

## Computer Science PhD Requirements

**Admission Requirements:** While there is some flexibility in our requirements, we generally require:

- MS or BS in Computer Science (or related areas)
- Undergraduate GPA of 3.25 or graduate GPA of 3.5
- GRE scores above the 40th percentile on the verbal section and 80th percentile on the quantitative section. Those whose quantitative score on the GRE general test is less than the 80th percentile will need to show compensating strength in their background to be considered
- TOEFL score of 79 or IELTS overall score of 6.0 and a minimum score of 5 on each subscale (international students)
- Extensive experience in computing, programming experience in C++, and a course in Data Structures and Algorithms (CS 2420), as well as a working grasp of calculus and statistics
- Faculty recommendation heavily emphasized
- These are in addition to the School of Graduate Studies (SGS) requirements that can be found at: <http://rgs.usu.edu/graduateschool/admissions>

**Supervisory Committee Approval Form (SCAF):** During the second semester of their program, all PhD students must complete their SCAF. A SCAF confirms the individuals who will serve on the student's committee. Required committee members (must be indicated on the form):

- Major Professor (or advisor) – must be from within the department issuing the student's degree
- 3 Committee members – 1 may be co-chair if necessary and approved
- Outside member – must be from outside the student's department

A doctoral degree supervisory committee must include five faculty with doctoral degrees who are approved by your department head and college dean. Three members must be from within and at least one must be from outside your department. You may have additional committee members if necessary. If the form does not have all required committee roles filled, it will be denied.

**Program of Study (POS):** The POS is a contract among the student, committee members, and the SGS outlining which courses the student will take to meet the SGS requirements and complete their degree program. Students joining the department in a Fall semester will need to submit a POS by April 1st of their second semester if they are on an assistantship or by November 1st of their third semester if they are not on an assistantship. Students joining the department in a Spring semester will need to submit a POS by November 1st of their second semester if they are on an assistantship or by April 1st of their third semester if they are not on an assistantship. In order to be approved, the POS must follow the [Computer Science PhD degree requirements](#) listed on the USU Catalog.

The current catalog listing for the Computer Science PhD in the 2021-2022 academic year is as follows:

The Doctor of Philosophy in Computer Science is, above all else, a degree of quality. Simply completing a number of graduate courses or years of study is not sufficient to receive the degree. The successful candidate must demonstrate a breadth of understanding in computer science, as

well as a depth of understanding in his or her chosen area(s) of emphasis. Also, students must show an ability to do creative research. This research should be carried out over a significant period of time. Thus, each successful PhD candidate will produce a significant piece of original research, presented in a written dissertation and defended in an oral examination. This work should be of such quality that one or more journal or conference articles can be derived from it.

Students completing a PhD/CS must fulfill the following requirements:

- Complete at least 70 credits of graduate coursework (including at least 18 credits of dissertation/research) beyond a BS/CS or at least 40 credits (including at least 18 credits of dissertation research) beyond an MS/CS with a minimum class grade of *B* and a minimum institution GPA of 3.5 on their Program of Study.
- Complete at least nine credits of 6000/7000-level computer science coursework. CS 6900 and CS 7970 are not included in the nine required credits.
- Complete 1 credit of CS 6900.
- Students with a master's degree must complete three credits of department-approved courses in addition to the 9 6000/7000-level credits. Students without a master's degree must complete 21 additional credits of department-approved courses. No more than 15 credits of 5000-level courses can be included with a previous master's or 21 without a previous master's degree. No courses below 5000-level are allowed.
- A student cannot take more than 9 credits outside of the Department. Any outside credits must be from ECE, MATH, STAT, or one of two approved courses: PSC 6150 and SOC 6150. Independent Study courses taken outside the Computer Science Department will not be approved.
- CS 5950, CS 6950, or CS 7950 can be taken only with advisor's prior permission and only for three credits at a time. The maximum total number of credits allowed for CS 5950 plus CS 6950 plus CS 7950 is three (with previous MS) or six (without previous MS).
- CS 6990, CS 7990, and CS 5060 CANNOT be counted on the Program of Study.
- CS 6250 can be taken only with advisor's prior permission and a maximum of three credits is allowed.
- Pass a PhD Qualifying exam, demonstrating depth and breadth of knowledge in computer science and the student's area(s) of emphasis.
- Successfully complete and defend a research proposal.
- Successfully complete and defend a dissertation (CS 7970), for at least 18 credits.
- The overall GPA must be at least 3.5 for degree-program courses, and grades of B- or lower will not be accepted.

Requirements may change from time to time, so students are advised to check with the department or their advisor to determine whether the requirements at the time of graduation or in the first semester of registration as a graduate student will have an effect.

**Individual Development Plan (IDP) & Annual Reviews:** Once per year, students should complete an IDP. This is a College of Science requirement. Information on IDPs can be found at <https://www.usu.edu/science/pages/students/graduate-individual-development-plan>. In addition, PhD students must complete an annual review with their major professor to ensure progress in their program.

**Qualifying Exam:** The aim of this exam is to demonstrate the students ability to write a technical research paper and to follow a complete research methodology on a small scale. While publication of the paper is not a requirement, it must be in a publishable format. The requirements of this exam are as follows:

### **1. PhD Paper and Presentation Examination**

- The expectations for this paper are as follows: (a) The student is the primary author of the paper, and its topic has been agreed to by his/her PhD faculty supervisor (b) It is at least six pages in length written in the accepted publication format for the targeted conference or journal (c) The paper should be written in the style of a standard technical research paper, i.e., incorporating elements such as an introduction, significance, problem definition, methodology, experimental results, discussion, and correct citations.
- When deemed ready by their major professor, the student will defend their paper in a public meeting before their PhD committee. The defense date must be set at least 10 working days from the exam date. The length of the oral presentation is at the discretion of the supervisory committee, but will not exceed two hours.
- All members of the supervisory committee must be present at the exam in person or remotely.
- The goal of this qualifying policy is to provide early validation of a student's ability to succeed in the research component of the doctoral program. The student must not only defend the paper but also their understanding of the foundations and state-of-the art of the paper's research focus.
- Upon completion of the paper defense, each member of the PhD committee will vote indicating his or her approval or disapproval of the paper as an indication of appropriate capability for a doctoral student; this will be a majority rules vote.
- If the student fails this qualifier, he or she must rewrite the paper to address the inadequacies identified by the committee. The student will have one additional opportunity to retake and pass the exam within three months in order to continue in the program.

While there is some flexibility in the scheduling of the qualifier, it is important that it be completed early in one's program. For that reason, the following timelines are given:

- Those without an MS must have completed 18 credits and have a 3.5 GPA in order to take the qualifier.
- Those with an MS must have completed 12 credits and have a 3.5 GPA in order to take the qualifier.
- Students may complete (register for) a maximum of six credits of CS 7970 (dissertation credits) before successfully completing the qualifier.

Students must complete this exam within a maximum of 24 credits or two years. Extensions beyond the 24 credits or two years require approval of the student's graduate committee.

### **2. Thesis Proposal Defense**

The primary objective of the thesis proposal defense is to determine the quality of the research proposed by the candidate. It is expected that the quality of the proposed research will be worthy of a Ph.D. in Computer Science. The requirements of this exam are as follows:

- At least 10 days before the examination the student must submit to the committee their written proposal. This proposal must be approved by the major professor before it is distributed. The proposal should be written in the style of a standard technical research proposal, i.e. incorporating elements such as an introduction, specific aims, significance, innovation, methodology/approach, preliminary results, impact, software data sharing plan, project timeline and correct citations.
- The thesis proposal defense is conducted by the student's supervisory committee and chaired by the examination chair selected according to the standard USU practice. This meeting is open to the public. The format of the thesis proposal defense is an oral presentation followed by questions. The length of the oral presentation is at the discretion of the supervisory committee, but will not exceed two hours.
- All members of the supervisory committee must be present at the exam in person or remotely.
- The supervisory committee grades the candidate's performance in terms of two grades: pass or fail.
- After the defense, the supervisory committee produces a written report documenting the student's performance. The report offers a justification of the committee's decision.
- In case of failure, the candidate will have one more opportunity to pass the thesis proposal defense. If the candidate fails the retake, the candidate may reapply to the Ph.D. program.
- While there is some flexibility in the scheduling of the proposal, it is important that it be completed in a timely manner. For that reason the student will complete this exam within a maximum 36 credits or three years. Extensions beyond the 36 credits or three years require approval of the student's graduate committee.

**Application for Candidacy (ACDD):** Submit an ACDD after your dissertation proposal is approved, all regulatory approvals are complete and you pass your comprehensive exam.

Responsible Conduct of Research (RCR) Training is required for all doctoral students who started their program after July 2013 and any master's student whose committee deems it appropriate for their student to take. Any doctoral student who was supported on a grant from the National Science Foundation after 2010 is required to take the RCR training.

Any graduate student funded by NSF, USDA-NIFA, or NIH has training requirements specific to their funding. Please contact Research Integrity and Compliance for more information about completing these requirements.

For updates on Institution Review Boards (IRB) regulations and to determine whether your research requires IRB approval, visit the IRB website.

If the research requires IRB or IACUC approval, the student must download a copy from ServiceNow of this form after it has been signed by all committee members and submit a copy of the document in Protis under the 'Students, Dates, and Funding' tab, where it requests a signed copy of the proposal cover page. NOTE: the student can log into ServiceNow and determine if all committee members have signed the form, and download a copy of the form (pdf format) even though the form has not yet been initialed by the IRB or signed by the Graduate School.

The ACDD, signed by all members of your committee and the department head, attests that you are ready to conduct independent dissertation research.

The student, major professor, committee members, department head, SGS dean and, if needed, the IRB office will receive an email notification from ServiceNow, an electronic signature service, to review and approve the ACDD.

Once all signatures are obtained electronically, all parties will receive a final email from ServiceNow with a completed form.

**Appointment for Examination (AFE):** Students should schedule their final defense during their final semester. At least four weeks prior to the defense, students should give a copy of the dissertation to each member of the supervisory committee for approval or corrections. After tentatively scheduling a time for the defense with their committee, the AFE form must be completed by the student and submitted to the SGS to officially schedule the defense of the dissertation. It must be submitted at least 10 business days prior to the student's defense. Submitting the AFE form allows the SGS to confirm that all required paperwork is complete and committee members have read the dissertation ahead of time and agree that it's ready to be defended.

#### **Defense:**

- Any final defense held without following the proper procedures is invalid
- All defenses are public
- You must be registered for at least 3 credits the semester of defense (to be considered full-time at 3 credits, a Full-Time at 3 credits form must be approved).
  - If *all* credit requirements on an approved POS are met, you may qualify to register for 1 credit in the semester of defense. Registering for 1 credit will not qualify you to be considered as a full-time student (i.e. you will not qualify for an assistantship).
  - International students should check in with the Office of Global Engagement when making decisions on the number of credits needed.
- Your supervisory committee cannot be changed in the 6 weeks prior to defense.
- All committee members *must* attend the defense at the date and time registered with the SGS
  - Up to 2 members of a doctoral committee may participate remotely (i.e. via Zoom or Skype). NOTE: This limit is currently suspended due to COVID precautions.
- No committee member should agree to proceed with a defense until they have carefully read and approved the dissertation
  - If the paper is not ready to be defended, notify the major professor and student, then reschedule the defense
- The student should be informed of the defense results at the conclusion of the defense
- Doctoral students should review the Thesis/Dissertation requirements
- If the defense is not successful, the student will need to schedule a new defense and will need to be registered for the semester of redefense.

**Record of Exam (ROE):** Once a student has completed their defense, the major professor must email the Graduate Program Coordinator (GPC) the outcome of the defense. The GPC will submit the ROE.

**Authorship & Copyright:** The Authorship form specifies plans for publication. You must discuss your plans for publication with your chairperson and your committee to avoid misunderstanding about co-authorship or other acknowledgements as you publish parts or all of your thesis/dissertation. The form also asks for a date by which an acceptable draft will be submitted to your major professor or other USU faculty with whom you will publish. Establishing this timeline is crucial as it is important to get contributions to knowledge into the literature promptly. If the date for submission is not met, the faculty member may prepare the first draft of a manuscript for submission and, consequently, be listed as the first author. Your signature and those of your committee members indicate that you have discussed the plans and all are in agreement.

The rights to copyright and data are especially of concern if your thesis /dissertation research is carried out as part of a project with a Principal Investigator (PI) or in a laboratory using supplies and equipment furnished for you. Under certain circumstances, data gathered for use as part of a research project are the property of a federal, state, or private agency, Utah State University, or the PI(s). Students using such data may be required to waive the right of ownership and/or the privilege of copyrighting the thesis/dissertation early in your program. You should discuss the ownership and the right to the data to be utilized in your thesis/dissertation with your committee chairperson and, if your thesis/dissertation involves work on a project or in a lab, with the PI or lab director.

## **Format & Style:**

### **Format:**

- **Monograph Format:** This, the ‘traditional’ format, consists of a multi-chapter document that uses the same style throughout. A single chapter is not acceptable for a thesis or dissertation.
- **Multiple-Paper Format:** A thesis or dissertation using this format consists of at least two chapters, typically written as independent papers, preceded by an introductory chapter that sets the context for the research, and followed by a summary and conclusions chapter that integrates all of the studies.

### **Style:**

- The style defines the way that text is presented on the page (e.g., fonts, font sizes, margins, indents, line spacing, page numbering). For a document in the monograph format, the style should be consistent throughout the document. For a document in the multiple-paper format, the style may differ for chapters that are targeted for publication in different journals, however the style should be consistent within each chapter. The style in which a thesis/dissertation is written is dependent upon the student’s departmental guidelines and the specifications of this document. The terms ‘journal style’ or ‘manual style’ refer only to the style guide a graduate student follows for citations, a reference list, headings/subheadings, table titles, figure captions, mathematical symbols, and other stylistic elements not specified by the USU Publication Guide. A journal style or a conventional style manual (such as APA or MLA) may be used as a guide for either a multiple-paper or a monograph format.

- The USU Publication Guide *and* department-approved style manuals are the final authority for format and style. Do not use previously approved theses or dissertations as models. Handling of special problems/materials not covered by this guide or by the departmental style manual should be discussed with and approved by the thesis and dissertation reviewer (currently, Erika Beckstrand) for the SGS.
- The USU publication guide *is not* a style guide. It should be referenced for your front matter and appendices.
- Individual departments have jurisdiction over stylistic elements not covered in the SGS Publication Guide. In Computer Science, the department requires its dissertations, theses, and reports to use the IEEE Transactions citation reference. The guide for IEEE citations can be found at <http://www.ieee.org/documents/ieeecitationref.pdf>
- In cases where the USU Publication Guide is unclear on stylistic elements, students are encouraged to confer with the IEEE author toolkit found at [http://www.ieee.org/documents/info\\_authors\\_kit.pdf](http://www.ieee.org/documents/info_authors_kit.pdf)

You, your major professor and your supervisory committee should agree on the format and style of your thesis or dissertation early in the writing process. The Dissertation/Thesis Format and Style form communicates which format and style have been chosen.

You are responsible for proofreading your thesis/dissertation and having it read and approved by all committee members and the department reviewer before having the GPC submit an electronic version (PDF format) of the document to Box.

The thesis and dissertation reviewer in the SGS will review your thesis or dissertation for proper format and conformity to departmental and SGS standards. If corrections are required, an annotated copy of the electronic file will be uploaded to Box where it can be accessed by the student, the major professor and the department reviewer.

**Signed Title Page:** Once your committee has approved your dissertation, they will need to sign the title page. Title pages are now signed digitally using the form on ServiceNow. By approving the form, the committee members agree that the student's final document is ready to be put before the SGS and the Vice Provost for final approval.

**Final Draft Submission:** Once your committee has approved your dissertation, submit the final draft to the Computer Science GPC. The GPC will review it and submit it to graduate school for their review. You will be informed if corrections need to be made. Once it has been approved, you will need to order two bound copies for the department: one copy for your major professor and one copy for the CS conference room. Please send the receipt to the GPC showing that you paid for them.

**Graduation Paperwork:** Students are eligible to graduate when they have completed all coursework on an approved POS and successfully defended their dissertation. If they have submitted all the above forms by the deadline for submitting paperwork (typically 3 weeks before the end of the semester), then they will be emailed the link for graduation paperwork. Students must submit an application for graduation and pay the application fee before their degree can be awarded.