course you wish to transfer. Please also send your transcript in electronic form to the DSD and the program coordinator and inform them that you have filled out the forms requesting credit.

The procedure for deciding whether to accept transfer credit for the PhD:

1. If the institution grants PhDs in CS or a closely related discipline, has a significant research enterprise, and there is no reason to suspect it of low standards, it is acceptable. Institutions that grant an MS in CS but not a PhD require more investigation / discussion.
2. If the course is eligible for PhD credit at the institution where it was taken, then a. If it is listed as a CSE course we accept it for CSE credit (18 CSE credits are required).
  - b. If it has a close analog at WU that would be accepted for CSE PhD credit here we accept it for CSE credit.
- c. If neither of the above hold, we accept it as a non-CSE graduate credit.

## Applying Credit from another Washington University Degree

If you complete a Washington University master's degree in CS or CoE, you may apply all 30 credits completed for these degrees toward the credits needed for the Ph.D. Note that all MS credits, including those for CSE 599 "Masters Research" (typically taken as part of a thesis or project), are considered *course credits* relative to our doctoral programs and count toward your 33 non-seminar credit requirement. They *cannot* be counted as doctoral research credit.

## Breadth Requirements

An important component of your required course credits is a set of *breadth requirements*, which ensure that you have a sufficiently broad base of general knowledge in the area of your doctoral program. For the PhD in Computer Science, you must complete one course in each of the following 3 breadth areas:

### Theory of Computing

- CSE 541T: Advanced Algorithms

### Computer Systems

- CSE 422S: Operating Systems
- CSE 522S: Advanced Operating Systems
- CSE 560M: Computer Systems Architecture I

### Data Science

- CSE 417T: Introduction to Machine Learning

- CSE 412A: Introduction to Artificial Intelligence
- CSE 514A: Data Mining
- CSE 517A: Machine Learning

For the PhD in Computer Engineering, you must complete one course in each of the following 3 breadth areas:

### Theory

- ESE 520: Probability and Stochastic Processes
- CSE 541T: Advanced Algorithms
- CSE 547: Introduction to Formal Languages and Automata

### Computer Architecture

- CSE 560M: Computer Systems Architecture I

### Design

- ESE 461A: Design Automation for Integrated Circuit Systems
- CSE 463M: Digital Integrated Circuit Design and Architecture
- CSE 521S: Wireless Sensor Networks
- CSE 523S: Systems Security
- ESE 562: Analog Integrated Circuits

Only courses taken at Washington University with a grade of B- or higher may be used to satisfy the breadth requirements. Students who receive transfer credit for CSE 541T can fulfill the theory breadth requirement with another 500-level CSE course with the "T" suffix.

**The breadth requirement must be satisfied by the end of the 5th semester. Students failing to meet this deadline will be placed on probation during which they must satisfy the requirement.**

### Planning your coursework for your first two years

You should try to complete your breadth requirements in your first 2, or at most 3 semesters. Plan this in advance as they are not offered every semester. Also, it would be a mistake to load up on courses in your first three semesters, preventing you from making research progress. Most students will progress better if they take no more than two courses in their 2nd, 3rd, and 4th, semesters, leaving significant time for research progress.

### Enrollment and Residency Requirements

All Ph.D. students must either be enrolled full-time or registered as a nonresident candidate every semester until graduation. Full-time enrollment is achieved by registering for at least 9



units per semester. If you have reached the 72 credit hours required by the program, you can maintain full-time status by registering for either LGS 9000 (Full-time Graduate Research/Study) or LGS 9001 (Full-time Graduate Study *in Absentia*) that indicates the student's full-time engagement in research or academic writing. Both of these courses require departmental approval. LGS 9001 is for students who will be completing research away from the university. These cases need to be approved by the Graduate School, the student's advisor, and the department. Students are allowed to register for LGS 9001 for up to four fall/spring semesters, and these are counted towards the student's program length. Full details of the graduate school's enrollment and residency requirements can be found [here](#).

## Residency

All students must fulfill a one-year *residency requirement*. Residency is satisfied by registering for at least 9 units in each of two consecutive academic semesters at some time in your doctoral career. *A full 9 units must be taken in each semester of residency; it is not sufficient to register for LGS 9000 for those semesters.* If you transferred to Ph.D. status from a WU CSE Master's Program, consecutive semesters spent enrolled full-time in that program may be used to satisfy your residency requirement. Residency requires full participation in the life of the Department. For part-time students who work full time, the Department requires that you reduce the amount of time you spend at work by at least 50% during the residency period. You will have a desk and all the responsibilities of a full-time doctoral student (e.g. attending colloquia) during your residency.

## Training in Teaching

The skills required to obtain a Ph.D. include not only mastery of core and specialized CSE knowledge but also the ability to communicate this knowledge to others. Teaching skills are especially important if you choose to pursue an academic career, but similar abilities are required in industrial research and many areas of public life. Our Ph.D. programs therefore require you to satisfy teaching requirements as part of obtaining your degree.

There are three aspects of the Teaching Requirement that must be completed prior to graduation:

- *scholarly communication*, by participating in the Doctoral Student Research Seminar;
- *mentored teaching*, by acting as a teacher or course TA (officially called AI, for *Assistant in Instruction*, but for obvious reasons I will abbreviate with TA rather than AI).
- *pedagogy training*, before and during the mentored teaching experience

## Scholarly Communication Requirement

All doctoral students are expected to gain proficiency in oral communication of research results to an audience of scholars, who may be either your peers or the research community at large. Various parts of your doctoral training, such as your research seminars, your oral qualifying exam, and communication of your own doctoral research will help you build skills in this area.

## Doctoral Student Research Seminar

The Department's Graduate Student Association organizes a regular non-credit seminar in which doctoral students present their ongoing research. *If a student feels that their results are not ready to be presented, they present the problem they are working on, along with appropriate background, and the approaches they are taking to that problem.* This seminar provides an opportunity to practice the skills of talk preparation and presentation.

The format of the seminar is two 20-minute slots. Each slot is devoted to a conference-style presentation by one student, followed by time for questions and then oral feedback on the presentation from faculty members appointed to judge it. Talks should provide sufficient background that anyone in department can grasp the goals and significance of the work. In particular, the talk should **not** be pitched to an audience within your own research area. Presentations are typically fairly polished (practicing is strongly recommended). Audience members provide anonymous feedback to speakers in the form of comment sheets filled out during the seminar. Talks are announced in advance by posted abstract, which should be sent to the seminar organizer(s) about a week in advance of a presentation.

**As a requirement of graduation, all Ph.D. students must give at least one DSS talk that receives a rating of “met requirements” from both faculty judges.** We expect most students to give multiple talks before satisfying this requirement. Students who take research credits (699 or LGS 9000) are required to present once per year until they meet the requirement. Students who take research credits only in spring may present the following fall. A student may ask to give additional DSS talks, beyond one per year, if needed to pass this requirement in time for their thesis defense. All students who have not yet met the requirement must attend the presentations by other students and those who have met it are encouraged to continue attending to support their peers.

## Mentored Teaching Experience

The Mentored Teaching Experience (MTE) consists of a minimum of 14 hours of contact with students and will also typically require about 10 hours per week of participation in course administration such as grading assignments, answering students' questions online, and other such duties as assigned by the course instructor. The 14 contact hours are organized into two levels.

1. Level 1. At least 4 hours of lecture, traditional recitation section, lab section, or structured studio. The defining features are that (a) the MTE student must prepare and plan the session in advance, and (b) the MTE student must be in charge of a group of 3 or more students engaged in some form of planned, structured learning experience. The MTE student should record the names of the students in attendance. Office hours or 1-on-1 help do not satisfy this requirement. If the student engages in more than 4 hours of this

activity, the additional hours can count toward the Level 2 requirement.

2. Level 2. At least 10 hours of some combination of (a) and (b) below:

- a. Helping students 1-on-1, in person. These can be in scheduled office hours or ad hoc meetings. The MTE student should record the names of the students he or she helped and the approximate time spent. Or,
- b. Designing and grading significant new assignments and writing a one-page reflection on how they went, including strengths and weaknesses. The reflection should be turned in to and discussed with the mentor in charge of the course. Hours devoted to either of these two options can be combined to satisfy the requirement.

**In addition to the specific requirements above, MTE students are required to help run the course throughout the semester as needed.** The total time commitment for the MTE should be similar to that of a 3-unit course, i.e. not more than about 12-14 hours per week, on average. However, the time required may vary significantly from week to week.

**MTE mentors must be faculty members in the CSE department or have a courtesy appointment in CSE. If the person in charge of a course is a student or adjunct faculty member they cannot serve as an MTE mentor.**

The mentor should submit an online [MTE Commitment Form](#) before the beginning of the semester and an [MTE Completion Form](#) at the end. The student should enroll in both LGS 600 (0 credits, just for the Graduate School's record keeping system) and CSE 802, Mentored

11

Teaching Experience (3 credits), for the semester in which they plan to satisfy the teaching requirement. Finally, MTE students must register for and participate in "CSE 7001 Research Seminar on Computer Science Pedagogy", a 1-credit seminar that meets once per week to discuss approaches to teaching computer science.

## Pedagogy training

The university has a [Teaching Center](#) that provides many short workshops on teaching techniques and approaches. These span the range from university policies to the latest teaching techniques based on empirical research. Their most basic workshop is *Graduate Student Mentored Teaching Orientation*, which is offered about a week to 10 days before the beginning of classes. Immediately before the semester in which they register for MTE, all students *must* register and participate in this workshop, which takes most of a day. In addition, you must participate in at least one of the Teaching Center's "Foundations in Teaching" workshops, which are typically a single session of 1.5 to 2 hours. This second workshop must be completed before the MTE requirement is satisfied. You are encouraged to do it in the semester before your MTE or early in the semester of your MTE. All students who do not have an undergraduate degree from a US institution are encouraged to participate in the "Teaching in an American Classroom" workshop when it is offered.

## Optional teaching training

Doctoral students interested in academic careers have the option to undertake additional training to better prepare them to the challenges of teaching. Specifically, in cooperation with the department's Associate Chair and with the approval of their advisor, students can opt to teach a one semester course in the CSE department. This option cannot be exercised more than twice during a student's Ph.D. program, and requires that the student enroll in CSE 801 in the semester(s) during which she/he is teaching such a course.

Teaching a course does not translate into additional compensation, and will result in a reduction in the amount of time the student is able to devote to research by 40% to 60% depending on the course. A student must, therefore, ensure that the approval of her/his advisor is officially conveyed to the Director of Graduate Studies before enrolling in CSE 801. Selection of a suitable course will then be performed in collaboration with the Associate Chair, who will also coordinate supervision of the student's teaching during the semester.

## Transferring Teaching

If you believe you have satisfied some or all of the fundamental teaching requirement before joining our program, you may apply to transfer your outside teaching experience. Transfers must be approved as a special exception by the Department Chair and the Dean of the Graduate School. You must both document the activity as described above and supply an official memo, signed by the faculty member who supervised you at the time of the outside teaching activity, to verify that you did the work described. Please check with the Doctoral Program Director if you want to pursue such a transfer.

## Program Milestones

Your graduate career is marked by a series of milestones achieved on the way to your doctorate. At each milestone, you will demonstrate certain skills and abilities critical to success in CSE research. These milestones serve both to give you intermediate targets at which to aim and to give us ways to assess your progress toward the doctorate.

### Timing

Milestone Ideal time (semester)

Time limit (semester)

Find an advisor and file commitment form 1st 2nd + summer Pass an oral qualifying exam 3rd

4th Submit and successfully defend a dissertation proposal 5th 7th Submit and successfully

defend a dissertation 10th-12th 14th (7 years)

In the very rare case where a student does not find an advisor by August 31 after joining the program, they are dismissed. Failure to meet the deadlines for oral exam and dissertation proposal result in an academic probation, which gives the student a short additional time within which to complete the milestone. Failure to complete within that additional time can lead to dismissal. The 7 year limit for completing the dissertation is imposed by the university. If a

student does not complete the dissertation defense within 7 years but their advisor feels they are making progress and close to completion, it is possible to petition the department for an extra year. If the department approves the petition, then it will be submitted to the Graduate School, which must also approve.

Students who begin the program in January have the same deadlines as students who begin the following August. Even if they work in a research lab and are supported by a research grant between January and August, they are considered to be without an advisor during their first fall semester. They must participate in rotations and submit a lab affiliation form as though they started in August.

## Oral Qualifying Examination

The oral qualifying examination tests your ability to read deeply the research literature on a particular topic, to synthesize and critically evaluate it, to present your synthesis in a scholarly and professional oral presentation, and to answer questions about the literature you've read. All of these skills are essential for being able to pursue research at the doctoral level. To the extent that the research topic for your oral exam is related to your doctoral research area, the time you spend preparing for the exam should help you make progress toward your degree. The exam will also be one of many opportunities for you to build confidence in your research and oral presentation skills.

### Procedure of the Exam

During your third, or sometimes fourth semester, you initiate the oral qualifying examination by meeting with your advisor to identify a research area for the exam and three published papers that span that area. You and your advisor will then decide which other faculty members to ask to serve on your oral exam committee. Your committee must include at least three tenured or tenure-track faculty members whose primary appointment is in CSE (i.e. not teaching faculty or faculty from other departments with courtesy appointments in CSE). **Your advisor may not serve on this committee and will not be present at the exam.** We recommend that at least one member of the committee be someone in your research area and that at least one committee member be from outside your research area. It is the student's responsibility to contact prospective examiners, tell them the topic, and ask them to serve. Faculty members may from time to time decline to serve on a committee, in which case others must be asked. The committee may suggest replacing one or more of the papers, especially if they are too similar or too diverse.

**Your advisor may not work closely with you on exam preparation** after the initial choice of papers and committee are complete. Your interactions regarding the exam should be limited to occasional questions and **at most one practice talk attended by the advisor.** You may give additional practice talks for other students, including those in your research group. Indeed, we strongly recommend practicing your presentation for other students before (and possibly after) practicing in front of your advisor.

As part of your preparation, you are expected to read each assigned paper in depth to understand both the significance of its results and the details of how these results were

achieved. However, **your preparation should cover the whole area spanned by the three focal papers, not just the papers themselves. You will likely need to do significant background reading to understand current work in the area and to place it in its historical context.** A good place to start is with the most relevant of the works cited by your focal papers as well as those that cite your focal papers. You should have well-informed opinions about the quality of the work in the selected papers and how their approaches relate to each other and to other work in the area. You should also formulate well-reasoned opinions about the future of the research area and the role, if any, that each of the focal papers is likely to play in it.

After completing your research and synthesizing the literature in your mind, you should prepare a polished, professional, conference-style oral presentation of around 35 minutes that presents an overall view of and direction for work in the area of the exam. The reading and analyzing portion should take approximately 3-5 weeks, preparing for the first practice talk might take a week, and revisions between your first practice talk and the exam may take a week or more. Overall, the process should take 4-8 weeks.

**Important:** Your presentation should include a summary of important ideas from the selected papers, their significance, and how they relate to each other and to other relevant work. However, **it is not sufficient to give a talk focused on these papers alone.** Let me repeat this: **A talk that merely summarizes the three papers is a failing talk.** Rather, you must demonstrate that, having read both the selected papers and other relevant literature, you have synthesized a clear understanding of the current state of research in the area and can propose and defend reasonable directions for further, novel research in it.

During and after your presentation, the committee will ask you questions about the substance of the papers and their implications for your research area and your own planned work. Please schedule two hours for your exam to allow sufficient time for questions. At the end, the committee will confer in private to determine whether you have passed the exam.

## Possible Outcomes and Retakes

There are only two possible outcomes of the oral exam: pass or fail. **There are no conditional passes or minor revisions.** Students who fail the first time may take the exam up to two more times, for a total of three. When a student retakes the exam, each retake committee should include at least one person who has served on a previous exam committee for the student and at least one who has not.

Students who have not passed their oral exam by the end of their 5th semester will be placed on academic probation, with the condition for return to good standing being to pass the oral exam.

## Dissertation Proposal

The next milestone for the Ph.D. program is proposal of a topic for dissertation research. You should choose your dissertation topic and formulate a plan of research on this topic in consultation with your research advisor. The planned research must be original, novel, and significant enough to warrant publication (typically at least three journal-quality papers' worth of work).

When you have selected a research topic, you must describe your research plan in a

written *dissertation proposal*. Proposals are typically between 10 and 15 single-spaced pages in length, not counting the bibliography / references section. Learning how to condense your ideas to a proposal of limited length is a very important research skill in industry as well as in academia. The proposal should include the following information:

- motivation for the planned research
- one or more goals that you will achieve through your research program
- background sufficient for someone educated in CSE (but not necessarily in your area) to understand your goals and their significance
- a review of existing work related to your research plan, indicating how your planned research is novel
- high-level details of the planned research, including challenges, methods, and deliverables, sufficient for an expert in your area to evaluate its technical feasibility
- a timeline indicating when you plan to achieve your goals and when you plan to complete the dissertation.

A good model for the dissertation proposal is an NSF or NIH grant proposal. Your advisor or another faculty member can provide examples of such proposals. Like a grant proposal, the thesis proposal must provide enough technical detail to be compelling, but it must also leave room for discovery as part of the research process. Furthermore, some of the aims of the proposal may turn out not to be feasible once the research is fully underway. The proposal is a roadmap and a plan, but not a guarantee that every point of interest on the map will be visited.

## When to propose

Students should propose between their 4th and 7th semesters. Students should propose as soon as their able to provide background, research goals, and methodological approaches necessary to convince a thesis committee that the research is both significant and feasible. **There are no other requirements that must be met before proposing.** For example, the advisor should not require the student to have a published paper or external funding before proposing. Students who have not passed their proposal defense by the end of their 7th semester will be placed on academic probation, with the condition for return to good standing being to successfully defend a thesis proposal.

## The thesis committee

Your dissertation work, starting with the proposal, will be supervised by an *advisory committee*, which is typically also the committee before whom you present your final dissertation defense. Your committee is typically chaired by your advisor, and must include a total of at least **five members**, who collectively must meet two criteria imposed by the Graduate School:

1. Four of the five must be tenured or tenure-track Washington University faculty; one of these four may be a member of the Emeritus faculty. The fifth member must have a doctoral degree and an active research program, whether at Washington University, at another university, in government, or in industry.
2. Three of the five must come from CSE (“inside” members); at least one of the five must not (“outside” member). Washington University faculty whose primary appointment is

wholly or partially in the CSE Department are never considered "outside", even if they have appointments in other departments as well. Faculty with primary appointments in another department and courtesy appointments in CSE may be considered "inside" or "outside" at the student's discretion. The required outside member may be at Washington University, at another university, or in a non-academic position (e.g., government or industry). The only requirements are that the person have a doctoral degree and an active research program.

Your committee may be as large as you wish, so long as some subset of five members satisfies the above requirements. The Dean of the Graduate School is the final arbiter of what constitutes an acceptable committee.

In addition to the Graduate School requirements, **the CSE doctoral program requires that at least two members of the committee must have primary appointments in the CSE department.**

**Students whose thesis advisors do not have primary appointments in CSE are required to form and meet with a thesis committee within 6 months of joining their thesis lab.** At that meeting they should present research plans but they are not required to present a full written proposal ahead of the usual schedule.

## Procedure of the Proposal

You must defend your written dissertation proposal in a public oral examination before your committee. You should supply each committee member with a copy of the proposal at least seven days prior to the examination.

**Attendance by a minimum of four members of the committee, including the committee chair and an outside member, is required for the proposal to take place.** This provision is designed to permit your defense to proceed in case of a situation that unexpectedly prevents one of the five members from attending. Do not plan in advance to have only four members in attendance; if one of those four cannot attend, your proposal must be rescheduled. Members of the committee normally attend in person, but only three are required to be physically present. In that, one other committee member must attend virtually.

The proposal defense consists of two parts. First, you must give an oral presentation of about 45 minutes describing the content of your proposal, including its background and motivation, its aims, related work, the research plan itself, and the timeline for completion. This presentation is open to all, so it should be comprehensible to those outside your area of research. Following this presentation and questions from the audience, the research advisory committee examines you privately about details of the research plan and any questions raised by their reading of the proposal. At the end, the committee deliberates privately to determine whether to accept the dissertation proposal. You should schedule two hours for this examination.

## Outcomes

The committee may either accept or reject the dissertation proposal. Even if the proposal is



accepted, the committee may still recommend changes to the research plan and may require you to provide regular oral and/or written updates on your progress toward the proposal's specific aims.

## The Title, Scope, and Procedure Form

Once you pass your proposal defense, you should submit a [Title, Scope, and Procedure Form](#) to the Graduate School as soon as possible. This form briefly describes the planned work of the dissertation. The "scope" of your dissertation indicates the specific area of study and the questions to be answered, while the "procedure" briefly describes how you will carry out the work. You should have the form filled out and ready for signatures prior to the proposal defense. **At least three CSE faculty from your committee, including your advisor, must sign the form.** Ideally the entire committee should sign.

## Dissertation Defense

At the conclusion of your doctoral research, you will produce a written dissertation describing the results of your doctoral research, along with sufficient context to make the importance of the question you addressed and the implications of your findings clear to a general computer science audience. It should also provide sufficient details for a specialist in your field to verify your findings. This dissertation must be produced according to the [Graduate School's Dissertation Guide](#). Please see this guide for detailed instructions about formatting and which materials and forms must be submitted to the Graduate School before and after the examination. **You must file an *intent to graduate* through the University's on-line WebSTAC system in the semester in which you defend your dissertation.**

**Important Note: you may not schedule the final dissertation defense less than six months from the time a signed Title, Scope, and Procedure Form is received by the Graduate School.**

## Procedure of the Dissertation Defense

The written dissertation must be defended in a final, public oral examination (the *defense*), which uses a procedure similar to that of the proposal examination. The defense is conducted by a five-member *examining committee* (usually referred to as the "thesis committee"), whose composition and attendance requirements are the same as those of the proposal defense.

Per Graduate School rules, you must deliver your written dissertation to your examining committee at least seven days prior to your examination. However, the CSE Department strongly recommends that the dissertation be delivered at least fourteen days in advance. You should offer to provide each committee member a printed copy of the dissertation as well as an electronic copy.

## Outcomes

The examining committee may separately accept or reject the written dissertation and the oral

defense. A committee that accepts the written dissertation may still request changes to the document that you should complete before submitting it to the Graduate School.

## Time Limits, Consequences, and Appeals Process

Some students, for a variety of reasons, are not able to complete the entire process of attaining a Ph.D. degree. You should do your best to understand, at the earliest possible stage in your doctoral program, which steps may be troublesome for you and to work to meet these challenges. At any step in the process, the faculty may raise concerns about your ability to continue and may even ask you to leave the program. This does not mean that you are a failure, only that the faculty strongly believes that continuing with doctoral research is not in your best interest. Making this determination earlier rather than later is in the best interest of both students and faculty.

## Procedures for Progress Evaluation, Probation and Dismissal

The Graduate School has rules governing the procedures to follow for students that fail to meet the timeline for milestones or fail to make sufficient progress in research. These guidelines can be found [here](#).

### Academic Probation

*Academic probation* is the mechanism that the Graduate School provides for formally expressing concerns to a student about their progress, officially recording those concerns, and setting the conditions for return to good standing. **Academic probation does not mean we expect you to fail -- the vast majority of probations are followed by a return to good standing.** However, it does inform you that you need to be doing something differently than you have been. If you do not change course, you are at risk of failing. Obviously, you should strive to avoid being put on academic probation as it does not make a good impression on the people who will later have to recommend you to potential employers. But if you make the necessary changes and return to good standing, that effect is likely to fade and impressions of you are likely to improve.

Let me emphasize once again that **academic probation is a signal from the faculty that you need to make a mid-course correction.** It does not mean that we have lost respect for you or that we expect you to fail.

When a student is put on academic probation, they receive a formal letter stating the duration of the probation and the conditions for returning to good standing. If the student does not meet the conditions in the specified time period, the result may be either dismissal or a second probation. Failure to return to good standing after a second probation for the same cause will result in dismissal. Probations must be approved by at least 3 members of the Doctoral Studies Committee and can be appealed to the department

**The most common cause of academic probations is failure to meet the recommended timeline for milestones. It is your responsibility to keep track of the milestones and timeline. Academic probations are also issued for failure to make sufficient progress in research. A typical measure of sufficient progress is the**

**preparation of manuscripts based on your research that are suitable for publication.** If a student and advisor have a healthy relationship with good communication, probation for insufficient progress should never come as a surprise to a student. The advisor should communicate concerns informally before they reach the level of a probation and the student should be sensitive to those signals. Good communication is the responsibility of both parties. If you don't feel confident that you know what your advisor thinks about your progress in research, you should ask. Try to keep a mental model of what your advisor thinks of you and to make sure it is based on regular communication.

Extreme underperformance, such as consistently missing research group meetings, failing to discharge basic laboratory responsibilities, or actions that negatively affect the safety and productivity of the workplace for others may result in a recommendation for dismissal from the program without a probationary period. Such a dismissal requires deliberation by the Doctoral Studies Committee followed a vote in which  $\frac{2}{3}$  of the DSC members support dismissal. This decision can be appealed to the department chair.

## Colloquium Series

Throughout the year, faculty members invite speakers from other universities and from industry to give public colloquia in the department. These talks are extremely important in helping us to stay abreast of developments in our field and in encouraging productive relationships with researchers outside the Department. Some talks also serve as job interviews by applicants for CSE faculty positions.

**Doctoral students are expected to attend all talks in the colloquium series.** You will have the opportunity to hear about exciting research in your field and to find out about areas in which you might want to work. You will also have the opportunity to critically assess presentations, which will help you present well yourself. Seeing what works and does not work in job talks is especially useful as you yourself begin to think about applying for jobs.

The obligation to attend colloquia applies less stringently to part-time students, who may not be in the Department during our usual colloquium times.

## Annual Review of Progress (PRODS)

Each spring, the CSE faculty reviews the progress of each student in the PhD program. The first step in the annual review is for each student to fill a form describing their progress, the challenges they faced, and their goals for the coming year.

1. Each year, you will receive an email reminding you to go to <https://prods.cse.wustl.edu> and fill out your progress form. **It is essential that you give this careful thought and complete it on time.** Although it is a form with prompts, please feel free to tell us anything that you think is relevant to evaluating your progress over the last year and the potential for progress in the coming year. Your form will be reviewed by your advisor and the entire faculty. If there is anything you need to say in confidence, please communicate directly with the program director.
2. Your research advisor (if you have one) or academic advisor (if you don't) will review your form first, discuss it with you, and possibly suggest revisions or additions. However, the

form is ultimately your statement and you should make the final judgment about what to say.

3. Your advisor will fill out a different form describing their perspective on your progress. The contents of this form is seen only the by the faculty.
4. Each student will be reviewed by a committee consisting of approximately half the CSE faculty. The committee discussion will focus on students whose progress is exemplary and those whose progress is, or may be, slower than expected. After discussion, the faculty will come to a consensus about what feedback to give you.

After PRODS each student's progress will be rated as one of:

- Exemplary / Exceeding expectations. This is rare so don't feel bad if you don't get it.
- Fine / Meeting expectations. Most students receive this progress rating. It is the default and indicates that the faculty is pleased with your progress and you are not showing any signs of falling behind at this time.
- Concern / at risk of falling behind. This indicates that you need to make a change to the way you have been doing things so far. It comes with a letter of academic probation as that is the mechanism the Graduate School provides for documenting concerns. As described above, it does not mean we think you are likely to fail. Most probations result in a return to good standing. If you receive a probation letter, it will detail the requirements and deadlines for returning to good standing. Probations resulting from the PRODS process will be reviewed at the end of the summer.
- Second probation. If you have already received a probation and have not made the necessary corrections, or significant new concerns have arisen, you may receive a second probation. This is rare, but when it happens it is a red-flag warning that you are at risk of being dismissed from the program. If you wish to remain, you must work closely with your advisor to make changes that will allow you to meet the expectations for a Ph.D. student at your stage.

## Academic Integrity and Ethics

We expect doctoral students to maintain a high standard of academic integrity. This standard includes integrity in both your coursework and your research activities. **Failure to abide by the department's standards of academic integrity can result in your dismissal from the Ph.D. program.** For details on expectations, policies, and procedures associated with academic integrity, please see the school's academic integrity policy [here](#). If you have any questions or uncertainties, please do not hesitate to ask your instructor (for courses), your advisor (for research), or the program director for rare circumstances in which you do not feel comfortable with these other options.

## Outside Employment and Internships

Full-time CSE doctoral students receiving research assistantships are restricted as to what kinds of work they may do outside of their doctoral research. Students receiving research assistantships are expected to dedicate all their energy to making progress toward their degrees

and to contribute to related research activities. **Outside income-generating activities for full-time students is limited to one day per calendar week.**

1. The student must secure explicit approval of their research advisor. The advisor may deny this request for any reason related to research or academic progress.
2. The student must abide by the university's conflict of interest policy.
3. The student must keep their advisor and the Program Directory informed about all such extra activities.

Exceptions to the one day per week limit may be made for certain kinds of teaching, such as covering a summer course for the Department; please consult your advisor for more information.

## Internships

In summary areas of computer science, doctoral students often pursue research internship opportunities. An internship experience generally involves doing CSE research in an industrial or other non-academic setting. The work, which typically lasts several months, is done under the supervision of the company or lab supporting the internship. Students do not receive graduate assistantship support during their internships; rather, they are paid by their employer.

Any student contemplating an internship must first obtain their advisor's permission. Moreover, you should carefully consider whether the work you will perform for your internship could overlap with work you plan to do for your dissertation. In most cases, your employer holds intellectual property rights in the work you do while on an internship; hence, you should be careful to avoid unintentionally encumbering your dissertation research.

International students on F-1 visas need a work permit to take an outside internship. These permits can be obtained through the University's [Office of International Students and Scholars \(OISS\)](#). OISS will treat your internship as co-op experience, which is eligible for Curricular Practical Training but does not count for academic credit. Please note the following rules that apply to F-1 visa holders seeking an internship:

1. You must obtain written approval for the internship from both your advisor and the department chair.
2. You must register for one of the following non-credit co-op courses:
  - a. E60 ENGR 500S for summer internship
  - b. E60 ENGR 500A for academic-year internships

Academic-year internships must be one full semester, full-time. Please contact OISS or the [Career Center](#) to learn more about how to arrange an internship and the procedures associated with co-op experience.

## Forms and links

- Lab affiliation form (get the paper form from the program administrator)
- [Rotation opportunities](#)
- [Form for rotations outside of CSE591](#) (for faculty to fill).
- [PRODS annual review form](#) (for students)

- [MTE commitment form](#) (for faculty to fill)
- [MTE completion form](#) (for faculty to fill)
- [Title, Scope, and Procedure Form](#)
- [Graduate School's Dissertation Guide.](#)
- [Office of International Students and Scholars \(OISS\)](#)
- [Graduate School policy on probations and dismissal for academic causes](#)
- [Career Center](#)
- [Academic integrity policy.](#)