Computer Science

TENNESSEE TECH

PhD Handbook

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Admission Requirements for the Ph.D. Degree in Computer Science

Admission is decided based on a multi-parameter criterion that includes the following items to be evaluated by the department's graduate admission committee:

- Master's or Bachelor's degree in Computer Science or a related field from an accredited institution
    - GPA >=3.5 on a 4.0 scale
- GRE scores (*students with undergraduate or Masters degrees from a U.S.-based institution are not required to take the GRE*).
    - GRE scores with the following percentiles: Quantitative $\geq 66\%$, Verbal $\geq 33\%$, and Analytical Writing $\geq 25\%$.
- Three letters of recommendation that demonstrate strong evidence for success in the doctoral program.
- Availability of TTU CS faculty to serve as research advisor(s).
- Research experience and accomplishment.
- Post-BS/MS degree professional experience relevant to the planned degree of study.
- Publications in peer-reviewed journals and conferences.
- TOEFL/IELTS score (*international students only*).
    - Minimum score of 79 (IBT) or 213 (CBT) on the TOEFL, or a minimum base score of 6.5 on the IELTS.

Though the general requirement for admission to the Ph.D. program is a master's degree in an appropriate discipline, students with a bachelor's degree may be admitted to the Ph.D. program directly on an exceptional basis, provided the applicant has a record of excellent academic performance in an appropriate science or engineering undergraduate program. Based on the level of satisfaction with the above criterion, the department will either recommend admission to Full Standing, Provisional Standing, Special Standing, or deny admission. Special Standing and Provisional Standing status may be changed to Full Standing after the student satisfies the requirements specified by the department at the time of admission.

If admitted in provisional standing, the student must remove all deficiencies and apply for reclassification to full standing prior to the completion of fifteen (15) graduate hours.

Requirements for the Ph.D. Degree in Computer Science

Students Admitted with a Master's Degree

A minimum of 48 credits of course work and doctoral research and dissertation as follows:

1. A minimum of 18 semester credits of course work beyond the master's degree, including 6 semester credits of 7000-level course work acceptable to the student's advisory committee. Additional six semester credits of either graduate level course work or research work. The following restrictions apply for the course work:
   a. If student did not take a computer science theory course during their Master's work, 3 of the 18 credits must include CSC 6400 (Advanced Analysis of Algorithms).
   b. No 5000-level courses are to be used to meet the minimum requirements of course work.
   c. No directed study courses (CSC7980) are to be used to meet the 7000-level course requirement.
   d. No more than 3 credit hours of directed study (CSC 7980 or CSC 680X) are to be used to fulfil the course work requirement.
2. The equivalent of 24 semester credits of doctoral research and dissertation built upon the student's course of study and making a significant contribution to the state of knowledge is required; not more than 9 credits may be earned in a particular semester.
3. Residence of four semesters beyond the master's degree, with at least two semesters in continuous residence, is required. All requirements, including the dissertation, must be completed within a period of eight consecutive years.
4. Maintenance of a minimum quality point average of 3.0 and adherence to the general regulations of the Graduate School are expected.
5. All students in the program must follow a plan of study and research developed in conjunction with an advisory committee, satisfactorily complete a comprehensive examination, achieve candidacy, and satisfactorily defend the dissertation.

Student's Admitted Directly from the Bachelor's Degree

A student admitted with a bachelor's degree on an exceptional basis **from a non-ABET accredited program**, must successfully complete an *assessment interview* based mostly on undergraduate materials before the end of the second semester of enrollment. This examination will be aimed at determining the student's mastery of the basic concepts in the discipline and the potential for successfully conducting research at the doctoral level. Based on the student's performance on the assessment interview, the student may be (i) permitted to continue in the Doctoral Program, or (ii) advised to transfer to a MS Degree program in an appropriate discipline in the College, or (iii) recommended for termination from the graduate program of the College. (*See **Assessment Interview** section below.*)

If permitted to continue in the doctoral program, the student, as described elsewhere in the catalog, will select a research advisor, form an advisory committee, and submit a program of study. The program of study should have a minimum total of 72 semester credit hours of academic work, consisting of course work and dissertation work, beyond baccalaureate work, subject to the following:

1. The program of study should include a minimum of 42 semester credits of appropriate graduate level course work consisting of a minimum of 6 semester credits at the 7000-level. It should also include an additional 6 semester credits of either graduate level course work or research work. Following restrictions apply for the course work:
   a. A maximum of 9 credit hours of 5000-level courses may be used to meet the minimum requirements of course work.

    b.   No directed study courses (CSC7980) are to be used to meet the 7000-level course requirement.

    c.   No more than 9 credit hours of directed study (CSC 7980 or CSC 680X) are to be used to fulfil the course work requirement.

        i.   Up to 3 credit hours may count toward an M.S. degree.

        ii.   A total of 6 credit hours can be used toward the Ph.D.

2. A minimum of 24 semester credit hours of doctoral research and dissertation, built upon the student's course of study and making significant contribution to the state of knowledge, is required; no more than nine credit hours may be earned in a particular semester.

3. The other requirements, such as residency, grade point average, comprehensive exam, and dissertation are the same as those for students admitted with a master's degree, as described in the catalog.

Assessment Interview (BS-to-PHD students ONLY if from non-ABET accredited program)

If admitted directly with a Bachelor's degree (Direct Admit) from a non-ABET accredited program, a Ph.D. student must successfully complete an **oral** Assessment Interview, by the end of their second semester of graduate study at TTU.

An Assessment Interview Committee (AIC) is formed each year, composed of 4 graduate faculty members, consisting of 3 members of the graduate faculty 1 member of the CS Graduate Application Committee. At the time of the Assessment Interview, IF the student has a Graduate Advisor, the AIC may elect to replace a member with the student's Graduate Advisor.

The Assessment Interview will consist of oral questions, covering the following:

1. The student's research background

2. The student's curricular and extra-curricular experiences

3. Undergraduate CS subjects

In order to pass the Assessment Interview, the student must receive a majority of "pass" votes from the AIC; otherwise, they have failed the exam. If the student passes the exam, a memo is written by the CS Graduate Application Committee member of the AIC to the Chair of the department, indicating the student has passed the Assessment Interview. If the student fails the interview, they may be given ONE more chance to take the assessment interview at a later date.

If the student fails the interview a second time, the AIC may choose one of the following (and submit a corresponding memo to said effect):

1. Dismissal from the program; or

2. Admission into the MS program

If there is a tie in the AIC voting on the second attempt, the CS Graduate Application Committee member of the AIC breaks the tie.

Advisory Committee

Each Ph.D. student's advisory committee will have a minimum of five (5) voting members with at least three members from the CS department and at least one (1) member from outside the

department. The Assistant/Associate Dean of Graduate Education and/or Research in the College of Engineering will serve as an ex officio, nonvoting member. The student is responsible for identifying, in consultation with the departmental chairperson and Assistant/Associate Dean, a faculty member who is willing to chair his/her advisory committee. In consultation with the chairperson of the committee, the student is responsible for identifying the other faculty members required/desired and determining if they are willing to serve. Advisory committee is permitted to have more than the minimum number required. Normally one faculty member will serve as the chair. If the proposed research work is interdisciplinary, or if the initial chair retires, experiences health problems, or for some other cannot continue to perform all of the duties of the chair, the student may request that a co-chair be appointed. The request should be made in writing to the Associate Vice President for Research and Graduate Studies, via the Departmental Chair and the Assistant/Associate Dean of Engineering Graduate Education and/or Research. If a student is not able to identify a sufficient number and type of faculty who are suitable and willing to serve on his/her advisory committee, the student will be advised by the Associate Dean that he/she should either change his/her area of research interest to more closely match those of the available faculty or consider selecting another major. Failure to be able to form a committee is a cause for transfer to non-degree status. Further regulations concerning the membership, appointment, and responsibilities of the advisory committee are given in other sections of the catalog, including the sections on "Organization of the Graduate School" and "Degree Requirements."

PhD Pre-Proposal Presentation

No later than the semester before the student plans to take their comprehensive exam (*see PhD Comprehensive Exam section*), they must present a pre-proposal presentation of the research that have accomplished so far to their Advisory Committee (*see previous section*). This includes any research they have done, ideas they are considering for their eventual dissertation research, courses they have taken, and their proposed Program of Study. The student's committee will use this opportunity to provide the student feedback and guidance.

PhD Comprehensive Exam and Admission to Candidacy

The PhD comprehensive examination will consist of an exam and a written and oral presentation of the Research Proposal. The examination will be formulated by the advisory committee, as appropriate to the student's area of research. This examination will test the student's breadth of knowledge across the discipline, depth of knowledge in the research area, and the ability to integrate the knowledge acquired from several courses. This examination is given after the student has completed most of the coursework prescribed in the program of study. It must be completed within one semester following completion of all coursework in the program of study. All parts of the comprehensive examination should be completed within a period of two weeks. The details of this examination, including format, content, method of evaluation and timing, will be left to the discretion of the committee. All voting members of the committee should participate in evaluating the student's performance in the examination. The research proposal should consist of the development of the research problem from the extant knowledge in the area, the approach and methodology to be followed, the expected original contribution to the extant knowledge and the expected time-line for the completion of the research. The student should submit copies of written proposal to the committee at least two weeks before the oral proposal presentation. The student will be informed of the results of the entire comprehensive examination at the end of the defense of the research proposal.

On passing the comprehensive exam, the student is admitted to candidacy for the doctoral degree. A student not passing any part of the comprehensive examination will be given a second chance to pass the part of the examination that he/she did not pass. The committee may prescribe additional academic work to be undertaken by the student prior to making the second attempt. No student will be permitted to continue in the PhD program if he/she does not successfully complete all parts of the comprehensive examination after the second attempt.

Dissertation Defense

A fundamental milestone in the graduation requirements is completion of the Oral Defense, which consists of an oral presentation by the student of her/his dissertation research results, followed by questioning. The overall intention is to test the breadth of knowledge in the discipline, depth in the specific area of research and ability to integrate concepts and techniques learned in the various courses. Students should schedule the dissertation defense date well in advance to ensure that all members of their committee are in attendance. Students must submit a draft copy of their dissertation to their committee and to Graduate Studies at least two weeks before the defense date. The defense begins with an open session in which the candidates make a presentation to their committee and other faculty and students. The audience then asks the candidate questions regarding their research work. Afterward, in a closed session, the committee examines the candidate on the details of their thesis, as well as any other relevant material. Then the candidate is asked to leave the room, and the committee discusses the candidate's performance and then votes to pass or fail the candidate. The student must pass this examination by three (3) positive votes or three- fourths of the committee members eligible to vote. A signature form is then forwarded to Graduate Studies with the results of the examination. If the candidate passes the exam, the committee instructs the candidate on any required changes or new work needed to complete their thesis. If the candidate fails the exam, the committee informs the candidate in writing regarding the additional work that the candidate must undertake before taking the examination a second time. The second attempt may be scheduled as soon as these deficiencies are rectified. However, failure on the second attempt results in dismissal from the graduate program. The requested revisions to the dissertation must be made, final signatures of all committee members obtained, and the Final Dissertation must be electronically uploaded to the office of Graduate Studies at least one week before graduation.