

**Graduate Program Handbook
Policies and Procedures
2016-2017**

**School of Electrical Engineering
and Computer Science**



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Chapter 1

EECS Graduate Programs

1.1 Admission

The School evaluates applicants for admission to its graduate programs based on college transcripts, GPA, the score on the general GRE, (3) letters of recommendation, a statement of purpose, and TOEFL score, if applicable. Apply online at <http://www.gradschool.wsu.edu>. Materials that are mailed should be sent to the Graduate School at P.O. Box 641030, Pullman, WA 99164-1030 or if you use express mail such as FedEx or DHL, send them to the Graduate School, French Administration Building, Room 324, Pullman, WA 99164-1030. The EECS Graduate Studies Committee will consider these materials and students judged most qualified will be offered admission. (Admission does not guarantee assistantship support.)

1.1.1 Specific Admission Requirements for Non-Majors

1.1.1.1 Requirements in Computer Science for students with non-BS/CptS:

Students whose undergraduate studies did not include material equivalent to that covered in the following WSU courses will be asked to take course work to resolve that undergraduate deficiency: **CptS 121, 122, 223, 260, 317, 350, 355, 360, Phil 201, and Math 216.** *All or most of these courses should be completed before the student is eligible for admission into the MS or PhD Program in Computer Science.* The admissions committee may require the student to correct other undergraduate deficiencies as well, including undergraduate prerequisite courses to graduate courses.

1.1.1.2 Requirements in Computer Engineering for students with non-BS/CptE:

Students whose undergraduate studies did not include material equivalent to that covered in the following WSU courses will be asked to take course work to resolve that undergraduate deficiency: **CptS 121, 122, 360, EE 214, 234, 324, 334, and Math 216.** *All or most of these courses should be completed before the student is eligible for admission into the MS or PhD Program in CptE.* In addition, the committee may require the student to complete other undergraduate deficiencies including courses that are prerequisite to graduate courses.

1.1.1.3 Requirements in Electrical Engineering for students with non-BS/EE:

Students whose undergraduate studies did not include material equivalent to that covered in the following WSU courses will be asked to take course work to resolve that undergraduate deficiency: **EE 214, 261, 311, 234, 321, 331, 352, and any three of 341, 351, 361, 489, or CptS 360.** *All or most of these courses should be completed before the student is eligible for admission into the MS or PhD Program in EE.* In addition, the committee may require the student to

complete other undergraduate deficiencies including courses that are prerequisite to graduate courses.

1.2 Registration Requirements

Each graduate student receiving financial support from the School of Electrical Engineering and Computer Science in the form of a Teaching or Research Assistantship or a Fellowship must register for 10-12 credit hours each semester. At least 9 of these credits should be graded courses unless the student is near the end of the program and the course work is near completion. The remainder of the credits may be made up of research credits, i.e., EE 700, CptS 700, EE 800, or CptS 800 or EE 702, CPT S 702 for Non-thesis.

Full-time students who are self-supporting should register for at least 10 credit hours each semester but may choose to register for more.

Students considering dropping or withdrawing from a course that will put them below the requirements listed above should have the approval of their advisor, International Programs and/or the Graduate Coordinator.

1.3 Transfer Credits from Other Institutions

Transfer of graduate course work earned at another university is subject to the following procedures:

- 1) During the first year at EECS, students submit a Transfer Credit Request Form, written petition with supporting materials (e.g., transcript, course outline, exams, projects, catalog description, etc.) to their research advisor for an initial evaluation and signature. Make sure the form information contains, Name of School, Date of Course, & Grade received.
- 2) If supportive, the advisor begins an in-depth review process by signing the form and the form and materials are delivered to the Program Coordinator who assigns the case to an appropriate faculty member for further review.
- 3) The selected faculty member evaluates the materials, interviews the student if necessary, and provides one of the following written recommendations:
 - a) Transfer approval as a substitute for an equivalent EECS graduate course (3 credits);
 - b) Transfer approval as a graduate course appropriate for EECS (1-3 credits);
 - c) Transfer denial.
 - d) No more than seventeen (17) transfer credits (or 5 courses) will be allowed for a Doctoral.

Limitations:

Please make sure that your Transfer Credit is not going to be too old by the time you complete your degree; 10 years for PhD.

1.4 Guidelines for EE 595 and CptS 595 (Directed Study)

- 1) Faculty and student should provide an abstract of the planned work by the end of the third week of the semester. A copy of the abstract should be filed with the Academic Coordinator for the students file.
- 2) A report describing the work must be submitted at the end of the semester. If a conference or journal paper or Tech Report is generated, a separate report is not necessary.
- 3) MS Students can use 3 credits of 595 toward their degrees; PhD Students can use 6 credits of 595 toward their degrees.

1.5 Annual Review Process

Each year the progress of every student will be reviewed by their Faculty Advisor. A written and signed copy of the review is to be placed in the student's file, and a copy will be available to the student. This review, conducted by the EECS Faculty, should indicate the student's progress on course work and on their research. The review will be conducted in spring semester unless there is reason for a fall review.

Students on appointment must reapply for assistantship every semester and will not be reappointed if performance and progress are deemed unsatisfactory. Students need to file a RA/TA Renewal Form every semester to be renewed. The Academic Coordinator will send the Renewal Forms to you when they are due.

1.6 Reinstatement Policy

Graduate students whose cumulative GPA falls below 3.00 are academically deficient and must be reinstated to continue in the program. They may be reinstated only once. If the cumulative GPA falls below a 3.0, a student may apply for reinstatement in a following semester provided the following semester GPA is 3.3 and the cumulative GPA is at least 3.00. The Faculty Advisor should send a supportive email to the Academic Coordinator if they support your Reinstatement. After the email is sent, you will need to meet with the Program Coordinator to discuss your plan to bring your GPA back to the requirements.

Chapter 2

Master of Science Programs

The degree of Master of Science is awarded to graduate students for demonstration of substantial scholarly achievement beyond the baccalaureate level. This achievement represents more than the mere accumulation of additional credit as the student is expected to demonstrate an integrated knowledge of the chosen discipline. The School of EECS offers MS programs in Computer Science, Computer Engineering, and Electrical Engineering (thesis and non-thesis options). The regulations below apply to all MS programs unless otherwise noted.

2.1 Thesis Option

2.1.1 Thesis Option Program of Study and Advisory Committee

Under the thesis option (all programs), the student is expected to complete a significant research project and submit a thesis, which adheres to EECS standards and the formatting requirements of the advisory committee and the Graduate School. The thesis work should be submitted for refereed publication prior to scheduling the final exam. It is the student's responsibility to meet the deadlines specified by the Graduate School.

Before a **thesis** student has earned fifteen credits toward a graduate degree, an advisory committee of at least three faculty members shall be nominated with the mutual consent of the student, the director of the School of EECS (or the director's designee), and each prospective committee member. The major advisor (also Chair of the advisory committee) and another committee member must be members of EECS Permanent (i.e., Non-Adjunct) Faculty. The Chair of the advisory committee must be a specialist in the student's intended area of research and the supervisor of the research. It is the responsibility of the student to find a major advisor (committee chair) and work with him or her to nominate additional members in accordance with the timetable in Section 2.3. As soon as the committee is nominated, members should assist the student in identifying a research topic and selecting a set of courses (the program) that meets EECS and Graduate School requirements and is consistent with the research objectives of the student.

The program for the MS degree specifies the courses that the student **must** complete. The program of study, signed by members of the advisory committee and the director (or designee), is submitted for approval to the Graduate School on the form "Program for Master's Degree." Committee appointments and the MS program are not official until approved by the Graduate School. Changes in the student's program can be made with the approval of the student, the advisory committee, the director (or designee), and the Graduate School. The advisory committee membership can be changed with the approval of the student, the school director, the Graduate School, and the persons who would constitute the new committee.

2.1.2 MS Degree Program in Computer Science: Thesis Option

Under the Thesis Option, the student is required to take at least 33 credits of course work of which a minimum of 24 credits must be graded and at least 18 credits must be from EECS. The coursework can include 6 credits of graded EECS 400 level coursework which must be approved by the EECS Graduate Studies Committee. No more than 6 credits of approved Transfer Credits and 3 credits of (CPT S 595) Directed Study are allowed.

In order to ensure that each student obtains a reasonable graduate-level understanding of a number of fundamental areas, each MS CptS student must complete the following course requirements. The requirement is 2 courses from the list of "Core" courses (Note: Some tracks may require more than two courses) and 2 courses from the list of "Advanced or Elective" courses, for each area (tracks). The core courses declared by the student on the MS Program of Study must be passed with a B- grade or better. In addition Algorithmics 516 is a mandatory course for all areas.

Thesis Requirement: The student needs to take a minimum of 9 credits of Thesis Research (CptS 700); write a Thesis based on the research; at least submit a paper (conference or journal) based on the research; and defend the Thesis in an oral exam administered by the thesis committee. The examination committee will evaluate the written thesis for quality of the research work in addition to the oral examination, and ballot on the results of the examination.

The core courses requirements for each area (track) are listed below;

The areas for the MS in CptS options are;

- 1) Artificial Intelligence / Machine Learning
- 2) Data Science
- 3) Systems and Networking
- 4) Software Engineering

The list of **Core** and **Advanced** courses for each track is given below.

NOTE: CptS 516 Algorithmics is a mandatory course for all the tracks. This may be replaced with “Graduate Algorithm Design and Analysis” course in the future.

1) Artificial Intelligence and Machine Learning

CORE COURSES:

- Artificial Intelligence (CptS 540)
- Machine Learning (CptS 570)

ADVANCED COURSES:

- Reinforcement Learning (CptS 580)
- Structured Prediction: Algorithms and Applications (CptS 580)
- Gerontechnology (CptS 580)

- Smart Health (CptS 580)
- Other Special Topics courses taught by the Artificial Intelligence and Machine Learning faculty (CptS 580)

2) Data Science

CORE COURSES:

- Introduction to Data Science (CptS 483)
- Big Data (CptS 483)
- Machine Learning (CptS 570)

NOTE: The 400 level courses will be replaced by the 500 level courses in the future.

ADVANCED COURSES:

- Elements of Network Science (CptS 580)
- Advanced Graph Databases (CptS 580)
- Computational Genomics (CptS 580)
- Human-Computer Interaction (CptS 543)
- Other Special Topics courses taught by the Data Science faculty (CptS 580)

3) Systems and Networking

CORE COURSES:

- Introduction to Computer Networks (CptS 555)
- Operating Systems (CptS 560)
- Distributed Systems (CptS 564)
- Parallel Computation (CptS 550)

ADVANCED COURSES:

- Network / Computer Security (CptS 527)
- Advanced Distributed Systems (CptS 580)
- Embedded Systems (CptS 566)
- Other Special Topics courses taught by the Systems and Networking faculty (CptS 580)

4) Software Engineering

CORE COURSES:

- Software Engineering (CptS 580)
- Software Design (CptS 580)
- Software Testing (CptS 580)

ADVANCED COURSES:

- Software Requirements (CptS 580)
- Software Architecture (CptS 580)
- Software Quality (CptS 580)

- Other Special Topics courses taught by the DS faculty (CptS 580)

NOTE: The CptS 580 courses will get regular course numbers after each course is taught TWICE.

2.1.3 MS Degree Program in Computer Engineering: Thesis Option

Under the Thesis Option, the student is required to take at least 30 credits of course work of which a minimum of 21 credits must be graded and at least 18 credits must be from EECS. The coursework can include 6 credits of graded EECS 400 level coursework which must be approved by the EECS Graduate Studies Committee. No more than 6 credits of approved Transfer Credits and 3 credits of (EE 595) Directed Study are allowed. Students must have a minimum 3.0 GPA on their program of study as well as on the transcript to be eligible to graduate.

In order to ensure that each student obtains a reasonable graduate-level understanding of a number of fundamental aspects of Computer Engineering, the student must successfully complete at least three of the following courses, the core courses declared by the student on the MS Program of Study must be passed with a B- grade or better;

- EE 530 Digital Signal Processing
- EE 586 VLSI Systems Design
- EE 524/CptS 561 Advanced Computer Architecture
- CptS 560 Operating Systems
- EE 587 System on Chip Design and Test

2.1.4 MS Degree Program in Electrical Engineering: Thesis Option:

Under the Thesis Option, the student is required to take at least 30 credits of course work of which a minimum of 21 credits must be graded and at least 18 credits must be from EECS. The coursework can include 6 credits of graded EECS 400 level coursework which must be approved by the EECS Graduate Studies Committee. No more than 6 credits of approved Transfer Credits and 3 credits of (EE 595) Directed Study are allowed. Students must have a minimum 3.0 GPA on their program of study as well as on the transcript to be eligible to graduate.

In order to ensure that each student obtains a reasonable graduate-level understanding of a number of fundamental areas, each MS EE student must complete the following course requirements. The areas are; Computer Engineering, Electrophysics, Energy and Power Systems, Microelectronics, & Systems. The core courses declared by the student on the MS Program of Study must be passed with a B- grade or better. The requirement is at least 3 courses from the list of core courses below.

The core courses requirements for each area (track) are listed below;

Core courses;

- EE 501 Linear Systems Theory
- EE 507 Random Processes in Engineering

- EE 518 Advanced Electromagnetic Theory
- EE 521 Power Systems Analysis
- EE 523 Power Systems Stability and Control
- EE 524 Digital Systems Architecture
- EE 555 Computer Communication Networks
- EE 571 Advanced Wireless Integrated Circuits and Systems
- EE 586 VLSI Systems Design
- EE 596 Advanced Analog Integrated Circuits
- CptS 516 Algorithmics

Note: Only one course from EE 503 and EE 555 can be counted as one of the three required core courses.

Thesis Requirement: The student needs to take a minimum of 9 credits of Thesis Research (EE 700); write a Thesis based on the research; at least submit a paper (conference or journal) based on the research; and defend the Thesis in an oral exam administered by the Thesis committee. The examination committee will evaluate the written thesis for quality of the research work in addition to the oral examination, and ballot on the results of the examination.

Guidelines for choosing core courses for each area (track);

***Systems Track:**

MS thesis students specializing in Systems area must take at least three core courses. Two of these must be EE501 and EE507. At least one other core course should be chosen from among the remaining non-systems core courses (i.e., courses other than EE501, EE507, or EE503).

***Power Track:**

MS Thesis students specializing in the Power area need to take both EE521 and EE523 as two required core courses. They also need to complete the at least a third core course outside of the Power area based on the student's choice.

***Microelectronics Track:**

MS Thesis students specializing in Microelectronics area need to take at least three core courses. The core courses are EE596, EE571 and at least one core outside of Microelectronics based on student's choice.

***Electrophysics Track:**

MS Thesis students specializing in the Electrophysics area must take at least three core courses. The core courses are EE518, EE571 and at least one core outside of Electrophysics based on the student's technical interests.

***Computer Engineering Track;**

MS Thesis students specializing in the Computer Engineering Area need to take both EE 524 and EE 586 and at least one core course outside of Computer Engineering area based on the student's choice.

2.1.3 Thesis Option Final Examination

The student must file an “Application for Degree” form with the Graduate School on or before the deadline date specified by the Graduate School; this is an on-line process and submission.

The final examination should be scheduled after the student has completed course work, applied for the degree, and had the thesis approved by the advisory committee. Along with the scheduling form for the MS Thesis Final Exam, a List of Publications (submitted, accepted, or in preparation) should be submitted to the GSC. The publication list should include (anticipated) date of submission (or appearance) and the full name of the conference or journal.

Note: At least one paper must have been submitted for publication before the scheduling form will be signed. The examination will be administered by the advisory committee and will cover the thesis defense and the area of knowledge covered by the student's program of study. The advisory committee members must vote on passage or failure and any other member of the permanent faculty may elect to do so. In the event of a failed examination, a second and final attempt may be scheduled at the request of the School after a lapse of at least three months.

2.2 Non-Thesis Option

2.2.1 MS Computer Science Degree Program: Non-Thesis Option

Under the non-thesis option, the student is required to take at least **30** graded credits (Non P/F and non S/F) of graduate-level course work plus a minimum of 4 credits of CptS 702. Of the 30 credits of course work, at least 12 credits must be from graduate-level Computer Science courses. No more than 6 approved Transfer Credits and 3 credits of 595 are allowed. The core courses declared by the student on the MS Program of Study must be passed with a B-grade or better;

Required:

- CptS 516 Automata Theory

At least one or two of:

- CptS 550 Parallel Computation
- CptS 555 Computer Communication Networks
- CptS 560 Operating Systems
- CptS 561 Computer Architecture
- CptS 564 Distributed Systems

At least one or two of:

- CptS 527 Computer Security
- CptS 540 Artificial Intelligence
- CptS 542 Computer Graphics
- CptS 543 Human Computer Interaction
- CptS 571 Computational Genomics

Only one 3-credit Directed Study (CptS or EE 595) may be included. A maximum of 6 credits of 400-level course work approved by the GSC may be included. In general, undergraduate courses REQUIRED for the BS/CptS or BA/CptS and undergraduate courses listed as pre-requisite for admission into the MS/PhD in CptS program will NOT BE allowed. Students should obtain approval of the advisory committee and the GSC *before* taking non-CptS courses. The student should consult with their graduate advisor regarding the choice of an emphasis area, and plan to take appropriate courses in this area.

2.2.1.1 Non-Thesis Final Examination in Computer Science:

Students following the course option must take a one-hour written exam in each of the following three areas after the completion of the course work.

- Theory
- Systems
- Application (for example, artificial intelligence, genomics, graphics, security, human computer interaction, etc.)

The MS non-thesis exam will be offered every semester depending upon student request.

2.2.1.2 Non-thesis Project Option (Tri-Cities campus only):

The project option shall consist of at least 27 graded credits and six credits of CptS 702. Of the 27 credits of course work, at least 15 must be in Computer Science and must satisfy the program requirements as stated in Section 2.1.2. Specific course requirements are the same as for other CptS non-thesis programs. . The core courses declared by the student on the MS Program of Study must be passed with a B- grade or better. Students are required to complete a project and submit a report on the project that is satisfactory to the advisory committee. The project should represent work equivalent to two 3-credit hour graduate courses with quality equivalent to a grade of “B” or better

2.2.2 MS Computer Engineering Degree Program: Non-Thesis Option

Under the non-thesis option, the student is required to take at least 28 credits of graduate-level course work (non P/F and non S/F) and can include 6 credits of graded 400 level, plus a minimum of 4 credits of EE 702. No more than 6 approved Transfer Credits and 3 credits of 595 are allowed. Of the 28 credits of course work, at least 12 credits must be from the following courses. The core courses declared by the student on the MS Program of Study must be passed with a B- grade or better;

- EE 530 Digital Signal Processing
- EE 586 VLSI Systems Design
- EE 524/CptS 561 Advanced Computer Architecture
- CptS/EE 555 Computer Communication Networks **OR** EE 503 Structure, Dynamics and Control of Large-Scale Networks
- CptS 560 Operating Systems
- EE 587 System on Chip Design and Test

A maximum of 6 credits of 400-level course work approved by the GSC may be included. The student is required to follow the procedures described above for the thesis student and form an advisory committee (chaired by a computer engineering faculty) to assist them in designing a program for this option. In particular, the student's advisor must approve the student's course program.

Non-thesis final Examination in Computer Engineering:

The student must take a comprehensive examination that includes questions from two computer engineering courses (EE 524/CptS 561, EE 586, or EE 587) and an EE or CptS course from the student's course program. The student must show proficiency in computer engineering and pass the exam with a minimum grade of 70%. Students may take the MS comprehensive exam only twice. A failure to pass the examination for the second time will result in a recommendation for dismissal from the CptE graduate program.

2.2.3 MS Electrical Engineering Degree Program: Non-Thesis Option

Under the non-thesis option, the student is required to take at least 28 credits of graduate-level course work (non P/F and non S/F) plus 4 credits of EE 702 for a total of 32 credits. Of the 28 credits of course work, at least 18 must be in Electrical Engineering and must satisfy the program requirements as stated in Section 2.1.4. A maximum of 6 credits of EECS 400-level course work approved by the GSC may be included. Only one 3-credit Directed Study (EE 595) may be included. The student is required to follow the procedures described above for the thesis student and form an advisory committee to assist them in designing a program for this option. In particular, the student's advisor must approve the student's course program. The student following the course option must take a comprehensive examination in one of the following areas after the completion of the course work. The core courses declared by the student on the MS Program of Study must be passed with a B- grade or better. Students can take more core courses than the minimum required from the list of core courses. But, this policy is applicable for the core courses that the student declares as the core courses in his/her program of study. If the students receive a grade below our requirement mentioned above, Dr. Saberi will write an exception memo to the Grad School for the Repeat and the Grad School will go into the system and update the student's transcript with the better grade/ required grade once complete. This is again applicable for the declared core courses.

- 1) Computer Engineering
- 2) Electrophysics (Electromagnetics, Waves, and Solid State)
- 3) Energy and Power Systems
- 4) Microelectronics
- 5) Systems (Communications, Controls, and Signal Processing)

The student must show proficiency in the chosen area and pass the exam. Students may take the MS comprehensive exam only twice. A failure to pass the examination for the second time will result in a recommendation for dismissal from the graduate program.

2.2.3.1 Guidelines for Non-Thesis Examination by Area:

1) Computer Engineering: Of the 28 credits of coursework, at least 9 credits must be from the following courses. The core courses declared by the student on the MS Program of Study must be passed with a B- grade or better. Students can take more core courses than the minimum required from the list of core courses. But, this policy is applicable for the core courses that the student declares as the core courses in his/her program of study. If the students receive a grade below our requirement mentioned above, Dr. Saberi will write an exception memo to the Grad School for the Repeat and the Grad School will go into the system and update the student's transcript with the better grade/ required grade once complete. This is again applicable for the declared core courses.

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- EE 530 Digital Signal Processing
- EE 586 VLSI Systems Design
- EE 524/CptS 561 Advanced Computer Architecture
- CptS/EE 555 Computer Communication Networks or EE 503 Structure, Dynamics and Control of Large-Scale Networks
- CptS 560 Operating Systems
- EE 587 System on Chip Design and Test

Students who enroll in the non-thesis (course work only) Master's degree in Electrical Engineering (see Section 2.2.2 for the requirements for a non-thesis MS degree in Computer Engineering) will be required to pass a final, comprehensive exam of their graduate program. Three faculty members, of whom two will be in the computer and electrical engineering area and the third will be from the general faculty of the School of EECS, will administer this exam.

The examination committee will select material to evaluate the candidate. The evaluation will consist of a written exam on the subjects within the computer engineering field. The candidate will be given specific, written instructions on each of these components of the exam.

2) Electrophysics: The electrophysics area comprehensive MS exam will be an oral exam with the format and passing requirement determined by the student's committee. The student will be expected to make an oral presentation of material selected by the committee.

3) Energy and Power: The power systems area comprehensive MS exam will be an oral exam with the format and passing requirement determined by the student's committee. The student will be expected to make an oral presentation of material selected by the committee.

4) Microelectronics: Students choosing Microelectronics as their major area in their non-thesis Master program are required to take and pass EE 596 and EE 571. A pass is considered to be a grade of B or better.

There will be a two-part comprehensive evaluation near the end of the semester in which the student will complete the required number of credits for the degree. The examining committee will first select one research paper from which the student will have 2 weeks to provide a 4 page double-spaced paper summarizing and interpreting the research in the paper. After the student has submitted this written report to the committee, there will be an oral exam scheduled where

the student will discuss the paper in a 20-30 minute presentation. After this time, the committee will have an oral question and answer period to assess the student's knowledge of the fundamentals and analytical abilities.

5)Systems: The systems area comprehensive MS exam will be identical to the systems PhD qualifying exam, with the following exceptions: (1) there will be no breadth category and (2) the passing threshold will be 60%. The exam committee reserves the option to reset the passing threshold, depending on the difficulty of a particular exam. Students who fail the systems area comprehensive MS exam on the first try will be allowed to retake the exam the next time it is offered. Students who fail the exam on their second attempt will not be allowed to take the systems area exam again.

2.2.3.2 Non-Thesis Project Option (Tri-Cities campus only):

The project option shall consist of at least 27 graded credits and 6 credits of EE 702. Of the 27 credits of course work, at least 15 must be in electrical engineering and must satisfy the program requirements as stated in Section 2.1.4. Specific course requirements are the same as for other EE non-thesis programs. The core courses declared by the student on the MS Program of Study must be passed with a B- grade or better. Students are required to complete a project and submit a report on the project that is satisfactory to the advisory committee. The project should represent work equivalent to two 3-credit hour graduate courses and the quality equivalent to a grade of "B" or better.

2.3 Timetable for All MS Degree Students

- 1) Submission of program and advisory committee nomination (as soon as possible and before 15 credits have been earned toward the MS degree). Failure to file a program will result in cancellation of any state support, such as teaching assistantship. File the form at least 1 semester prior to graduating.
- 2) Application for MS degree (prior to the middle of the last semester). See the current "Deadlines & Procedure" from the Graduate School for the dates.
- 3) Approval of the thesis. Theses must receive preliminary approval from the advisory committee before the final examination is scheduled. Committee members must be given 14 days (10 working days) to review the thesis prior to scheduling the final exam.
- 4) Scheduling of final master's examination for thesis option at least 14 days (10 working days) before requested final examination date.
- 5) Request to take final master's exam for non-thesis option must be submitted before beginning of the semester during which it is scheduled. Submit "Final Exam Scheduling Form to the Graduate School at least 14 days (10 working days).
- 6) Distribution of thesis to the advisory committee, the Graduate Studies Committee representative (at least five days before the requested final examination date), and a copy to the Graduate School office (at least ten working days prior to the examination date).
- 7) Final examination.
- 8) Change of EE/CptS 700/702 grades from 'X' to 'S' will occur only following successful completion of the final examination and after the thesis has been filed with the department office.

Chapter 3

Doctoral Programs

The university requirements for doctoral programs are specified in the “Graduate School Policies and Procedures” and shall not be repeated here. It is the student’s responsibility to become familiar with this information. The policies and procedures unique to the PhD programs in Electrical Engineering and Computer Science are listed below.

3.1 The Program of Study and Advisory Committee

Upon admission to the PhD program, each student is advised by the EE or CptS Graduate Coordinator and by a faculty member acceptable to the student and the coordinator. The program of study should consist of a minimum 35 credits of graded course work plus 30 or more research credits (CptS or EE 800). The core courses declared by the student on the PhD Program of Study must be passed with a B grade or better. Students can take more core courses than the minimum required from the list of core courses. But, this policy is applicable for the core courses that the student declares as the core courses in his/her program of study. If the students receive a grade below our requirement mentioned above, Dr. Saberi will write an exception memo to the Grad School for the Repeat and the Grad School will go into the system and update the student’s transcript with the better grade/ required grade once complete. This is again applicable for the declared core courses.

A maximum of 6 credits of Directed Study (CptS or EE 595) may be included. A maximum of 9 credits of 400-level graded course work approved by the GSC may be included. In general, undergraduate courses REQUIRED for the BS/CptS, BS/EE or BA/CptS and undergraduate courses listed as pre-requisite for admission into the MS/PhD in CptS or EE program will NOT BE allowed. This program becomes the student’s official study plan after approval by the doctoral committee (described below), the GSC of EECS, and the Graduate School.

In addition to specifying a program of course work, the program of study also lists the proposed doctoral committee, which becomes official upon approval by the Graduate School. The doctoral committee consists of three or more faculty. At least three (including the major advisor or Chair of the committee) must be members of the WSU Permanent (i.e., non-Adjunct) faculty, of which the major advisor and another member must be members of EECS Permanent faculty. The Chair of the advisory committee must be a specialist in the student's intended area of research and the supervisor of the research.

3.2 PhD in Computer Science Degree Program

The following non-graded, 1-credit course is required for all Pullman campus students their first fall in residence:

- CptS 500 Proseminar

The program of course work for the PhD in Computer Science includes the following required course;

- CptS 516
- And, at least 3 of the following core courses. The core courses declared by the student on the PhD Program of Study must be passed with a B grade or better;
- CptS 543 Human Computer Interaction
- CptS 550 Parallel Computation
- CptS 555 Computer Communication Networks
- CptS 560 Operating Systems
- CptS 561 Computer Architecture
- CptS 564 Distributed Systems
- CptS 527 Computer Security
- CptS 542 Computer Graphics
- CptS 540 Artificial Intelligence
- CptS 571 Computational Genomics

All the required courses must be successfully completed within three semesters of admission to the program. Students may petition the Graduate Studies Committee (GSC) to include transfer credits, but only if equivalent courses are offered at the graduate level, are completed in a recognized graduate school as a graduate student, and are clearly consistent with the objectives of the student's PhD program at WSU. Any transfer credits used toward the PhD must comprise no more than 17 credits and such use is subject to the approval of both the doctoral committee and the Graduate School. Refer to Section 1.3 for the procedure to request graduate-level transfer credits. All coursework must be completed before you can schedule your Preliminary Examination.

3.3 PhD in Electrical and Computer Engineering Degree Program

The program of course work for the PhD in Electrical and Computer Engineering must include at least three of the following core courses. The core courses declared by the student on the PhD Program of Study must be passed with a B grade or better;

- EE 501 Linear System Theory
- EE 503 Structure Dynamics and Control of Large-Scale Networks **OR** EE 555 Computer Communication Networks*
- EE 507 Random Processes In Engineering
- EE 518 Advanced Electromagnetic Theory
- EE 521 Power Systems Analysis
- EE 523 Power Systems Stability and Control
- EE 524 Digital Systems Architecture
- EE 571 Advanced Wireless Integrated Circuits and Systems
- EE 586 VLSI Systems Design
- EE 596 Advanced Analog Integrated Circuits
- CptS 516 Algorithmics

***Note:** Only one course from EE 503 and EE 555 can be counted as one of the three required core courses.

All core courses must be successfully completed within three semesters of admission to the program. Students may petition the Graduate Studies Committee (GSC) to include transfer credits, but only if equivalent courses are offered at the graduate level, are completed in a recognized graduate school as a graduate student, and are clearly consistent with the objectives of the student's PhD program at WSU. Any transfer credits used toward the PhD must comprise a maximum of 17 and these are subject to the approval of both the GSC and the Graduate School. Refer to Section 1.3 for the procedure to request graduate-level transfer credits. The core courses declared by the student on the PhD Program of Study must be passed with a B grade or better. Students can take more core courses than the minimum required from the list of core courses. But, this policy is applicable for the core courses that the student declares as the core courses in his/her program of study. If the students receive a grade below our requirement mentioned above, Dr. Saberi will write an exception memo to the Grad School for the Repeat and the Grad School will go into the system and update the student's transcript with the better grade/ required grade once complete. This is again applicable for the declared core courses. All coursework must be completed before you can schedule your Preliminary Examination.

3.4 Advanced Graduate Standing (AGS)

AGS is the departmental designation for official permission to pursue a PhD degree. The Graduate Studies Committee (GSC) grants AGS status. The GSC considers a student for AGS within three weeks of completing the PhD Qualifying Exam. The process of evaluation of AGS is based on:

- The student's performance on the PhD qualifying examination,
- Performance in graduate courses,
- Letter of recommendation from the student's research advisor, and
- Other information pertinent to the student's ability to perform high-quality doctoral-level work.

The Graduate Studies Committee may:

- 1) Grant AGS,
- 2) Grant AGS with specified conditions,
- 3) Grant continuation in the program with reevaluation by the GSC after specified conditions are satisfied, or
- 4) Terminate the student from the PhD program.

Note: Only students granted AGS can be appointed as RA II or TA II. AGS holds a raise for funded EECS Graduate Students to step 42.

3.5 Qualifying Exam

The purpose of the PhD qualifying exam (QE) is to assess the student's depth and breadth of knowledge suitable for the doctoral program. Passing the QE is required for Advanced Graduate Standing (AGS), the status that permits students to pursue the PhD degree.

This examination will be taken no later than the end of the student's third semester in the PhD program. The exam will be given each semester. If any area committee chooses not to offer its exam in Spring Semester, the student may postpone that area exam for one semester. Students must sign up for the exam in the second semester in the program, or no later than the second week of the third semester. Engineering students must at this time specify their areas of depth and breadth. Area committees in Electrical and Computer Engineering should administer major area examinations before the end of the semester and the minor area examinations before the end of the semester. The QE in Computer Science should follow the same general schedule. The results of the examinations should be reported to the GSC by the end of the semester. The GSC should meet soon afterwards to discuss the results.

3.5.1 Computer Science QE

The Computer Science Qualifying Exam consists of two parts: a breadth requirement, satisfied by outstanding performance in course work, and a written and oral exam designed to assess the student's readiness to undertake research at the PhD level.

3.5.1.1 Breadth Requirement:

A student must take at least 15 graded credits of computer science courses (i.e., excluding CptS 595 and CptS 500) at the 500 level. A grade point average of 3.70 must be obtained for these 15 credits. The courses making up the 15 credits may be selected from a larger set of courses that the student has completed. A course with a grade below B cannot be applied toward this requirement. The courses must include CptS 516 and courses from the current catalog. Graded graduate credits transferred from other institutions may be used to fulfill up to 6 credits of the 15 graded credits required for the breadth requirement.

A student who has not fulfilled this requirement at the end of two semesters of study must nevertheless take the written and oral portions of the qualifying exam in the scheduled semester (see Section 3.5.1.2), taking courses and achieving sufficient grades in that semester to meet the breadth requirement. A student who does not meet the breadth requirement by the end of the third semester will be dismissed as a PhD student.

3.5.1.2 Written and Oral Examination Structure:

The written and oral qualifying examination is normally taken following completion of the breadth requirement, in the third semester following admission to the WSU PhD program in Computer Science. It must be taken prior to the completion of 21 graded graduate credit hours in the PhD Program at WSU. This examination is intended to ascertain the student's readiness to undertake research at the PhD level. The student will be examined in an appropriate area selected by the student and his or her advisor.

The exam is a take-home exam given on a Friday and due the following Tuesday. On the following Friday, the committee administers the oral portion of the exam. For the examination, the student is given a set of research questions and a set of related research papers. The student prepares a written report of 10-20 pages based on the papers and the questions. The oral exam consists of a presentation and defense by the student of the answers to the research questions, which can be expected to take up most of the examination. Students should also expect some general questions not directly related to the take-home questions.

If a student fails the exam, it may be retaken once during the following semester.

The retake need not be in the same area as the failed examination, but only one retake is allowed.

3.5.1.3 Written and Oral Examination Procedure:

At the beginning of each semester an e-mail is sent to PhD students due to take the qualifying exam the following semester, asking in which area they wish to be examined. For each student, the Director (or his/her designee) assembles three faculty members to serve as the examining committee, one of which is designated to be the committee chair. At least one of the faculty members should be expert in the exam area. The exam for each student should be written by the student's advisor and approved by the committee. The advisor may be a member of the committee, but not the committee chair. The scheduling of the exam, both written and oral components, is performed by a designated EECS staff member, who works with the student and committee members to schedule the exam. The committee chair serves as the contact point for the student, providing the exam at the scheduled time, receiving the exam response from the student at the scheduled time, distributing the exam response to the other committee members, and answering any questions the student may have about the exam. After the student delivers the oral presentation component of the exam, the committee chair summarizes committee's feedback on the exam and emails recommendation (pass/fail) to the CS faculty with a one-week time for faculty feedback. The committee chair communicates to the CS faculty and GSC the final decision regarding the student's result on the exam. GSC informs the student of the result.

3.5.1.4 Qualifier Expectations:

Students should have done work equivalent to taking 500-level courses in the examination area. They must be able to read and comprehend the recent literature in that topic area and be able to critique and compare the motivations, methods, and results of the work. They must be able to find related material in the library and on the Internet. They must be able to write a scholarly report on a collection of papers that includes reviews of the papers and conclusions produced by synthesizing information from multiple papers. They must be able to orally present their findings

with supporting visual materials to the examination committee. They must be able to answer technical questions about the material they read and present.

3.5.1.5 Grading and Decision-Making:

Each committee grades the exams in their area and reports the results to the CptS permanent faculty. Each report includes a pass/fail recommendation and a summary of the student's performance on the exam. If no objections to the results are raised within 7 days, the committee's recommendation stands. Otherwise, the graduate CptS faculty meets to discuss the matter and decides by majority vote whether the student passes.

3.5.2 Electrical and Computer Engineering QE

The Minor area requirement portion of the ECE QE consists of taking two courses in the chosen breadth/minor area and passing each course with a minimum grade of B+, subject to the following criteria:

- The eligible QE courses will be defined by each area faculty. A combination of a core course plus a choice of a course from a set of eligible courses is recommended.
- A maximum of one transferred course can be used to partially meet the Minor area QE requirement. The eligibility of a course for transfer and its associated grade will be determined by the area faculty.
- For each Minor area requirement course that the student fails to make a grade of B+ or better, s/he must take another course in the minor area and make a grade of at least B+. The choice of the second-attempt course(s) and any petitioned exceptions (e.g., taking a course outside the minor area or retaking a course with a grade of C or lower) will be determined and approved by a committee consisting of the Minor area faculty and the student's PhD supervisor.
- Students have a maximum of 2 tries to achieve a grade of B+ or better for each of the two courses that satisfy their Minor. Failure to meet this criterion will result in dismissal from the program (independent of the Major area QE results).
- If a student decides to change his/her minor area, s/he must meet the Minor area requirement for the new area (this case may arise if a student changes his/her Minor area).

The doctoral program in Electrical and Computer Engineering is broadly divided into the following five areas:

- 1) Computer Engineering
- 2) Electrophysics (Electromagnetics, Waves, and Solid State)
- 3) Energy and Power Systems
- 4) Microelectronics
- 5) Systems (Communications, Controls, and Signal Processing)

The students in the PhD ECE program are required to take one exam in their primary (depth) area. The examination is not, in principle, tied to any particular WSU course; however, it is expected to be at the first-year graduate level in each area. Each area has specific guidelines regarding the nature and format of the exam as described below. The examining committee in each area will provide a written evaluation of the performance of each student to the GSC. The

major advisor of a student taking an exam should not be part of that examining committee and (if a member of the graduate studies committee) will be excused from deliberations and voting. Students must perform satisfactorily in order to pass the QE.

3.5.2.1 Descriptions of Area Exams:

1) Computer Engineering: The computer engineering examination will be a written exam lasting two hours and will consist of six questions: two each from EE 524 (CptS 561), EE 586, and EE 587. Students whose major area is computer engineering are required to answer a total of four out of the six questions.

Students taking the CptE qualifying exam as their minor area are required to take two of the following three courses: EE 524 (CptS 561), EE 586, and EE 587. The minimum satisfactory grade in each course is B+.

The computer engineering area examination committee will provide an assessment of each student's performance on the CptE qualifying exam to the Graduate Studies Committee within two weeks after the date of the exam.

Performance assessment guidelines for students majoring in the CptE area: The three possible performance assessments for students specializing in the CptE area will be: (1) Pass; (2) Fail, but be allowed to retake the exam the next time it is offered; and (3) Fail, should not be allowed to continue in the CptE area. Each question on the computer engineering qualifying exam will be worth 25 points. Students specializing in the computer engineering area will automatically pass the exam if they score 80 or higher. Depending upon the particular exam, the examining committee may set the pass/fail threshold lower than 80. Computer engineering students who fail the exam on their first attempt but who achieve a score within 15 points of the pass/fail threshold will be assessed at performance level 2 (see above). Computer engineering students who fail to achieve a score greater than or equal to 15 points below the pass/fail threshold on their first attempt or who fail the exam on their second attempt will be assessed at performance level 3 (see above).

2) Electrophysics (Electromagnetics, Waves, and Solid State): PhD students with a major emphasis of electrophysics must pass EE 518 with a grade of B or better. Additionally, students must pass a written and oral examination that assesses a student's readiness to undertake research at the PhD level. The written and oral examination is normally taken in the third semester following admission into the WSU PhD program. The exam material consists of a set of research questions and a set of related research papers. This material is delivered to the student at the start of business on a Friday. The student prepares a written report of 10-20 pages based on the material provided. The written report is submitted in electronic form to the chair of the examining committee by 11:59 p.m. the following Tuesday. On the following Friday, the committee administers the oral portion of the exam. The oral exam is scheduled for two hours. The student prepares a presentation of approximately 30 minutes on his or her answers to the research questions. During the student's presentation the committee primarily asks questions to probe the student's depth of understanding of material directly related to the written examination. However, students should also expect general questions pertinent to graduate study in electrophysics.

A student will have passed the exam if at least two of the three members of the examining committee judge the student to have passed. Any faculty member may attend the oral exam and ask questions of the student, but only the examining committee members have a direct say in grading the student's performance.

At the request of the student's faculty advisor, a student who fails the exam may retake the exam the following semester. Students who fail the exam twice may not retake it again.

Examining Committee: PhD students majoring in electrophysics are appointed an examining committee consisting of three people. One person is designated the chair of the committee. The student's advisor will typically serve on the committee but cannot be the chair.

It is the responsibility of the student's faculty advisor to provide material for the written exam but the entire committee must approve the exam. The number of questions and the number of research papers is at the discretion of the committee.

Within two weeks of the completion of the written and oral exams, the chair of the examining committee will report the result to the graduate advisor and the other electrophysics faculty.

Students taking electrophysics as their secondary (breadth) area must take EE 518 and complete this course with a grade of B or better. Additionally, students must complete one of the following courses with a grade of B or better: EE 431, EE 432, and EE 520.

3) Energy and Power Systems: The QE major examination will consist of two parts: 1) a written take-home examination and 2) an oral examination.

The written take-home exam will include open-ended questions that involve problem formulation as well as problem solving, and the exam typically requires sound programming skills. The written exam is administered over a period of about five days. Students can refer to power system literature as well as previous course material in the power area during the exam. However, discussions of any kind with anyone other than power area faculty administering the exam are strictly not allowed.

For the oral examination, the student will give an hour-long seminar presentation on a pre-approved set of technical papers. The student will be expected to answer questions related to the seminar papers as well as from the written qualifying exam during the oral examination.

Topics for the written examination are as follows:

Power system fundamentals:

Three-phase circuits, Balanced three phase networks, Concepts of real and reactive power; Transmission line inductance; capacitance and reactance computations; Short, medium, and long line representations; Transformer representation; Principles of electromechanical energy conversion; Synchronous machines; Induction machines; Phasor diagrams. Textbook: Grainger and Stevenson book.

Power-flow methods:

Power-flow equations; Gauss-Seidel algorithm; Newton-Raphson and fast decoupled algorithms; Convergence issues; Reactive power limits; Sparsity issues; Static limits; Phase-shifting transformers, shunt capacitor banks, and synchronous condensers; Basics of voltage control; Basics of contingency analysis. Textbooks: Grainger and Stevenson book, Glover and Sharma book.

Modeling of dynamic components:

Synchronous generators: electromagnetics, electro-mechanics, exciters, governors, power system stabilizers; Construction of multi-machine network models. Textbooks: Kundur book, Fouad and Anderson book.

Stability analysis:

Small-signal stability: local linearization, eigenvalues, modes of oscillation, small-signal stability limits; Transient stability: equal area criterion, multi-machine transient stability analysis, transient stability limits; Concepts of voltage stability and angle stability. Textbooks: Kundur book, Fouad and Anderson book.

Power system controls:

Principles of exciters and governor; Basics of automatic generation control; Basics of voltage controls: shunt capacitor banks and condensers. Textbooks: Grainger and Stevenson (voltage controls), Kundur book and Fouad Anderson book (dynamic controls).

Economy methods:

Economic load dispatch: classical lossless and lossy line computations; Formulation of optimal power-flow; Principles of optimal power-flow algorithms; Hydro-thermal coordination methods. Textbook: Grainger and Stevenson book.

Operation issues:

State estimation problem; Principles of state estimation algorithms; Basics of secondary control architecture. Textbook: Grainger and Stevenson book.

Protection issues:

Basics of symmetric components; Formulation of positive, negative, and zero sequence networks; Fault computations; Introduction to types of relays. Textbook: Glover and Sharma book.

QE minor policy in the power area:

Students minoring in the power area need to get a minimum B+ grade in each of the two courses EE 521 and EE 523 (formerly an EE 581 course).

4) Microelectronics: Students declaring microelectronics as their major field will complete a two-part evaluation. The examining committee will first select between 3 and 5 relevant research papers from which the student will have 3 weeks to provide a five-page, double-spaced paper summarizing and interpreting the research in these papers. After the student has submitted this written report to the committee, there will be an exam scheduled for which the student will

present these results in a 20-30 minute presentation. After this time, the committee will have an oral question and answer period to assess the student's knowledge of the fundamentals and the student's analytical abilities.

The microelectronics area examination committee (consisting of three faculty and may not include the student's advisor) will provide an assessment of each student's performance to the graduate studies committee within two weeks after the date of the oral exam.

Performance assessment guidelines for students majoring in the microelectronics area:

The three possible performance assessments for students specializing in the microelectronics area will be: (1) Pass; (2) Fail, but may be allowed to retake the exam the next time it is offered; (3) Fail, should not be allowed to continue in the microelectronics area.

Students choosing microelectronics as their minor area in their PhD program are required to take and pass EE 576 and EE 571. A pass is considered to be a grade of B or better.

5) Systems (Communications, Control and Signal Processing): Effective spring 2010, the systems qualifying exam will be a written exam lasting 3 hours 30 minutes and will consist of 7 questions: two each from EE 501 and EE 507 and one each from EE 451, EE 464, and EE 489. Students are required to answer a total of 5 out of the 7 questions. Four of the 5 required answers must be to the questions from EE 501 and EE 507. The other question must be chosen from among the questions for courses EE 451, EE 464, and EE 489.

- The exam will be closed book and closed notes.
- Students may bring two 8.5" x 11" study sheets per course (front and back may be used).
- At the beginning of the exam, students may read the problems from EE 451, EE 464, and EE489 before deciding which one to attempt and retain the two study sheets pertaining to that course.
- Scientific calculators with the following capabilities will be allowed: in addition to basic arithmetic operations, Trigonometric, Log and exponential, Hyperbolic functions. In particular, calculators with significantly more capabilities than those listed, including graphing or programmability will NOT be allowed.
- Students will be allowed to bring in one handbook of mathematical tables (such as a CRC handbook). Printout of an electronic copy of mathematical tables can be substituted as long as the number of pages does not exceed 100 sheets (double-sided).

The systems area examination committee will provide an assessment of each student's performance on the systems qualifying exam to the graduate committee within two weeks after the date of the exam.

The three possible performance assessments for students specializing in the systems area are: (1) Pass; (2) Fail, but be allowed to retake the exam the next time it is offered; (3) Fail, should not be allowed to continue in the systems area. Each question on the systems qualifying exam will be worth 20 points. Students specializing in the systems area will automatically pass the exam if they score 80 or higher. Depending upon the particular exam, the examining committee may set the pass/fail threshold lower than 80. Systems students who fail the exam on their first attempt

but who achieve a score within 15 points of the pass/fail threshold will be assessed at performance level (2) above. Systems students who fail to achieve a score greater than or equal to 15 points below the pass/fail threshold on their first attempt or who fail the exam on their second attempt may be assessed at performance level (3).

Students minoring in the Systems area are required to take EE501 and EE507 and obtain a grade of B+ or better in each course.

3.5.3 Timetable for QE

- 1) At the beginning of every semester, the Graduate Coordinator will identify students who are required to take the examination and send them a form to sign up for QE.
- 2) ECE students must identify the area (depth) in which they desire to be examined. The students are required to coordinate with the chair of the appropriate area committee. Each area committee will choose exam dates for QE.
- 3) The exam is administered according to the schedule set by each area committee.
- 4) Area committees must have recommendations to the Graduate Studies Committee within two weeks after the exam is administered.
- 5) Graduate Studies Committee decisions on Advanced Graduate Standing will be issued and letters will be distributed as results are known.

3.5.4. Urban Campus Students Completing QE

- Computer Science Qualifying Examinations: The student and faculty can choose to come to Pullman or use Academic Media Services <http://www.ams.wsu.edu/> facilities.
- Electrical and Computer Engineering Qualifying Examinations: The student and faculty must be in Pullman only.

3.6 Teaching Fellowships

PhD students who have passed the qualifying exam and obtained Advanced Graduate Standing are encouraged to apply for instructor appointments as teaching fellows. These one-semester appointments involve full responsibility for teaching an undergraduate course and generally provide a higher level of pay than RA/TA appointments. Three letters of recommendation from EECS faculty, including one from the student's advisor, are required.

3.7 The Preliminary Examination

A doctoral student is advanced to candidacy when he/she passes the Preliminary Examination (PE). The PE should be held no later than the fifth semester of the student's PhD program. If unsuccessful, a student may be allowed to take this examination one more time. The overall

format for the PE is described in the WSU Graduate Student Handbook. The specific format of the EECS PE is described below.

The PhD student will submit an 8 to 12-page (single-spaced) “Dissertation Proposal” to the GSC, BEFORE scheduling the PhD preliminary examination and AFTER passing the PhD qualifying examination. This document shall describe the student's intended Ph.D. research in reasonable detail - including introductory and background material, preliminary research conducted, plans for further research, and bibliography. The proposal may serve as the focus for the preliminary exam, although this is not required. Also, there must be a MINIMUM period of SIX (6) months between passing the preliminary exam and taking the PhD final exam (i.e., dissertation defense). The exam itself will consist of the presentation of the proposal by the student and questioning from the committee and permanent faculty. The vote on the PE will be held at the end of the exam.

3.8 The Final Examination

An oral final examination is given after the completion of the dissertation. This examination (open to the public) is primarily a defense of the dissertation. Along with the scheduling form for the PhD Final Exam, a List of Publications (accepted, submitted, or in preparation) should be submitted to the GSC. The publication list should include date of submission or appearance (or anticipated date) and the full name of the conference or journal. **Note:** The scheduling form will not be signed unless at least one paper has been submitted for publication. The student’s doctoral committee must attend and vote and any other member of the WSU Permanent Faculty may also attend and vote. Graduate students often attend PhD oral examinations as spectators. The student must file a Final Examination Scheduling Form indicating preliminary approval of the dissertation; this form also specifies the examination location, date, and time. The form needs to be signed by all Committee and Dr. Saberi and to the Grad School Office at least 2 weeks prior to the date.

3.9 The Dissertation/Thesis

If the student’s dissertation/thesis is approved and the oral defense is passed, the student must provide a digital copy of the dissertation to the School of EECS. Dissertations must be formatted in accordance with University and Graduate School requirements, and all changes suggested by the doctoral committee must be made in the final version. The results of the dissertation research should be submitted to a refereed journal.

3.10 Timetable for PhD Students

- 1) Application to take the qualifying exam, passing exam, and receiving AGS status.

- 2) Scheduling of preliminary examination (after completion of all of the doctoral program course work). Forms must be filed with the Graduate School at least 2 full weeks prior to the examination date.
- 3) Application for degree (apply during the semester prior to the date the final oral exam is scheduled).
- 4) Committee members must be given 14 days (10 working days) to review the dissertation prior to scheduling the final exam.
- 5) Submission of dissertation to the Graduate School (after approval by the doctoral committee and at least 2 weeks (10 working days) prior to scheduled date of the final oral exam).
- 6) Payment of the graduation fees.
- 7) Schedule final oral exam (schedule at least 2 weeks prior to exam date with the Graduate School Office).

Chapter 4

Assistantships

Note: Master's students awarded research assistantships are required to choose the thesis option.

A *Research Assistantship (RA)* is a fractional-time professional appointment to assist a faculty member in a specific research project. The faculty specifies the work to be accomplished by the RA during the appointment. There is a wide latitude in the types of work an RA may do for the research effort, and the time spent in various aspects may vary widely. As a guide, a half-time appointment should average about 20 hours per week, with other fractional appointments in proportion.

A *Teaching Assistantship (TA)* is a fractional-time professional appointment. A Teaching Assistant provides professional assistance as either a grader or as a laboratory assistant. The GSC and the Associate Director make TA assignments.

The TA is expected to report to the School of EECS, one week prior to START of classes; if he/she fails to do so, the assistantship will be revoked immediately. The TA's responsibilities are not completed until the final course grading is completed, unless excused earlier by the instructor.

The specific work duties are the responsibility of the faculty member to whom the TA is assigned. TAs usually have contact with students and may teach laboratory courses or recitation sections, grade course related materials, and perform other support work for a faculty member. The TA is expected to be familiar with the course material and/or laboratory and experiments before the beginning of classes. The TA may be required to attend the lectures if so specified by the course instructor. Foreign students must have passed the English proficiency examination required by the Graduate School prior to assignment.

4.1 About Assistantships

4.1.1 Obtaining an Assistantship

A beginning graduate student who meets the admission requirements of EECS and the Graduate School is eligible to apply for a graduate Teaching Assistantship (TA) or Research Assistantship (RA). Formal application must be made to the School of Electrical Engineering and Computer Science (usually at the time of application for admission).

If an assistantship is not awarded for the first semester of graduate work, the student may apply for support for subsequent semesters by filling out an assistantship request form available from the Graduate Coordinator.

4.1.2 Work Assignments and Course Loads

Assistantship students are expected to be available for performance of their duties beginning one week prior to classes through the date grades are due at the end of the semester. Assistantships require a work commitment of about 20 hours per week.

Graduate assistants are required to choose the thesis option and must register for 10-12 credit hours. This total includes graded course work, and research hours.

4.1.3 Grading Assistance

A TA assigned as a grader may review, critique, and grade problem sets, exercises, reports, examinations and other written or oral material. A grader may assist in preparing programs, problem sets, and contribute to examination sets.

4.1.4 Laboratory Assistance

The lab TA assists in the laboratory by interpreting the laboratory instructions, demonstrating proper use of equipment and supplies, answering students' questions, encouraging students to perform quality work and investigating odd or unexpected results. The TA may aid in preparing experiments and exams, performing demonstrations, preparing and grading reports and examinations.

Laboratory assistance may include helping students learn computer techniques.

4.2 Continuing an Assistantship

It is the intention of the School of Electrical Engineering and Computer Science to continue financial support through the timely completion of the degree program. However, appointments are competitively based and dependent upon funding available to the school. Students must reapply every semester and continuation or renewal of an assistantship is contingent upon:

- Satisfactory academic progress,
- Satisfactory performance of assistantship duties,
- Professional and personal conduct of an exemplary nature,
- And for non-native English speaking students, passing the required oral English exam (ITA).

Students will be evaluated on the quality and quantity of work performed. The Graduate Studies Committee, with the recommendation of the student's supervisor and advisor, awards assistantship renewals.

Research Assistants: The research supervisor determines satisfactory progress.

Teaching Assistants: A student is required to enroll in 3 graded courses unless his or her course work is essentially complete.

4.3 Definitions

Regular TA Appointment: Any appointment resulting from the normal reappointment of existing TAs and any new appointment made from a list of candidates approved by the department at the normal fall and spring selection times (approximately November 1st and April 1st).

Special TA Appointment: These are exceptional appointments, such as to fill unexpected mid-semester resignations, or to fill any temporary teaching assistant positions.

RA Appointment: These appointments are offered to students by principal investigators on funded projects. The Graduate Coordinator or Associate Chair, however, should be informed of such offers as early as possible to assist in departmental planning.

4.4 Minimum Conditions for Reappointment (RA and TA)

Only students on regular TA appointments are eligible for reappointment. Students who once held but do not currently hold appointments are to be placed in competition with new applicants for available positions. The department has established the following criteria as the minimum standard for reappointment. (Reappointments are subject to the availability of positions.)

- Satisfactory progress in research as determined by research advisor.
- (Teaching Assistants only) A minimum cumulative GPA will be set every semester depending upon the pool of applicants who are competing for the open positions.
- Satisfactory progress in course work as determined by the student's advisory committee and/or the graduate coordinator.
- (Teaching Assistants only) Satisfactory performance as a TA as determined by faculty supervisor.
- (Teaching Assistants only) Passage of TA oral English exam (for non-native English speaking students) (ITA).

4.5 Termination Conditions

- Unsatisfactory performance of duties as a teaching or research assistant.
- A semester GPA below 3.00 at any time or a semester GPA between 2.5 and 3.0 for more than one semester.
- Failure to file a program by required date.
- Violation of academic integrity policy.
- Failure to pass the TA oral English exam (for non-native English speaking students).

4.6 Changing Between an RA and TA

Students can switch from a TA position to an RA position if they find a suitable research project and arrangements are made with the principal investigator in charge of that research project and the Associate Director. However, the switch must be arranged prior to appointment to a new term.

A student holding an RA position cannot be automatically switched to a TA position. A formal request must be made to the Graduate Studies Committee (through the Graduate Coordinator) during the semester preceding the semester in which the change is to be effective. In addition, the student should request that the principal investigator write a letter to the Graduate Studies Committee explaining the circumstances of the RA termination and an assessment of the student's potential as a TA. This procedure applies to both MS and PhD students.

4.7 Duration of Assistantship Support

Master's students are not eligible to receive a TA. Master's students in the thesis option who have had three semesters of financial support (RA) are not eligible for further RA support.

PhD students have a major commitment to research. As such, it is customary for a PhD student to hold an RA position. Departmental support (in the form of a TA) for PhD students is offered to some new students and some continuing students on a funds-available basis. Students holding a TA are generally expected to obtain RA support before becoming a PhD candidate (i.e., when the student passes the preliminary examination). Financial support questions for PhD students should be coordinated through their advisor.

All students should be aware that it may be necessary to work on their research during the summer even if they do not have financial support. Very few assistantship positions are available in Summer Session.

Appendix A

Important Information for EECS Graduate Students

- New students should be emailed a **To-Do List** from the Graduate Advisor.
- New students should attend the Departmental Orientation Meeting normally held during the second week of classes in the fall semester. Location and time will be announced. Check with the Graduate Advisor in EME 303 for more information.
- New students should find an advisor the first semester of enrollment if they were not assigned one prior to their arrival.
- Research and Teaching assistants should apply for assistantship renewals approximately mid-semester. Forms will be handed out to you in your Sloan 3rd Floor mailbox and sent via email from the Graduate Advisor.
- MS-thesis and PhD students must participate in the WSU Academic Showcase or the Graduate School Wiley Exposition at least once during their degree program.
- Teaching Assistants should attend at least one Graduate School TA workshop.
- Attending seminars presented by visiting faculty or other EECS experts is mandatory for all MS-thesis and PhD students. Students must attend two in-house seminars each semester; attendance will be taken. Students should check with their advisors if an attendance waiver is needed.
- MS students should file a program of study with the Graduate School before the end of the second semester when approximately 15 credits will have been completed. PhD students should file a program of study after they pass the qualifying exam (QE) and are granted Advanced Graduate Standing (AGS).

Graduation Deadlines:

EECS follows the guidelines set by the Graduate School. See the deadlines at this website; <http://gradschool.wsu.edu/facultystaff-resources/18-2/>
These are updated every semester.

Graduate School Policies and Procedures:

To view or download the Graduate School's Policies and Procedures manual, see:
<http://gradschool.wsu.edu/policies-procedures/>

Dissertation and Thesis Guidelines:

The URL for the digital dissertation and thesis guidelines is:
<http://gradschool.wsu.edu/documents/2014/12/dissertation-and-thesis-submission-guidelines.pdf>

Information on Reporting Grievances:

For information on reporting grievances to the Graduate School, see:
<http://gradschool.wsu.edu/documents/2015/05/grievance-procedures.pdf>

Information on Rights and Responsibilities:

For information on graduate students rights and responsibilities, see:
<https://gradschool.wsu.edu/wp-content/uploads/sites/19/2014/06/Graduate-Student-Rights-and-Responsibilities-2014-15.pdf>

Appendix B

EECS PhD Degree Requirements

Effective Fall 2009

	Grad School Requirements	Current EECS Requirements	New Requirements
Minimum total number of hours required (beyond BS degree)	72	72	72
Minimum number of "Graded" hours required (beyond BS degree)	34	45	35
Minimum number of "Dissertation" hours required	20	30	30
Maximum number of "Directed Studies" hours	No limit	6	6
Maximum number of "400-level" hours accepted	9 (if graded)	9 (only if graded)	9 (only if graded)
Maximum number of "transfer" hours (including MS degree hours)	17	17	17
Publications requirement	None	Submission of a paper	Minimum of [1 accepted journal paper] OR [2 accepted peer-reviewed conference papers AND a journal submission]. The publication venues (journal or conference) must be approved by either the PhD Advisory Committee or the PhD Dissertation Committee.

Note 1: The PhD Dissertation committee, with the approval of the Graduate Studies Committee, has the right to impose more PhD studies requirements on a case-by-case basis, depending on a student's individual circumstances.

Note 2: The requirements will apply to all new, incoming students entering their PhD program at EECS in spring 2009 and beyond

Appendix C

Students with Disabilities Syllabus Statement

We are an institution of higher education and we have a responsibility to inform students with disabilities about the process of accessing reasonable accommodations. The Students with Disabilities syllabus statement is an important part of fulfilling this institutional responsibility; therefore, we ask that all teaching faculty include it in every syllabus.

Students with Disabilities: Reasonable accommodations are available for students with a documented disability. If you have a disability and need accommodations to fully participate in this class, please either visit or call the Access Center (Washington Building 217; 509-335-3417) to schedule an appointment with an Access Advisor. All accommodations **MUST** be approved through the Access Center.

Website: <http://accesscenter.wsu.edu/>

Appendix D

EECS Program of Study Core Course Requirement

EECS Program of Study Core Course Requirement

*The core course declared by the student on the MS Program of Study must be passed with a B-grade or better.

*The core courses declared by the student on the PhD Program of Study must be passed with a B grade or better.

Students can take more core courses than the minimum required from the list of core courses. But, this policy is applicable for the core courses that the student declares as the core courses in his/her program of study. If the students receive a grade below our requirement mentioned above, Dr. Saberi will write an exception memo to the Grad School for the Repeat and the Grad School will go into the system and update the student's transcript with the better grade/ required grade once complete. This is again applicable for the declared core course

Appendix E

EECS Assessment Report

2014 Graduate and Professional Program Assessment Review Report For School of Electrical Engineering and Computer Science

Behrooz Shirazi; Director, School of Electrical Engineering and Computer Science

Ali Saberi, Graduate Program Director, School of Electrical Engineering and Computer Science

Report prepared by Sakire Arslan Ay; Assistant Director, School of Electrical Engineering and Computer Science

Date: 06/11/2014

Degrees Covered in Assessment Plan:

- PhD in Electrical Engineering
- PhD in Computer Science
- MS in Electrical Engineering
- MS in Computer Science
- MS in Computer Engineering

Campuses Covered in Assessment Plan:

- WSU Pullman
- WSU Tri-Cities

Individuals or Groups Receiving this Report:

- Some Faculty
- Graduate Coordinator
- Program Coordinator
- Department Chair/Program Director
- WSU Graduate School

Introduction

This report presents an overall assessment of the graduate programs at the School of Electrical Engineering and Computer Science. The information provided in this document assesses the quality and effectiveness of our graduate program in order to identify areas of excellence, opportunities for improved management, and priorities for investment or disinvestment of resources.

Sidra Gleason, Academic Coordinator with EECS, invests many hours per month amassing and collating data that have been used by EECS for the continuous assessment reviews and for this report. Sakire Arslan Ay, Associate Director of the School of EECS, has prepared this document with support from Sidra Gleason. The two primary sources of data for the continuous assessment process and for this report are the WSU Graduate School and the School of EECS.

Currently the graduate program at EECS offers the following degrees: 1) Computer Engineering – MS; 2) Computer Science – MS; 3) Electrical Engineering – MS; 4) Computer Science – PhD; and 5) Electrical Engineering – PhD. When convenient in this report, these degrees are abbreviated as 1) MS-CptE, 2) MS-CptS, 3) MS-EE, 4) PhD-CptS and 5) PhD-EE, respectively.

Program Updates:

The EECS Graduate Studies Committee (GSC) is the primary authority in making changes in the EECS graduate program. The EECS Graduate Program Director, Dr. Saberi, serves as the chair of GSC. The bylaws of the GSC committee are provided in Appendix-A.

Based on feedback from faculty and based on a review of similar programs in peer institutions, the EECS GSC has revised the policy for “graduate program coursework minimum requirement” in spring 2014.

According to the new policy:

- every MS core course must be passed with a B- grade or better, and
- every PhD core course must be passed with a B grade or better.
- If the student receives a grade below our requirement, Graduate Program Director Dr. Saberi will write an exception memo to the Grad School for permission to repeat the course and the Graduate School will go into the system and update the student’s transcript with the better (required) grade, once complete.

The above policy has been voted, and accepted by the majority of the faculty vote.

Previously, for MS-EE/CptE and PhD-EE students the graduate program required a minimum grade of B- or better in all core courses. If a student failed to meet the minimum requirement above and had a grade of C or better, since the graduate school wouldn’t allow the student to retake the class officially, the student had to retake the course as independent study (EE595). There was no requirement for MS-CptS and PhD-CptS.

Faculty Updates:

The School of EECS strategic plan calls for focus on and enhancing graduate programs, research excellence, and national reputation in the areas of “Power Engineering”, “Smart Environments and Pervasive Computing”, and “Data Science and Big Data Analytics”. These areas are identified as high priority Interdisciplinary Research Units (IRUs) within the College of Engineering and Architecture (CEA)

as well. With generous support from the University, we recently successfully executed a plan to add 16 new faculty to the high-priority programs listed above.

The EECS Power Engineering program is on its way to becoming one of the top-5 power programs nationally. We have also seen a dramatic expansion of the PhD program and graduate student population in the power engineering area. EECS is currently interviewing with candidates for 2 new faculty positions in Power Engineering.

We carry out the same tried-and-true plan for our Smart Environments and Pervasive Computing research area in Computer Science by adding several tenure-track faculty with research emphasis in artificial intelligence, data mining, and machine learning. The smart environments projects being carried out by Dr. Cook enjoy interdisciplinary participation by researchers from Psychology, Mechanical Engineering, Nursing, Electrical Engineering, and Pharmacy. The investment in this area will be beneficial to the graduate programs in any discipline within CEA and the University that involves managing and making sense out of large amounts of data. EECS already hired 4 new faculties specializing in data mining and machine learning. EECS is currently interviewing with candidates for one additional position in this area.

The third EECS emphasis area, “Data Science and Big Data Analytics”, has recently become a national high priority research area with NSF and many other Federal funding agencies. EECS has recently hired 2 faculties specializing in data science area and will be hiring 4 additional faculties next year. The search is still active for these positions and EECS is currently interviewing with candidates.

In addition to the above EECS will be hiring 3 more faculties in various areas of Computer Science including software engineering, cyber security, and sustainable design. Based on many “Return on Investment” models, investments in hiring new faculty (in the proposed areas) will result in significant additional research expenditures and a significant increase in number of PhD students and scholarly publications (expansion of the graduate programs).

Changes to Assessment Plan

The EECS graduate program assessment plan (reported in the “Graduate Program Assessment Review Report” - dated September 4th, 2012) has been reviewed by the Graduate Studies Committee. No major modifications have been made for the program objectives and program outcomes. There have been couple minor additions/updates in the assessment process.

The revised assessment plan is summarized in Table-1 and Table-2.

Assessment Activities Directed by Faculty

Graduate Studies Committee (GSC) Weekly Meetings

The EECS GSC is the primary authority in making changes in the EECS graduate program. The GSC members meet weekly to discuss various topics regarding EECS graduate students, graduate program, and graduate program assessment. The GSC duties include developing policies for EECS Graduate Program, handling graduate admission process, EECS graduate student exams (QE, Prelim and the Final Defense), EECS graduate program administration, graduate course and curriculum changes, student evaluations, alumni tracking, and EECS graduate student issues and problems. The bylaws of the GSC committee are available in Appendix-A.

Faculty Meetings:

Issues regarding Graduate Program and Graduate Program assessment have been discussed occasionally in the department faculty meetings. During AY 2012-2013 and AY 2013-2014 faculty met 2-3 times per semester. Some relevant discussion items include: faculty hires, EECS strategic plan, graduate student enrollments, graduate admissions, qualifying and defense exams for PhD and MS programs, etc.

Faculty Retreats:

All EECS faculty gather annually in an all-day faculty retreat event and discuss major issues in the department. Discussion topics are determined by the EECS chair and faculty. Graduate program assessment issues are occasionally brought to attention and discussed in detail. For issues that need further investigation workgroups are formed. The workgroups investigate the matters further and provide a report summarizing the findings and outcome of the discussion. Some relevant discussion items for the faculty retreats during the past 2 academic years include: the structure and format of the EECS qualifier (QE) and defense exams for the EE and CptS PhD degrees, faculty hires, giving graduate students opportunities to teach, educating graduate students on ethics and plagiarism, changes in the PhD and MS program course curriculums, etc.

	Outcomes:	Measurement (Data):	Source:	Frequency:
1	Students have general mastery of their field of study in either EE, CptE, or CptS	<u>MS</u> : course grades <u>PhD</u> : qualifying exam	<u>MS</u> : student transcript <u>PhD</u> : examining committee	<u>MS</u> : at degree completion <u>PhD</u> : at completion of qualifying exam
2	Students have mastery of knowledge in a specialized area	<u>MS</u> (non-thesis): comprehensive exam <u>MS</u> (thesis): thesis defense <u>PhD</u> : qualifying exam, advanced graduate standing, faculty advisor evaluation	<u>MS</u> (non-thesis): examining committee <u>MS</u> (thesis): <u>PhD</u> : faculty advisor	<u>MS</u> : at degree completion <u>PhD</u> : at completion of preliminary exam
3	Students are able to conduct state-of-the-art research in a specialized area that makes a contribution to the knowledge base	<u>MS</u> (thesis): thesis, thesis defense <u>PhD</u> : dissertation, dissertation defense	Examining committee	At degree completion
4	Students can effectively communicate their research in oral and written form	<u>MS</u> (thesis): thesis, thesis defense, conference or journal publication <u>PhD</u> : dissertation, dissertation defense, conference presentations, journal publications	Faculty advisor	At degree completion
5	Students are able to disseminate research results in archival literature	<u>MS</u> (thesis): submission to a refereed journal or conference <u>PhD</u> : at least 1 accepted journal paper or 2 accepted peer-reviewed conference papers and a journal submission	Faculty advisor	At degree completion

Table 1 - Assessing graduate program outcomes

	Objectives:	Measurement (Data):	Source:	Frequency:
A	Attract, admit, and enroll students of highest quality	GPA, GRE, undergraduate institution	Student application	Annually
B	Provide balanced student body	Graduate student demographics	Graduate enrollment	Annually
C	Have a graduate student body recognized by national awards	Fellowships, best paper awards, etc.	The student and their faculty advisor	Annually
D	Place graduating students in academic or industrial positions in relevant technical fields	Alumni tracking, exit Interviews by EECS	Alumni, development office	Biennially
E	Maintain faculty research and graduate teaching of highest caliber	Research expenditures, publications, graduate student output, teaching evaluations, editorships, fellowships, faculty evaluation	Faculty evaluations	Annually

Table 2 - Assessing graduate program objectives

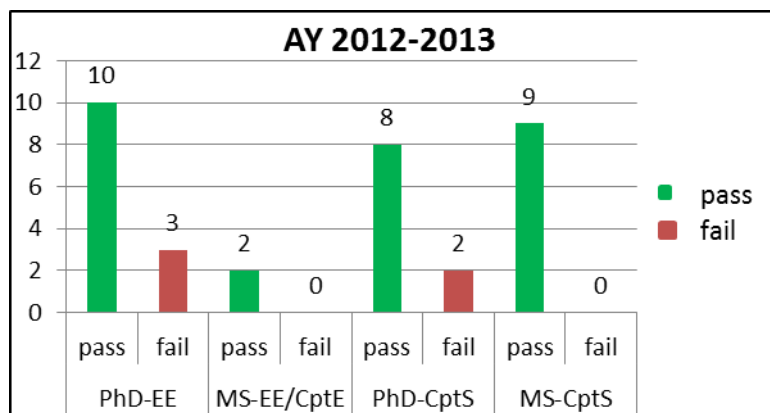
Assessment of Student Learning Outcomes

1. Examinations for EECS Graduate Students (PhD Qualifying Exam, PhD Dissertation Defense, MS Comprehensive Exam, and MS Thesis Defense)

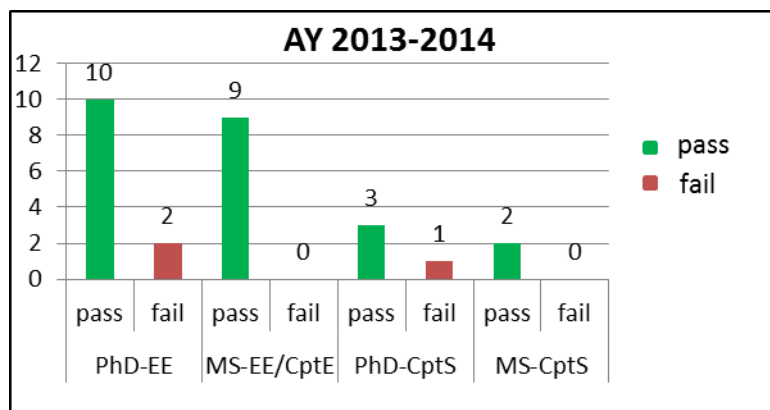
Applies to outcomes 1,2,3,4 and 5.

At the time of the thesis defense for MS students and at the time of the qualifying or dissertation defense for PhD students, the faculty advisor completes a rubric to assess the performance of the student. All members of the examining committee either concur with the assessment of the faculty advisor or, if there is dissent, the dissenting members of the committee complete their own rubrics (dissenters may complete this either collectively or individually). Based on the assessment of the faculty advisor the committee makes a decision on whether the student passes or fails the exam.

Unfortunately, for the last 2 academic years the EECS graduate program has not amassed the evaluation rubrics of the MS and PhD committees. However the graduate secretary has created a spreadsheet that lists the Ph.D. students who took the qualifying exam in the previous academic year and noted whether the student passed or failed the exam. Figure 1 (a) and (b) illustrate the number of passed and failed students for MS-EE, MS-CptS, PhD-EE, and PhD-MS programs during AY2012-2013 and AY 2013-2014, respectively. Both academic years, on average, more than 75% of the students have passes their exams.



(a)



(b)

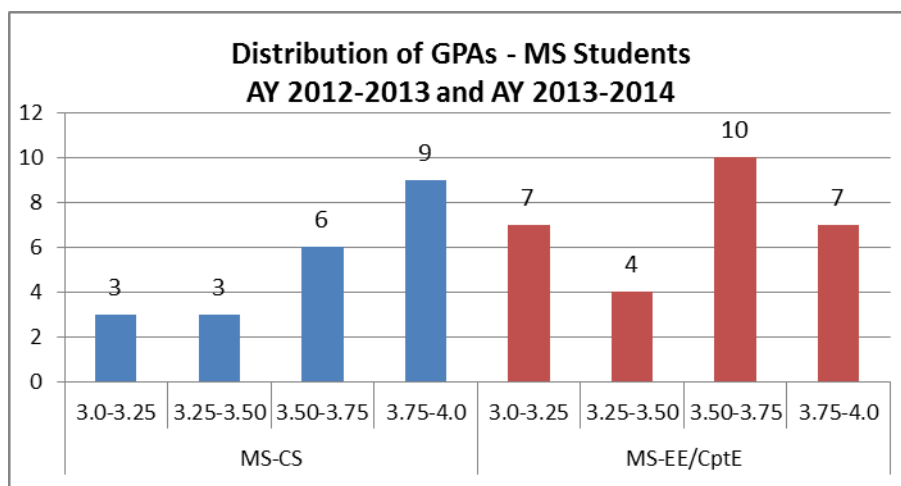
Figure1- Number of passed and failed students in PhD qualifying and MS comprehensive exams during (a) AY2012-2013 and (b) AY 2013-2014.

In the next semesters, GSC will work with the EECS faculty to revise the PhD qualifying exam and MS comprehensive exam rubrics. Graduate secretary will make sure all faculty advisors return these rubrics to her after each exam.

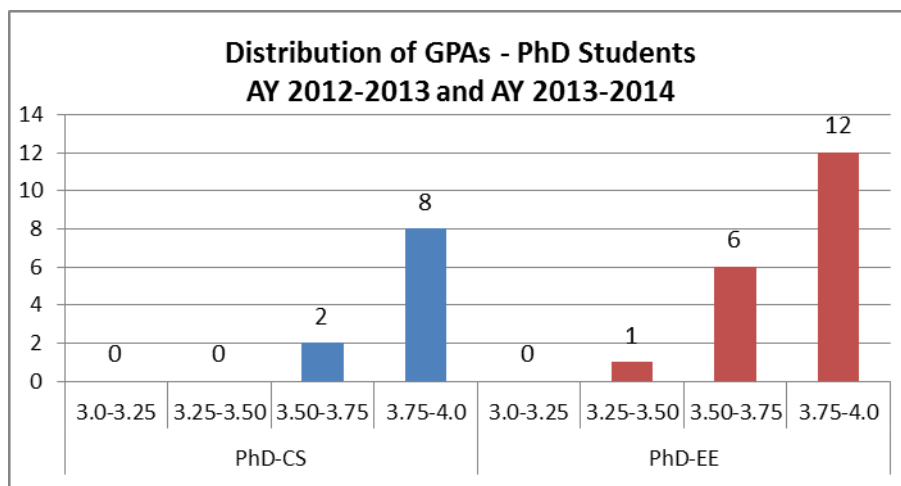
2. Academic Standing of Graduate Students and Student GPAs

Applies to outcome 1.

Each summer the graduate secretary creates a spreadsheet that lists the graduated MS and PhD students along with their GPAs. The distribution of the student GPAs for each program is helpful in assessing the level of mastery of students in their field of study (major). Figure 2 (a) and (b) illustrate the distribution of the student GPAs (at graduation) during the last two academic years (AY 2012-2013 and AY 2013-2014) for MS and PhD students, respectively. Overall, as expected, PhD students have better academic standing compared to MS students and achieve higher GPAs. Among MS students, CptS students overall have better GPAs than EE and CptE students.



(a)



(b)

Figure 2 - Distribution of student GPAs (a) MS Students (b) PhD students

3. Disseminate Research Results in Archival Literature; Graduate Student Publications

Applies to outcomes 4 and 5.

All graduate students need to publish their research results in peer-reviewed journals and conferences. EECS graduate program requires each PhD student to publish at least 1 journal article in a peer reviewed journal and at least 2 conference papers in peer-reviewed conferences. Additionally they are required to submit one additional journal article towards the end of their PhD study. The publication venues are approved by either the PhD Advisory Committee or the PhD Dissertation Committee. The stated requirements are the minimum required by the School of EESC. Additional publications may be required by the faculty advisor.

Figure 3 shows the histogram for number of peer reviewed journal articles and peer reviewed conference papers published by EECS PhD students in 2012 and 2013. Half of the papers were journal articles published in prestigious peer reviewed journals including IEEE Transactions and ACM Journals. This is a positive indication of the quality of the research in School of EECS. The average enrollment in PhD programs during 2012 and 2013 was around 100 students. Among those 65% did not publish any papers during those years. As seen in the figure, among the students who published, majority of them had one or two conference papers and/or journal articles. We are planning to put more emphasis on dissemination of research results and improve the publication rate in both PhD-CptS and PhD-EE programs.

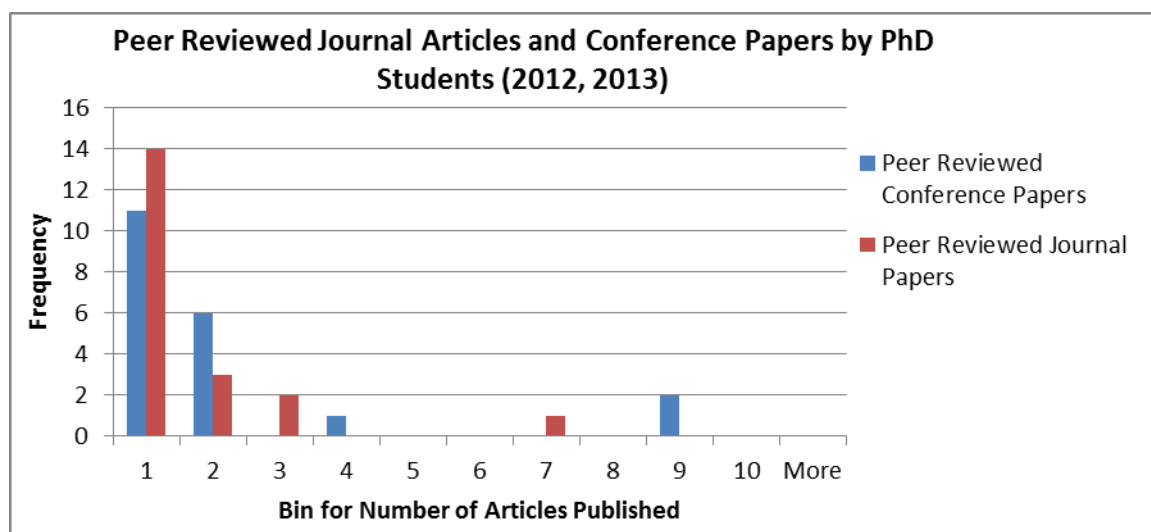


Figure 3 - Histogram for peer reviewed Journal Articles and Conference Papers published by EECS PhD students in 2012 and 2013.

4. Employment of EECS Graduate Students after Graduation

Applies to objective D.

On the summers of odd years the graduate secretary works with the alumni office and the faculty to obtain information about the placement of our graduates. The primary concern is employment immediately following graduation, but attempts are made to track student's employment up to four

years following graduation (i.e., three cycles of the collection of this data representing employment at graduation, two years after graduation, and three years after graduation).

Figure 4 (a) and (b) illustrate the histogram for the placement of EECS PhD and MS students (respectively) in various job categories by the time they graduate. The job offers has been categorized under 3 group: jobs in industry, academic positions, and researcher positions in various national research labs or centers. The academic positions include tenure track or non-tenure track faculty positions and post doctoral researcher positions.

As shown in the figure, all PhD graduates had a job offer that they had accepted by the time they graduate (without an offer rate is 0% for the PhD graduates). Among the MS graduates, around 24% of the students were still looking for a job at graduation. Overall the job placement rate was pretty high despite the slowdown in hiring in CptS and EE related areas during years 2012 and 2013. Among the PhD graduates total 30% have secured a research related position (either an academic position or a researcher position in a research center), which is a good measure of the strength of the research foundation at EECS. Among the MS graduates, total 21% has continued to conduct research either as a PhD student or a researcher.

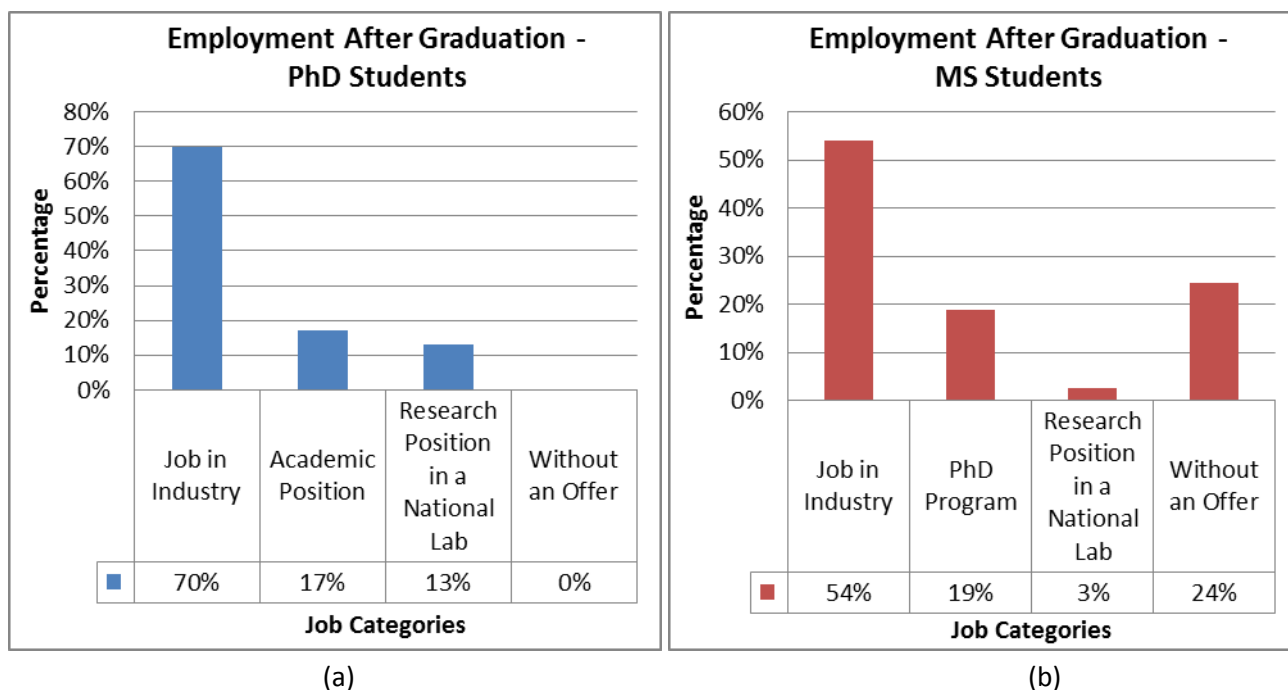


Figure 4- Histogram for the placement of (a) PhD and (b) MS students in various job categories by the time they graduate.

5. Engaging Graduate Students in Teaching

Applies to outcome 4 and objective D.

For the last 2 academic years, EECS has put special emphasis on providing opportunities to graduate students to gain teaching experiences and engaging them in teaching. Almost all graduate students serve as teaching assistants for couple semesters during their PhD studies for courses in their research

fields. In addition, several qualified graduate students were given the chance to teach undergraduate courses under the supervision of their faculty advisors. During the last 2 academic years 6 EE and 5 CptS graduate students have taught various undergraduate courses at School of EECS. Overall they got very positive feedback in student evaluations. EECS would continue to provide opportunities for graduate students to gain teaching experience when they are qualified.

6. Enrollment and Number of Degrees Granted

The number of degrees awarded for the calendar years 2010 through 2013 is shown in Figure 5. There has been a steep drop in the metric for the overall program in 2011. We suspect that the decline was due to the dramatic reduction in enrollment numbers in 2008 and 2009. (Please note that on average an MS student complete their study in 2 years) . From 2011 till 2013 the metric grew steadily with the total number of degrees granted reaching 48 in 2013. The MS-CptS, MS-EE, and PhD-EE degrees exhibited substantial growth from 2011 to 2013, while PhD-CptS degree showed slight growth. The small number of MS-CptE graduates is commensurate with the small number of faculty members specializing in that very important technical area. Production of MS-CptE degrees has fluctuated since 2011. EECS has hired 2 new faculties in CptE related areas and we are expecting to have stable growth for CptE-MS degree.

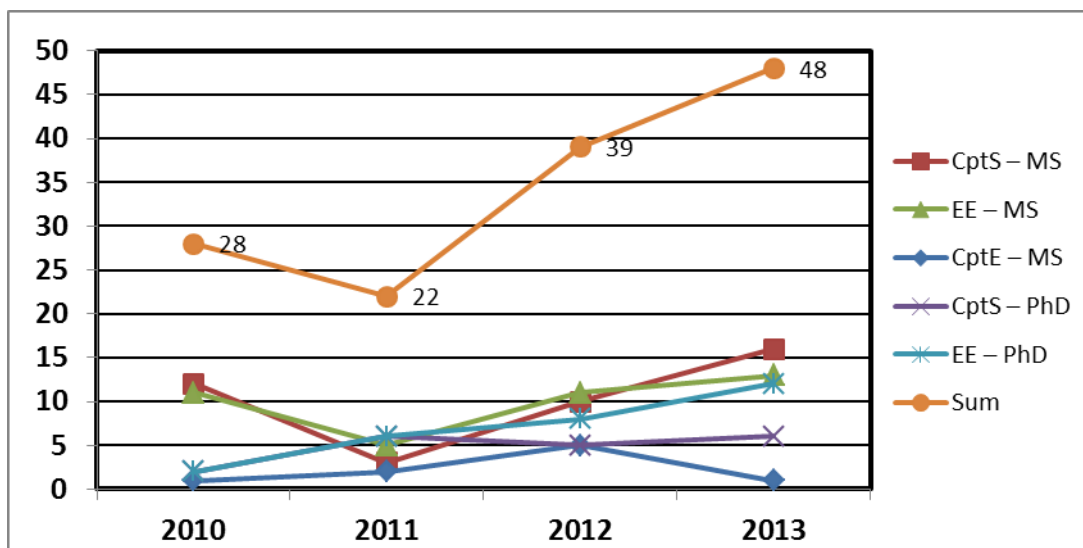


Figure 5 - Number of graduate degrees granted at EECS from 2010 through 2013

Enrollment data (as opposed to degrees granted data discussed so far) related to specific EECS degree programs are shown in Figure 6 for the past 5 years. Salient points from Figure 6 data include the following:

- From 2009 through 2013, the total enrollment for EECS graduate programs has increased steadily, except a slight drop in 2011. Almost all programs' enrollments shrank in 2011.
- For both CptS programs (MS and PhD) the enrollment numbers have fluctuated for the last 5 years.
- MS-EE program enrollment has increased in 2010 but lost that gain in 2011, but then slightly increased in 2012 and 2013. The small MS-CptE enrollment has shrank even further.
- PhD-EE program achieved the steadiest growth. PhD-EE enrolment has dropped slightly from 2009 to 2011, but increased more than 50% from 2011 to 2013.

As explained in the introduction, EECS has hired several new tenure-track faculties in all three EECS majors, and the searches for several additional positions are still going on. These new faculty will recruit and support numerous new MS and PhD student. Therefore we expect to have major improvements in enrollments of all EECS graduate programs.

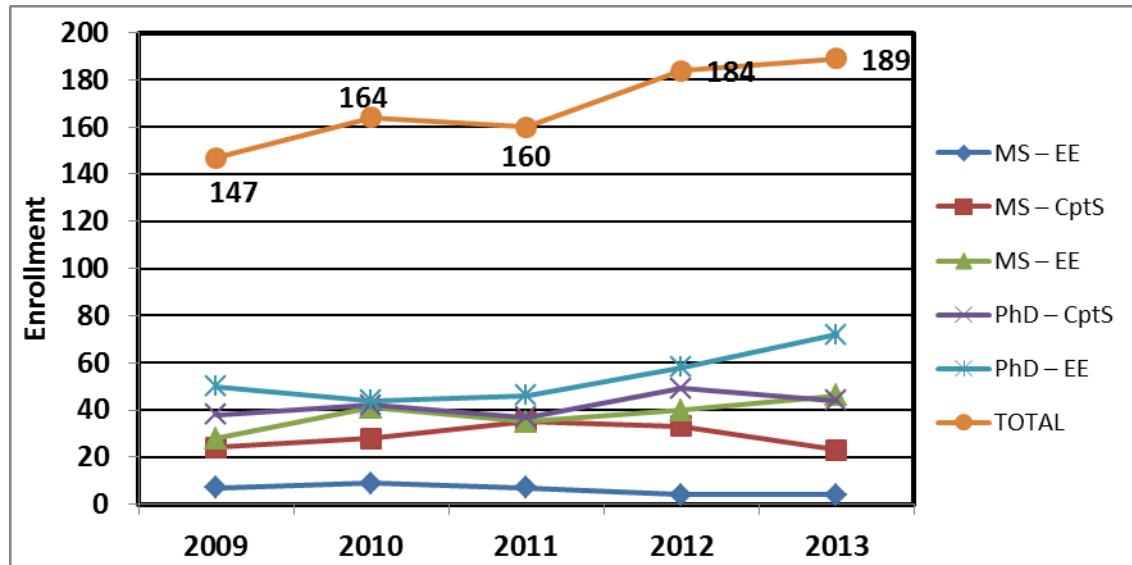


Figure 6– Enrollment of EECS graduate programs from 2009 through 2013

7. Scholarships

Applies to objective C.

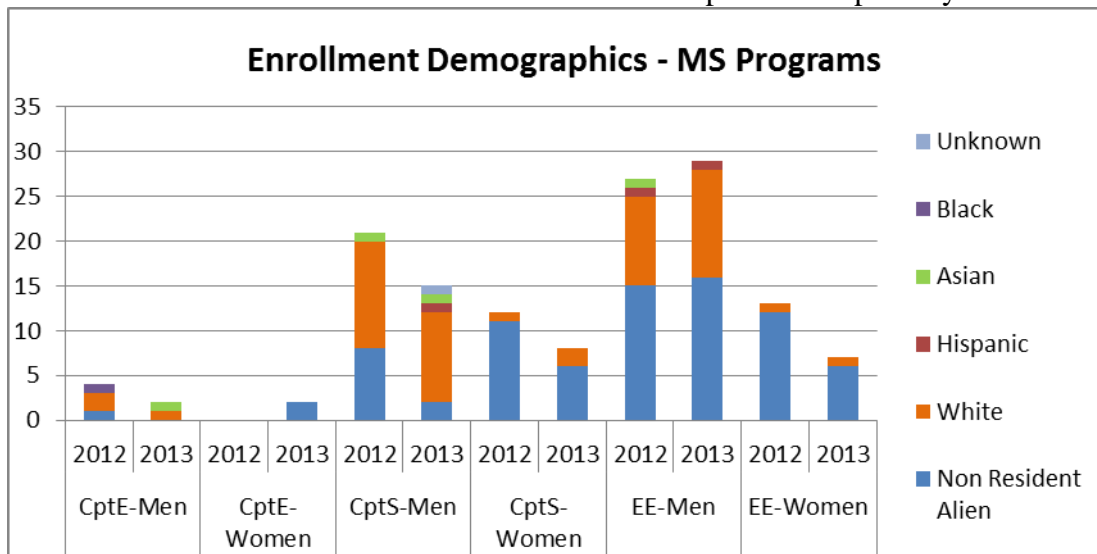
Each summer the graduate secretary collects a list of all the scholarships and national awards that have been obtained over the past academic year. This information is provided by the students and/or the faculty advisors. During 2012 and 2013, total 15 students have received scholarships. Table-3 provides a list of the awarded scholarships and the number of students received those. EECS faculty would continue to encourage graduate students to apply to various scholarships and national awards.

Name of the Scholarship:	Number of Students Awarded:
FULBRIGHT Scholarship	4
CEA Scholarship	3
EECS Scholarship	4
CURTIS Scholarship	3
IGERT Scholarship	1
Other Scholarships	2

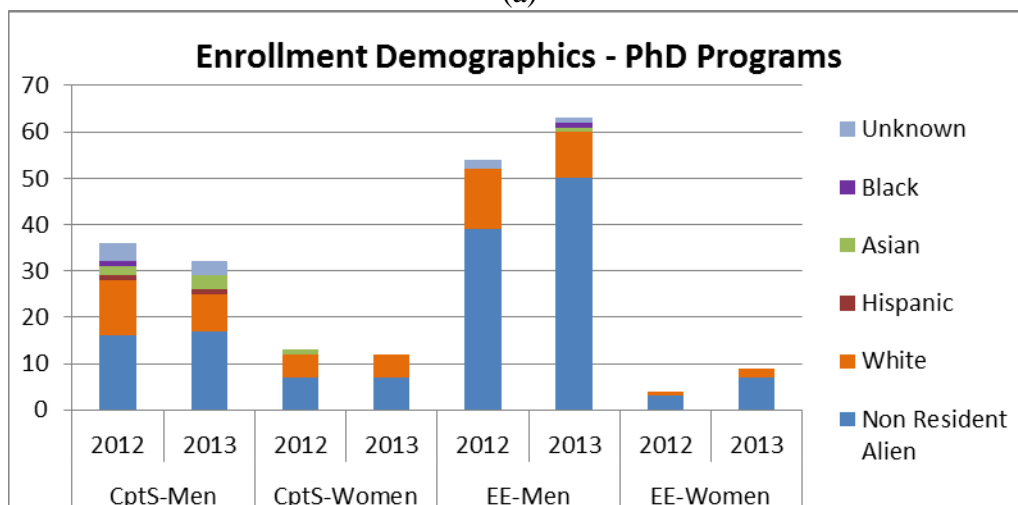
8. Student Demographics

Applies to objective B.

Figure 7 (a) and (b) illustrate the enrollment demographics for MS and PhD programs, respectively. The distributions of the enrolled students among various race/ethnic groups are provided. The enrollments for male and female students are provided separately.



(a)



(b)

Figure 7- Enrollment demographics for (a) MS and (b) PhD programs

The second program objective states that the graduate program should have an unbiased student body that balances representation of women, U.S. citizens and permanent residents, and international students. According to Figure 6, most of the students enrolled in EECS graduate programs are non-resident aliens (i.e. international students). In most programs (except EE-Men and CptS-Men) more than 65% of the student body is international. This percentage is even bigger for female students. Only a very small percentage of the female graduate students are domestic. In all programs, majority of the domestic students are white. Only a few programs (for example PhD/MS CptS-men and MS CptE) have small percentages of Asian or Hispanic originated domestic students. In all programs, male student bodies are much larger than female student bodies. The difference is even bigger in PhD programs. From 2012 to 2013, there has been a slight increase in the domestic PhD student populations, however the improvement is far

below our target. In 2013 even though there was some increase in PhD female student population, the number of female students in MS programs has dropped dramatically. We continuously work on strategies to increase the number of domestic and female applicants for the graduate programs. This is one of the issues that we will be actively working on in the coming years.

9. Exit Interviews by EECS

Every person exiting the EECS graduate programs is interviewed by the graduate secretary. This type of database is anecdotal but does raise important issues since perceptions held by the students are a very important part of their graduate school experience. Salient points from the spring 2013, fall 2013 and spring 2014 exit interviews were as follows:

- Majority of the students were pleased with the help and support they received from EECS faculty. Most students commented that all instructors were great and the teaching quality was very good. They said they enjoyed all of the courses they took.
- Some students mentioned that they would like to have more elective options and more theoretical math classes.
- Some students complained about the lack of resources that provide information on classes offered and the content covered in those courses.
- Some CptE/EE majors complained that there are not many courses offered in the area of Computer Engineering. They said EECS should hire faculty in this area.
- Several students said some labs are outdated. They also commented that the labs and office spaces are not clean. The air circulation is poor in Sloan 3rd floor (where most graduate student offices are located).
- Several students have pointed out that some graduate courses are open once a year or once every two years due to resource constraints. Sometimes, these rarely-offered courses may have a time conflict with a graduate student's course syllabus or research plan, and he or she may have to skip those courses. One student said: "It would be nice to see more coursework offered, add "Big Data Topics" such as programming with data processing and machine learning with map reduce."

Conclusion/Action Plan

1. Summary of Issues Addressed by the Continuous EECS Assessment Process

- Based on the WSU College of Engineering and architecture Strategic Plan and feedback from EECS graduate students and faculty, 16 new faculty members are being added to the EE, CptE and CptS programs. This would in return improve the course variety offered to students in their specialized areas. EECS already hired 5 CptS faculty and 2 EE/CptE faculty. The searches continue for the remaining 9 open positions.
- Based on the Survey of EECS Graduate Students and the recommendations of the faculty, we are engaging more and more graduate students in teaching classes, providing them opportunities to gain teaching experiences. During the last 2 academic years 6 EE and 5 CptS graduate students have taught various undergraduate students at School of EECS. Overall they got very positive feedback in student evaluations. EECS would continue to provide opportunities for graduate students to gain teaching experience when they are qualified.
- Based on feedback from EECS faculty and based on a review of similar programs in peer institutions, the EECS GSC committee has changed the policy for “graduate program coursework minimum requirement”. According to the new policy every MS core course must be passed with a B- grade or better, and every PhD core course must be passed with a B grade or better.
- Based on feedback from students and faculty EECS is revamping the Graduate Program Handbook Policies and Procedures to make it even more effective at communicating graduate program policies to our students.
- Based on EECS objectives and faculty input, EECS has streamlined the recruitment and admission process for graduate students with an emphasis on quality metrics and recruiting of self-funded students.
- Based on the Survey of EECS Graduate Students, a strong seminar program is established to bring external speakers to EECS and improve networking and professional development for graduate students.

2. Summary of Issues Identified and Still Being Processed by EECS

- Based on the Survey of EECS Graduate Students, we are investigating ways to improve social experiences for graduate students.
- Based on the Survey of EECS Graduate Students, we are investigating ways to institutionalize grant/proposal writing opportunities for graduate students.
- Based on the Survey of EECS Graduate Students, we will encourage the faculty to help the students with professional development opportunities and will encourage the students to take advantage of career services offered by WSU.
- We are trying to increase recruitment of domestic students and female students for our graduate programs.
- Based on the Survey of EECS Graduate Students, we plan to train the faculty in equal treatment of graduate students and avoiding preferential treatment to those students that are similar to them.

APPENDIX –A

Duties of the EECS Graduate Studies Committee (GSC):

1. Provide overall academic leadership for EECS Graduate Program.
2. Develop and implement policies for EECS Graduate Program.
3. Oversee complete graduate admission process.
4. Oversee all necessary examinations for EECS graduate students (QE, Prelim and the Final Defense)
5. Approval of Curricular Practical Training
6. Make decisions regarding EECS Graduate Program exceptions to Policies
7. Be responsible for coordinating all EECS administrative matters within the Graduate School.
8. Manage the budgets of EECS Graduate Studies Committee.
9. Submit course and curriculum changes and approval forms.
10. Submit Bylaw changes and approval forms.
11. Be responsible for the accuracy of all graduate publications related to EECS including web pages and catalog copy.
12. Coordinate semester evaluations for all EECS graduate students, including Exit Interviews.
13. Collect Alumni Tracking Data
14. Review students every semester for RA & TA Renewal and make the decision on financial support
15. Run the process for the Best EECS Graduate Student Awards every spring semester
16. Managing and addressing student issues and problems of EECS Grad Students

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