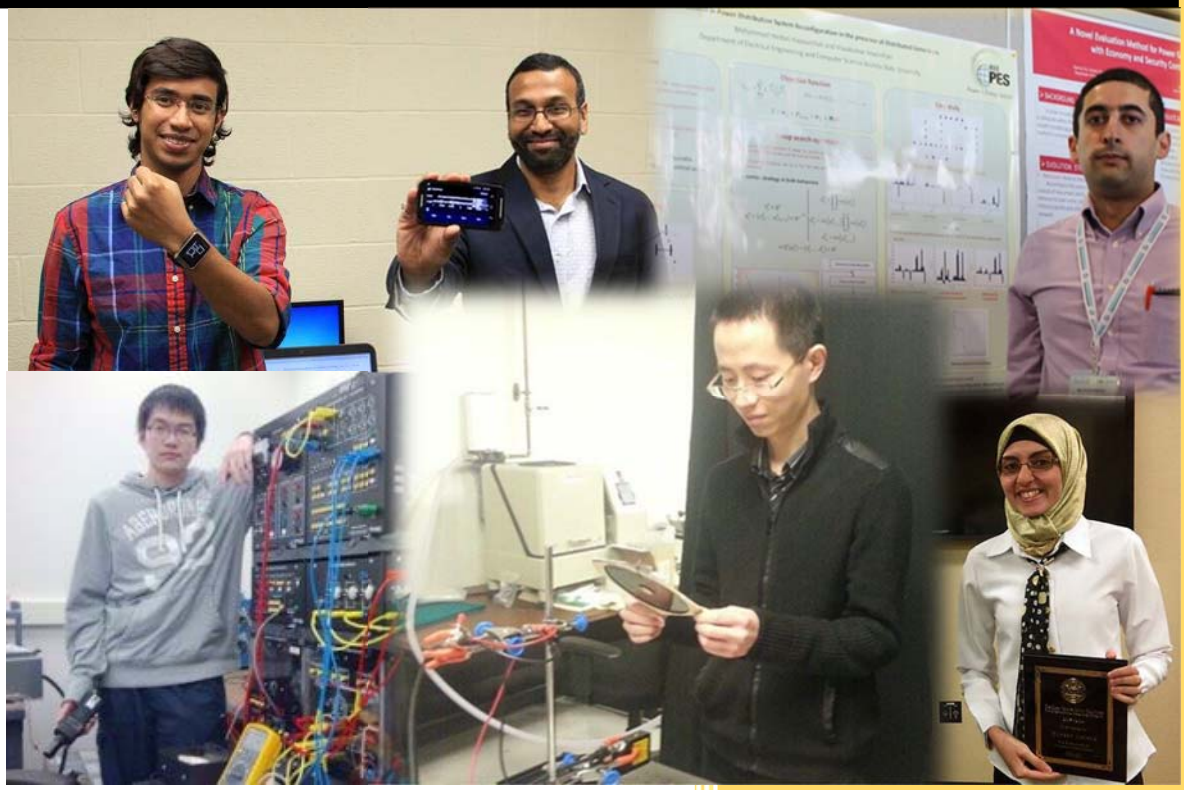
WICHITA STATE UNIVERSITY

Ph.D. in EECS Handbook



Electrical Engineering and Computer Science

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Contents

Program Description

The Doctor of Philosophy program in Electrical Engineering and Computer Science (***Ph.D. in EECS***) is a degree designed mainly to prepare students for a career in research and education (in industry or academia). Even though, the program title is Ph.D. in EECS, ***students may tailor their educational experience based on their interest***. (For example, a student interested in computer science can solely focus on CS related areas [i.e., algorithms and data structures, cybersecurity and privacy, data science and machine learning and software engineering] and meet the requirements based on this specific area of interest; such student is not required to have any preparation in electrical engineering. Similarly, students interested in EE or CE can focus on their own sub-disciplines.)

The focus of the degree is on developing necessary skills to advance the knowledge in **any** one of the specialized areas offered by the department, contribute to the field by proposing new ideas, showing new results, expanding human knowledge, or making discoveries, and disseminating the results to others in scholarly publications and patents. Students take ***advanced courses*** to have necessary skills to complete their *doctoral dissertation*.

Ph.D. Admission Requirements

Students can enter the Ph.D. in EECS program under either of the following two classifications:

- **MS-to-Ph.D.** admission requirements are:
    1. A completed master's degree, with a grade point average of at least 3.250 in electrical engineering, computer engineering, computer science, or a related field.
    2. Official GRE General (Aptitude) test score, with an excellent quantitative portion.
    3. Evidence of ability to carry out independent research and present it in written English is highly desirable (e.g., evidence of prior scholarly publications).
    4. A statement of purpose is encouraged
    5. Two letters of recommendation are encouraged

- **BS-to-Ph.D.**
    1. A completed bachelor's with a grade point average of at least 3.250 in electrical engineering, computer engineering, computer science, or a related field.
    2. Commitment from an EECS faculty member to serve as the Ph.D. advisor from the beginning of the program (it is recommended that students contact relevant faculty members prior to completing the application).
    3. An official GRE General (Aptitude) test score, with an outstanding quantitative portion.
    4. Evidence of ability to carry out independent research and present it in written English is highly desirable (e.g., evidence of prior scholarly publications).
    5. A statement of purpose is highly encouraged.
    6. Two letters of recommendation are highly encouraged.

Ph.D. Degree Requirements

The requirements listed below apply to both options (M.S.-to-Ph.D. and B.S.-to-Ph.D.), except where explicitly specified.

1. EECS Areas of Study:

The following are considered as specialization areas for Ph.D. in EECS degree. Students will major in one of the topics of their interest.

- Algorithms and data structures
- Computer architecture
- Computer networking
- Control systems
- Communication systems
- Cybersecurity, information assurance and privacy
- Data science and machine learning
- Intelligent systems and robotics
- Power and energy systems
- Software engineering

2. Advisory Committee:

Advisory Committee must be formed within the first 12 credit hours of Ph.D. coursework. The *Student* and her/his *Advisor* will form the committee (in consultation with the Department Chair and the Ph.D. Graduate Coordinator). The *Advisor* should ensure that the committee is composed of a minimum of five graduate faculty, with at least four having regular Graduate Faculty membership, including the chairperson. Faculty holding Affiliate Graduate Faculty status may co-chair the advisory committee if the other co-chair holds regular Graduate Faculty status. At least one committee member (the graduate dean's representative) must be from an academic department outside the major department. The majority of the committee members must be from the major department. The chairperson of the advisory committee is by definition the *Student'*s dissertation advisor (i.e., *Advisor*). However, ***only*** *upon successful completion of Dissertation Proposal Examination and notification to the graduate dean, the Student's doctoral advisory committee is officially acknowledged and recorded by the Graduate School*.

3. Plan of Study:

Upon formation of the advisory committee and before the completion of the first 12 credit hours, the *Student* and the *Advisor* will develop a plan of study. The plan of study should be acknowledged by the advisory committee and approved by the Ph.D. Graduate Coordinator and the Dean of Graduate School. Students need to complete a **minimum of 72 credit hours in order to graduate.** The following degree requirements must be met for each option:

MS to Ph.D.

- A student entering with M.S. degree in a related area can be credited with up to 24 credit hours for relevant courses in their M.S. degree. Therefore, M.S.-to-Ph.D. students are required to complete 48 credit hours beyond their M.S. degree (72-24 = 48 hours).

- If a student has completed less than 24 hours of coursework as a part of their MS degree, credit would be given to the exact number of hours completed (for those classes that transfer). The difference in credit hours must be met by coursework as a part of their Ph.D. (For example, a student coming in with an 18 credit hour M.S. degree where all 18 hours belong to acceptable transfer courses then (s)he would have to complete 6 more credit hours.)
- If a student has completed more than 24 credit hours of coursework as a part of their M.S. degree only 24 hours can be used.
- A minimum of 12 credit hours of coursework approved by the Advisor are required. Any individual reading/independent study courses such as EE893 can't satisfy this requirement.
- A minimum of 24 dissertation hours are required.
- The remaining 12 credit hours can be coursework, dissertation, or any combination of both/either. A maximum of 6 credit hours of individual reading/independent study courses such as EE893 can be used.
- At least 60% of the doctoral credit hours, beyond the master's degree, must be 800-level and above. (Ph.D. dissertation hours are counted as 800-level or above hours.)

BS to Ph.D.

- A minimum of 36 credit hours of coursework are required as approved by the Advisor. A maximum of 6 hours of individual reading/impendent study courses such as EE893 can be used.
- A minimum of 24 dissertation hours are required.
- The remaining 12 credit hours can be coursework, dissertation, or any combination of both/either.
- Students must complete 60% of total hours at the 700-level or above, and the majority of total hours (50% plus one hour) must be 800-level or above. (Ph.D. dissertation hours are counted as 800-level or above hours.)
- Students who convert from an M.S. degree to Ph.D. in EECS can use courses taken prior to admission to fulfil Ph.D. degree requirements only with the approval of their advisory committee.

Transfer hours cannot be used to satisfy the course level requirements (at 700 or above or at 800 or above) stated above unless transfer hours are of the appropriate level, and from Kansas Board of Regents institutions (please see Section 11 of this document). Workshop hours may not be used to satisfy the course level requirements. Transfer credit policies are outlined under the heading "Transfer of Credit from Another University" in the graduate catalog. (This means that even if a student has 24 credit hours of transfer from outside Kansas, they will not count towards the 700 or above or 800 level or above requirement, even if these classes were advanced level classes)

4. Qualifying Examination

The Student should complete the qualifying exam no later than completion of the initial two academic years in the program. Upon passing the qualifying examination, the Student is known as an aspirant for the Ph.D.

The Ph.D. advisory committee, on the request from the Advisor, shall conduct the Qualifying Exam (QE) to evaluate the Student's research readiness to eventually complete the dissertation requirements. That is, whether the Student has the required background and satisfactory performance in the relevant coursework, demonstrated a preliminary understanding of the research literature relevant to their

projected dissertation, and has a future-research plan including the graduation timeframe. The committee must inform the Student about the structure of the qualifying exam in advance, e.g., allocated time to present their case for research readiness and Q&A from the committee. If the full committee is unavailable, at least three committee members are sufficient to administer the qualifying exam, although tele-presence is preferred. Research reediness part of the QE should be open to the public unless any of the research presented is undergoing or will undergo protection; in such case the QE can be administered in a private fashion.

The Student is graded pass or fail on the qualifying exam based on a simple majority vote of the committee. The committee may require revisions to the plan of study, remedial actions, and/or supplementary assignments regardless of the outcome. If the Student fails the qualifying exam, another attempt can be requested. No more than two attempts are permitted. The advisor should report the outcome (date, format and results) to the department (Ph.D. Graduate Coordinator) within three business days of the qualifying exam's conclusion.

Recommended qualifying exam Format:

- It is recommended that the advisory committee members administering the qualifying examination should have a good understating of the area of research.
- The exam could comprise of two parts. The recommended two parts are:
    - **Mastery in background related to the core area of study:** A written or oral examination could be administered by the Ph.D. advisory committee to test the necessary fundamental knowledge in the core area that is vital for the successful completion of their research. This part of the example will be closed to public.
    - **Research readiness:** the Student should have the ability to read technical papers, critically analyze the main contribution, understand the technical approach and determine the limitations of the proposed work. The advisory committee will select paper(s) of interest, with recommendation from the advisor. The Student is expected to provide a comprehensive analysis of these paper(s). This part of the exam shall be open to public. The oral and written presentation must contain the following:
        - Summary of the paper(s) presented
        - Problem solved in this paper(s) and main contribution
        - Technical approach (other related approaches, reason for using a specific approach, etc.)
        - Limitations of the proposed work and
        - Relevance and rationale for selection (especially how it is related to the planned research)

It is recommended that the *Student* provide a written summary along with the paper to the advisory committee two weeks prior the oral presentation date.

Mastery in background related to the core area of study can be tested by implementation, time-limited exam, or oral examination. It is recommended not use take-home examinations to check the mastery in the background related to the core area of study.

5. Dissertation Proposal Examination (Dissertation Approval Examination)

The dissertation proposal examination (Dissertation Approval Examination – DAE) is required to ensure that that the Ph.D. aspirant has the ability to carry out the proposed research and this research qualifies as a Ph.D. dissertation.

The *Student* and the *Advisor* with consultation by the advisory committee will petition for permission to administer the DAE to the Dean of Graduate School. Based on the *Student's* performance the *Advisor* will determine an appropriate timeline for DAE. It is recommended that B.S.-to-Ph.D. students petition for DAE by their eighth semester and that M.S.-to-Ph.D. students petition for dissertation proposal examination by their fifth semester. It is expected that the proposal is the initial skeleton of the dissertation with some chapters already written.

The *Student* will submit a written dissertation proposal to the advisory committee. At minimum, the written proposal should contain the following:

- Comprehensive literature review including current state of the topic of interest and limitations;
- The research problem that is solved in this dissertation;
- Preliminary results showing the *Student*'s ability to conduct research;
- Expected outcomes of this research work; and
- Timeline for graduation.

Upon passing the dissertation proposal examination (within two weeks) the *Student* must submit a formal proposal agreement document to the EECS department, which will be placed in the student file. This proposal agreement document must include the expected research outcomes from the destitution, expected publications and any conditions; the document will have to be signed by the *Student*, the *Advisor*, and the advisory committee.

It is understood that the research might undergo changes as the *Student* progresses. The *Student* and the *Advisor* could change the project as deemed with the approval from the advisory committee. In such case an amendment to the proposal agreement document has to be completed.

The *Advisor* will relay the results to the graduate school within three business days.

Upon passing the dissertation proposal examination the *Student* will be known as a candidate for the Ph.D. degree (or Ph.D. Candidate for short). Upon notification to the graduate dean of a successful completion of dissertation proposal examination, the Student's committee is officially acknowledged and recorded by the Graduate School.

6. Dissertation Credits and Periodic Assessment

Upon successful completion of dissertation proposal examination, the candidate must be continuously enrolled in Ph.D. Dissertation for a minimum of 6 credit hours each long semester and 2 credit hours in the summer session until completing at least 24 credits hours of Ph.D. Dissertation. After this, 2 credit hours per semester are required.

At the completion of the dissertation proposal examination, the advisory committee will determine the frequency of periodic assessment of candidate's dissertation work (usually semi-annual). The candidate will be required to submit a one-page report showing their progress. Additional pages could be attached as annexure if deemed necessary by the *Advisor*

7. Final Dissertation Examination

The final examination is the oral defense of the dissertation. The *Student* must defend their dissertation in front of the advisory committee. At least five months must elapse between the dissertation proposal (DAE) and the final examination. The final examination is open to public.

When the *Advisor* makes the determination that the *Student* has completed their dissertation and ready to defend, they can initiate the defense process by contacting the advisory committee members. Once date and location are confirmed, the *Advisor* will petition the Graduate School to schedule the oral defense. The *Request to Schedule Oral Defense* form should be submitted to the Graduate School two weeks prior to the requested defense date.

The Graduate School publishes deadline to hold oral defense every semester. The dissertation manuscript must be delivered by the *Student* to the committee members at least two weeks prior to the date of the oral defense.

After the defense, the advisory committee deliberates and votes. If the *Student* receives two or more negative votes, or a negative vote from the *Advisor*, the *Student* will be considered to have failed the final dissertation examination. In such a case, the *Student* will be allowed to retake the exam upon satisfying the concerns from the committee members. If the *Student* fails the final dissertation examination twice, the *Student* will be dismissed from the program without a degree.

8. Publication: Journal Articles and Conference Proceedings

Distributing research outcomes through peer reviewed scholarly journals and/or conference proceedings is important for Ph.D. students. These publications and participation in conferences provides much needed recognition to students in their professional community. It is important to publish Ph.D. work in an appropriate venue, which would provide the necessary exposure. A magnitude of high-quality journals and conferences are published/held annually. Experienced scholars would typically subscribe to specialized journals or conferences. Being able to publish in a recognized venue shows that the *Student* has the potential to advance in that field. Therefore, it is important to share Ph.D. work in specialized and recognized venues. Potential employers of Ph.D. holders prefer candidates who have shown their ability to publish their work in recognized journals and/or conference proceedings.

It is expected that students publish parts of their dissertation in peer-reviewed recognized journals or conference proceedings. Any publication while being a Ph.D. student should be approved by the *Advisor*. The EECS department does not require any minimum number of publications; however it expects that students' dissertations result in multiple recognized publications. Students are encouraged to discuss the venues of publication and typical expectation with their advisors periodically, but as soon as completing the first semester.

Department recommendation:
If you prefer your work to be noticed by others you need to have effective written communication skills. You will be able to acquire such skills only by your publication attempts. Recognized journals will take several months to accept an article for publication. First publication is very crucial. Start the process very early and interact with your advisor often in this process.

9. Residency Requirement

Doctoral students are required to spend at least two continuous semesters (summer excluded) as full-time students.

10. Time limits

From the time the *Student* is admitted to the program, no more than 10 years may elapse until requirements for the degree have been completed.

11. Transferring Coursework

Upon approval by the advisory committee courses can be transferred from another institution. The courses that are transferred from another university must meet the graduate school requirements. A course taken during the M.S. but not included in the M.S. plan of study can be transferred to the Ph.D. program if it meets the time limits. The current time limit is 10 years at the time of graduation.

12. Scholarly Integrity

Students are expected to uphold the highest standards in terms of academic integrity. Wichita State Academic Integrity policy could be found in the section 2.17 of the policies and procedures manual. Violation of academic integrity include but not limited to:

- Cheating in any form, whether in formal examinations or elsewhere.
- Using or submitting the work of others as one's own original work without assigning proper credit to the source.
- Misrepresentation of any work done in or out of the classroom or in preparation for class.
- Falsification, forgery or alteration of any documents pertaining to academic records.
- Falsification, forgery or alteration of research results or misrepresentation of research findings.
- Colluding with others in an effort to obtain a grade or credit not truly reflective of what the student knows or has learned

Students violating the EECS department integrity standards must accept the appropriate consequence. Please refer to the EECS scholarly integrity policy.

13. Recommended Timeline

MS-to-PhD

Time since admission	Goal
Semester 1	• Meet with potential advisors; discuss about courses to be taken and the research plan. • Select Ph.D. *Advisor*.
Year 1	• Finalize the advisory committee. • Complete the plan of study and submit for approval.
Year 2	• Complete required courses. • Complete the qualifying exam. • *Recommendation: by the end of the second year, students should have submitted their first research outcome for publication.*
Year 3*	• Complete dissertation proposal examination. • 6 months after completion of proposal complete periodic assessment. • Publish scholarly papers.
Year 4* and beyond*	• 6 months after completion of proposal complete periodic assessment. • Complete Ph.D. research and dissertation writing. • Schedule dissertation defense. • Upon completion of dissertation defense and with the approval from the committee submit the report to the graduate school. • Publish scholarly papers.

* At the discretion of the *advisor*, the timeline could change.

BS-to-PhD

Time since admission	Goal
Year 1	• Meet with potential advisors; discuss about courses to be taken and the research plan. • Select Ph.D. *Advisor*.
Year 2 and 3	• Finalize the advisory committee. • Complete the plan of study and submit for approval.
Year 4	• Complete required courses. • Complete the qualifying exam. • *Recommendation: by the end of the second year, students should have submitted their first research outcome for publication.*
Year 5*	• Complete dissertation proposal examination. • 6 months after completion of proposal complete periodic assessment. • Publish scholarly papers.
Year 6* and beyond*	• 6 months after completion of proposal complete periodic assessment. • Complete Ph.D. research and dissertation writing. • Schedule dissertation defense. • Upon completion of dissertation defense and with the approval from the committee submit the report to the graduate school. • Publish scholarly papers.

* At the discretion of your advisor, the timeline could change.