

Computer Science
Ph.D. Graduate Handbook
2015 - 2016

**MANUAL OF THE PH.D. DEGREE IN
COMPUTER SCIENCE
AND
CONCENTRATIONS**

ARIZONA STATE UNIVERSITY

2015 - 2016

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Table of Contents

I. Introduction to the Computer Science Program	1
II. Objective of the handbook	1
III. Student responsibility.....	1
IV. Faculty responsibility.....	1
V. Admission and eligibility to the doctoral degree program	1
Eligibility.	2
Application.....	2
Application deadlines.....	2
GRE scores.....	2
English Proficiency	2
Personal statement	2
Letters of recommendation	3
GPA requirement	3
Application evaluation	3
Deficiencies.....	3
Notice of Admission	4
Pre-admission credits and Transfer credit.....	4
Transfer between programs.....	4
VI. Doctoral degree requirements	5
a. Formulation of the Plan of Study	5
b. Selection of Faculty Advisor	7
c. Dissertation Supervisory Committee	7
d. Comprehensive Examination	9
e. Dissertation Prospectus	10
f. Dissertation	12
g. Checklist for Graduation.....	13
VII. General Information, Policies and Procedures	14
a. Research standards for publication of dissertation.....	14
b. Financial assistance and/or fellowships	14
c. Continuous Enrollment	14
d. Leave of Absence Policies	15
e. Maximum Time Limit.....	15

f. Registration requirements for research assistants (RA) and teaching assistants (TA)	16
g. Policy for Maintaining Academic Satisfactory Progress	16
h. Filing for Graduation	18
i. Academic Integrity	18
j. CSE 584 Internship	18
k. CSE 790 Independent Study	21
l. Engineering Student Organizations	21
m. Instructional Concerns and Course-Related Complaints	21
List of Approved 500-level Area Courses – Spring 2016 and earlier admits	24
Approved 400-Level courses to count towards CSE Graduate Program	26
Course Descriptions	27
Appendix I - Absent Committee Member Procedure	33

I. Introduction to the Computer Science Program

The Computer Science (CS) program of the Ira A. Fulton Schools of Engineering at Arizona State University (ASU) offers an advanced academic program leading to the Doctor of Philosophy (Ph.D.) degree. The Ph.D. program in computer science prepares students to undertake fundamental and applied research in computer science, preparing them to apply their studies in the world of academia, governmental policy, and/or the industrial sector. The Ph.D. in computer science is available for students of high ability who seek to develop and implement their own research studies. The program requires core and elective coursework, comprehensive exams, prospectus proposal, a written dissertation, and an oral defense of the dissertation. The Ph.D. degree is offered to exceptional students who have completed, with distinction, a Bachelor's or Master's degree in engineering, or a closely related field.

II. Objective of the Handbook

The purpose of this handbook is to provide guidance and information related to admission, degree requirements, and general policies and procedures. Please note that in some cases you will find differences between the Graduate Education policies and procedures and the Computer Science program requirements. In these cases, CS has established higher standards. Students must satisfy both sets of requirements. Please note that policies and procedures are occasionally amended to improve the program. Changes will be communicated to students through e-mail, and posting on the paper and online bulletin boards.

III. Student Responsibility

All students are expected to become familiar with university and program policies and procedures and abide by the terms set forth. Information is available both online and by hardcopy upon request. Most importantly you should visit the following websites:

- The Office of Graduate Education – <http://graduate.asu.edu>
- Graduate Education Policies and Procedures – <https://graduate.asu.edu/policies-procedures>
- The Computer Science Program – <http://cidse.engineering.asu.edu/forstudent/graduate/computer-science/>
- The International Student and Scholars Center – <https://students.asu.edu/international>, if applicable.
- The Ira A. Fulton School of Engineering – <http://engineering.asu.edu>

IV. Faculty Responsibility

The members of the faculty of Computer Science have diverse backgrounds and knowledge. They are available to assist you in your plan of study and your educational and career goals. We encourage you to take the opportunity to make individual appointments with faculty members with whom you have common interests. Please refer to the [CIDSE website](#) for a list of the faculty names, areas of expertise, and research interest.

V. Admission and Eligibility to the Doctoral Degree Program

The Computer Science doctoral degree requires a background in engineering, math, statistics, physical science, or a closely related field. However, in some cases, students with non-traditional educational backgrounds will be considered for admission. These students may be required to take fundamental courses to better prepare them for the program coursework. A

student is encouraged to contact the School of Computing, Informatics, and Decision Systems Engineering to obtain advice on their educational pursuits.

Eligibility - Prior to applying to the CS doctoral program, students are required to have completed three semesters or 12 credit hours of calculus, including multivariate calculus.

Application - All students are required to submit an application with the Office of Graduate Admission and pay the required fee in order to have their application properly processed.

Application deadlines - December 31 for Fall and August 1 for Spring:

To receive full consideration, we ask that you have all the required documents submitted by the deadline.

GRE scores - All students, except ASU undergraduate CSE alumni, are required to submit official **general** Graduate Record Examination (GRE) scores directly to the Office of Graduate Admission. The average GRE scores for students admitted into the Ph.D. program have been 153 or 63 percentile Verbal, 163 or 88 percentile Quantitative, and 4.0 Analytical. However, admission decisions are made on the basis of the entire application packet. We do not require specific subject GRE scores. The ASU institution code is 4007. If department code is required use 000 for GRE.

English Proficiency - The University requires all international applicants from a country whose native language is not English to provide the Test of English as a Foreign Languages (TOEFL) or the International English Language Testing System (IETLS) scores. CSE uses 575 (paper-based) or 90 (internet-based) or 7 for IETLS as minimum expectations for admission. **Please note that your application will not be processed until the university receives official TOEFL scores, which are valid two years from the start date of the degree program.** There are some exceptions for students who have been living in the United States and would like to have the TOEFL waived. They should consult the Office of Graduate Admissions. Please address all TOEFL questions to the Office of Graduate Admissions. The ASU institution code is 4007. If department code is required use 99 for TOEFL.

Personal statement - The application must include a personal statement. The statement should: 1) explain professional goals and reasons for desiring to enroll in the doctorate program; 2) describe any research experiences; 3) indicate personal research interests; and 4) identify two or three ASU CSE faculty with matching research interests.

Letters of recommendation - CSE requires three (3) letters of recommendation, at least one of which must come from ~~former~~ faculty. There is no standard form for letters of recommendation. Our current application process allows students to submit the recommendation requests electronically by indicating the names and the e-mails of the recommenders. In turn, the Office of Graduate Admissions sends an e-mail to the recommender alerting him or her to go online and submit a recommendation. We encourage letters from people who know you well, such as teachers, professional associates, and supervisors. Ask people who can comment on your academic, emotional, intellectual, and professional development.

GPA requirement - Students applying directly from an undergraduate program must have a minimum cumulative GPA of 3.5 in the last 60 credit hours of the undergraduate degree and have been involved in some form of research at the undergraduate level. Students who are applying following a master's degree must have a minimum GPA of 3.5 for the last degree awarded.

Application evaluation - Several factors are taken into consideration when evaluating a student's application: the student's cumulative GPA, major, institution, personal statement, letters of recommendation, standardized test scores, and performance in individual courses.

Deficiencies - Depending on prior academic preparation and accomplishments of an applicant, deficiency courses may be specified to ensure adequate background preparation.

Below is a list of pre-requisites along with the associated ASU course numbers:

- CSE 230 - Computer Organization and Assembly Language Programming
- CSE 310 - Data Structures and Algorithms
- CSE 330 - Operating Systems
- CSE 340 - Principles of Programming Languages
- CSE 355 - Introduction to Theoretical Computer Science
- CSE 360 - Introduction to Software Engineering

Deficiency coursework completed with a grade of "C" or better at the undergraduate level will satisfy the requirements. A grade of "B" or better is required for all assigned deficiency coursework at the post-baccalaureate level.

Waiver Process: Students wishing to have their course syllabi examined as evidence that deficiencies have been satisfied must submit a petition form. Submit an e-mail to cidse.advising@asu.edu with the [Petition for Reevaluation of Deficiency Course](#) form and supporting documents (such as syllabus, catalog description, or university transcripts) to prove that you have met the requirements. Be advised that the documents you uploaded during the admission application have been evaluated. Submit only **new** information when requesting a reevaluation of assigned deficiencies. Once the petition has been reviewed it is final. There will be no future petition or consideration request. If after evaluation

the petition is not approved, the student may choose to take the deficiency test-out examination.

Deficiency test-out exam - Before Welcome Day in Fall and Spring semesters, a classroom will be set aside to allow students entering with deficiencies (listed in the admissions letter) to take a test to establish whether they possess basic knowledge of the course sufficient to have an assigned deficiency waived. Students may take up to three test-out exams. This scheduled testing period is the only opportunity for deficiency test-outs. No other arrangements will be made for students to test out of assigned deficiencies.

Notice of Admission - CSE submits its recommendation of admission to the Office of Graduate Admission and the final admission decision is sent to the applicant in writing by the Office of Graduate Education. You may check your application status on My ASU (my.asu.edu).

Pre-admission Credits and Transfer Credit

A student can transfer a maximum of 30 credit hours from an earned Master's degree from another accredited institution, plus 12 credits not used in any previous degree program with the approval of the Program Chair. Credit for coursework taken from an accredited institution can be awarded subject to the following constraints:

1. Transferred credit should satisfy degree requirements
2. 0-30 hours of graduate credit from a Master's degree may be allocated from a previously awarded master's degree with approval from the academic unit. Note that a student is not guaranteed to transfer all 30 credits from a previous Master's degree if the credits do not satisfy degree requirements.
3. 0-12 additional credit hours can be transferred if they are not used towards a degree. A student will have to prove by a Master's plan of study from the previous institution that these credits were not required for their Master's as stated in the ASU Graduate Education Pre-admission policy. Pre-admission credits must have been taken within three years of admission to the ASU degree program to be accepted.
4. The equivalent of a grade of B (at ASU) or higher should have been earned on every transferred course. A course with a grade of "Pass", "Credit", or "Satisfactory" is not acceptable for transfer.
5. Courses transferred should match or be sufficiently similar to courses offered at ASU.

A student who wishes to transfer credits from another institution should contact a graduate advisor in the CIDSE Advising Center to initiate the transfer credit process.

Transfer between Programs

Students that want to change from a Master's to a Ph.D. in Computer Science must submit a new application with Graduate Admissions. Admission to the Ph.D. program can be denied. If admitted, the student is allowed to use only 12 credits from the original program to the new program.

A student who would like to transfer from the Ph.D. program to a Master's program should submit a "Degree Change Request form" at the CIDSE Advising Office, and if approved, then the student can submit an official request through My ASU. A request to transfer from the Ph.D. program to a Master's program is subject to program approval. Nine credits can be transferred from the Ph.D. program to a Master's program subject to the course transfer rules and the Master's program rules at the time of the transfer. The student's program of study after a transfer from the Ph.D. program to a Master's program should satisfy the Master's program degree requirements in effect at the time of the transfer.

VI. Doctoral Degree Requirements

Degree requirements for the Ph.D. include a minimum of 84 semester hours beyond the bachelor's degree and deficiency courses. A maximum of 30 credit hours taken during the Master's degree can be applied to a Ph.D. degree, provided that coursework is approved as applicable to the doctoral degree.

The Ph.D. is comprised of five major milestones, which all students are required to pass successfully prior to graduation:

- a) Completion of coursework,
- b) Filing an approved plan of study,
- c) Passing the comprehensive examination and
- d) Approval of the dissertation prospectus to advance to candidacy,
- e) Successful oral defense of an approved written dissertation.

Assigned deficiency courses must be completed by the end of the first academic year. A "B" or better average is required for deficiency courses, and a "B" must be achieved in each course. A grade of "B" or better in a course that follows a prerequisite class does not waive this requirement.

The Computer Science Ph.D. program also offers concentrations in Information Assurance and Arts, Media, and Engineering.

a. Formulation of the Plan of Study

The supervisory committee advises the student in planning the plan of study (iPOS). The iPOS must be submitted by the time a student has completed their first year of coursework and identified a dissertation chair. The iPOS must have the approval of the student's faculty advisor, the academic unit, and Graduate Education.

Students admitted Spring 2016 and earlier:

Eighty-four credit hours of graduate work (500-level or above) beyond the bachelor's degree are required with the following constraints:

1. 48 credit hours must be in courses, including CSE 790 and excluding practicum, dissertation, and research (CSE 580, 592, 599, 792 and 799).
2. At most 12 credit hours of reading and conference (independent study) courses (CSE 590 and 790) can be used.

3. A maximum of 6 credit hours of 400-level coursework is allowed. A maximum of 12 hours of a combination of 400-level and cross-listed courses (4XX/5XX) is allowed. This includes courses taken as a Master's student. Students cannot take CSE 598 courses in subject areas they have taken as an undergraduate student.
4. 12 – 18 credit hours of research (CSE 792)
5. 12 credit hours of dissertation (CSE 799)
6. At most 15 credit hours of interdisciplinary studies are permitted (the remaining must be in computer science), with approval by the faculty advisor.
7. At most 30 hours of graduate credit from a Master's degree can be transferred from an accredited institution. Transfer credits must not have been used for an undergraduate degree must adhere to the above constraints and must have been graded with a "B" or higher. An additional 12 credit hours can be transferred in if not used in any previous degree program. A student will have to prove by a Master's plan of study from the previous institution that these credits were not required for their Master's.
8. At least 18 credit hours of CSE 500-level courses (excluding CSE 4XX/598, 580, 590, 592, 599, 790, 792, 799) must be taken at ASU. At least 3 credit hours in CSE 500-level courses must be taken in each of the three areas: Foundations, Systems, and Applications.
9. Practicum hours (CSE 580) or audited classes cannot be included on the plan of study (iPOS).

i. Area Courses

All Computer Science students must achieve a grade of "B" or higher (not a "B-") in the three area courses listed on their plan of study and to complete the degree. This policy applies to all students admitted in Fall 2011, and will be applicable to all new students from this point forward. It is recommended that students complete the area courses early in their program to ensure they are able to achieve a "B" in the three area courses. Please see the area course listing on page 24 for a list of approved area courses.

A transfer course may be used to satisfy an area course requirement only if the course is approved by a faculty member teaching a similar area course at ASU.

ii. Concentration Requirements

The Computer Science Ph.D. program also offers concentrations in Information Assurance and Arts, Media, and Engineering.

Courses that are used to satisfy the concentration requirement in the plan of study cannot be used to satisfy the core area requirement.

CS Ph.D. in Information Assurance:

Core courses: 9 credits (3 courses): 3 credit hours in each of the 3 areas

IA courses: 18 credits (6 courses): CSE 539, CSE 543, CSE 545, CSE 548 and two (2) IA electives:

- CSE 466: Computer Systems Security (3)
- CSE 467: Data and Information Security (3)
- CSE 469: Computer and Network Forensics (3)
- CSE 531: Distributed and Multi-Processor Operating Systems (3)

- CSE 534: Advanced Computer Networks (3)
- CSE 565: Software Verification, Validation, and Testing (3)

Interdisciplinary Electives: 0-15 credit hours

CSE electives: 12 - 33 credit hours

Research: 12-18 credit hours of research (CSE 792)

Dissertation: 12 hours of dissertation (CSE 799)

CS Ph.D. in Arts, Media, and Engineering:

Core courses: 9 credits (3 courses): 3 credit hours in each of the 3 areas

AME courses: 18 credits (6 courses)

CSE electives: 27 credits

Research: 12 credit hours of CSE 792 and 6 credit hours of AME 792

Dissertation: 8 credit hours of CSE 799 and 4 credit hours of AME 799

iii. Approved 400 and 4XX/5XX level

Effective Spring 2016: A maximum of 6 credit hours of 400-level coursework is allowed. A maximum of 12 hours of a combination of 400-level and cross-listed courses (4XX/5XX) is allowed. If a 400-level course is cross-listed with a 500-level course, students will be required to enroll in the 500-level. Students who have taken any of the 4XX courses as 598 cannot take the same class at the 400-level. Please see the approved list of 400-level courses on page 26.

iv. Interdisciplinary Studies

In recognition of the interdisciplinary nature of computer science and individual research interests, Ph.D. students are encouraged to acquire a certain level of knowledge in another discipline by completing up to 15 credit hours of graduate work in other departments such as biomedical informatics, mathematics, psychology, engineering, philosophy (logic), and linguistics. Although the School wants to maintain uniform standards concerning the academic work of all students, an individual student's educational background, research interests and plans for the future must play a role in course selection. Therefore, the members of the student's program committee and the student together are to agree on which area and which courses are permitted for interdisciplinary studies. The guidelines for the selection are:

1. The quality of the course is satisfactory, and the content is relevant to computer science and the student's research.
2. There is no significant overlap between the courses in question and others that the student has already taken to satisfy Ph.D. requirements.

b. Selection of Faculty Advisor

When a student has decided on a primary area of research, the student must select a faculty advisor in that area of study. The faculty advisor must have the right to chair Computer Science committees. The faculty advisor will serve as the chair of the supervisory committee that supervises the student's dissertation. The list of faculty with the right to chair can be found on Graduate Education's faculty website: <https://graduate.asu.edu/graduate-faculty/degree/G2>.

c. Dissertation Supervisory Committee

The Computer Science supervising committee serves three roles:

1. The comprehensive examination committee
2. The dissertation proposal committee
3. The dissertation and dissertation defense committee.

In consultation, the faculty advisor and the student form a supervisory committee. The faculty advisor serves as the chair of the supervisory committee. Membership in the Computer Science supervising committee is a privilege that is extended to tenure/tenure-track faculty members of ASU as well as to other individuals as described in the following membership rules.

1. **Members:** A CS Ph.D. supervising committee must have at least 4 members
2. **Chair:** The chair of the CS Ph.D. supervising committee must be a member of the CS graduate faculty with right to chair Ph.D. committees in computer science.
3. **Composition requirement:** A majority of the members of the Ph.D. supervising committee must be members of the CS graduate faculty with right to chair Ph.D. committees.
4. **CS Graduate Faculty members:** Members of the CS graduate faculty can serve on CS Ph.D. supervising committees. This includes both tenure/tenure-track faculties from other units, as well as others (research faculty, for example) who are members of the CS graduate faculty.
5. **Other ASU Faculty:** ASU tenure/tenure-track faculty members who are not members of the CS graduate faculty can serve on CS Ph.D. supervising committees.
6. **Co-Chair:** For a faculty member to serve as co-chair of a CS Ph.D. supervising committee, the faculty member must be a member of the CS graduate faculty with right to co-chair or be approved to serve as co-chair with an approved [Committee Approval \(Individual Approval 1 time\)](#) on file. The form is available on ASU's Graduate Education web site. The form needs to be completed by the student and submitted to the Advising Center BYENG 225 together with the CV of the external member.
7. **External members:** Individuals who are not affiliated with ASU can serve on CS PhD supervising committee subject to approval.
 - a. **Approval for serving on committee:** To get an individual who is not affiliated with ASU approved to serve as an external member, a [Committee Approval \(Individual Approval 1 time\)](#) form must be submitted and approved. The form is available on the Graduate Education web site. The form needs to be completed by the student and submitted at the Advising Center BYENG 225 together with the CV of the external member.
 - b. **Approval for serving as co-chair:** To get an external member who is not affiliated with ASU approved to serve as a co-chair, a [Committee Approval \(Individual Approval 1 time\)](#) form must be submitted and approved. The form is available on the Graduate Education web site. The form needs to be completed by the student and submitted at the Advising Center BYENG 225 together with the CV of the external member.
8. **AME and Information Assurance Concentration:** For students in one of the concentrations, at least one member of the student's committee must be from that program.

The composition of the committee must be in accordance with the guidelines of ASU Graduate Education. Once the committee is established, changes to the committee are highly discouraged. Any changes to the committee must be submitted by completing a Graduate Committee Change

form through the ASU Graduate Education that is signed by the student and all members of the student's committee.

The supervisory committee, in its role as comprehensive examination committee, administers the comprehensive examination, which consists of written and oral examinations designed to test the student's mastery of the field of specialization.

The supervisory committee, in its role as dissertation proposal committee, approves the student's research proposal.

The supervisory committee, in its role as dissertation committee, approves the subject and title of the dissertation and advises the student during the formulation of the research topic and during the completion of the research and the dissertation.

d. Comprehensive Examination

The comprehensive examination tests the student's mastery in the specialization and closely related areas, and, when applicable, the specific topic of the intended dissertation. The purpose of the comprehensive examination is to show that the student has developed the research tools necessary to undertake the dissertation research.

The student must file an approved plan of study (iPOS), including all committee members, prior to taking the comprehensive exam. The comprehensive examination consists of least two components: an oral component and written component. The comprehensive examination committee members determine both the content and format of the written components.

A syllabus for the exam is set by the comprehensive examination committee in consultation with the student. Each committee member is required to submit written questions to the graduate advisor, who will forward them to the candidate. The candidate will have ten business days to answer the questions and will submit the answers to the graduate advisor in the CIDSE Advising Center, who will distribute them to the committee. The candidate must be enrolled at the time of the comprehensive exam.

The chair of the comprehensive examination committee reports the results of the written exam to all committee members.

The oral component follows the conclusion of the written component. The oral exam is attended by the comprehensive examination committee and is open to the department faculty. At the discretion of the committee, graduate students may also attend the oral examination. Once the candidate has passed both parts of the comprehensive exam, the prospectus defense may take place.

The student's supervisory committee must sign the [Report of Doctoral Comprehensive Exam Form](#) once the examinations are successfully completed. The student submits the form to the graduate advisor, who will submit the form to the Graduate Program Chair and will be recorded in the system for final approval by the Graduate Education.

Failure of the comprehensive examinations is considered final unless the supervisory committee and the Graduate Program Director recommends, and the dean of Graduate Education approves, a re-examination. A re-examination may be administered no earlier than three months and no later than one year from the date of the original examination. Only one re-examination is permitted. A student cannot obtain the approval of the dissertation prospectus until the comprehensive examination has been passed.

Steps to Preparing the Written and Oral Comprehensive Exam

The Written Portion

- Step 1: Student submits an electronic copy of the comprehensive exam syllabus to the graduate advisor. In the subject heading, the student mentions comprehensive exam and first and last name. In the message, the student mentions all committee member names and provides e-mails of the committee members, especially for external members.
- Step 2: The graduate advisor e-mails the committee the exam syllabus and gives them a two-week deadline to send their questions to the graduate advisor.
- Step 3: The graduate advisor gathers the questions from all committee members and sends it in one e-mail to the student with a 10-working day deadline to respond to the questions.
- Step 4: The student sends the Q & A back to the committee and copies the graduate advisor. The outline of the written paper should include the faculty name, the questions given by the faculty, and immediately following the answer for each of the questions.

The Oral Portion

- Step 1: Normally, the oral exam is scheduled after two weeks from the date the student submits the Q & A to the committee. However, if this is not possible to schedule within two weeks, it should be scheduled at the earliest convenience of the committee availability. It is the student's responsibility to schedule the oral exam by contacting the committee and arranging for room reservation.
- Step 2: The student contacts Monica Dugan, 5th Floor Brickyard, to reserve a room and provides the date and time. The student should plan to have the room reserved for at least 2-3 hours. Also, the student sends an electronic abstract to Monica which in turn she will announce to all students, faculty, and staff.
- Step 3: On the day of the exam, the student downloads the Doctoral Comprehensive Exam Form and hands it to the dissertation chair. This form is located on the CIDSE Graduate Forms webpage.
- Step 4: After the exam, the student drops off the Doctoral Comprehensive Exam Form at the Advising Center (BYENG 225) for processing. Please keep a copy for yourself!

Please see Appendix I for Absent Committee Member Procedures

e. Dissertation Prospectus

The dissertation proposal/prospectus will typically take place in the semester following the comprehensive exam. The dissertation prospectus may be presented immediately following the successful comprehensive examination, if all members of the supervisory committee agree.

Under these circumstances, there must be a clear separation of the successful completion of the comprehensive examination and the start of the dissertation prospectus defense.

The student must prepare a dissertation prospectus in accordance with the following guidelines.

The dissertation prospectus must contain:

1. a statement of the research and why it is important.
2. an overview of bibliography of the relevant literature.
3. a description of the student's competence in conducting the research (an initial competence metric is the successful completion of the comprehensive examination in the area of research. The student, however, is encouraged to provide evidence of initial results in the scope of the dissertation research).
4. a discussion of how the research will be approached (including specific criteria for the completion of the research broken down by research tasks, and the order in which the tasks will be completed).
5. a projected time-table and outline of the dissertation.

The length of the written dissertation prospectus is not to exceed 20 pages (no exceptions). The student is encouraged to provide the required material in an effective manner. Ultimately, the student's committee chair guides the prospectus writing process.

After the student's committee chair is satisfied with the student's dissertation prospectus, the student must submit a copy of the dissertation prospectus to each member of the supervisory committee at least two weeks before the defense. The student must also post and submit a [Defense Announcement](#) of the dissertation prospectus defense at least two weeks before the defense. The candidate must be enrolled at the time of the prospectus defense.

Before the student submits the announcement, the student must schedule a room through the Administrative office (5th floor Brickyard) for the date and time agreed to by the supervisory committee. The announcement must include an abstract, the name of the student and the names of the committee members in addition to specifying the time, date and place of the presentation of the dissertation prospectus. The presentation must be announced and open to the School faculty. Attendance by others is left to the discretion of the supervisory committee. The committee evaluates the prospectus in terms of:

1. The value of the research.
2. The feasibility of the research plan.
3. The student's preparation for carrying out the proposed research.

The committee accepts the dissertation prospectus, accepts it with changes or rejects it. If the committee deems the student's work on the dissertation prospectus to be unsatisfactory, the student may request one more opportunity to submit a dissertation prospectus. The student must wait until the next semester or summer session before making the second and final attempt and the student must make the second and final attempt within one year after the first attempt.

If the committee accepts the dissertation prospectus with changes, the supervisory committee indicates a description of the required changes on a separate e-mail to the student. The student

must submit the revised dissertation prospectus to the supervisory committee no later than one month after the oral presentation of the prospectus. The committee must evaluate the revised prospectus no later than one month following the student's submission of the revision. When the committee accepts the proposal, each committee member must sign the [Doctoral Proposal/Prospectus Results Form](#). Then the student must submit the prospectus to the graduate advisor for approval by the Graduate Program Chair. Graduate Education will then approve the student for candidacy.

Please see Appendix I for Absent Committee Member Procedures

f. Dissertation

Before a dissertation can be defended, parts of it must have been published or accepted for publication in at least one journal, conference, or book of a quality acceptable to the dissertation committee.

A student must be enrolled in at least one graduate-level course at the time of the defense. If you are holding the defense during the interim period between semesters, you must be registered in the following semester. If you defend during the period between the spring and summer semester, you must be registered for the summer session. If you defend during the period between the summer session and fall semester, then you must be registered in the fall semester. Please see the [Graduate Education policies](#).

Graduate Education publishes information regarding the details of dissertation preparation, formal requirements, deadlines, and oral examinations. The student must comply with all guidelines that Graduate Education publishes regarding the submission of a dissertation and the scheduling of a final oral examination.

Once the dissertation is completed, the candidate will submit it to the committee members as well as to the external reviewer. The dissertation defense will take place no earlier than four weeks after the dissertation is received by the committee.

There will be an open oral defense following the completion of the dissertation. A student can schedule the defense after the student's committee chair has approved the student's dissertation format. The student must schedule their defense on My ASU at least [10 working days](#) prior to the defense announcement. The student must also post and submit a [Defense Announcement](#) at least two weeks before the defense.

The supervisory committee evaluates the dissertation and the student's performance on the defense. The committee accepts the dissertation, accepts it with changes, or rejects it. If the committee deems the student's work on the dissertation or performance on the oral examination to be unsatisfactory, the student may request one more opportunity to submit a dissertation and pass the defense. The student must wait until the next semester or summer session before making the second and final attempt and the student must make the second and final attempt within one year after the first attempt.

Once the dissertation has been approved, the student is required to upload their dissertation to ProQuest and provide at least one bound copy of the dissertation to the committee chair. As a courtesy, the student should determine whether other members of the supervisory committee would like a bound copy of the dissertation.

Please see Appendix I for Absent Committee Member Procedures

Steps to Preparing for Your Defense

Prior to defense:

1. Obtain a consensus of approval from the committee chair and the members to proceed with the oral defense.
2. Schedule a date and time with your committee for the oral defense.
3. Important: Ensure that a minimum of 50% of the official committee be physically present at the defense. If at least 50% of the committee cannot be physically present, the defense must be rescheduled.
4. Visit the [Graduate Education website](#) to become familiar with the dates and deadlines on format approval and oral defense.

10 days prior to the defense:

These steps are required to be completed prior to 10 working days from the date of oral defense.

1. Reserve a room with the CIDSE front desk (Brickyard 5th floor).
2. Submit an electronic version of your abstract with title, full names of your committee members, defense date/time/place, and your name as you want it to appear on the defense announcement to the CIDSE front desk.
3. Schedule your defense on MyASU with the Office of Graduate Education.

On the day of the defense:

1. Set-up all your equipment at least one half-hour prior to your presentation to make sure they work.

After the defense:

1. Your committee will discuss the results of the exam with you and may have additional comments for you. At the end, the committee will make a recommendation: Pass, Pass with minor revisions, Pass with major revisions, or Fail.
2. Revisions are normal and are expected to be completed within one year. This includes remaining registered until the finished document has been uploaded on ProQuest.
3. Hand-deliver a signed copy of the Report for Doctoral Defense Form to the CIDSE Advising Office BYENG 225.
4. Follow the steps on My ASU on uploading your final dissertation through the Office of Graduate Education and ProQuest.

g. Checklist for Graduation

- Every deficiency course is completed with grade of “B” or higher within the first two terms
- File an approved tentative plan of study before the end of the first semester

- Select the faculty advisor to serve as chair of the supervisory committee by the end of the first semester
- Select the supervisory committee, in consultation with the faculty advisor
- File the final plan of study (iPOS) after securing a faculty advisor.
- When the course work on the plan of study is completed and approved by the Graduate Education, the comprehensive examination can be completed.
- Dissertation prospectus including written proposal and oral defense
- In the final semester, file an application for graduation on My ASU with the Graduation Office of the Registrar
- Defend your dissertation in your last semester
- Deliver one bound copy of the dissertation to the faculty advisor. As a courtesy, determine which members of the supervisory committee would like a bound copy of the dissertation.

Please review current Graduate Education policies and procedures.

VII. General Information, Policies and Procedures

a. Research standards for publication of dissertation

Graduate research is the study of an issue that is of sufficient breadth and depth to be publishable in a CSE-related journal. The effort should reflect a minimum of 1,500 hours of thoughtful work for a dissertation (Ph.D.). The research should follow the ‘scientific method’ and thus be both objective and reproducible. The dissertation should demonstrate independent, original, and creative inquiry. There should be predefined hypotheses or developmental goals and objectives that are measurable and can be tested. The document should demonstrate proficiency with written English and should conform to the Office of Graduate Education format guidelines.

b. Financial assistance and/or fellowships

The Computer Science program’s goal is to provide support to all incoming Ph.D. students. According to the student’s academic performance and past academic research, funding offers will be extended to individual students with the highest academic achievements. We encourage students to highlight their past academic achievements in their personal statement and in their resume.

c. Continuous Enrollment

Once admitted to a graduate degree program or graduate certificate program, students must be registered for a minimum of one credit hour during all phases of their graduate education, including the term in which they graduate. This includes periods when students are engaged in research, conducting a doctoral prospectus, working on or defending theses or dissertations, taking comprehensive examinations, taking graduate foreign language examinations, or in any other way utilizing university resources, facilities, or faculty time.

Registration for every fall semester and spring semester is required. Summer registration is required for students taking examinations, completing culminating experiences,

conducting a doctoral prospectus, defending theses or dissertations, or graduating from the degree program.

To maintain continuous enrollment the credit hour(s) must:

- Appear on the student's plan of study, OR
- Be research (592, 792), thesis (599), dissertation (799), or continuing registration (595, 695, 795), OR
- Be a graduate-level course.

Grades of "W" and/or "X" are not considered valid registration for continuous enrollment purposes. "W" grades are received when students officially withdraw from a course after the drop/add period. "X" grades are received for audit courses. Additionally, students completing work for a course in which they received a grade of "I" must maintain continuous enrollment as defined previously. Graduate students have one year to complete work for an incomplete grade; if the work is not complete and the grade changed within one year, the "I" grade becomes permanent. Additional information regarding incomplete grades can be found at <http://asu.edu/aad/manuals/ssm/ssm203-09.html>.

d. Leave of Absence Policies

Graduate students planning to discontinue registration for a semester or more must submit a Request to Maintain Continuous Enrollment form. This request must be submitted and approved **before** the anticipated semester of non-registration. Students may request to maintain continuous enrollment without course registration for a maximum of two semesters during their entire program.

Having an approved Request to Maintain Continuous Enrollment by Graduate Education will enable students to re-enter their program without re-applying to the university. Students who do not register for a fall or spring semester without an approved Request are considered withdrawn from the university under the assumption that they have decided to discontinue their program. Students removed for this reason may reapply for admission to resume their degree program; the application will be considered along with all other new applications to the degree program.

A student with a Graduate Education approved Request to Maintain Continuous Enrollment is not required to pay tuition and/or fees, but in turn is not permitted to place any demands on university faculty or use any university resources. These resources include university libraries, laboratories, recreation facilities, or faculty time.

e. Maximum Time Limit

Doctoral students must complete all program requirements within a ten-year period. The ten-year period starts with the semester and year of admission to the doctoral program. Graduate courses taken prior to admission that are included on the plan of study must have been completed within three years of the semester and year of admission to the program (previously awarded Master's degrees used on the plan of study are exempt).

Any exceptions must be approved by the supervisory committee and the Office of Graduate Education dean and ordinarily involves repeating the comprehensive examinations. The Office of Graduate Education may withdraw students who are unable to complete all degree requirements and graduate within the allowed maximum time limits.

f. Registration Requirements for Research Assistants (RA) and Teaching Assistants (TA)

Students awarded an assistantship within the Ira A. Fulton School of Engineering are required to be registered for 12 credit hours. Audit credit hours do not count toward the 12 credit hours.

Students who obtain an assistantship outside the Ira A. Fulton Schools of Engineering are required to be enrolled a minimum of six credit hours. Audit credit do not count toward the six credit hours. Enrollment in continuing registration (CSE 795) does not count toward the six hour requirement.

TAs and RAs are treated as residents for tuition purposes. To be eligible for tuition remission, TAs and RAs must be employed a minimum of 10 hours per week (25 percent Full Time Equivalency {FTE}). TAs/RAs working 10-19 hours per week (25-49 percent FTE) receive a 50 percent remission of tuition for the semester or summer session of their employment. TAs/RAs working 20 hours per week (50 percent FTE) do not pay tuition during the semester or summer session of their employment. In addition, the university pays the individual health insurance premium for those TAs and RAs working 20 hours per week (50 percent FTE). The TA/RA offer does not cover additional fees beyond tuition.

g. Policy for Maintaining Academic Satisfactory Progress

Each semester, the Computer Science program reviews students' files for satisfactory progress toward completion of the degree. All students who do not meet one of the four categories are placed on probation or withdrawn from the program:

- 1) Satisfactory progress;
- 2) Academic Probation;
- 3) Progress probation;
- 4) Withdrawal from the CSE Program.

1. **Satisfactory progress** means that a student does not have any academic and progress probationary issues. In addition to the probationary rules, satisfactory progress includes communication each semester with the student's committee chair regarding his/her progress.

2. Academic Probation

A student who has been admitted to a graduate degree program in the School of Computing, Informatics, and Decision Systems Engineering with either regular or provisional admission status, must maintain a semester grade point average (GPA) of 3.25:

1. in all work taken for graduate credit (courses numbered 500 or higher),
2. in the coursework in the student's approved plan of study, and
3. in all coursework taken at ASU (overall GPA) post baccalaureate.

A student will be placed on academic probation if one or more of the student's semester GPAs listed above falls below 3.25. Students will be notified by mail and e-mail when placed on academic probation.

A student will earn academic good standing by obtaining a semester 3.25 or better in the GPAs listed above by the time the next nine hours are completed. A maximum of two semesters are allowed to complete the nine hours of graduate-level coursework to raise the GPA. Coursework such as research and dissertation registration that are for Z or Y grade cannot be included in these nine hours.

Students will also receive an academic probation notice/letter if one of these pertains to your academics:

- Received a "D" or "E" in a required deficiency course or in a course at the 400-level or above.
- Deficiency GPA below 3.0.

3. Progress probation pertains to issues dealing with making progress toward a degree. The following are notices/letters you will receive if one of these pertains to your academics:

- Lack of progress toward removing deficiencies as listed on your admission letter.
- Lack of progress toward completing the core area courses within the first two years of iPOS courses.
- Failure to pass the Ph.D. comprehensive examination.
- Failure to take the Ph.D. comprehensive examination at the end of fourth year.
- Failure to pass the Ph.D. prospectus.

4. Withdrawal from the CS Program:

A Ph.D. student may be removed from program for any of the reasons listed below:

1. Cumulative GPA is less than 3.25 for two consecutive semesters. (The student with such a cumulative GPA will be put on probation after the first semester.)
2. The semester GPA is less than 3.25 in the course of two consecutive semesters. (The student is put on probation with such GPA after the first semester.)
3. Failure to make up deficiencies within the time allowed, as determined by the admissions committee.
4. Failure to meet a requirement specified for the Ph.D. degree, including not making satisfactory progress toward the completion of the degree.

A student is recommended for withdrawal from the CSE program if she or he fails to meet the probationary standards placed upon in the semester mentioned in the probationary letter. The student will receive a letter from the Computer Science Program explaining the reasons for the withdrawal. The student will have five calendar days from the date of the letter to appeal the decision. The CSE Graduate Program Committee (GPC) will review the case and will make the necessary recommendation. The Graduate Program Chair, on behalf of the GPC, will provide a written explanation of the outcome. If the outcome is favorable, the student will have to meet all the outlined requirements at the end of the specified period. The student will be required to sign an agreement acknowledging the recommendations and the consequences if the agreements are not met. If the GPC recommends that the appeal is not granted in favor of the student, the Graduate Program Chair, on behalf of the GPC, will recommend to the Dean's Academic Affairs to withdraw the student from the CSE Program. The student will then have the opportunity to appeal to the Ira A. Fulton Schools Standards Committee which reviews the student's case and makes the final ruling to Associate Dean and the CSE Program. If the appeal is not granted in favor of the student, the Dean's Office of Academic and Student Affairs will recommend to the Office of Graduate Education to withdraw the student from the CSE program. Please refer the Office of Graduate Education on policies and procedures or contact a graduate advisor in the CIDSE Advising Center.

h. Filing for Graduation

During the final semester, a student must file an application for graduation with the Graduation Office of the Registrar on My ASU. The student's approved final plan of study (iPOS) must be on file with Graduate Education before the student can apply for graduation.

i. Academic Integrity

The highest standards of academic integrity are expected of all graduate students, both in the academic coursework and in their related research activities. The failure of any graduate student to meet these standards may result in serious consequences including suspension or expulsion from the university and/or other sanctions as specified in the academic integrity policies of individual schools as well as the university.

Violations of academic integrity include, but are not limited to: cheating, fabrication, tampering, plagiarism, or aiding and/or facilitating such activities. At the graduate level, it is expected that students are familiar with these issues and each student must take personal responsibility in their work. In addition, graduate students are expected to follow university guidelines related to the Student Code of Conduct. University policies related to academic integrity and code of conduct are available in the Office of Student Life, or at <http://graduate.asu.edu/beintheknow>.

j. CSE 584 Internship

Curricular Practical Training (CPT) is an academic experience usually obtained at off-campus work settings, allowing the student to apply knowledge and skills gained in

various classes. It is intended as a unique, hands-on learning experience to provide students with a number of valuable skills that they can use upon graduation from their graduate degree programs. Accordingly, it is not available to full-time or part-time workers regularly employed by the company where the internship is proposed.

The CPT is available to both domestic and international students. However, international students must work with the International Students and Scholars Center (ISSC) and submit additional documentation to obtain work authorization. Furthermore, international students must include the CPT course CSE 584 (1 credit hour) as an integral part of their Program of Study, reflected by their approved iPOS.

Addition of the CPT course(s) should be done at the initial submission of the student's iPOS. Later additions of CPT courses must be requested and approved at least one full semester (fall, spring or summer) prior to the proposed start date of the internship course. For example, a student planning to do an internship during the summer semester should have an approved iPOS with the internship course before the beginning of classes in the preceding spring semester. The Internship course cannot be added to an approved iPOS once all coursework has been completed. Exceptions may be made if the internship is relevant to dissertation research.

The CSE Program Chair will determine the need for a CPT internship in such cases in consultation with the Graduate Academic Advisor. Note that approval of an iPOS with the CSE 584 course confirms that the internship is an integral part of the degree requirements as planned by the student. Hence, students who are not able to fulfill the internship credit requirements in their iPOS are required to replace the course credit requirements through the following options:

- taking a 3-credit hour graduate course,
- taking the 1-credit hour CSE 594 seminar course
- taking one credit hour of CSE 790 – Reading and Conference (Independent Study).

In order to be eligible for internship, a student must be in **good academic standing (cumulative, graduate and iPOS GPA of 3.25 or above) and not have an academic integrity violation** in a course for two full semesters (summer semesters not included) from the initial reporting of the incident. For example, a sanctioned academic integrity violation initially reported on April 15, 2012 will make the student ineligible for this approval until the end of Spring 13 semester.

International students need to be aware of immigration policies and regulations, which may jeopardize their academic status. Hence, it is strongly recommended for international students to consult with the International Students and Scholars Center (ISSC).

All students (domestic and international) may take part in an out-of-state internship in the summer semester. The eligibility requirements for CPT internships remain the same as mentioned.

During the regular fall and spring semesters, international graduate students in F-1 status must register for a minimum of nine (9) credit hours to maintain full-time status and be enrolled in a minimum six (6) credit hours of in-person, on-campus coursework at the ASU Tempe campus. A maximum of three (3) credit hours of online courses is permitted. The CSE 580 Practicum course will not count as satisfying the student's "physical presence" at ASU. Students will not be able to take part in internships outside the Phoenix metropolitan area. In some cases students may be approved to do an internship in Tucson or other nearby locations to Phoenix, as long as the student is able to prove they can physically attend their courses on campus.

Required documents and forms for the internship proposal must be submitted to the CIDSE Advising Office at least two weeks prior to the beginning of the semester in which the internship is planned. Students will not be able to request late-add registration of the CSE 584 Internship credit to their class schedule after the drop/add deadline of each semester.

An approved proposal is required before commencing the internship. The request will include a statement from the employer that indicates they understand that the work is to satisfy a degree requirement. A sample letter and other required forms are available on the CIDSE [CPT website](#). Students must receive approval from their faculty advisor and from the Graduate Program Director before registering for CSE 584. At the Ph.D. level, internship is intended to enhance the student's research capabilities in the area related to the dissertation. Therefore, the internship plan must show the relationship between the work proposed and the intended research program. The dissertation advisor may be asked to write a separate letter explaining why the internship is required. In order to register for the CSE 584 - Internship, a student must have a **cumulative, graduate and iPOS GPA of 3.25 or above** and not have an academic integrity violation in a course for two full semesters (summer semesters not included) from the initial reporting of the incident. A final Plan of Study must be filed with the Office of Graduate Education showing the Internship course before registering for CSE 584. All application materials for an Internship must be completed by the last day of regular registration for any semester. The student must take classes appearing on the Plan of Study the semester following the internship.

Renegé: (verb) to fail to carry out a promise or commitment

Never accept a job with the intention of turning it down if "something better" comes along. Not only is it inconsiderate and unprofessional, it also reflects badly on Arizona State University and might negatively impact another ASU student's opportunities with that employer. Also, employers communicate with each other and you don't want to get a bad reputation.

After you have given your decision careful consideration and accepted an offer, stop looking. Inform other employers who have extended offers that you have accepted another position. Don't accept further interview invitations or search further. Please refer to NACE's *Playing Fair...Your Rights and Responsibilities as a Job Seeker*

http://www.nacweb.org/playing_fair/ to become familiar with Principles for Professional Practice.

A five-page final report is required at the end of the internship before a grade and credit is given. The final report must be submitted to the reporting supervisor for comments and then to the faculty advisor for grade assignment. Refer to the CIDSE [CPT website](#) for guidelines to prepare the final report.

k. CSE 790 Independent Study

Independent study is available for Ph.D. students. The student must get written approval from the supervising faculty outlining the coverage of the content. The Independent Study form must be approved by the faculty advisor and will be placed in the student's file.

l. Engineering Student Organizations

There are dozens of engineering student organizations and teams ranging from honors and professional associations to groups creating underwater robots, concrete canoes, and launching rockets. Student organizations are excellent opportunities to learn about career possibilities as many of the student groups operate in conjunction with industry professional societies ... get involved today! Please visit <http://studentorgs.engineering.asu.edu/> for a list of engineering student organizations.

m. Instructional Concerns and Course-Related Complaints

Being part of a large university creates opportunities to learn from a diverse instructor population with different teaching styles and modalities for delivering course content. Courses are offered by a diverse set of faculty including those who are research intensive, those whose primary responsibility is teaching, and part-time faculty who are working in the field. Based on enrollment or modality of offering, faculty may also be supported by graduate student teaching assistants and graders. This diverse higher education delivery platform may differ significantly from the high school experience, and while it provides opportunity to expand the student's ability to learn and develop problem solving skills, concerns and conflicts with requirements and instructors may occasionally arise. CIDSE students with instructional concerns should review and adhere to the following guidelines for attempting to resolve their issues. First and foremost keep in mind that the faculty and advising staff are experienced, dedicated educators that are here to help you achieve your educational goals but at the same time, as an engineering and computer science program, they have a responsibility to ensure standards are maintained and student outcomes are achieved prior to graduation. The university culture recognizes the value of diversity in multiple dimensions as well as the presumption of expertise and academic freedom of the faculty.

Communicate with your Instructor

If you have a difference of opinion with your instructor or teaching assistant (TA), or have concerns about technical or administrative aspects of the course, visit the instructor or TA during office hours or contact them via email (if you cannot visit them during the

office hours). Express your concerns clearly and respectfully and ask for help. Be sure to provide succinct information about what you are having trouble understanding in the course or your concern. Instructors and TAs are here to help. Please remember that you are responsible for pre-requisite knowledge/skills required for a course and regularly studying the material taught in the course. The teaching staff may not be able to help you with your problem if you lack in the pre-requisite knowledge/skills or have not been keeping up with the course material. As a guideline, you should be spending three hours studying every week for -each hour of course credit. Thus you should schedule 8-10 hours of time each week to devote to each 3-credit course. In addition, make sure to resolve the issues as soon as they occur and maintain all documentation. For example, if the assignment instructions are not clear, get the clarification on the day the assignment is assigned and do not wait until the deadline of the assignment. If, after communicating with your instructor or TA, you are still having problems in the course, connect with your academic advisor to understand your options moving forward.

Connect with your Graduate Program Chair

If you are unable to resolve the concern after initial contact with the instructor or the TA, and you have met with your academic advisor, you should then connect with the Graduate Program Chair for your major (or the department offering the course). The Graduate Program Chair will confer with the instructor and/or TA to better understand the concern and try to resolve the problem. Please note that before meeting with the Graduate Program Chair you should have made a reasonable effort to meet with the course instructor (not just the TA) and get the issue resolved. When contacting the Graduate Program Chair provide all the relevant details such as the course syllabus, assignment handout, email exchange with the instructor etc. so that the Graduate Program Chair can promptly act on your concerns. Please be brief and precise in the description of your concerns. In some cases, the Graduate Program Chair would like to meet you. When coming for the meeting please bring along all the relevant documents.

If the instructional concern is not resolved with the Graduate Program Chair or the department offering the course, contact the Associate Dean of Academic Affairs office for the college offering the course for assistance.

Remain Focused

When faced with instructional concerns, it is important to remain focused on the rest of the course while addressing specific areas that are under review. Be sure to stay connected with your academic advisor if there are any changes in your situation.

NOTE:

- Misrepresentation of facts or disrespectful behavior when confronting your instructor or teaching assistant is considered an academic integrity violation.
- Maintain all documentations.
- Act proactively and promptly.

In Summary, Guidelines for Avoiding Problems

- Be sure you have the necessary prerequisite knowledge before starting a course;
- Attend class and on-line exercises regularly;

- Devote time each week to studying to avoid getting behind;
- Contact the TA (if assigned) or instructor during office hours at first sign of trouble and come prepared to ask precise questions and to explain your difficulty
- Accept the fact that you grow intellectually and professionally by being challenged and learning to deal with diverse expectations and environments.

Process for Resolving Conflicts in Grading, Course Expectations, etc.

- Contact the TA (if available) or instructor to explain your concern and seek resolution;
- If the TA/instructor has attempted to assist you but you are still having academic difficulty that is causing personal stress or hindering your academic success, see your Academic Advisor;
- If the TA/instructor is not responsive or does not provide a legitimate response/accommodation, then contact your Graduate Program Chair.
- If you still feel there is a legal, ethical or procedural violation that is victimizing you, contact the Office of the Associate Dean of Engineering for Academic Affairs.
- Circumventing this process will be considered a violation of professional ethics and protocol.

List of Approved 500-level Area Courses – Spring 2016 and earlier admits

Course Prefix	Course Title	Foundations	Systems	Applications
CSE 509	Digital Video Processing			X
CSE 510	Database Management System Implementation			X
CSE 511	Semi-Structured Data Management			X
CSE 512	Distributed Database Systems			X
CSE 515	Multimedia and Web Databases			X
CSE 520	Computer Architecture II		X	
CSE 522	Real-Time Embedded Systems		X	
CSE 530	Embedded Operating Systems Internals		X	
CSE 531	Distributed and Multiprocessor Operating Systems		X	
CSE 534	Advanced Computer Networks		X	
CSE 535	Mobile Computing		X	
CSE 536	Advanced Operating Systems		X	
CSE 539	Applied Cryptography		X	X
CSE 543	Information Assurance and Security		X	
CSE 545	Software Security		X	
CSE 546/591	Cloud Computing		X	
CSE 548	Advanced Computer Network Security		X	
CSE 550	Combinatorial Algorithms and Intractability	X		
CSE 551/591	Foundations of Algorithms*	X		
CSE 552	Randomized and Approximation Algorithms	X		
CSE 555	Theory of Computation	X		
CSE 556	Game Theory with Applications to Networks	X		
CSE 561	Modeling and Simulation Theory and Applications		X	
CSE 563	Software Requirements and Specification		X	
CSE 564	Software Design		X	
CSE 565	Software Verification, Validation and Testing		X	
CSE 566	Software Project, Process and Quality Management		X	
CSE 569	Fundamentals of Statistical Learning and Pattern Recognition	X		
CSE 570	Advanced Computer Graphics I			X
CSE 571	Artificial Intelligence			X
CSE 572	Data Mining			X
CSE 573/591	Semantic Web Mining			X
CSE 574	Planning and Learning Methods in AI			X

CSE 575	Statistical Machine Learning			X
CSE 576	Topics in Natural Language Processing			X
CSE 577	Advanced Geometric Modeling I			X
CSE 578/591	Data Visualization			X
CSE 579	Knowledge Representation and Reasoning	X		

4XX and 4XX/598 courses do not apply toward the required area courses.

* CSE 598 Design and Analysis of Algorithms and CSE 591 Foundations of Algorithms cannot both be listed on the iPOS.

Approved 400-Level courses to count towards CSE Graduate Program

IMPORTANT: Students who have taken any of the 4XX courses listed below as 598, cannot take the same class at the 400-level.

- CSE 408 Multimedia Information Systems
- CSE 412 Database Management
- CSE 414 Advanced Database Concepts
- CSE 432 Operating System Internals
- CSE 434 Computer Networks
- CSE 438 Embedded Systems Programming
- CSE 440 Compiler Construction I
- CSE 445 Distributed Software Development
- CSE 446 Software Integration and Engineering
- CSE 457 Theory of Formal Languages
- CSE 459 Logic for Computing Scientists
- CSE 460 Software Analysis and Design
- CSE 463 Introduction to Human Computer Interaction
- CSE 464 Software Quality Assurance and Testing
- CSE 465 Information Assurance*
- CSE 466 Computer Systems Security
- CSE 467 Data and Information Security
- CSE 468 Computer Network Security
- CSE 469 Computer and Network Forensics
- CSE 470 Computer Graphics
- CSE 471 Introduction to Artificial Intelligence
- CSE 472 Social Media Mining
- CSE 476 Introduction to Natural Language Processing
- CSE 477 Introduction to Computer-Aided Geometric Design

*Credit is allowed for only CSE 465 or CSE 543 but not both.

A maximum of 6 credit hours of 400-level coursework is allowed. A maximum of 12 hours of a combination of 400-level and cross-listed courses (4XX/5XX) is allowed. If a 400 level course is cross-listed with a 500 level course, students will be required to enroll in the 500 level.

Course Descriptions

CSE 509 Digital Video Processing

Concepts of digital video compression, video analysis, video indexing, browsing and retrieval, video transmission over networks, video processors, and relevant industry standards.

CSE 510 Database Management System Implementation

Implementation of database systems. Data storage, indexing, querying, and retrieval. Query optimization and execution, concurrency control, and transaction management.

CSE 511 Semi-Structured Data Management

Addresses the data management issues for semi-structured data, which are commonly found in Web applications. Covers techniques on modeling, storing, querying and searching data without schemas, with optional confidence, and/or provenance information. Requires knowledge on relational databases and programming skills.

CSE 512 Distributed Database Systems

Distributed database design, query processing, and transaction processing. Distributed database architectures and interoperability. Emerging technology.

CSE 515 Multimedia and Web Databases

Data models for multimedia and Web data; query processing and optimization for inexact retrieval; advanced indexing, clustering, and search techniques.

CSE 520 Computer Architecture II

Computer architecture description languages, computer arithmetic, memory-hierarchy design, parallel, vector, multiprocessors, and input/output.

CSE 522 Real-Time Embedded Systems

Development of real-time embedded systems, scheduling algorithms, embedded software structures, real-time operating system.

CSE 530 Embedded Operating System Internals

Investigating Linux source including: memory management, kernel synchronization and driver design topics. Designing, coding, testing, and evaluating embedded operating system software in a Linux environment.

CSE 531 Distributed and Multiprocessor Operating Systems

Distributed systems architecture, remote file access, message-based systems, object-based systems, client/server paradigms, distributed algorithms, replication and consistency, and multiprocessor operating systems.

CSE 534 Advanced Computer Networks

Advanced network protocols and infrastructure, applications of high-performance networks to distributed systems, high-performance computing and multimedia domains, special features of networks.

CSE 535 Mobile Computing

Mobile networking, mobile information access, adaptive applications, energy-aware systems, location-aware computing, mobile security and privacy.

CSE 536 Advanced Operating Systems

Protection and file systems. Communication, processes, synchronization, naming, fault tolerance, security, data replication, and coherence in distributed systems. Real-time systems.

CSE 539 Applied Cryptography

Uses cryptography for secure protocols over networked systems, including signatures, certificates, timestamps, electrons, digital cash, and other multiparty coordination.

CSE 543 Information Assurance and Security

Comprehensive understanding of information assurance and security problems with the solutions as well as hands-on experiences about applying these solutions.

CSE 545 Software Security

Theories and tools for software security, including secure design, threat analysis and modeling, security testing and coding.

CSE 546 Cloud Computing

Virtualization, cloud computing, programmable networking, performance evaluation, information assurance, distributed and parallel computing, and cloud computing-based applications. Students must have a solid background in computer architecture, operating system and computer networking to be successful in this course.

CSE 548 Advanced Computer Network Security

Comprehensive understanding of network security and corresponding solutions, including cryptography, access control, secure Web transactions, e-mail security, and viruses.

CSE 550 Combinatorial Algorithms and Intractability

Combinatorial algorithms, nondeterministic algorithms, classes P and NP, NP-hard and NP-complete problems, and intractability. Design techniques for fast combinatorial algorithms.

CSE 551 Foundations of Algorithms

Advanced topics in formal algorithm design and analysis, including advanced shortest-paths algorithms, amortized analysis, network flows, NP-completeness and selected topics in computational geometry, distributed/parallel, randomized, and approximation algorithms.

CSE 552 Randomized and Approximation Algorithms

Introduces two important areas of algorithm design for graduate students. A randomized algorithm is allowed to rely on the outcome of a random experiment in deciding on its next step. In many applications, randomized algorithms are simpler than any deterministic algorithms known, but in several cases, they are in fact more powerful or more efficient than any

deterministic algorithms. Covers basic paradigms for randomized algorithm design and analysis, as well as for derandomization.

CSE 555 Theory of Computation

Rigorous treatment of regular languages, context-free languages, Turing machines and decidability, reducibility, and other advanced topics in computability theory.

CSE 556 Game Theory with Applications to Networks

Strategic conflict as matrix games, notions of equilibrium, definition and existence of Nash equilibrium, zero-sum games, extensive-form games, Bayes Nash equilibrium, potential games, routing games, algorithmic game theory, computation of Nash equilibrium, incentives and pricing in communication networks, application of game theory in wireless networks. Knowledge of calculus, discrete mathematics, probability theory and algorithms is necessary to be successful in this course.

CSE 561 Modeling and Simulation Theory and Application

Modeling theories, simulation protocols, object-oriented modeling, model design, simulation analysis, network-based systems, discrete-event modeling, continuous modeling, hybrid modeling.

CSE 563 Software Requirements and Specification

Examines the definitional stage of software development; analysis of specification representations, formal methods, and techniques emphasizing important application issues.

CSE 564 Software Design

Examines software design issues and techniques. Includes a survey of design representations and a comparison of design methods.

CSE 565 Software Verification, Validation, and Testing

Test planning, requirements-based and code-based testing techniques, tools, reliability models, and statistical testing.

CSE 566 Software Project, Process, and Quality Management

Project management, risk management, configuration management, quality management, and simulated project management experiences.

CSE 569 Fundamentals of Statistical Learning and Pattern Recognition

Concepts of statistical pattern recognition, Bayesian decision theory, parameter estimation, discriminant analysis, basics of artificial neural networks, basics of data clustering. Knowledge of college-level calculus, linear algebra, basic probability theory and proficiency in computer programming is necessary to be successful in this course.

CSE 570 Advanced Computer Graphics I

Hidden surface algorithms, lighting models, and shading techniques. User interface design. Animation techniques. Fractals and stochastic models. Raster algorithms.

CSE 571 Artificial Intelligence

Definitions of intelligence, computer problem solving, game playing, pattern recognition, theorem proving, and semantic information processing; evolutionary systems; heuristic programming.

CSE 572 Data Mining

Advanced data mining techniques: classification, clustering, association, preprocessing; performance evaluation; information assurance, Web mining, security and privacy issues, and other applications. Students must have a solid background in database management systems, search, learning, and statistics to be successful in this course.

CSE 573 Semantic Web Mining

Data mining techniques for structuring and organizing unstructured sources such as text and Web data into meaningful machine-processable information; computational aspects of information extraction and data linkage; discovery and prediction tasks where text serves as data such as detecting events, measuring public opinion and making recommendations. A background in databases, algorithms and theory of computation is necessary to be successful in this course.

CSE 574 Planning and Learning Methods in AI

Reasoning about time and action, plan synthesis and execution, improving planning performance, applications to manufacturing intelligent agents.

CSE 575 Statistical Machine Learning

Spectral clustering, regression, classification, semi-supervised learning, feature reduction, manifold learning, ranking, kernel learning and multitask learning.

CSE 576 Topics in Natural Language Processing

Comparative parsing strategies, scoping and reference problems, nonfirst-order logical semantic representations, and discourse structure.

CSE 577 Advanced Geometric Modeling I

Advanced concepts of geometric modeling: rectangular and triangular surfaces, triangle meshes, Voronoi diagrams, discrete and continuous shape measures, volumes and volume visualization. Students must have a solid background in linear algebra, calculus, and basic 3D graphics to be successful in this course

CSE 579 Knowledge Representation and Reasoning

Covers knowledge representation and reasoning algorithms in artificial intelligence, shows how they can be used in practice, and provides an overview of current research trends.

CSE 580 Practicum

Structured practical experience in a professional program, supervised by a practitioner and/or faculty member with whom the student works closely.

CSE 584 Internship

Structured practical experience following a contract or plan, supervised by faculty and practitioners.

CSE 590 Reading and Conference

Independent study in which a student meets regularly with a faculty member to discuss assignments. Course may include such assignments as intensive reading in a specialized area, writing a synthesis of literature on a specified topic, or writing a literature review of a topic.

CSE 591 Seminar

A small class emphasizing discussion, presentations by students, and written research papers.

CSE 594 Conference and Workshop

Topical instruction, usually in compressed format, leading to academic credit. Often offered off campus to groups of professionals.

CSE 595 Continuing Registration

Used in situations where registration is necessary but where credit is not needed. Replaces arbitrary enrollment in reading and conference, research, thesis, dissertation, etc. Used by students when taking comprehensive examinations, defending theses or dissertations, or fulfilling the continuous enrollment requirement in doctoral programs. Credit is not awarded, and no grade is assigned.

CSE 598 Special Topics

Topical courses not offered in regular course rotation--e.g., new courses not in the catalog, courses by visiting faculty, courses on timely topics, highly specialized courses responding to unique student demand.

CSE 599 Thesis

Supervised research focused on preparation of thesis, including literature review, research, data collection and analysis, and writing.

CSE 691 Seminar

A small class emphasizing discussion, presentations by students, and written research papers.

CSE 790 Reading and Conference

Independent study in which a student meets regularly with a faculty member to discuss assignments. Course may include such assignments as intensive reading in a specialized area, writing a synthesis of literature on a specified topic, or writing a literature review of a topic.

CSE 792 Research

Independent study in which a student, under the supervision of a faculty member, conducts research that is expected to lead to a specific project such as a dissertation, report, or publication. Assignments might include data collection, experimental work, data analysis, or preparation of a manuscript.

CSE 795 Continuing Registration

Used in situations where registration is necessary but where credit is not needed. Replaces arbitrary enrollment in reading and conference, research, thesis, dissertation, etc. Used by students when taking comprehensive examinations, defending theses or dissertations, or fulfilling the continuous enrollment requirement in doctoral programs. Credit is not awarded, and no grade is assigned.

CSE 799 Dissertation

Supervised research focused on preparation of dissertation, including literature review, research, data collection and analysis, and writing.

Appendix I - Absent Committee Member Procedure

While it is desirable that all members of a student's supervisory committee be available during the oral exam, prospectus and final dissertation defense, there are situations (e.g. faculty travel, faculty emergencies and/or faculty leave) that may necessitate holding the oral exam, prospectus, or final dissertation defense with one or more committee member(s) absent. The Academic Unit has established the following policies and procedures for such cases.

1. A minimum of 4 committee members (including chair/co-chair) from the student's official committee must be available during the student's oral exam, prospectus, and final dissertation defense.
2. A minimum of 50% of the student's official committee must be physically present with the student at the oral exam, prospectus, and final dissertation defense. If at least 50% of the committee cannot be physically present, the exam/defense must be rescheduled.
3. The chair (or one co-chair) must be available for the oral exam, prospectus, and final dissertation defense. If this is not possible, the exam/defense must be rescheduled.
4. The chair or (one co-chair) must be physically present at the oral exam, prospectus, or final dissertation defense. If this is not possible, the exam/defense must be rescheduled. The student cannot submit a committee change after the defense is scheduled to create co-chairs in the case of an absent chair.
5. A committee co-chair or member who cannot be available during the oral exam, prospectus, or final dissertation defense, may participate in one of three ways. These options are listed in the order of preference:
 - a. The absent committee member videoconferences into the oral exam defense location.*
 - b. The absent committee member teleconferences into the oral exam defense location.*
 - c. The absent committee member provides a substitute to be physically present (approved by the committee chair & the head of the academic unit) for the oral exam, prospectus, or final dissertation defense. The substitute must be someone who is approved to serve on graduate supervisory committees for that program. The absent committee member should provide the substitute questions, in writing, to be asked at the exam/defense. The substitute, although respecting the opinions expressed by the regular committee, must be free to use his/her judgment in voting on whether the student passes or fails the defense. The substitute should sign the absent committee member's name, and add his/her initials directly after the signature.

*The defense location must have the necessary equipment to accommodate video/teleconference materials.

*Students must provide a copy of their document and any other supporting presentation materials to the committee member at least 5 working days in advance of the defense. The defense location must have the necessary equipment to accommodate video/teleconference materials.

If the videoconference or teleconference option is selected, the absent member needs to e-mail the committee chair or co-chair to state that member voted to pass or fail the student and authorize that the chair sign their name on the form. The committee chair or co-chair should sign

the name of the absent individual on the form and then add his/her initials directly after the signature.

If a committee member will be absent from the oral defense, the student or committee chair/co-chair must notify the Program Chair before or at the time of scheduling the oral exam defense. If the student is notified of an absence after scheduling the oral exam, the student must contact the Program Chair prior to the oral exam defense date, so he/she finds a substitute.

For the final dissertation defense, if a committee member will be absent from the defense, the student or committee chair/co-chair must notify Graduate Education before or at the time of scheduling the defense. If the student is notified of an absence after scheduling the defense, the student must contact Graduate Education prior to the defense date.