GRADUATE DEGREE PROGRAMS
IN
COMPUTER SCIENCE AND ENGINEERING
Computer Science and Engineering Division
The University of Michigan
2260 Hayward
Ann Arbor, Michigan 48109-2121

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1. OVERVIEW OF THE CSE GRADUATE PROGRAMS

At the Graduate Level: All graduate CSE degrees are offered under the rules of the Rackham School of Graduate Studies. This document covers the CSE Graduate Degree Programs: the Master's Degree Program and the Ph.D. Degree Program.

The CSE Graduate Committee is the governing committee for all CSE academic degrees and students. The CSE Programs fall under the College of Engineering Honor Code, please see the College website for details (http://www.engin.umich.edu/).

1.1 Terminal M.S. /M.S.E. Degree Program in Computer Science and Engineering

The Master's degree program is administered by the Computer Science and Engineering Division of the Department of Electrical Engineering and Computer Science. In addition to satisfying the rules of the CSE Graduate Program (covered in this document), a student must also satisfy the regulations of the Rackham School of Graduate Studies, the College of Engineering, for details see the Rackham Website: http://www.rackham.umich.edu/.

The M.S.E. and M.S. degree programs are identical except for admission requirements. Students desiring admission to the M.S.E. program must have an earned bachelor's degree in computer engineering. Application procedures and the principal requirements for the M.S.E. and M.S. degree programs are described in detail on our web page: http://www.eecs.umich.edu.

A student must earn at least 30 credit hours of graduate level coursework, of which at least 24 hours must be technical courses. At least 15 hours must be CSE coursework at the 500 level or above (excluding credit hours earned in individual study, research or seminar courses). The student must also satisfy course requirements in "breadth" areas of software, hardware, artificial intelligence and theory. A maximum of six (6) credit hours of individual study, research and seminar courses will be accepted toward the master's degree. The VLSI/CAD concentration has different course requirements. It usually takes 1 1/2 to 2 years to complete the masters degree (3-4 full terms).

The Program requires that the Grade Point Average received in CSE coursework must be at least 3.0 based on Rackham's 4.0 scale. An individual course grade of B- or better is required for the credit hours received in any course to be counted towards any master's degree requirement. A master's thesis is optional. Credit hours transferred may be applied to meet any master's degree requirement except the 15 credit hours of 500 level CSE coursework required. (Rackham specifies limitations to the circumstances under which credits may be transferred. See the Rackham Graduate School Academic Policies: http://www.rackham.umich.edu.) Courses of an insufficiently advanced level, or which substantially duplicate in level and/or content courses already completed by the student, may not be counted as meeting any master's degree requirements.

1.2 Ph.D. Degree Program in Computer Science and Engineering

The doctoral degree in Computer Science and Engineering is conferred by the Rackham Graduate School in recognition of marked ability and scholarship in some relatively broad field of knowledge, plus the demonstrated ability to carry out independent research yielding significant original results.

The doctoral program proceeds in three stages: (1) qualification (see Section 6.1) (2) candidacy (there are both departmental and Rackham requirements for achieving candidacy) and (3) dissertation (writing and defense of the dissertation). Candidacy signifies that course work is essentially completed and some research has been started. Successful completion and defense of the doctoral dissertation marks the completion of the requirements for the Ph.D. degree.
2. INTERNET RESOURCES

The Rackham Student Handbook and the Engineering College Bulletin are among the numerous UM publications available on-line. The Rackham Student Handbook gives details about the Ph.D. degree requirements imposed by the Graduate School, and should be consulted by all Ph.D. students, particularly in regard to questions about continuous enrollment, fees, cognates, etc. All EECS course descriptions are available on the web as well at http://www.eecs.umich.edu/eecs/academics/courses.html.

The EECS website is http://www.eecs.umich.edu
The Rackham website is http://www.rackham.umich.edu
The College of Engineering website is http://www.engin.umich.edu/

3. CSE TERMINAL MASTERS’ DEGREE PROGRAM

3.1 Requirements: MS/MSE Degree Program (Terminal Master’s Degree)

A CSE Terminal Master’s student may earn a CSE MS/MSE degree by successful completion of the following:

(1) The Rackham requirements including the 4-credit cognate requirement;
(2) The Master's Breadth Requirements including both course and grade requirements;
(3) The required 30 hours of graduate level credit, which must include:
   (a) at least 24 credit hours of approved graduate-level technical courses;
   (b) at least 15 credit hours of CSE technical courses at the 500 level or above
   (c) up to six credit hours of seminar courses (e.g., EECS 598) and directed study courses, special topics, etc. (e.g., EECS 599).

Courses of insufficiently advanced level, or which substantially duplicate in level and content courses already completed by the student may not be counted as meeting any degree requirement.

400-level special topics (EECS 498), independent study (EECS 499), and MDE courses (EECS 496/497, 441, etc.) are not considered graduate-level technical courses for CSE students. For a list of graduate-level CSE courses see the attachment “EECS Courses”.

EECS 598 (Special Topics) courses intended to become regular CSE technical courses may be approved by the Graduate Program Committee to count under category (3b) rather than (3c). These are determined on a case-by-case basis.

EECS 699 (Research Work in EECS) credits will not count toward the CSE Terminal Master’s degree program.

An individual course grade of B- or better is required for the credit hours received in any course to be counted towards any master's degree requirement. Rackham requires the overall GPA among all courses applied to the master's degree to be at least 3.0 based on Rackham's 4.0 scale. In addition to this, the CSE Program requires that the Grade Point Average received in CSE coursework must be at least 3.0 based on Rackham's 4.0 scale. (No letter-graded courses taken as S/U may be used toward any degree requirement.)

Students who enter without an undergraduate engineering degree receive an M.S. degree. Students who enter with an undergraduate engineering degree have a choice of either the M.S. or M.S.E. degrees.

3.1.1. MS/MSE Breadth Requirements (Terminal Master’s Degree)

The CSE Master’s degree program requires students to complete certain "master's breadth" course requirements. The purpose of the breadth requirement is to give the student broad training in the major areas of computer science and engineering.
Students must complete one breadth course (in some cases, two courses) in each of the following technical areas:

a. Hardware: EECS 427, EECS 470, EECS 473, EECS 478, EECS 527, EECS 570, EECS 573, EECS 577, EECS 578, EECS 579, EECS 583, EECS 627.

b. Artificial Intelligence: EECS 543, EECS 545, EECS 592

c. Software: (must complete one 500-level or two 400-level courses from this list) EECS 482, EECS 483, EECS 484, EECS 485, EECS 487, EECS 489, EECS 490, EECS 571, EECS 582, EECS 583, EECS 584, EECS 587, EECS 588, EECS 589, EECS 590, EECS 591

d. Theory: EECS 574, EECS 575, EECS 586.

3.1.2. The VLSI/CAD master’s kernel differs from the other areas as follows:

e. VLSI/CAD students are required to take both EECS 427 and EECS 627.

In addition, students must complete two of the four master’s kernel options listed above (a, b, c, or d). However, EECS 427 and/or EECS 627 cannot be used to fulfill the hardware kernel option. One of the chosen 500-level courses must be from the following list: EECS 522 or EECS 523, EECS 527, EECS 578, EECS 579.

3.1.3. Technical Coursework

A “technical course” is a lecture based class that requires a rigorous combination of homework, exams and/or projects (i.e., not an individual study, research, or seminar course). The course must be an established course that conveys a specified body of material, taught by a regular EECS faculty member and approved for Rackham graduate credit.

3.1.4. Course Equivalency

Courses taken at another university that are equivalent in level and content may be used to fulfill one or more of the breadth course requirements provided the student is awarded equivalency for that course. In general, equivalency does not fulfill any other degree requirements, in particular, credit-hour requirements. Forms to request equivalency include the instructions/procedures and are available in the CSE Graduate Office or at the end of this document in the appendix.

3.1.5. Master's Cognate Requirement

A student may satisfy the cognate requirement (at least four (4) hours of graduate-level course work) by taking course(s) associated with another EECS program (not his/her own), by taking course(s) outside the department, or by a mixture thereof. Courses taken from other programs cannot overlap in content with any CSE course related material. Any course in question must have prior approval of the CSE Graduate Program Committee. In the VLSI/CAD kernel, one of either EECS 522 or EECS 523 may be used toward the 500 level or above requirement if it is taken to fulfill a VLSI/CAD kernel requirement; neither may be used toward the cognate requirement.

3.1.6. Transfer of Credit

Credit hours transferred may be applied to meet any master's degree requirements except the 15 credit hours of 500 level or above CSE coursework. Rackham specifies limitations to the
circumstances under which credits may be transferred. See the Rackham Student Handbook http://www.rackham.umich.edu.

3.1.7. Master's Thesis Option

The option of writing a Master's thesis is available to master's students in good academic standing. A student wishing to exercise this option may initiate the process by taking the following two steps. He/she must: a) find a CSE faculty member willing to serve as thesis advisor; b) enroll under the master's thesis course number (EECS 698) for one to six credit hours. (EECS 698 will not count for technical credit hours.) These credit hours may be spread over more than one term, and are graded on an S/U basis.

The thesis advisor is responsible for supervising the work of the master's thesis project, and choosing the master's thesis committee. This committee shall consist of the thesis advisor who serves as chair, and two additional faculty members, and must be approved by the CSE Graduate Program Committee. At least two of the three thesis committee members must be a regular CSE faculty (CSE tenure-track faculty with at least a 50% appointment in CSE).

The student must write and deposit with the department a written thesis whose format is substantially consistent with the Rackham format requirements for theses. An oral presentation and defense of the thesis before the thesis committee is also required. Each member of the thesis committee must submit a written report on the thesis, and approval of the thesis by all members is required.

3.2. Academic Advisor

Each incoming graduate student is assigned an academic advisor (a regular faculty member in the CSE program). The advisor may subsequently be changed with permission of the CSE Graduate Program Committee. Forms are available in the CSE Graduate Office, attached to this document in the appendix, and/or online: http://www.eecs.umich.edu/eecs/graduate/cse/csegradpage.html.

3.3. Masters Plan of Study

In consultation with the advisor, each student must submit a "Master's Plan of Study" (approved by his/her academic advisor) during the first term of enrollment. This plan must contain a listing of the courses the student intends to take to satisfy the degree requirements and must constitute a coherent program at an appropriate level. The Master's Plan of Study is intended as a guide to the student and program advisor. Final responsibility for ensuring that degree requirements are satisfactorily met rests with the student. Forms are available in the CSE Graduate Office, attached to this document in the appendix, and/or online: http://www.eecs.umich.edu/eecs/graduate/cse/csegradpage.html.

4. APPLYING TO GRADUATE WITH THE MASTER'S DEGREE

At the beginning of the term in which you expect to receive your master's degree you will need meet with CSE Graduate Program Coordinator, and review your academic record. To do so you need to bring: a) a copy of the confirmation of graduation application (it is submitted on-line through Wolverine Access, so you will need to bring a printed copy with you when you meet with the Graduate Program Coordinator); b) an approved and current Master's Plan of Study (if an up to date version is not on file in the CSE Graduate Office). Forms are available in the CSE Graduate Office, attached to this document in the appendix, and/or online: http://www.eecs.umich.edu/eecs/graduate/cse/csegradpage.html.

You must have this meeting for your degree to be processed (please do not hand in the forms without meeting with Graduate Program Coordinator). You must complete the above procedure by at least one week before the posted Rackham deadline for submission.

5. TRANSFER FROM THE TERMINAL MASTERS TO THE PH.D.

PROGRAM

Students currently in the terminal master's who wish to transfer to the Ph.D. Program should submit an
application for admission to the Ph.D. Program. The deadline for applying for Fall Term is December 15 of the previous year. General information about the application process, including a link to the Rackham online application site, is available at http://www.cse.umich.edu/eecs/graduate/cse/apply/. You will need to submit the application, a statement of purpose, and arrange for letters of recommendation.

Given that you are already in our terminal masters degree program, it is expected you will have recommendation letters from Michigan faculty. Further, your application must be sponsored by a particular CSE faculty member who has advised you on a substantial research project and is willing to supervise your Ph.D. research. Your application will be evaluated on the overall record, with special attention to performance in the CSE MS/MSE program and demonstrated research potential at Michigan.

6. CSE Ph.D. DEGREE REQUIREMENTS

6.1. Ph.D. CSE Requirements Overview

Students should note carefully the general requirements for graduate studies stated on, http://www.rackham.umich.edu as well as the requirements stated in this brochure. It is the student’s responsibility to ensure that all requirements are satisfactorily met.

A student earns a CSE Ph.D. in three stages:

(1) **Qualification** for the CSE Ph.D. requires the following:
   - Breadth Coursework
   - Depth Coursework
   - Directed study Coursework/Research
   - Preliminary Examination
   - Reciprocal working relationship with an EECS Faculty member (research advisor)

(2) **Candidacy** for the Ph.D. requires the following:
   - Successful qualification in the CSE Program.
   - Completion of all Rackham requirements for Candidacy, including the 4-hour cognate requirement. (Beginning Fall 2014, Rackham requires that all Responsible Conduct of Research and Scholarship (RCRS) requirements must be met before candidacy).

(3) **Dissertation** and defense:
   - Identify a research advisor, and agree on a topic.
   - Identify a doctoral committee.
   - Submit and defend a proposal for the content of the doctoral research.
   - Do the research and write the dissertation.
   - Submit and defend the dissertation.
6.1.1. Ph.D. Timetable

These are guidelines/deadlines for maintaining normal progress toward your degree. To stay in the Ph.D. program after a * deadline requires a petition (with advisor’s approval) and a waiver from the CSE Graduate Program Committee.

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<tr>
<th>Milestone</th>
<th>Enter Without Relevant Masters</th>
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<tr>
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<td>3*</td>
</tr>
<tr>
<td>Candidacy</td>
<td>5(6*)</td>
<td>3(4*)</td>
</tr>
<tr>
<td>Proposal</td>
<td>7*</td>
<td>5*</td>
</tr>
<tr>
<td>Defend</td>
<td>12*</td>
<td>10*</td>
</tr>
</tbody>
</table>

Prelim exams (part of Quals) are scheduled only in mid-September, mid-January, and mid-May.

CSE Ph.D. Deadlines

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<td>December 2018</td>
<td>December 2019</td>
<td>December 2020</td>
<td>December 2021</td>
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<table>
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<td>May 2015</td>
<td>May 2016</td>
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<tr>
<td>Candidacy</td>
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<td>December 2013</td>
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<td>December 2019</td>
<td>December 2020</td>
<td>December 2021</td>
<td>December 2022</td>
</tr>
</tbody>
</table>

6.1.2. Qualification

Qualification is based on all of the following which must be successfully completed by each student’s individual qualification deadline. A Ph.D. student must have a 3.5 GPA overall and a 3.5 GPA for all CSE courses to sign up for the qualification exams:

6.1.2.1. Ph.D. Breadth Coursework

**Breadth:** three courses from three different technical areas, drawn from a specified list of technical areas and approved courses (attached), completed with a grade of B+ or better. Equivalency is possible.

Courses selected to fulfill the CSE Ph.D. Breadth requirement may not also be used to fulfill the CSE Ph.D. Depth requirement. All Ph.D. breadth courses must be completed with a grade of B+ or better within 3 full terms (1 1/2 years) for a student with a relevant Master’s degree and 4 full terms for all other students. Courses taken at another university that are equivalent in level and content may fulfill one or more of these requirements. A list of approved courses is attached to this document in the appendix, and/or online: [http://www.eecs.umich.edu/eecs/graduate/cse/csegradpage.html](http://www.eecs.umich.edu/eecs/graduate/cse/csegradpage.html)
6.1.2.2. Ph.D. Depth Coursework

**Depth**: two courses from a specified list of courses (attached), including at least one "starred" course, completed with a grade of A- or better. These courses may not be completed via equivalency.

The “Depth” coursework requirement is designed to ensure that students complete graduate-level coursework relevant to their chosen area of specialization and acquire the core research skills and knowledge of the literature relevant to this specialization. Students must complete two (2) courses from the lists below, achieving a minimum grade of A- in each. These courses may **not** be completed via equivalency. At least one of the courses must be a “Star” course, marked with an asterisk in the list below. The selected courses must be approved by the student’s research advisor; a signed Depth Course Approval form must be submitted when signing up for the qualification exam (by the deadline). A list of approved courses is attached to this document in the appendix, and/or online:

http://www.eecs.umich.edu/eecs/graduate/cse/csegradpage.html

6.1.2.3. Directed Study and Research Potential

A commitment from an approved EECS Faculty to act as one’s research advisor is a requirement of qualification.

A Ph.D aspirant must demonstrate potential for conducting original research. This may be accomplished by completing at least three hours of research-oriented directed study (EECS 699) prior to the Preliminary Exam. These must be taken as a Rackham CSE student at UM. (Alternatively, this requirement may be satisfied by six credit hours for a UM CSE Masters Thesis (EECS 698).)

A Ph.D student must complete at least one of the three required credits of EECS 699 (directed study) within their first two terms of the Ph.D program, or have their academic or research advisor sign a waiver of this requirement. Students must submit a form documenting their directed study/waiver by the course registration Drop/Add deadline of their second semester.

During their first summer in the PhD program, students are required to remain resident in Ann Arbor and perform independent research in collaboration with a CSE faculty member. The intent of this summer research requirement is to provide adequate opportunity for students to work closely with a research advisor to prepare to take the qualifying exam before their qualification deadline. The first-year summer research/residency requirement is a condition of continued departmental financial aid guarantees and can be waived only by petition to the graduate program committee with an explanation of special circumstances (e.g., a research-oriented internship directly relevant to the student's qualifying exam preparation) endorsed by the student's academic or research advisor. This requirement does not apply to students who transfer from a terminal MS to the PhD program more than one calendar year after entering the MS program.

6.1.2.4. Preliminary Examination

**Preliminary Exam**: Research readiness is evaluated through a written report of a project done in a research-oriented directed study, followed by a 90 minute oral exam by three faculty members not including one's research advisor.

The Preliminary Examination (Prelim) is a major component of the Ph.D. qualification process. Each student will be given an oral examination on the student's directed study
project and on material directly related to the student's research area. This examination will be administered during the qualification examination period in mid-January, mid-May or mid-September. The examination will be given by three faculty members selected by the CSE Graduate Program Committee. None will be the director of the students' directed study project. Examiners will be given the written report on the directed study at least one week before the examination, and each examiner will submit a written report on the examination. The student must submit four copies of the written report to the CSE Graduate Coordinator at least one week before the qualification exams begin.

The Preliminary Exam is scheduled for a 90 minute time slot. With "Michigan time", this means that there is 80 minutes available. The student presentation should aim for 40 minutes or less, with the other 40 minutes for questions.

Once all the above requirements for Qualification have been met, a decision whether the student is qualified to continue in the Ph.D. Program is made by vote of the CSE Faculty.

6.1.3. Candidacy

The decision to admit a student to Candidacy is based on the following factors:

1. Successful completion of the CSE Qualification process.
2. Fulfillment of all other Rackham candidacy requirements such as cognate course work, RCRS, etc.

A student may satisfy the Ph.D. cognate requirement (at least four (4) hours of graduate-level course work) by taking course(s) associated with another EECS program (not his/her own), by taking course(s) outside the department, or by a mixture thereof. Courses taken from other programs cannot overlap in content with any CSE course related material. Any course in question must have prior approval of the CSE Graduate Program Committee.

To become a "Candidate", a student must have been declared "qualified" by the CSE Program, and must have satisfied all of the CSE Program's and Rackham's candidacy requirements (beginning Fall 2014, Rackham requires that all RCRS requirements are met before candidacy). A student must apply for candidacy by submitting the "CSE Candidacy Checklist" via the CSE Graduate Office. These requirements and the form must be submitted before the term before you plan to become a candidate. Candidacy is not awarded automatically; it must be applied for.

The achievement of candidacy is considered an important milestone in a Ph.D. student's progress, and all students are expected to apply for candidacy as soon as they are eligible. A student with a relevant Master's degree is making satisfactory progress if candidacy is achieved within 3 full terms (1.5 years), and must be achieved within 4 full terms (2 years). Other students are making satisfactory progress if candidacy is achieved within 5 full terms (2.5) years, and must be achieved within 6 full terms (3 years). A student without adequate undergraduate coursework in CSE may petition for an extension to these deadlines; however, that petition must be made to the Graduate Program Committee before the end of the first term of study.

6.1.4. Dissertation Committee

Soon after admission into candidacy, the candidate and his or her advisor should form a Dissertation Committee and submit it to the CSE Graduate Program Committee for preliminary approval. The CSE form to request approval is available on CSE Graduate Web Site: http://www.eecs.umich.edu/eecs/graduate/cse/csegradpage.html. This request form must be first approved by the students’ chair (or co-chairs). Once approved by the CSE Graduate Program Committee, it will be forwarded to the Rackham Graduate School for their approval. Normally the research advisor serves as chair or co-chair of this committee. It is the responsibility of the student and the advisor to find eligible faculty members willing to serve.
A typical CSE Dissertation Committee consists of three regular CSE Faculty and one cognate Rackham Faculty member representing a non-CSE discipline. The committee's composition must be approved by the CSE Graduate Program Committee.

In addition to complying with all the Rackham requirements the CSE Graduate Program requires that: one member of the committee must be a tenure-track CSE faculty with at least 50% appointment in CSE, and a second member must have a CSE appointment exceeding 50%. A faculty member with a 50% or higher CSE appointment may not serve as the Cognate member of the committee.

A CSE faculty member with a 0% appointment can serve as sole chair of a committee. A CSE faculty member with a 0% appointment can be a cognate member of a committee, however one person cannot be both a cognate and regular (non-cognate) member of the same committee. The Dissertation Committee is responsible for reviewing the student's progress, including the thesis proposal and the final dissertation. The dissertation committee must be approved at least one month before the thesis proposal date.

6.1.5. Thesis Proposal

After a student achieves candidacy, a thesis (dissertation) proposal must be successfully completed by a candidate within 7 full terms (3.5 years) from the start of graduate study to maintain satisfactory progress. A student with a relevant Master's degree must complete a thesis proposal within 5 full terms (2.5 years). The thesis proposal will be administered by the Dissertation Committee (see above). The student will submit a dissertation research proposal to the Dissertation Committee at least two weeks in advance of the date of an oral presentation. In the written proposal, the student must precisely identify the intellectual area in which he or she intends to pursue research and must demonstrate an in-depth understanding of that area. The student must give a general description of the research problem to be addressed and an outline of the approach that will be taken. It is desirable that the research problem be specified in considerable detail and that some initial results be presented. During the oral presentation, the student will present the proposed dissertation research, including relevant background material and preliminary research results. During and after the presentation, the Dissertation Committee will explore the research area with the student to determine whether the student has completed this phase successfully. The Dissertation Committee will prepare a written report on the outcome of the proposal presentation, and a copy of the written proposal will be placed in the student's file.

6.1.6. Dissertation and Final Defense

After the thesis proposal has been approved, the candidate may proceed with the thesis research and the writing of the dissertation. Upon completion, the dissertation must receive a written evaluation from each member of the Dissertation Committee and must be defended orally in an open examination (the Final Defense) before the Committee, in accordance with Rackham rules. The thesis defense may not be scheduled in the same academic term as the thesis proposal. (http://www.rackham.umich.edu)

6.2. Ph.D. Research Advisor

An incoming graduate student will be assigned an academic advisor (a regular faculty member in the CSE program) in his/her area of interest. Students already in the CSE master's degree program may continue with the same academic advisor. The academic advisor will assist the student with meeting the academic requirements of the degree.

A student’s research advisor, chosen through mutual agreement between the student and the faculty member, will guide and counsel the student on the research and academic planning for, and completion of, the Ph.D. degree.
The advisor (academic and/or research) may subsequently change by mutual agreement. (Forms are available on the CSE Program Website or in the CSE Graduate Office.)

If the research advisor is a regular tenure-track CSE Faculty, they may assume the role of both research and academic advisor. If your research advisor is outside of the CSE regular faculty, the CSE faculty academic advisor will remain.

A commitment from a CSE Tenure-Track Faculty to act as a research advisor is a requirement of qualification/candidacy and satisfactory progress toward the degree.

6.3. CSE MS/MSE Degree Requirements for CSE Ph.D. Students

A CSE Ph.D. student (entering without a relevant Masters), has the option of earning a CSE MS/MSE degree by completion of the following:

1. Completing the Rackham requirements for the Masters, including the 4-credit Cognate requirement;
2. Completing the Breadth and Depth requirements of the CSE Ph.D. program, including both course and grade requirements;
3. Filling out the required 30 hours of graduate level credit with some combination of approved graduate-level technical courses and research credits, i.e. EECS 699.

400-level special topics (EECS 498), independent study (EECS 499), and MDE courses (EECS 496/497, 441, etc.) are not considered graduate-level technical courses for CSE students. For a list of graduate-level CSE courses see the attachment “EECS Courses”.

A typical Ph.D. Student will take 5 courses (15-20 credits) to complete the Ph.D. Breadth/Depth requirements; complete the 4 credit cognate requirement; and fill the remaining credit hours through Ph.D.-oriented research (EECS 699).

An individual course grade of B- or better, is required for the credit hours received in any course to be counted towards any master's degree requirement. Rackham requires the overall GPA among all courses applied to the master's degree to be at least 3.0 based on Rackham's 4.0 scale. In addition to this, the CSE Program requires that the Grade Point Average received in CSE coursework must be at least 3.5 based on Rackham's 4.0 scale. (No letter-graded courses taken as S/U may be used toward any degree requirement.)

Students who enter without an undergraduate engineering degree receive an M.S. degree. Students who enter with an undergraduate engineering degree have a choice of either the M.S. or M.S.E. degrees.

7. NON-DEGREE (NCFD) STUDENTS

The CSE Division will occasionally admit qualified students who are not candidates for a degree (NCFD students) to enable them to take graduate courses. Such students typically have a full-time job in a local industry or business in Southeastern Michigan and take relatively few courses. A student who is interested in a graduate degree program is strongly encouraged to apply as a regular graduate student, and not as an NCFD student. Note that courses taken by a student under NCFD status may not be subsequently used for a graduate degree. NCFD status is only granted for one term at a time.

8. POLICY FOR DROPPING COURSES

After the eighth week of a full term (fourth week of a half term), courses may be dropped or changed to Visit status only under exceptional circumstances and with the approval of the course instructor, advisor, and the graduate chair of the program. The specific deadline dates are posted in the CSE Graduate Office, 3909A CSE and on the CSE Program website. The Rackham Graduate School rules for dropping courses also apply (see the Rackham Student Handbook http://www.rackham.umich.edu).
9. ADDITIONAL INFORMATION AND FORMS

Various current forms such as the CSE Graduate Courses list, the master's degree plan of study, etc. are also available on the CSE Graduate Website:
http://www.cse.umich.edu/eecs/graduate/cse/cse_current.html

**Forms included:**

*For Terminal Masters Students:*
- CSE Terminal Masters Plan of Study
- CSE Terminal Masters Plan of Study in VLSI

*For Ph.D. Students:*
- First Year Directed Study Requirement Form
- Qualification Sign Up Form
- CSE Candidacy Checklist for the Ph.D. Program
- CSE Ph.D. Student Masters Plan of Study
- CSE Dissertation Committee Request Form

*For All Students:*
- CSE Petition Request Form
- Request for Equivalency
- Notification of Advisor and/or Area Change
- EECS Course List
# CSE Terminal Masters Plan of Study

(must take breadth courses is all 4 areas listed below)

Advisor (signature required)

<table>
<thead>
<tr>
<th>Name:</th>
<th>UMID:</th>
<th>Date</th>
<th>MSE Degree or MS Degree (circle one)</th>
<th>Degree Term:</th>
</tr>
</thead>
</table>

(What is your undergrad degree field? (engineering or non-engineering)

<table>
<thead>
<tr>
<th>Credit Hours</th>
<th>Technical Electives:</th>
<th>CSE Courses</th>
<th>Cognates: At least 4 hrs. of Grad. Level course work of (Software)</th>
<th>(Artificial Intelligence)</th>
<th>(Theory)</th>
</tr>
</thead>
<tbody>
<tr>
<td>At least 30 credit hours</td>
<td>at least 24 credit hours</td>
<td>500 level or above</td>
<td>at least 15 credit hours</td>
<td>0482; 483; 484; 485; 487; 490; 517; 582</td>
<td>427; or 470 or 478 or 527</td>
</tr>
<tr>
<td>0513, 0541, 0546</td>
<td>0533, 0548, 0584, 0598, 0599</td>
<td>0592, 0543, 0545</td>
<td>0527, or 470 or 473 or 478 or 527</td>
<td>0570 or 573, 0577 or 578</td>
<td>0574 or 575 or 586</td>
</tr>
<tr>
<td>0513, 0541, 0546</td>
<td>0533, 0548, 0584, 0598, 0599</td>
<td>0592, 0543, 0545</td>
<td>0527, or 470 or 473 or 478 or 527</td>
<td>0570 or 573, 0577 or 578</td>
<td>0574 or 575 or 586</td>
</tr>
</tbody>
</table>

**NOTES:**

1) Cognates are courses outside the CSE Division (Courses cross-listed with CSE may not be used, and all cognates must be approved by advisor).

2) A maximum of six credit hours of individual study, research, and seminars.

3) You must meet all Rackham and Program requirements (see brochures for details).

4) It is expected that most entering students will have already completed courses equivalent to (482 or 483) and 492 and (470 or 478)

5) Seminar, directed study credits (except 3 hrs. of EECS 599) do not count toward the 500 level course requirement.

6) It is the student’s responsibility to see that all requirements are met.

7) If you already have a masters degree from another institution that has been deemed relevant by CSE you are not eligible for a masters degree from this program.

**Total Hours:** (fill in for each column)

**Office Use Only:**

- No grades below B-
- Approved MPS
- MSE
- MS
- Other, Masters thesis, TC
- GPA
- CTP

08/16
<table>
<thead>
<tr>
<th>Term</th>
<th>Course</th>
<th>Grade</th>
</tr>
</thead>
</table>

**Total Hours:** (fill in for each column)

**NOTES:**

1. Cognates are courses outside the CSE Division (Courses cross-listed with CSE may not be used, and all cognates must be approved by advisor)

2. A maximum of six credit hours of individual study, research, and seminars

3. You must meet all Rackham and Program requirements (see brochures for details)

4. It is expected that most entering students will have already completed courses equivalent to (482 or 483) and 492 and (470 or 478)

5. Seminar, directed study credits (except 3 hrs. of EECS 599) do not count toward the 500 level course requirement

6. It is the student’s responsibility to see that all requirements are met.

7. You must choose 2 of the 4 areas in addition to the VLSI Kernel

8. one of the 500 level must be from the approved list/see brochu

9. If you already have a masters degree from another institution that has been deemed relevant by CSE you are not eligible for a masters degree from this program.

---

For office use only:

- No grades below B-
- Approved MPS
- Other, Masters thesis, TC

GPA | CTP

08/16
Computer Science and Engineering Program
FIRST YEAR PH.D.
DIRECTED STUDY REQUIREMENT

Directions: The academic advisor and/or research advisor must endorse the request. Return this form to Dawn Freysinger, 3909A BBB before the drop deadline for your second academic term.

Type or print your name and your mailing address:
Name ___________________________________ UMID# ________________
Address __________________________________________________________
_________________________________________________________________
e-mail __________________________________________________________

Degree level _______________ Term Admitted to Program ________________

FIRST YEAR PH.D. DIRECTED STUDY REQUIREMENT
Is being fulfilled by working with ______________________________
during ________________________ term.

What are your plans for your first Summer term?
_________________________________________________________________
_________________________________________________________________

WAIVER REQUEST
I have met with my advisor and with his/her approval am requesting a waiver for the first year (1 hr.)
directed study requirement. I will complete this requirement within the next academic term:

Signature of Student __________________________________ Date ____________

Academic Advisor Name (print and sign): ______________________________

Research Advisor Name (print and sign): ______________________________
CSE Qualification Sign up Form

Stu Name: ____________________________ UMID: ____________________________ Date: ____________________________

Local mailing address (include city/zip, etc): ________________________________________________________________

email: ____________________________ telephone: ____________________________

<table>
<thead>
<tr>
<th>Depth</th>
<th>Breadth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Directed study (3 hrs of 699)</td>
<td></td>
</tr>
<tr>
<td>Course</td>
<td>* Course</td>
</tr>
<tr>
<td>Software</td>
<td>Intelligent Systems</td>
</tr>
<tr>
<td>Hardware</td>
<td>Theory</td>
</tr>
</tbody>
</table>

Depth Coursework:
2 courses from list, A- or better, one must be a * Course, no equiv

Breadth Coursework:
1 course each from 3 of the 4 areas, B+ or better, equiv possible

Prelim papers are due one week before the first day of prelims.

Are you a Pre-candidate: YES NO (if no, you are not eligible to take the qualification exams)

Overall GPA (must be => 3.5):

__________________________

Academic Advisor: ____________________________

Research Advisor: ____________________________

Faculty Director for your project: ____________________________

What term did you conduct the research: ____________________________

Title: ____________________________________________

If you are completing all three components of the quals and are expecting a qualification decision please mark here: ____________________________________________
CSE Candidacy Checklist for the Ph.D. Program

Advisor (signature required)

<table>
<thead>
<tr>
<th>Course</th>
<th>Grade</th>
<th>Credit Hrs.</th>
</tr>
</thead>
</table>

**Depth Coursework:**
- 2 courses from list, A- or better, one must be a * Course, no equiv

**Breadth Coursework:**
- 1 course each from 3 of the 4 areas, B+ or better, equiv possible

Approved List is attached

Cognates are courses outside the CSE Division (Courses cross-listed with CSE may not be used, and all cognates must be approved by advisor)

You must meet all Rackham and Program requirements (see brochures for details)

It is the student’s responsibility to see that all requirements are met.

Term you plan to become a candidate:

Have you completed RCRS training?
- If yes, please attach a copy of the confirmation. If no, you are not eligible for candidacy

Has your bachelor’s degree and master’s (if applicable) been posted to your transcript?
- If no, you are not eligible for candidacy

Oral Preliminary Exam Date:

Qualification Date:

Were you registered when you took the prelim?

Faculty you will register with for research in your first candidacy term:

*** You are responsible for meeting all department and Rackham requirements for candidacy.
This form should be filled out after you have been qualified by the CSE Faculty to continue on for the Ph.D. Program.
You must complete all requirements for candidacy the term before you can be advanced (including the submission of this form).
# CSE Ph.D. Student
## Masters Plan of Study

**Advisor (signature required)**

**Stu Name:**

**UMID:**

**Date:**

**MSE Degree** or **MS Degree** (circle one)

**Degree Term:**

(What is your undergrad degree field? (engineering or non-engineering))

---

**Depth**

<table>
<thead>
<tr>
<th>Course</th>
<th>Grade</th>
<th>Credit Hrs.</th>
<th>Depth Coursework:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>2 courses from list, A- or better, one must be * Course, no equiv</td>
</tr>
</tbody>
</table>

**Breadth**

<table>
<thead>
<tr>
<th>Course</th>
<th>Grade</th>
<th>Credit Hrs.</th>
<th>Breadth Coursework:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>1 course each from 3 of the 4 areas, B+ or better, equiv possible</td>
</tr>
</tbody>
</table>

- Cognates are courses outside the CSE Division (Courses cross-listed with CSE may not be used, and all cognates must be approved by advisor)
- You must meet all Rackham and Program requirements (see brochures for details)
- It is expected that most entering students will have already completed courses equivalent to (482 or 483) and 492 and (470 or 478)
- It is the student’s responsibility to see that all requirements are met.
- If you already have a masters degree from another institution that has been deemed relevant by CSE you are not eligible for a masters degree from this program.

**Total Hours:** (fill in for each column)

- (=> 30)
- (=>3)
- (=>4)

---

**for office use only:**

- No grades below B-
- Approved MPS
- Other, Masters thesis, TC

**Term**

**GPA**

**CTP**

1/15
Computer Science and Engineering Graduate Program  
Dissertation Committee Request Form  

To:         Professor John Laird, Graduate Program Chair  

From:        
Name:  
Mailing address        City/State/Zip  
Student ID# email address  

Subject:  Dissertation Committee Approval  

Please consider the following professionals for my Dissertation Committee.  

Chair/Co-Chairs  

<table>
<thead>
<tr>
<th>Name and UM email address</th>
<th>Title</th>
<th>Department</th>
</tr>
</thead>
<tbody>
<tr>
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</tbody>
</table>

Cognate member  

<table>
<thead>
<tr>
<th>Name and UM email address</th>
<th>Title</th>
<th>Department</th>
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<tbody>
<tr>
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</tbody>
</table>

Other member(s)  

<table>
<thead>
<tr>
<th>Name and UM email address</th>
<th>Title</th>
<th>Department</th>
</tr>
</thead>
<tbody>
<tr>
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<table>
<thead>
<tr>
<th>Name and UM email address</th>
<th>Title</th>
<th>Department</th>
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</thead>
<tbody>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Name and UM email address</th>
<th>Title</th>
<th>Department</th>
</tr>
</thead>
</table>

If a committee member is not a tenure-track Rackham faculty member, please attach their C.V. and a paragraph/statement regarding their qualification for serving on your committee.  

Approval of Chair/Co-Chairs ___________________________  Date: ___________  

_____________________________ Date: ___________  

For department use only.  Circle one:  

Dissertation Committee is/ is not approved.  

CSE Grad Prog Chair : ___________________________  Date: ___________
CSE Guidelines for the CSE Dissertation Committee

A typical CSE Dissertation Committee consists of three regular CSE Faculty and one cognate Rackham Faculty member representing a non-CSE discipline. The committee's composition must be approved by the CSE Graduate Program Committee.

In addition to complying with all the Rackham requirements the CSE Graduate Program requires that: one member of the committee must be a tenure-track CSE faculty with at least 50% appointment in CSE, and a second member must have a CSE appointment exceeding 50%. A faculty member with a 50% or higher CSE appointment may not serve as the Cognate member of the committee.

A CSE faculty member with a 0% appointment can serve as sole chair of a committee. A CSE faculty member with a 0% appointment can be a cognate member of a committee, however one person cannot be both a cognate and regular (non-cognate) member of the same committee. The Dissertation Committee is responsible for reviewing the student's progress, including the thesis proposal and the final dissertation. The dissertation committee must be approved at least one month before the thesis proposal date.

01/2015
Computer Science and Engineering Graduate Program
PETITION REQUEST

PETITION TO THE CSE GRADUATE COMMITTEE

Request for extension of deadline for completion of milestones (e.g. Qualifying examinations, thesis proposal, etc.) or other special requests.

Directions: The student should provide an explanation of why the deadline cannot be met as scheduled; what work remains; and by what date (month/year) it can be completed. The academic advisor and/or research advisor must endorse the request before forwarding it to the Graduate Committee. Return this completed form to the CSE Graduate Office, 3909A BBB.

Type or print your name and your mailing address:

Name ________________________________ UMID# __________________________

UM e-mail ____________________________

Degree level ________________ Term Admitted to Program ________________

Brief description of your petition request:

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

OR TYPE YOUR REQUEST ON A SEPARATE SHEET AND ATTACH TO THIS FORM.
(student and advisor must also sign the attached request)

Signature of Student __________________________ Date __________

I (do) (do not) support this petition.
Academic Advisor Name (print and signature): __________________________

I (do) (do not) support this petition.
Research Advisor Name (print and signature) (if applicable): __________________________

I (do) (do not) support this petition.

Graduate Committee Decision: ________________________________________________

Graduate Chair: __________________________ Date __________
Instructions to the student: Please complete and sign this form and take it to the UM Faculty member responsible for the UM course in question. Obtain your advisor's signature and return the form to the CSE Graduate Coordinator in 3909A BBB.

Equivalency can be accepted for breadth coursework requirements only. 
(Do not use this form for cognate course requirements.)

1. Student Name: ____________________________________   ID:_______________________

2. UM Course for which equivalency is requested (Number and title):
   _______________________________________________________

3. Course taken elsewhere to be considered for equivalency:
   University that the course was taken at:  __________________________________________
   Course Number and title:  ______________________________________________
   Credit Hours: ______________ Grade earned: _________
   STUDENT SIGNATURE:  ________________________________    Date _________________

4. UM Faculty Member teaching equivalent course:  _________________________
   url for past teaching assignments for EECS courses:   http://www.eecs.umich.edu/eecs/undergraduate/pastteaching.pdf
   ************************************************************************************
   This section to be filled out by the faculty member reviewing materials:
   5. Course information reviewed by UM faculty member:
      _____ 1)  Course outline
      _____ 2)  Course catalog description
      _____ 3)  Course notes, assignments, tests
      _____ 4)  Course pack
      _____ 5)  Transcript copy
      _____ Other   ____________________________________________________
   This course is equivalent for purposes of Masters requirements  ____________________________
   This course is equivalent for purposes of Ph.D. breadth requirements (please make sure grade is equal to B+ or better)  ____________________________
   SIGNATURE OF FACULTY MEMBER:  ________________________________    Date:________________
   SIGNATURE OF ACADEMIC ADVISOR:  ______________________________Date:________________
   ************************************************************************************
   **Return form to CSE Graduate Coordinator in 3909A BBB**

   APPROVAL OF CSE GRADUATE CHAIR:  ______________________________
   Date:________________

   1/15
CSE
NOTIFICATION OF ADVISOR CHANGE

STUDENT NAME _______________________________ ID ________________________

UM Email ____________________

I am requesting a change of advisor.

My current academic / research advisor is ________________________________.
(circle appropriate choice)

My new academic / research advisor will be ________________________________.
(circle appropriate choice)

Student Signature: _______________________________ Date _________________

Previous Advisor: _______________________________ Date _________________

New Advisor: _______________________________ Date _________________

1/15
### Terminal Masters Requirements:

<table>
<thead>
<tr>
<th>Core Technical Electives</th>
<th>Hardware</th>
<th>Software</th>
<th>Artificial Intelligence</th>
<th>Theory</th>
<th>Ph.D. Depth/Specialization</th>
</tr>
</thead>
<tbody>
<tr>
<td>EECS Courses</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>402. Computer Programming For Scientists and Engineers (3 credits)</td>
<td>402</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>410/ENGR 406. High-Tech Entrepreneurship (4 credits)</td>
<td>406</td>
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<tr>
<td>411. Microwave Circuits I (4 credits)</td>
<td>411</td>
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<td>413. Microelectronics Circuits (4 credits)</td>
<td>413</td>
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<tr>
<td>414. Introduction to MEMS (4 credits)</td>
<td>414</td>
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<tr>
<td>417/BIOMEDE 417. Electrical Biophysics (4 credits)</td>
<td>417</td>
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<td>418. Power Electronics (4 credits)</td>
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<td>419. Electric Machinery and Drives (4 credits)</td>
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<tr>
<td>421. Properties of Transistors (4 credits)</td>
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<tr>
<td>423. Solid-State Device Laboratory (4 credits)</td>
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<td>425. Integrated Microsystems Laboratory (4 credits)</td>
<td>425</td>
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<tr>
<td>427. VLSI Design I (4 credits)</td>
<td>427</td>
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<tr>
<td>429. Semiconductor Optoelectronic Devices (4 credits)</td>
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<td>435/AOSS 431. Radiowave Propagation and Link Design (4 credits)</td>
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<tr>
<td>434. Principles of Photonics (4 credits)</td>
<td>434</td>
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<tr>
<td>435. Fourier Optics. (3 credits)</td>
<td>435</td>
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<tr>
<td>438. Advanced Lasers and Optics Laboratory (4 credits)</td>
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<td>441. Mobile App Development for Entrepreneurs (3 credits)</td>
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<td>442. Computer Vision. (4 credits)</td>
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<tr>
<td>443. Senior Thesis (3 credits)</td>
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<tr>
<td>445. Introduction to Machine Learning (4 credits)</td>
<td>445</td>
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<tr>
<td>451. Digital Signal Processing and Analysis (4 credits)</td>
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<tr>
<td>452. Digital Signal Processing Design Laboratory (4 credits)</td>
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<tr>
<td>453. App Matrix for BP (4 credits)</td>
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<td>455. Digital Communication Signals and Systems (4 credits)</td>
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<td>458/BIOMEDE 458. Biomedical Instrumentation and Design (4 credits)</td>
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<td>459. Control Systems Analysis and Design (4 credits)</td>
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<td>461. Embedded Control Systems (4 credits)</td>
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<td>463. Power Systems Design and Operation (4 credits)</td>
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<td>467. Autonomous Robotics (4 credits)</td>
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<td>470. Computer Architecture (4 credits)</td>
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<td>473. Advanced Embedded Systems (4 credits)</td>
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<td>477. Introduction to Cryptography (4 credits)</td>
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<td>478. Logic Circuit Synthesis and Optimization (4 credits)</td>
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<td>480. Logic and Formal Verification (4 credits)</td>
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<td>481. Software Engineering (4 credits)</td>
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<td>482. Introduction to Operating Systems (4 credits)</td>
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<td>494. Computer Game Design and Development (4 credits)</td>
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<td>511. A/D Interfaces (4 credits)</td>
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<td>513. Flat Panel Displays (3 credits)</td>
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<td>524. Advanced Solid State Microwave Circuits (3 credits)</td>
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<td>527. Layout Synthesis and Optimization (3 to 4 credits)</td>
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<td>528. Principles of Microelectronics Process Technology (3 credits)</td>
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<td>529. Semiconductor Lasers and LEDs (3 credits)</td>
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<td>530/APP/PHYS 530. Electromagnetic Theory I (3 credits)</td>
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<td>531. Antenna Theory and Design (3 credits)</td>
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</table>
### Terminal Masters Requirements:

**EECS Courses**

- 532/AOSS 587. Microwave Remote Sensing I: Radiometry (3 credits)
- 533. Microwave Measurements Laboratory (3 credits)
- 534. Design and Characterization of Microwave Devices and Monolithic Circuits (4 credits)
- 535. Optical Information Processing (3 credits)
- 536. Statistical Optics (3 credits)
- 537/APPHY 537. Classical Optics (3 credits)
- 538/APPHY 538/PHYSICS 656. Optical Waves in Crystals (3 credits)
- 539/APPHY 539/PHYSICS 651. Lasers (3 credits)
- 540/APPHY 540. Applied Quantum Mechanics I (3 credits)
- 541/APPHY 541. Applied Quantum Mechanics II (3 credits)

**Depth Depth starred**  
**Breadth**

- 543. Knowledge-Based Systems (2 credits)
- 544. Machine Learning (3 credits)
- 545. Ultrastar Optics (3 credits)
- 547. Electrical Engineering (3 credits)
- 548. Info Visualization (3 credits)
- 549/SI 560. Informatn Retrieval. Advisory pre-requisite: SI 562 (3 credits)
- 550. Information Theory (3 credits)
- 551. Mathematical Methods for Signal Processing (3 credits)
- 552/APPHY 552. Fiber Optics. Internet to Biomedical Applications (3 credits)
- 553. Data Compression (3 credits)
- 554. Introduction to Digital Communication and Coding (3 credits)
- 555. Digital Communication Theory - (3 credits)
- 556. Image Processing (3 credits)
- 557. Communication Networks (3 credits)
- 558. Stochastic Control (3 credits)
- 559. Advanced Signal Processing (3 credits)
- 560/MECHENG 560. Linear Systems Theory (4 credits)
- 561/MECHENG 561. Design of Digital Control Systems (3 credits)
- 562/AEROSP 551. Nonlinear Systems and Control (3 credits)
- 564. Estimation, Filtering, and Detection (3 credits)
- 565/AEROSP 550. Linear Feedback Control Systems (3 credits)
- 566. Discrete Event Systems (3 credits)

**Depth Depth starred**  
**Breadth**

- 567/MECHENG 567/MECHENG 567. Robot Kinemat Dynam (3 credits)

**D 568**

- 568/NAVARCH 568. Mobile Robotics: Methods and Algorithms (4 credits)

**D 570**

- 570. Parallel Computer Architecture (4 credits)
- 571. Principles of Real-Time Computing (4 credits)
- 572. Microarchitecture (3 credits)
- 574. Computational Complexity (4 credits)
- 575. Advanced Cryptography (4 credits)
- 578. Computer-Aided Design Verification of Digital Systems - (4 credits)
- 579. Digital System testing g (4 credits)

**D 580**

- 582. Advanced Operating Systems (4 credits)
- 583. Advanced Compilers (4 credits)
- 584. Advanced Database Systems (4 credits)
- 585. Algorithms (4 credits)
- 586. Parallel Computing (4 credits)
- 588. Computer and Network Security (4 credits)
- 589. Advanced Computer Networks (4 credits)
- 590. Advanced Programming Languages (4 credits)

**D 590**

- 591. Distributed Systems (4 credits)
- 592. AI Foundations (4 credits)

**D 600**

- 593. Hum as Inf Proc. (3 credits)
- 594. Introduction to Adaptive Systems (2 credits)
- 595/ENG 595/NAVARCH 595/NAVARCH 595. Nat Log Proc (3 credits)
- 596. Master of Engineering Team Project. (1 to 6 credits)

**D 600**

- 600/IE 600. Function Space Methods in System Theory (3 credits)
- 622. Electronic and Optical Properties of Semiconductors (4 credits)
- 627. VLSI Design II. Advisory pre-requisite: EECS 427 advised. (4 credits)
- 628. Advanced High Performance VLSI Design (3 credits)
- 631. Electromagnetic Scattering (3 credits)
- 632. Microwave Remote Sensing - Radar (3 credits)
- 633. Numerical Methods in Electromagnetics (3 credits)
- 634/PHYSICS 611/APPHY 611. Nonlinear Optics (3 credits)
- 638/PHYSICS 542. Quantum Opt (3 credits)

**Approved for Cognate by CSE**

- CSE 500 Level
- Technical Elective
- Hardware
- Software
- Artificial Intelligence
- Theory
- VLSI

**Depth Depth starred**  
**Breadth**

- 632/AOSS 587. Microwave Remote Sensing I: Radiometry (3 credits)
- 633. Microwave Measurements Laboratory (3 credits)
- 634. Design and Characterization of Microwave Devices and Monolithic Circuits (4 credits)
- 635. Optical Information Processing (3 credits)
- 636. Statistical Optics (3 credits)
- 637/APPHY 537. Classical Optics (3 credits)
- 638/APPHY 538/PHYSICS 656. Optical Waves in Crystals (3 credits)
- 639/APPHY 539/PHYSICS 651. Lasers (3 credits)
- 640/APPHY 540. Applied Quantum Mechanics I (3 credits)
- 641/APPHY 541. Applied Quantum Mechanics II (3 credits)
- 643. Knowledge-Based Systems (2 credits)
- 644. Machine Learning (3 credits)
- 645. Ultrastar Optics (3 credits)
- 647. Electrical Engineering (3 credits)
- 648. Info Visualization (3 credits)
- 649/SI 560. Informatn Retrieval. Advisory pre-requisite: SI 562 (3 credits)
- 650. Information Theory (3 credits)
- 651. Mathematical Methods for Signal Processing (3 credits)
- 652/APPHY 552. Fiber Optics. Internet to Biomedical Applications (3 credits)
- 653. Data Compression (3 credits)
- 654. Introduction to Digital Communication and Coding (3 credits)
- 655. Digital Communication Theory - (3 credits)
- 656. Image Processing (3 credits)
- 657. Communication Networks (3 credits)
- 658. Stochastic Control (3 credits)
- 659. Advanced Signal Processing (3 credits)
- 660/MECHENG 560. Linear Systems Theory (4 credits)
- 661/MECHENG 561. Design of Digital Control Systems (3 credits)
- 662/AEROSP 551. Nonlinear Systems and Control (3 credits)
- 664. Estimation, Filtering, and Detection (3 credits)
- 665/AEROSP 550. Linear Feedback Control Systems (3 credits)
- 666. Discrete Event Systems (3 credits)
- 667/MECHENG 567/MECHENG 567. Robot Kinemat Dynam (3 credits)

**D 668**

- 668/NAVARCH 568. Mobile Robotics: Methods and Algorithms (4 credits)

**D 670**

- 670. Parallel Computer Architecture (4 credits)
- 671. Principles of Real-Time Computing (4 credits)
- 673. Microarchitecture (3 credits)
- 674. Computational Complexity (4 credits)
- 675. Advanced Cryptography (4 credits)
- 678. Computer-Aided Design Verification of Digital Systems - (4 credits)
- 679. Digital System testing g (4 credits)

**D 680**

- 682. Advanced Operating Systems (4 credits)
- 683. Advanced Compilers (4 credits)
- 684. Advanced Database Systems (4 credits)
- 686. Algorithms (4 credits)
- 687. Parallel Computing (4 credits)
- 688. Computer and Network Security (4 credits)
- 689. Advanced Computer Networks (4 credits)
- 690. Advanced Programming Languages (4 credits)

**D 690**

- 691. Distributed Systems (4 credits)

**D 700**

- 702. AI Foundations (4 credits)
- 703. Hum as InfProc. (3 credits)
- 704. Introduction to Adaptive Systems (2 credits)
- 705/ENG 595/NAVARCH 595/NAVARCH 595. Nat Log Proc (3 credits)
- 706. Master of Engineering Team Project. (1 to 6 credits)

**D 700**

- 707. Function Space Methods in System Theory (3 credits)
- 708. Electronic and Optical Properties of Semiconductors (4 credits)
- 709. VLSI Design II. Advisory pre-requisite: EECS 427 advised. (4 credits)
### Ph.D. Degree Requirements:

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<tr>
<th>Depth Starred</th>
<th>Hardware</th>
<th>Software</th>
<th>Artificial Intelligence</th>
<th>Theory</th>
<th>EECS Courses</th>
<th>Approved for Cognate by CSE</th>
<th>CSE Course Level</th>
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<td>765. Special Topics in Stochastic Systems and Control (3 credits)</td>
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<td>D 767</td>
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<td>767/SI 767. Advanced Natural Language Processing and Information Retrieval (3 credits)</td>
<td>767 x</td>
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<td>770. Special Topics in Computer Systems (1 to 16 credits)</td>
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<td>792. Advanced AI Techniques (3 credits)</td>
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<td>820. Seminar in Solid-State Electronics (1 credit)</td>
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<td>892. Seminar in Artificial Intelligence (2 credits)</td>
<td>892 x</td>
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<td>990. Dissertation/Pre-Candidate (counts toward phd only) (1 to 8 credits)</td>
<td>990 x</td>
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<td>995. Dissertation/Candidate (counts toward phd only) (4 or 8 credits)</td>
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### Terminal Masters Requirements:

August 2016