

# Requirements for the Doctor of Philosophy (PhD) Degree in Computer Science: A Handbook

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## 1 Introduction

**1.1** This document describes requirements and standards defined by Kansas State University and by the Department of Computer Science for the degree of Doctor of Philosophy in Computer Science. All students are expected to meet these standards. If any exceptions to the requirements are warranted, the student may petition their Supervisory Committee and the Graduate Studies Committee, who must approve and support those exceptions by signing a written statement that defines alternate requirements.

**1.2** Other University requirements are described in the “Graduate Handbook” which is available on the Graduate School web page.

## 2 Admission

**2.1** A strong background in computer science is normally required for admission. Evidence of this background should include either a Bachelor’s degree in computer science or a Master’s degree in computer science or a closely related field. Exceptional candidates with degrees in other areas will also be considered. If a student has a Master’s degree, the grade point average (GPA) across the graduate courses taken toward this degree must be at least 3.5 out of 4.0 (excluding thesis, seminar, and implementation or independent study courses). For students who do not have a Master’s degree, the undergraduate grade point average must be at least 3.0, although a 3.5 GPA is recommended.

**2.2** PhD applicants must have taken the Graduate Record Exam (GRE) and received minimum scores of 146 Verbal, 151 Quantitative, 3.0 Analytical Writing; recommended scores are at least 150 Verbal, 160 Quantitative, 3.5 Analytical Writing.

**2.3** International students who received their degree(s) abroad must take the Test of English as a Foreign Language (TOEFL) and achieve a score of at least 79 or the International English Testing System (IELTS) and achieve a score of at least 6.5. (This requirement may be waived in certain cases, e.g., for applicants from English-speaking countries such as the Philippines, Canada, and Britain.)

**2.4** All qualifications taken as a whole must give evidence of a potential to conduct scholarly research. Besides the qualifications listed above, additional qualifications might include the strength of prior training, a strong score on the Computer Science GRE subject test, and/or published research.

### 3 General Requirements

**3.1** The PhD degree requirements include 90 credit hours of graduate-level credit, typically distributed as 30 credit hours of Master's level coursework, 24-30 credit hours of PhD level coursework, and 30-36 credit hours of research culminating in a PhD dissertation (See Section 4.3 below). At least 15 credit hours of PhD level coursework must be at the 800 or 900 level. Students may take up to 12 credit hours of graduate coursework from another department. In line with Graduate School requirements, at most 6 credit hours of these 12 credit hours can be taken at the 500-level. No 500-level courses within the department can be completed for graduate credit.

**3.2** Students must complete all work within seven years. International students may have attendance requirements to maintain their immigration status.

**3.3** Students must maintain a grade point average of at least 3.0 in all coursework.

**3.4** Students must make regular progress toward completion of the PhD degree.

**3.5** If a student is employed by the Department of Computer Science, they must enroll for at least 6 hours of graduate-level credit each Fall and Spring term of employment. International students must have a score of 23 or better on the Speaking section of the TOEFL if they hold a GTA position.

**3.6** PhD students are expected to participate in the professional activities of the Department of Computer Science. They should attend seminars and research group presentations offered by the department and by the professional societies within the department.

### 4 Specific requirements for the PhD Degree

**4.1** Upon admission to the PhD program, the student will be assigned an academic advisor who will remain their advisor until the student selects a research advisor.

**4.2** By the end of the first year of PhD studies, the student should select and be accepted by a research advisor or major professor. A student's research advisor must be a member of the Graduate Faculty in the Department of Computer Science (see the "Kansas State University General Catalog" online for further information). Because the research advisor will organize and direct all research, students should choose an advisor carefully. Faculty members are not obligated to accept every student who asks them to be their research advisor. The faculty member may impose further requirements before agreeing to serve as the major professor.

**4.3** In consultation with the research advisor, students must compose a Supervisory Committee. The research advisor is identified as the Major Professor and the Chair of the Supervisory Committee. In addition to the Major Professor, the Supervisory Committee must include three additional members. Two of these additional members must be chosen from the Graduate Faculty in the Department of Computer Science at Kansas State University. The third additional member must be chosen from outside of the Department of Computer Science, but must be a member of the Graduate Faculty at Kansas State University. All committee members must be chosen so their field of interest is related to the dissertation research the student proposes to do.

**4.4** Students should consult regularly with their research advisor.

## 4.5 The Program of Study

**4.5.1** The student must meet with the members of their Supervisory Committee and formulate a Program of Study which must be filed with the Graduate School within one year of starting the program. The PhD Program of Study form is found on the Graduate School web page under Student Guidelines.

**4.5.2** The Program of Study contains the following information:

1. Name of the major professor
2. Names of all members of the Supervisory Committee
3. Proposed title of dissertation
4. List of graduate credits taken and to be taken (totaling at least 90 hours). These must include the following:
  - (a) Graduate Courses taken at other universities which have been transferred. All transfer credit is subject to the approval of the Graduate Studies Committee, the student's Supervisory Committee, and the Graduate School. Up to 30 credit hours from a Master's degree, and up to 10 credit hours of other graduate credit may be transferred.
  - (b) Hours taken at Kansas State University(\*) towards the PhD degree;
  - (c) Hours to be taken at Kansas State University(\*) towards the PhD degree;
  - (d) Any additional requirements imposed by the student's Supervisory Committee. (An example: English 516, "Written Communication for the Sciences" is sometimes required for additional writing experience.)

(\*)Note: For the fulfillment of the 90-credit-hour requirement of the Program of Study, no more than 12 credit hours taken at Kansas State University can be from outside the Department of Computer Science. Of these, no more than 6 credit hours can be at the 500 level. No 500-level courses in the Department of Computer Science can count towards the 90 credit hours. A PhD student is free to take any number of courses from outside the Department of Computer Science, but of these, only 12 credit hours can be counted towards the 90-credit-hour requirement.

**4.5.3** Students should not enroll in CIS 999, PhD Research, until a Program of Study has been approved by the Graduate School.

## 4.6 PhD Breadth Requirements

**4.6.1** The Breadth Requirement requires demonstrating proficiency in six courses from different areas, as described below. *NOTE: Although the same course may appear in different areas in the lists below, no one course may be used to satisfy the requirement for more than a single area.*

- One course from the following list, with a deep emphasis on Implementation: CIS 641, CIS 690, CIS 706, CIS 722, CIS 736
- One course from the following list, with a deep emphasis on Languages: CIS 705, CIS 706, CIS 771, CIS 806
- One course from the following list, with a deep emphasis on Systems: CIS 720, CIS 721, CIS 722, CIS 725, CIS 726, CIS 750, CIS 751, CIS 755
- One course from the following list, with a deep emphasis on Applied CS: CIS 655, CIS 730, CIS 740, CIS 744, CIS 761

- One course from the following list, with a deep emphasis on Foundations: CIS 770
- One course from the following list, with a deep emphasis on Algorithms: CIS 775

**4.6.2** The student must receive a grade of B (3.0) or better in each course used to satisfy the Breadth Requirement, and a 3.5 or higher average across all the six courses used to satisfy the Breadth Requirement. For example, a student may satisfy the Breadth Requirement with three Bs and three As (3.5 breadth GPA), but NOT with one C and five As (because a B or better is required in each course), or with four Bs and two As (because the breadth GPA would be only 3.33, which is less than 3.5).

**4.6.3** Courses taken at KSU as part of B.S. or M.S. or M.S.E. degree or approved courses from institutions with joint- PhD program with the CS Department at KSU can be used to satisfy the breadth requirement.

**4.6.4** A single course cannot be used to satisfy the breadth requirement in more than one area.

**4.6.5** In extenuating situations, courses transferred from other institutions or outside experience can be proposed to satisfy Breadth Requirements if approved by the Graduate Studies Committee.

**4.6.6 The Breadth Requirement must be completed by the end of the fifth semester.** If the student fails to complete the Breadth Requirement within the specified time, the student must leave the PhD program.

Area	Courses
Implementation	CIS 641, 690, 706, 722, 736
Languages	CIS 705, 706, 771, 806
Systems	CIS 720, 721, 722, 725, 726, 750, 751, 755
Applied CS	CIS 655, 730, 740, 744, 761
Foundations	CIS 770
Algorithms	CIS 775

Table 1: Breadth Requirements, Areas, and Courses for PhD Degree.

## 4.7 PhD Research Proficiency Exam (RPE)

**4.7.1** PhD students must pass a Research Proficiency Exam (RPE). The RPE is meant to judge the student’s ability to conduct research, and is expected to lead the student into PhD research.

**4.7.2** The RPE will be one-semester long, and during this semester, the student must make three public presentations and produce a written report. The gap between the presentations must be at least four weeks and the last presentation must be before the finals week.

**4.7.3** Students must have their Program of Study filed with the Graduate School before requesting to schedule the first presentation (see Section 4.5).

**4.7.4** For the RPE, the student must also fill out the RPE Form and form an RPE Committee consisting of three faculty members from the Department of Computer Science. Members of the PhD Supervisory Committee (as listed in the Program of Study form) belonging to the Department of Computer Science must be included in the RPE Committee. However, the chair of the RPE Committee must NOT be the Major Professor.

**4.7.5** The student will start the RPE process by choosing an area of study in consultation with the Major Professor. The first presentation should include a literature survey of the area, an open problem and a proposed approach. At the end of the first presentation, the RPE Committee will approve the plan or suggest an alternative problem. The second presentation should present the progress made towards addressing this problem. The third presentation must be accompanied by a written report containing literature survey, a description of the problem addressed, the technical approach used to solve the problem, and the results. At the end of the first and second presentations, the student will be provided feedback on his/her progress and expectations for the next presentation. After the final RPE presentation, the student's work will be judged as "pass" or "fail" by the RPE Committee. Positive votes from a majority of the RPE Committee will constitute a "pass". The chair of the RPE Committee will record the committee decision on the RPE ballot.

**4.7.6** The RPE must be completed before the end of the fifth semester. If the RPE is graded as "fail", then the student will have one more chance to pass the preliminary exam by taking the RPE exam again in the following semester. During the second attempt, the RPE Committee may choose to give the student a different problem to work on.

## **4.8 Preliminary Examination and PhD Candidacy**

**4.8.1** The student must request a Preliminary Examination Ballot from the Graduate School within one semester of completing the RPE and Breadth Requirements.

**4.8.2** The Preliminary Examination Presentation should include a presentation of the plan for the dissertation research and must be approved by the supervisory committee.

**4.8.3** Upon passing the Preliminary Examination, the student will be admitted to candidacy for the Ph.D. degree by the Graduate School.

**4.8.4** The Preliminary Examination Presentation may be completed in conjunction with the final RPE Presentation. In this case, the external Supervisory Committee member must be present for the final RPE presentation.

## **4.9 PhD Proposal Defense**

**4.9.1** Once the student has passed all parts of the preliminary examination, they must write a research proposal about their dissertation research. The proposal must present background concepts and ideas from relevant literature, must define the topic and goal of the research, and must describe how the student will evaluate successful completion of the goal. Typically, successful completion of research can be demonstrated by formal proofs of results, by empirical measurement of results, by construction and demonstration of an operational model, or a combination of these methods.

**4.9.2** The student must formally present and defend the proposal in an open seminar, and afterwards, the Supervisory Committee must approve of the proposal.

**4.9.3** The proposal defense will be publicly announced by the Department, and the defense must be scheduled during the time classes are in session.

**4.9.4** The proposal defense must be completed at least seven months before the dissertation defense, and not prior to being admitted into PhD candidacy.

## 4.10 PhD Dissertation

**4.10.1** The student must work closely with their advisor on research and must write a dissertation.

**4.10.2** The PhD candidate must successfully defend their dissertation, subject to the following conditions:

1. The student must have been a candidate for the PhD degree for at least seven months.
2. The student must obtain an “Approval to Schedule Final Examination” (Approval) form from the Graduate School. Each member of the Supervisory Committee must have a final draft of the dissertation, and each member must confirm receipt and acceptance of that copy by signing the Approval form. When the Approval form with all the required signatures has been submitted to the Graduate School, they will send formal notification of the place and time of the final examination to all persons concerned. The dissertation defense must be scheduled during the time when classes are in session.
3. The student must schedule the oral presentation and defense of their dissertation (also called the final examination) with the Graduate School by turning in their Approval form. When the Approval form and the abstract and title page of the dissertation have been received in the Graduate School, the ballot will be sent to the Chair of the Supervisory Committee for the final examination.
4. The student must distribute a copy of the dissertation to the Supervisory Committee at least ten working days prior to the dissertation defense. In the interest of open communication within the Department, when the dissertation is distributed to the student’s committee, a copy of the dissertation abstract must be given to the Graduate Program Coordinator so others may preview the work.
5. The PhD student must arrange with the Graduate Program Coordinator to reserve a room when they file the Approval form so the Department can make public announcement of the time and place of the PhD defense, along with the dissertation title and abstract.
6. The PhD candidate must present the material described in their dissertation to their Supervisory Committee in an open seminar. After the public part of the presentation, the Supervisory Committee will dismiss other persons and present further questions to the student. The Supervisory Committee will vote “pass” or “fail” on the dissertation and the presentation and defense of the material contained in it. If the Supervisory Committee votes “fail” the student may make one additional presentation of the defense.
7. After the student has successfully completed the presentation and defense of their dissertation, they must make any modifications recommended by the Supervisory Committee in response to their presentation and defense. The student must submit the required number of signed copies of the final version of their dissertation, together with the fees and address information to the Graduate School.

## 4.11 Other Issues and Exceptions

**4.11.1** Any exceptions or issues not covered in this document will be resolved by the Graduate Studies Committee and by the Graduate Faculty of the Department of Computer Science.

## 4.12 Examples of Typical PhD Degree Timelines

**4.12.1** The following table illustrates a typical 5-year PhD timeline, in which the preliminary examination is completed in conjunction with the third RPE presentation. Notice that, in order to take the preliminary examination, the breadth requirements have to be completed. Consequently, in this specific scenario, the preliminary examination will not be considered passed until all the final grades in the breadth requirements become available, and the breadth requirements are satisfied.

S1	S2	S3	S4	S5		S6	S7	S8	S9	S10
Breadth Requirements										
				RPE1	RPE2	RPE3				
						Prelim.				
								Prop. Defense		
										Diss. Defense

Table 2: A typical 5-year PhD Degree timeline, with RPE3 taken in conjunction with the Prelim.

**4.12.2** The following table illustrates a typical 5-year PhD timeline, in which the RPE is completed towards the beginning of the program (3rd semester), and the preliminary examination is separate from the RPE. Notice that the preliminary examination must be completed within one semester of completing the RPE and Breadth Requirements – in this scenario, no sooner than the end of the 5th semester, and no later than the 6th semester.

S1	S2	S3			S4	S5	S6	S7	S8	S9	S10
Breadth Requirements											
		RPE1	RPE2	RPE3							
						Prelim.					
								Prop. Defense			
											Diss. Defense

Table 3: A typical 5-year PhD Degree timeline, with RPE3 taken separately from the Prelim.

**4.12.3** The following table illustrates a typical 4-year PhD timeline. Notice that the breadth requirements and the RPE are both completed by the end of the second year, and the preliminary examination is taken in conjunction with RPE3 (this is a recommended strategy for a 4-year timeline, but it is not the only option).

S1	S2	S3	S4		S5	S6	S7	S8
Breadth Requirements								
			RPE1	RPE2	RPE3			
					Prelim.			
						Prop. Defense		
								Diss. Defense

Table 4: A typical 4-year PhD Degree timeline.