

**The Blue Graduate Student Guide  
School of Electrical, Computer, and Energy Engineering  
Electrical Engineering Programs  
Ira A. Fulton Schools of Engineering  
Arizona State University**



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## *I. Introduction*

### **A. Areas of Study**

The electrical engineering program at Arizona State University (administered by the School of Electrical, Computer and Energy Engineering, ECEE) offers opportunities for study beyond the bachelor's degree in several areas, including Control Systems; Electromagnetics, Antennas, and Microwave Circuits; Electronic and Mixed-Signal Circuit Design; Electric Power and Energy Systems; Signal Processing and Communications; Physical Electronics and Photonics; and arts, media and engineering. Studies may lead to the degrees of Master of Science (MS), Master of Science in Engineering (MSE), and Doctor of Philosophy (PhD). Courses are offered on-campus (Tempe campus students) and online (online campus students) over the Internet.

### **B. General Information**

General information, including admission, residency, and degree requirements of Graduate College, is contained in the latest ASU *Graduate Catalog* (The *Catalog* is available on the Web at <https://webapp4.asu.edu/catalog/>). Graduate College's general requirements apply in their entirety to the graduate programs in electrical engineering. This document contains additional and more specific requirements of the electrical engineering program. Most forms mentioned in this guide may be accessed from the School web page or directly at: <http://ecee.engineering.asu.edu/forms-and-faqs/>

### **C. New Students**

All new students should come to the ECEE Graduate Office for registration and advisement information and all new students will be assigned a faculty mentor in their first semester that corresponds to their area of specialization.

### **D. Student Responsibility**

It is the responsibility of each student to understand and observe all procedures and requirements specified by Graduate College and the electrical engineering program. The faculty mentor provides academic advice and assistance; however, the ultimate responsibility for meeting degree requirements remains with the student.

## II. The Graduate Program in Electrical Engineering

### A. Administration

The electrical engineering Graduate Committee advises the School Director on all policy matters concerning the graduate program. The committee administers the final written comprehensive examination for the MSE degree and rules on student petitions.

The ECEE Graduate Program Chair administers the electrical engineering graduate program for the School Director in accordance with policies of Graduate College and the School faculty. In addition, the Chair serves as the focal point for graduate students and graduate programs within the School.

### B. Graduate Degree Programs

The electrical engineering program offers courses leading to the degrees of Master of Science (MS), Master of Science in Engineering (MSE), and Doctor of Philosophy (PhD). The primary difference between the MS and MSE programs is that the MS is a research degree culminating in a thesis and the MSE is a professional degree with no thesis requirement. General requirements for these degrees are stated in the current *Graduate Catalog* and specific School requirements are contained in later sections of this guide.

### C. Courses

All graduate courses offered by the School are included in the current *Graduate Catalog*. Since all courses cannot be offered each semester, the School publishes a plan outlining the courses that it will offer over a six-semester period. Courses listed in the plan may be supplemented in any given semester by special courses according to demand and availability of instructors. Course requirements for degree programs and suggested programs of study are detailed in later sections. Sample programs for many of the areas of study are available in the Graduate Office and on the School web pages <http://ecee.engineering.asu.edu/>.

### D. Research

Graduate study for the PhD and MS has the goal of independent scholarship, originality, and competence in research. Research opportunities in the School are available in a broad spectrum of subjects encompassing traditional as well as new specialties. The faculty is engaged in significant research in the following areas:

- Control Systems
- Electromagnetics, Antennas and Microwave Circuits
- Electronic and Mixed-Signal Circuit Design
- Electric Power and Energy Systems
- Signal Processing and Communications
- Physical Electronics and Photonics
- Arts, Media and Engineering

The majority of the research is actively supported by national foundations, government agencies, and local industry.

### *III. The Masters Degrees*

#### **A. Admissions**

The decision to admit a student to a master's program in electrical engineering who has earned a bachelor's (BSE) degree in Electrical Engineering from a program in the U.S. is based upon a number of factors. If the school is ABET accredited a minimum requirement is a grade point average of 3.0 (out of 4.0) in the student's last two years (60 credits) of undergraduate work. A student whose undergraduate degree is not from a U.S. ABET-accredited program must have the equivalent of at least a 3.5 grade point average in the last two years of undergraduate study and score at least 156 on the quantitative portion of the Graduate Record Examination (GRE). In addition, an applicant whose native language is not English must demonstrate proficiency in the English language by scoring at least 90 on the Internet based TOEFL (iBT) or 6.5 on the IELTS. International students seeking teaching assistantships must demonstrate proficiency in spoken English by scoring at least 26 on the speaking portion of the iBT or 50 on the ASU administered SPEAK Test.

The admissions deadline for the fall semester is the preceding December 31 and for the spring semester it is the preceding July 31.

Non-degree students will not be allowed to register for electrical engineering courses without special permission. To enroll in graduate-level courses as a non-degree student, the applicant must meet the requirements for regular admission to the graduate program. Usually, only one graduate-level class will be allowed for a non-degree student.

#### **B. Advisory Committee**

In the first semester of the MSE program, students will be assigned a faculty mentor from their area of specialization. MS students select a faculty mentor who will serve as chair through direct contact with the faculty. The chair of the advisory committee must be a member of the electrical engineering program graduate faculty with endorse-to-chair approval. The MS thesis advisor will help the student select the other two members of the advisory committee. The advisory committee should be formed and approved by the Graduate Program Chair as early as possible, but certainly no later than the semester before graduation.

#### **C. Plan of Study**

Before completing the first semester of graduate course work, each student must submit an official plan of study (iPOS), which will be reviewed and approved by the Graduate Program Chair. Course work in excess of nine credits completed before submitting a plan of study may not count toward a student's degree requirements. A list showing the School's planned course offerings for the next three-year time period is available on the ECEE web pages at:

<http://ecee.engineering.asu.edu/three-year-course-plans/>

The plan of study will list all courses that are to be completed as part of the student's degree program as well as a schedule for completion of any undergraduate deficiencies. The plan of study may be amended as the student progresses through the program with the approval of the student's academic advisor and the Graduate Program Chair.

Special note: A PhD student completing the master's degree (Master in Passing) must enroll for EEE 595 (Continuing Registration) or a class on the master's iPOS the semester in which they wish to receive the master's degree.

A worksheet for developing the plan of study is attached as an appendix to this document.

#### **D. Courses and Course Prerequisites**

Most upper-division and graduate-level electrical engineering classes have prerequisites. These graduate classes cannot be completed satisfactorily without the prerequisites. Prerequisites for electrical engineering classes do not appear in the ASU catalog. Prerequisites appear in the ASU Class Schedule as part of the syllabus. This began with the spring 2013 class schedule. Prerequisites can also be found at the following website:

<http://ecee.engineering.asu.edu/academics/doctoral-degrees/course-prerequisites-and-syllabus/>

Because most of the electrical engineering graduate students graduated with undergraduate degrees from institutions other than ASU, these students would not have had the prerequisite class at ASU. It is only necessary that they have had the equivalent material in a previous class.

#### **E. Course Requirements for the MS and MSE**

The School offers graduate-level courses in a number of subject areas, however, a student pursuing a master's degree is expected to take six credits of course work outside the area of specialization as part of the plan of study. Particular courses from each area will be determined by the student and the student's faculty mentor. Suggested courses for inclusion in the MS and MSE programs in each area of specialization are specified on the ECEE School Web site. Some graduate courses offered outside the School do not have enough technical content to count toward the electrical engineering degree.

At least nine hours of the EEE course credits to be included on the plan of study must be at the 500 level or higher for the MS and MSE degrees. In addition, EEE590 and all courses with the prefix EEE591 do not count towards meeting this requirement. A maximum of three hours of Reading and Conference (EEE590) or FSE 500-level courses such as Entrepreneurship may be included on the plan of study. **A maximum of 4 courses (combined) from the following groups are allowed to count towards meeting the degree requirements: any 2 400-level, EEE591, EEE590, and FSE 500-level.** Other courses outside of Electrical Engineering might count as 400 level with special approval from the Graduate Program Chair prior to registering for the course. Please consult with your assigned academic advisor for additional information. Master's students are limited to 11 credits each fall and spring semester. Students with a 3.5 minimum GPA may request an exception to this policy by meeting with a graduate advisor.

There is a six-year time limit on courses applicable to the master's degree. Up to twelve semester hours of ASU transfer credit may be applied to the plan of study. The transfer courses must have been completed within three years of the semester and year of admission to the electrical engineering degree program.

## 1. Master of Science in Engineering (MSE)

The MSE is a professional degree requiring a minimum of 10 courses (30 hours minimum) and a final comprehensive exam (described in section G). There is no thesis. Requirements include:

- A minimum of 5 EEE courses
- **A maximum of 4 courses (combined) from the following groups: any 2 400-level, EEE591, EEE590, and FSE 500-level.**
- A minimum of 3 EEE 500-level courses (not including EEE591, EEE590, and FSE 500.)
- A minimum of 2 courses outside of your area of specialization
- A maximum of 1 Reading and Conference (EEE590) and FSE 500-level course.

A final comprehensive exam in the area of specialization completes the MSE requirements. The exam is given each semester at the end of the sixth week of classes.

## 2. Master of Science (MS)

The MS is a research degree requiring a minimum of 30 credits. These credits must include a minimum of 8 courses (24 hours minimum) and 6 hours of EEE599 (Thesis). As part of the 8 courses, at least 2 should be outside the area of specialization. Requirements include:

- A minimum of 4 EEE courses
- **A maximum of 4 courses (combined) from the following groups: any 2 400-level, EEE591, EEE590, and FSE 500-level.**
- A minimum of 3 EEE 500-level courses (not including EEE591, EEE590, and FSE 500.)
- A minimum of 2 courses outside of your area of specialization
- A maximum of 1 Reading and Conference (EEE590) and FSE 500-level course.

A final oral exam in defense of the thesis completes the MS degree requirements.

Most master's students will be admitted as MSE candidates and only those candidates who receive financial support or who show research potential will be admitted to the MS program. However, students who want to pursue the MS may seek out a faculty member in their areas of interest to act as their mentor/chair. With the faculty mentor's approval, the student may then switch from the MSE to the MS program. Students registered for the MS who do not complete a thesis and wish to switch back to the MSE may be awarded failing grades for up to six hours of thesis and research at the discretion of the advisor.

## **F. Research and Thesis**

Because the MS is a research degree, it requires a thesis. A student presenting a thesis must register for six credits of thesis (EEE599). Opportunities for participation in research are abundant in electrical engineering, so a student in a program that requires a thesis is expected to select a thesis advisor and become an active participant in a research program in the first year of study. A thesis usually requires a continuing effort over two or three semesters.

Thesis credit (EEE599) can be graded with options of C, D, E, or Z. A grade of Z indicates a course in progress and is at the discretion of the thesis advisor. Such a grade may later be changed to a letter grade or left on the permanent record. The Z is the usual grade for Thesis.

When the student completes the thesis, the advisor assigns a grade of Y, which indicates successful completion of the thesis and passing the oral defense. If a student does not complete the thesis, the thesis mentor may assign a failing grade of E for EEE599.

### **G. Thesis and Comprehensive Examinations**

For the MS degree, an oral examination in defense of the thesis will be conducted by the student's advisory committee. The oral defense must be scheduled through Graduate College 10 business days in advance. The thesis must be submitted to Graduate College for format review at least 10 calendar days before the oral defense. No exceptions to this rule will be made. In addition, the thesis must be delivered to all committee members at least 10 calendar days before the oral defense.

The MSE requires a comprehensive examination. It is administered typically in the sixth full week of the fall and spring semesters and consists of a written exam in the major area of study. It covers material through the master's degree level. The School area committees make up the written exam. Only students with a GPA of 3.0 or better can take the exam.

The student should consult the area committee chair for specifics regarding the nature of the exam. A grade of 60% or more is required to pass this exam.

The student must sign up for the exam by the end of the second week of classes. The MSE Comprehensive exam signup will be emailed to eligible students. A description of the exam is at: <http://ecee.engineering.asu.edu/comprehensive-exam-guide/>.

Any student failing the comprehensive exam may petition to attempt it a second time the very next time (after the failure) it is offered. There is no guarantee that the petition will be accepted. A third opportunity to take the exam will not be permitted.

### **H. Master's Degree in Passing**

The School also awards the master's degree in passing (MIP). The master's degree in passing will be the MS degree. Students eligible for master's degree in passing are those actively pursuing the PhD who do not already have a master's degree. The degree must be requested by the student and approved by the School and the PhD advisor. To obtain the degree, student must file the "master's in passing form" with the academic advisor, complete the MS iPOS, and file for graduation. The application form is available on the web site: <https://graduate.asu.edu/forms>. To receive the degree, the following conditions must be met:

- Students must have an initial regular admission into the PhD program in electrical engineering. Students transferring from the master's degree into the PhD degree cannot apply credit hours already taken towards the MIP.
- The student must have a planned master's plan of study approved by the supervisory committee and the School.

- The culminating experience will be the same as the School's PhD Qualifying Exam. The student must complete a research paper and make an oral presentation covering the research. The supervisory committee will grade the paper and the oral on a pass/fail basis.
- The student must complete 10 courses (30 hours minimum) of academic course work, as in the present MSE requirements. In addition, the student must achieve a grade point average of 3.0 or better in all work taken for graduate credit and in all work included on the plan of study. All grade requirements established by Graduate College and the Ira A. Fulton Schools of Engineering must be met.

### **I. Online Master's Degrees**

Students may obtain the MSE by taking all classes online. Classes given live on campus are digitized and streamed for viewing anywhere an Internet connection is available. The classes are the same as those taken by the on-campus students. Normally a lecture is ready for viewing within a few hours after the live presentation. The Ira A. Fulton Schools of Engineering Global Outreach and Extended Education (GOEE) administers the online program. A three-year plan is published on the School's web pages indicating the planned online classes for the following three years. Courses for the MS and PhD may also be taken online. The students must apply for the Tempe campus and the class charges will be the Tempe class charges plus an added fee for the online class. Further information on online programs is available at

<http://asuengineeringonline.com/degree-programs>

See paragraph III.G concerning the required MSE Comprehensive exam. The student must sign up for the exam by the end of the second week of classes. The MSE Comprehensive exam sign-up will be emailed to eligible students. A description of the exam is at:

<http://ecee.engineering.asu.edu/comprehensive-exam-guide/>.

### **J. Dual MBA/MSE EE Degree**

The MBA/MSE EE degree program requires 54 credit hours of study including courses from the W. P. Carey School of Business and the Ira A. Fulton Schools of Engineering. Students receive two degrees, the Master of Business Administration (MBA) and Master of Science in Engineering in Electrical Engineering (MSE EE), upon completion of all requirements.

The requirements are:

MBA Degree: 32 credit hours of business courses (8 courses)

MSE Degree: 22 credit hours of engineering courses

The MBA/MSE EE degree program is designed as:

- An online program - offering the working professional added flexibility on all courses
- A cohort program – students enter and take courses as a group for continued collaborative learning
- A consolidated program - completion of the entire program within three years

The ASU MBA/MSE EE dual degree program consists of 32 hours from the MBA program and an additional 22 hours from the MSE EE program, for a total of 54 hours to receive

both degrees over a 3 year period. Further information is available at <http://ecee.engineering.asu.edu/academics/doctoral-degrees/electrical-engineering-m-b-a-m-s-e/>

See paragraph III.G concerning the required Comprehensive exam. It is administered typically in the sixth full week of every fall and spring semester and consists of a written exam in the major area of study. It covers material through the master's degree level. The School area committees make up the written exam.

A worksheet for developing the plan of study is attached as an appendix to this document.

### **K. Accelerated Bachelor/Master Degree Program**

The School offers an accelerated BSE/MSE program for students currently enrolled in the Electrical Engineering-Bachelor of Science in Engineering degree. This allows students to graduate with both degrees in five years of full-time course work. Students in the accelerated program must be enrolled as full-time students (9 or more hours) unless in their final semester of the MSE program.

Students interested in this program must meet the following eligibility requirements:

- Have at least 75 credits applicable to an ASU EE BSE degree.
- Have a cumulative ASU GPA of 3.5 or higher.
- Have a minimum of 90 credit hours of coursework applicable to the ASU EE BSE degree completed prior to enrollment in the accelerated program.

Students will be able to earn a BSE and MSE degree by sharing up to nine credits of graduate-level coursework taken as technical electives for each program. Those credits will apply toward both the undergraduate and graduate degrees. You can also reserve up to three credits of graduate coursework taken as an undergraduate student. Any combination of shared and reserved coursework cannot exceed 12 credits. While pursuing the MSE, the student must be registered as a full time student (9 or more hours) unless enrolled for the final semester.

Contact an undergraduate advisor with questions about the accelerated program before you apply. You can set up an appointment to discuss the program by contacting the electrical engineering undergraduate academic advising center.

### **L. Art, Media and Engineering, MS and PhD**

The concentration in arts, media and engineering has been established as collaboration between the electrical engineering program at ASU and the Herberger Institute for Design and the Arts. This concentration is available both for the M.S. and the Ph.D. students admitted to this program, who take two-thirds of their course, research and thesis credits from the electrical engineering and one-third of the credits from the arts, media and engineering program. This concentration within electrical engineering is available both for the MS and PhD. Further description and requirements can be found at:

<http://ecee.engineering.asu.edu/academics/doctoral-degrees/electrical-engineering-arts-media-and-engineering-m-s-ph-d/>

### **M. Nuclear Power Generation Certificate**

The Nuclear Power Generation (NPG) graduate certificate is a multidisciplinary professional option within the Ira A. Fulton School of Engineering. All of the core classes and many of the NPG elective courses will be offered online through the Engineering Office of Global Outreach and Extended Education (GOEE). The graduate-level certificate program requires 15 hours of coursework with a minimum of two-thirds at the 500-level or higher. Find more information at: <http://ecee.engineering.asu.edu/academics/doctoral-degrees/nuclear-power-generation-certificate/>

### **N. Sensor and Signal Processing Certificate**

The Sensor and Signal Processing (SenSIP) graduate certificate is a multidisciplinary professional option within the Ira A. Fulton School of Engineering. The courses will be held online through through the Engineering Office of Global Outreach and Extended Education (GOEE) and in person. The graduate level certificate program requires 18 hours of coursework. For more information, please email Dr. Andreas Spanias at [spanias@asu.edu](mailto:spanias@asu.edu).

### **O. Continuous Registration**

Master's students must be continuously registered each fall and spring semester. If a semester is skipped, the student must reapply for admission. Students planning to discontinue enrollment for a semester or more must request approval for a leave of absence from Graduate College.

## *IV. The PhD Degree*

### **A. Admission**

In general, a student must have a least a 3.0 grade point average (out of 4.0) in all undergraduate course work and at least a 3.5 grade point average in all graduate course work for admission to the PhD program. Applicants from non-U.S. programs must have the equivalent of a 3.6 grade point average and must have earned a score of at least 156 on the quantitative section of the GRE. In addition, a student must usually hold a master's degree before being admitted to the PhD program.

A student whose master's degree is not from a U.S. institution must provide a score of at least 156 on the quantitative portion of the GRE. In addition, an applicant whose native language is not English must demonstrate proficiency in the English language by scoring at least 90 on the Internet based TOEFL (iBT). International students seeking teaching assistantships must demonstrate proficiency in spoken English by scoring at least 26 on the speaking portion of the iBT or 50 on the ASU administered SPEAK Test.

The admissions deadline for the fall semester is the preceding December 31 and for the spring semester it is the preceding July 31.

### **B. The Direct PhD**

Students with a grade point average of 3.6 or better from a U.S. ABET-accredited electrical engineering undergraduate program may apply directly to the PhD program. A previous master's degree is not required to enter the direct PhD program. Strong students from reputable international programs may be considered for the direct PhD program if they have a PhD graduate advisory committee chair that will support them with a 0.25 RA as a minimum.

In addition, international students may be considered for the direct PhD after one semester of full-time residence in the MS or MSE program at ASU and no later than the beginning of their third semester of graduate studies. Such students are eligible if they have earned a GPA of at least 3.5 in ASU courses that are listed in their MS/MSE plan of study. It is implied that the earned credit in this evaluation period will not all be independent study, research, thesis, or practicum credit but will include credit from regularly scheduled courses. No more than 12 credits will be accepted towards meeting the PhD requirements. Students will be considered only after a petition (with a recommendation letter and with all relevant supporting documents) is submitted to the graduate committee by a School faculty member.

Generally, direct PhD students will be paid for graduate assistantships at the master's level until they earn the master's in passing degree. The master's in passing is described in Section III.H.

### **C. Qualifying Examination**

Every student who wishes to pursue the PhD in electrical engineering must pass a Qualifying Examination. Because the PhD is primarily a research degree, the Qualifying Examination is designed to test the candidate's research skills and abilities. The exam consists of a written research paper and an oral presentation of the research. During the first semester as a PhD student, the candidate will select a graduate supervisory committee. The student and the

committee chair will select a topic. The student must take the exam before the end of the second semester in attendance at ASU as a PhD candidate; failure to do so may result in removal from the program.

Students in the direct PhD program can delay the Qualifying Exam until the semester in which they complete 10 courses or until their 4<sup>th</sup> semester. Students completing a Master of Science degree in electrical engineering at ASU can combine the MS oral defense with the qualifying exam.

When a student plans on remaining within the same area after completing their MS degree at ASU, the qualifying examination may be taken simultaneously with the final oral defense. Assuming that the graduate supervisory committee advisor is not changed, this exam will be supervised by the MS committee. These members may, or may not, be part of the doctoral graduate supervisory committee. If the doctoral advisor is not part of this committee, the advisor should be added to the committee. The graduate supervisory committee will be formed when the student's official program of study is filed. The exam is graded on a pass/fail basis. A passing grade indicates that the committee believes that the student is capable of doctoral research. A failing grade indicates that the committee believes that the student is incapable of conducting the level of research required for the PhD. As a result, students who fail the exam will be removed from the program. The student must submit their report to their committee 10 working days in advance. Once the exam is completed, the student must submit the form (which can be found on our website) and a copy of their report to their assigned academic advisor.

If a student does not wish to take the exam according to the above schedule, but wishes to continue in the program, must petition the School Graduate Committee for permission to take the exam at a later date. Petitions must be received well in advance of the required exam date. There is no guarantee that the Graduate Committee will approve such requests.

In other cases, the qualifying exam will be administered by the three members of the doctoral supervisory committee consisting of the mentor/chair(s) and the other member(s) chosen by the student.

#### **D. Supervisory Committee**

Sometime during the first semester in the PhD program the PhD student must form a graduate supervisory committee. The chair of the committee will be the faculty member who directs the student's research program. The chair of the committee must be a member of the electrical engineering program graduate faculty with endorse-to-chair approval. The graduate faculties are found at the web site:

<https://graduate.asu.edu/graduate-faculty/degree/ESEEPHD>

The supervisory committee will be composed of at least 4 members (the chair and the other members). Only three members need attend the qualifying exam, but at least four must attend the PhD comprehensive exam and the final dissertation oral. At least half of the committee members must be tenure (or tenure track) in the School of ECEE.

#### **E. Plan of study**

Before completing the first semester of graduate course work, each student must submit an official plan of study (iPOS), which will be reviewed and approved by the Graduate Program

Chair. Course work in excess of twelve credits completed before submitting a plan of study may not count toward a student's degree requirements. A list showing the School's planned course offerings for the next three-year time period is available on the ECEE web pages at:

<http://ecee.engineering.asu.edu/three-year-course-plans/>

The plan of study will list all courses that are to be completed as part of the student's degree program as well as a schedule for completion of any deficiencies. The plan of study may be amended as the student progresses through the program with the approval of the student's academic advisor and the Graduate Program Chair.

A worksheet for developing the plan of study is attached as an appendix to this document.

## F. Course Requirements

Electrical Engineering course prerequisites are discussed in Section III.D.

PhD students are required to complete 84 semester hours of academic credit beyond the bachelor's degree. The following table illustrates the PhD degree course requirements:

DESCRIPTION	NUMBER OF HOURS	COMMENTS
Master's degree	30	From any approved institution
500 level or above	18	At least 9 hours of EEE classes. EEE591 not allowed
Research or omnibus	12	500 level (and above) classes. EEE591 is allowed
Research	12	EEE792 (Select your chair from the course listing)
Dissertation	12	EEE799 (Select your chair from the course listing)
<b>Total hours required</b>	<b>84</b>	

The 84 hours include 30 semester hours for the master's degree, a *required 18 semester hours* of PhD class work, 12 hours of Research (EEE792), and 12 hours of Dissertation (EEE799). An *additional 12 semester hours* are required to meet the 84 hour Graduate College requirement. These can be more hours of Research (EEE792) or can be class work as determined by the supervisory committee. At least half (9 hours) of the minimum requirement of 18 semester hours of PhD course work must be in Electrical Engineering. Reading and Conference (EEE790) can be used for no more than 3 semester hours towards the required 18.

All courses counting toward the required 18 hour minimum must be at the 500 level or higher (but not EEE591). No more than one 3-hour Reading and Conference (EEE790) course can be taken as part of the 18 hour requirement. The content of any proposed Reading and Conference course must be reviewed and approved by the Graduate Program Chair before registering for the course.

In order to graduate, a grade point average of 3.5 or greater is required for all courses taken beyond the master's degree.

Students may elect to take more than 18 hours of PhD class work and may be required to do so by their advisors. It may be necessary to take more than 18 hours of class work to improve

the GPA to 3.5 or above. Hours beyond the required 18 described above may be regular classes or omnibus classes. “Omnibus” refers to additional research credits or additional courses. Please speak with your chair for recommendations and with your assigned academic for additional information. In addition, FSE classes can be taken as part of the *12 additional semester hours* required. Hours beyond the required 18 may be any 500 level, or higher, class.

Normally, a minimum of 54 hours of the approved PhD program (including research and dissertation hours) must be completed at ASU after admission to ASU. Transfer credit up to 12 hours taken towards a PhD at another institution may be accepted if approved by the supervisory committee and the Graduate Program Chair. If accepted, the transfer credits may apply to the required 18 hours of class work or the 12 additional hours (as determined by the supervisory committee and the Graduate Program Chair).

PhD students must be continuously enrolled in the program (they must be registered for at least one unit each fall and spring semester). If a semester is skipped, the student must apply for a new admission to the program and only 12 credits taken previously can be transferred.

The direct PhD has the following requirements:

DESCRIPTION	NUMBER OF HOURS	COMMENTS
Master’s in passing	30	10 classes
500 level or above	12	4 classes. EEE591 is not allowed
Research or omnibus	18	500 level (and above) classes. EEE591 is allowed
Research	12	EEE792 (Select your chair from the course listing)
Dissertation	12	EEE799 (Select your chair from the course listing)
<b>Total hours required</b>	<b>84</b>	

### G. Comprehensive Examination

A student must pass a comprehensive examination before being formally admitted to candidacy for the PhD. The examination is administered by the student’s graduate supervisory committee after the student has essentially completed coursework. The student must have an approved formal plan of study before taking the exam. The exam is typically completed in the 6<sup>th</sup> semester of study at ASU. If the exam is not completed by the end of the 6<sup>th</sup> semester, approval for registration must be obtained by your committee chair and the Graduate Program Chair.

The comprehensive examination will be given by the four members of the supervisory committee. The comprehensive examination will consist of a written part and an oral part. The written part will be composed of a background paper on the area of research, and includes the current status of this area, a summary of work the student has already done, and a thesis proposal. The oral part will be an examination on the contents of the paper in general and thesis proposal in particular.

Following completion of the exam, the completed “Ph.D. Comprehensive Examination” form must be returned to the Graduate Program Chair.

## **H. Admission to Candidacy**

The student will be granted candidacy by Graduate College immediately after passing the comprehensive exam.

## **I. Research and Dissertation**

A student is expected to become an active participant in a research program during the first semester of study in the PhD program. Research leading to a dissertation is performed under the direction of the supervisory committee. The candidate must register for a total of at least 12 credits of Research (EEE792) and 12 credits of Dissertation (EEE799). Credits for Research (EEE792) will be graded with options of C, D, E, Z, or Y. A grade of Y indicates satisfactory progress and is at the discretion of the dissertation advisor. Such a grade may later be changed to a letter grade or left on the permanent record. The Y is the usual grade for Research. The Z grade is typically used for Dissertation credits until you complete your dissertation defense.

When the dissertation is satisfactorily completed, a grade of Y is given for successful completion of the dissertation and for passing the oral dissertation defense. If a student does not complete the dissertation, the dissertation advisor may assign a failing grade of E for EEE799.

Dissertation research will usually be performed on campus. Off-campus research will be considered only by special petition. Such research will be considered only if the research cannot be done on campus and if the problem appears to be of sufficient merit that it should be pursued even though proper facilities do not exist on campus.

## **J. Dissertation Defense**

Upon completion of the dissertation, the student must successfully defend it by passing an oral examination. This defense may be conducted no earlier than six months after the student's formal admission to candidacy. In addition, the dissertation must be submitted to Graduate College for format review at least 10 calendar days before the oral defense. No exceptions to this rule will be made. In addition, the thesis must be delivered to all committee members at least 10 calendar days before the oral defense. The oral defense must be scheduled through Graduate College 10 working days in advance.

A list of archival publications published by the student and related to the dissertation must be presented at the defense. The form for this is located at

<http://ecee.engineering.asu.edu/forms-and-faqs/>

The form must be signed by the PhD committee and returned to the School office along with the defense pass/fail report.

All members of the supervisory committee must attend the oral dissertation defense in person. Teleconferencing is prohibited without the written approval of Graduate College. The chair or at least 1 co-chair must attend the oral defense in person. Members attending remotely must be reported at the time of scheduling your oral defense.

## **K. Continuous Registration**

Doctoral students must be continuously registered each Fall and Spring semester. If a semester is skipped, the student must reapply for admission. A doctoral student who interrupts a program without obtaining leave status will be automatically removed by Graduate College. If removed, the student may reapply for admission. Students planning to discontinue enrollment for a semester or more must request approval for a leave of absence from Graduate College.

## **L. Probation and Dismissal**

Procedures regarding probation and dismissal appear in section V of this document. A PhD student may be recommended for dismissal from the graduate program who fails to make satisfactory progress toward the degree. Satisfactory progress means completing the PhD requirements in a timely manner. These requirements include the Qualifying Exam, Comprehensive Exam, course requirements, selection of a chair and supervisory committee, filing of a plan of study, and completing research as assigned by the supervisory committee chair. Additional requirements may be imposed by the supervisory committee.

## **M. Outstanding Doctoral Student Award**

The Palais' Outstanding Doctoral Student award is presented to the top graduating PhD student each year. The award includes a plaque and a check for \$1000. The awardee is chosen by a faculty selection committee from a list of nominees made by the student's advisor. The award is presented at the Ira A. Fulton Schools of Engineering Spring convocation. Past winners can be viewed on the EE web page at: <http://ecee.engineering.asu.edu/academics/doctoral-degrees/palais-outstanding-doctoral-student-award/>

## V. Scholarship

### A. Grades

Academic excellence is expected of graduate students. To be eligible for a graduate degree, a student must achieve a grade point average of 3.0 or better in all work taken for graduate credit, exclusive of deficiencies, and in all work specifically included on the plan of study. The required grade point average for master's students is 3.0; however, doctoral students must maintain a grade point average of 3.5.

Three different grade point averages that are considered by Graduate College are (1) the grade point average in all courses numbered 500 or higher that appear on the transcript, except those that were listed as deficiencies in the original letter of admission, (2) the grade point average in all coursework that appears on the approved plan of study, and (3) the grade point average in all course work taken at ASU post baccalaureate.

A student who is not progressing satisfactorily toward a degree may be withdrawn from the program by Graduate College upon recommendation by the School. The policy of the Ira A. Fulton Schools of Engineering for academic probation and dismissal of graduate students follows below in part B.

A grading system, allowing + and – grades, was initiated in Fall 2004. The grade of A+ is not allowed for omnibus classes such as Reading and Conference, TVC, research, dissertation, thesis, and some others.

The grade of “I” (Incomplete) can only be given by an instructor when a student is unable to complete a course because of illness or other conditions beyond the student's control. The “Request for Grade of Incomplete” located at <http://students.asu.edu/forms/incomplete-grade-request> **must be submitted** to the ECEE graduate advising office and **approved** by the Graduate Program Chair before the incomplete grade is posted by the instructor.

### B. Ira A. Fulton Schools of Engineering (Engineering) Academic Standards

#### **Policy for Maintaining Academic Satisfactory Progress**

A student who has been admitted to a graduate degree program in Engineering, with either regular or provisional admission status, must maintain a 3.0 or higher grade point average (GPA):

1. in all work taken for graduate credit (courses numbered 500 or higher),
  2. in the coursework in the student's approved plan of study, and
  3. in all course work taken at ASU (overall GPA) post baccalaureate.
- A. A student will be placed on academic probation if one or more of the student's GPAs listed above falls below 3.0. Students will be notified by mail when placed on academic probation.

- B. A student will earn academic good standing by obtaining a 3.0 or better in the GPAs listed above by the time the next nine hours are completed. Coursework such as research and dissertation registration that are for Z or Y grade cannot be included in these nine hours.
- C. A student may be recommended for dismissal from a graduate program if the student fails to increase all of the GPAs listed above to 3.0 or better by the time he/she completes at least nine credit hours as defined in section B.

A student may appeal actions concerning dismissal by petitioning the School in which they are enrolled.

Academic units in Engineering can expand this policy statement to include additional policy governing the satisfactory academic progress of the students in their graduate programs.

## *VI. Financial*

### **A. Teaching and Research Assistantships**

Graduate students admitted with regular status may apply for teaching or research assistantships. International students seeking teaching assistantships must demonstrate proficiency in spoken English by scoring at least 26 on the speaking portion of the iBT or 50 on the SPEAK Test administered by Global Launch.

Because there are many more applicants than positions available, the competition is keen. Applicants who are fully qualified are judged primarily upon grade point average, recommendations by faculty members, and English speaking scores. Preference is usually given to PhD students, particularly those who have passed the Qualifying Examination. Graduate assistants may receive a salary, an out-of-state tuition waiver, and a portion of in-state registration fees.

Research assistantships are awarded by the individual faculty members. Those students desiring research assistantships should review the faculty areas of interest (as available on the web pages) and make contact with the appropriate professors. Students obtain research assistantships by directly contacting a faculty member who is conducting sponsored research in their area of interest. It is unprofessional to unselectively (or randomly) send messages to all faculty seeking financial assistance.

In addition to a stipend, graduate assistants working 50% (20 hours per week) receive waivers of both resident and non-resident tuitions.

Usually, MSE students may receive teaching or research assistantships only if they switch to the MS program; however, transfer from MSE to MS is possible at the time a graduate assistantship is awarded.

All TAs and RAs in the Ira A. Fulton Schools of Engineering must register for 12 credits each semester. Audit hours are not allowed. However, a student will not usually attempt more than nine credits of actual course work each semester. At the master's level, RAs may fill in their programs with Research (EEE592) or Thesis (EEE599). For the PhD, RAs may fill in their programs with Research (EEE792) or Dissertation (EEE799). TAs at all levels may fill in their programs with Practicum (EEE680).

PhD students holding RAs or TAs must enroll for a minimum of two classes from their plan of study each of their first two semesters. MS students holding RAs or TAs must enroll for a minimum of two classes from their plan of study each of their first three semesters.

### **B. Financial Aid**

The University Graduate Fellowship (UGF) program is designed to further the goals of excellence and diversity in the doctoral program. These awards are for recruiting outstanding new PhD students and for aiding students in completion of their doctoral dissertations. The Fulton Fellowship program provides additional funds for attracting new PhD students.

### **C. Internship (EEE 684): Curricula Practical Training (CPT)/Optional Practical Training (OPT)**

**Catalog description:** Structured practical experience following a contract or plan, supervised by faculty and practitioners.

Internship (EEE 684) may be required for inclusion on the official plan of study (iPOS) for some electrical engineering students. This is determined in consultation with the Graduate Program Chair. Internship may be necessary if the student needs practical engineering experience to complete qualifications for an advanced degree, needs industrial experience to gain the ability to perform required degree thesis research, or needs the use of unique industrial facilities not available on campus to complete a thesis research study. Students must complete two semesters on an F1 visa at an approved institution in the US before becoming eligible for Internship. Internship must be on the original iPOS, not added. The Internship must relate to the student's research or studies.

Internship registration is for one credit hour per semester. Internship for the master's degree is limited to no more than two semesters or one semester and a single summer session. For MSE students, Internship is not allowed after all course requirements have been met. Internship for the PhD degree is limited to no more than four credits. Internships may be part time or full time. A part-time Internship requires 20 hours of employment per week. A full-time Internship requires 40 hours employment per week. An international student having 12 months or more of full-time Internship will become ineligible for Optional Practical Training (OPT).

All degree requirements for those using Internship on their POS must be completed within a five-year time period. Internship is only available to full-time, on-campus students. Full-time is defined as having completed nine credit hours or more for the semester preceding the Internship unless the student has passed the PhD Comprehensive Exam and completed all required research and dissertation credits. In the latter case, the student will still be eligible for Internship. Students must receive all approvals from their advisor and from the Graduate Program Chair.

All application materials for Internship must be completed by the last day of regular registration for any semester.

During any regular semester (Fall or Spring), a student on an Internship must be registered full time unless completing their final semester. Interns not taking regular classes during this time can enroll for Practicum (EEE680). The work required for the Practicum is just that involved with the Internship itself. The required employer evaluation report verifies the work was completed in a satisfactory manner. Internship (EEE684) credit also counts towards the full-time requirement. For a summer Internship the student needs to register for only one credit hour of Internship.

Internship is intended as a unique new learning experience, apart from a regular engineering position. Therefore, it is not available to full or part-time workers regularly employed by the company where the internship is proposed.

At the PhD level, Internship is intended to enhance the student's research capabilities in the area related to the dissertation. Therefore, the Internship plan must show the relationship between the work proposed and the intended research program. The thesis advisor must write a separate letter explaining why the internship is required. An approved plan is required before commencing the internship. The request will include a statement from the employer that indicates they understand that the Internship work is to satisfy

a degree requirement. Sample letters and other required forms are available on the ECEE web page: <http://ecee.engineering.asu.edu/forms-and-faqs/>

Internship is not permitted for MSE degree students after all classes for the plan of study have been completed. Per ISSC, the student is then eligible for Pre-OPT.

The Ira A. Fulton Schools of Engineering Career Center administers the Internship program. Graduate students interested in applying for Internship should consult the Career Center.

After the Internship period ends, the industrial supervisor submits a report verifying satisfactory performance by the student. The last step in completing the Internship is submission of the evaluation report to the Electrical Engineering Graduate Program Chair, who notifies the registrar of course completion.

**Physical Presence Requirement:** ECEE offers EEE 590, 690, and 790 Reading and Conference as a possible opportunity for international students wanting to do out of state internships during fall or spring semesters. International Students and Scholar Center (ISSC) supports this use of EEE 590, 690 and 790 Reading and Conference for our international students to take as an on-campus class to meet the physical presence requirement for out of state internships during the fall or spring semesters. The Reading and Conference course requires a one-to-one written agreement between the student and the professor addressing the purpose of the study, the schedule of regular meetings with the instructor, and the criteria for grading (which must include a written graded report). The student is responsible for securing the agreement with the professor and obtaining ECEE approval through the academic advisor.

#### **D. Program Fees**

All graduate students in the electrical engineering program pay a program fee of \$50 per credit hour up to a maximum of \$400 in any one semester. This fee is not regularly covered by the tuition waivers associated with teaching and research assistantships.

## ***APPENDICES***

Following are worksheets you can use for developing your plan of study. The official plan of study (the iPOS) looks quite different. It is available online to students at the My ASU site.

The worksheets here are for the following degree programs:

1. MS
2. MSE
3. MBA/MSE (2 options)
4. PhD
5. Direct PhD

**PLAN OF STUDY WORKSHEET  
ELECTRICAL ENGINEERING  
MS Degree**

Name (last, first):	ASU I.D.:	Date:
Address:		
Phone:	E-mail Address:	
Date Admitted:	Expected Completion Date:	
Area of Specialization:	Faculty mentor's Name:	
Deficiencies:		

**Proposed Graduate Program**

	Course Number	Course Title	Credits	Sem/Year	Grade
1					
2					
3					
4					
5					
6					
7					
8					
	EEE599	Thesis	6		

Requirements:

- A minimum of 4 EEE courses
- **A maximum of 4 courses (combined) from the following groups: any 2 400-level, EEE591, EEE590, and FSE 500-level.**
- A minimum of 3 EEE 500-level courses (not including EEE591, EEE590, and FSE 500.)
- A minimum of 2 courses outside of your area of specialization
- A maximum of 1 Reading and Conference (EEE590) and FSE 500-level course.

**PLAN OF STUDY WORKSHEET  
ELECTRICAL ENGINEERING  
MSE Degree**

Name (last, first):	ASU I.D.:	Date:
Address:		
Phone:	E-mail Address:	
Date Admitted:	Expected Completion Date:	
Area of Specialization:	Faculty mentor's Name:	
Deficiencies:		

**Proposed Graduate Program**

	Course Number	Course Title	Credits	Semester/Year	Grade
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					

Requirements:

- A minimum of 5 EEE courses
- **A maximum of 4 courses (combined) from the following groups: any 2 400-level, EEE591, EEE590, and FSE 500-level.**
- A minimum of 3 EEE 500-level courses (not including EEE591, EEE590, and FSE 500.)
- A minimum of 2 courses outside of your area of specialization
- A maximum of 1 Reading and Conference (EEE590) and FSE 500-level course.

**PLAN OF STUDY WORKSHEET  
ELECTRICAL ENGINEERING  
MSE (DUAL MBA) Degree: Option 1**

Name (last, first):	ASU I.D.:	Date:
Address:		
Phone:	E-mail Address:	
Cohort Start Date:	Expected Completion Date:	
Area of Specialization:	Faculty mentor's Name:	

**Proposed Graduate Program**

	Course	Course Title	Credits	Semester/Year	Grade	Shared
1			3			3
2			3			3
3			3			3
4			3			3
5			3			3
6			3			
7			3			
8	EEE590	Reading and Conference	1			1
		Total EEE credits	22 minimum			16 exactly
9	MBA		4			4
10	MBA		4			4
		Program Total	30 minimum			
	MSE	Comprehensive Exam	0			

Requirements:

- A minimum of 5 EEE courses
- **A maximum of 4 courses (combined) from the following groups: any 2 400-level, EEE591, EEE590, and FSE 500-level.**
- A minimum of 3 EEE 500-level courses (not including EEE591, EEE590, and FSE 500.)
- A minimum of 2 courses outside of your area of specialization
- A maximum of 1 Reading and Conference (EEE590) and FSE 500-level course.

EEE590 Reading and Conference (optional) can be taken for 1 credit hour if needed to complete the 22 hour EEE part of the program.

Option 1: 7 EEE classes at 3 hours each plus one hour of EEE590. (22 hours)

Option 2: 6 EEE classes at 3 hours each plus one four hour EEE class. (22 hours)

Notes:

Exactly 16 hours (no more, no less) of EEE hours must be included on the final MBA program of study (iPOS). (e.g., 4 EEE classes at 3 hours plus one EEE class at 4 hours.)

Exactly 8 hours (no more, no less) of MBA hours will be included on the MSE EE program of study (iPOS). (e.g., 2 MBA classes at 4 hours each.)

Be sure to schedule the MSE Comprehensive Exam during the last semester taking classes. Otherwise you would need to enroll for one semester hour during the semester you take the exam.

**PLAN OF STUDY WORKSHEET  
ELECTRICAL ENGINEERING  
MSE (DUAL MBA) Degree: Option 2**

Name (last, first):	ASU I.D.:	Date:
Address:		
Phone:	E-mail Address:	
Cohort Start Date:	Expected Completion Date:	
Area of Specialization:	Faculty mentor's Name:	

**Proposed Graduate Program**

	Course	Course Title	Credits	Semester/Year	Grade	Shared
1			3			3
2			3			3
3			3			3
4			3			3
5			3			
6			3			
7			4			4
		Total EEE credits	22 minimum			16 exactly
9	MBA		4			4
10	MBA		4			4
		Program Total	30 minimum			
	MSE	Comprehensive Exam	0			

Requirements:

- A minimum of 5 EEE courses
- **A maximum of 4 courses (combined) from the following groups: any 2 400-level, EEE591, EEE590, and FSE 500-level.**
- A minimum of 3 EEE 500-level courses (not including EEE591, EEE590, and FSE 500.)
- A minimum of 2 courses outside of your area of specialization
- A maximum of 1 Reading and Conference (EEE590) and FSE 500-level course.

The required (minimum) 22 EEE credit hours can be done as shown below. EEE590 Reading and Conference (optional) can be taken for 1 credit hour if needed to complete the 22 hour EEE part of the program.

Option 1: 7 EEE classes at 3 hours each plus one hour of EEE590. (22 hours)

Option 2: 6 EEE classes at 3 hours each plus one four hour EEE class. (22 hours)

Notes:

Exactly 16 hours (no more, no less) of EEE hours must be included on the final MBA program of study (iPOS). (e.g., 4 EEE classes at 3 hours plus one EEE class at 4 hours.)

Exactly 8 hours (no more, no less) of MBA hours will be included on the MSE EE program of study (iPOS). (e.g., 2 MBA classes at 4 hours each.)

Be sure to schedule the MSE Comprehensive Exam during the last semester taking classes.

Otherwise you would need to enroll for one semester hour during the semester you take the exam.

**ELECTRICAL ENGINEERING PLAN OF STUDY WORKSHEET  
PhD Degree**

NAME:	ASU I.D.:
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**Proposed Doctoral Program**

18 hours of 500 (or above) level courses. Only one Reading and Conference allowed. At least 9 hours in EEE (does not include Reading and Conference).

	Course	Course Title	Credits	Semester Year	Grade
1			3		
2			3		
3			3		
4			3		
5			3		
6			3		

12 hours research (EEE792) or coursework or omnibus.

7					
8					
9					
10					

**Research and Dissertation**

11	EEE792	Research	12		
12	EEE799	Dissertation	12		
		<b>TOTAL</b>	<b>54</b>		

Special note: GPA must be 3.5 or greater. Research hours are not normally graded.

**Courses Taken for Master's Degree**

	Course	Course Title	Credits	Semester Year	Grade	School
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
		<b>TOTAL</b>	<b>30</b>			

<b>PROGRAM TOTAL</b>	<b>84</b>	
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**ELECTRICAL ENGINEERING PLAN OF STUDY WORKSHEET**  
**Direct PhD Degree**

<b>NAME:</b>	<b>ASU I.D.:</b>
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Proposed Doctoral Program

**12 hours of 500 (or above) level courses. Only one Reading and Conference allowed. At least 9 hours in EEE (does not include Reading and Conference).**

		Course Title	Class Hours	Semester Year	Grade
1			3		
2			3		
3			3		
4			3		

18 hours research (EEE792) or coursework or omnibus.

5			12		
6			6		

Research and Dissertation

7	EEE792	Research	12		
8	EEE799	Dissertation	12		
		<b>TOTAL</b>	<b>54</b>		

Special note: GPA must be 3.5 or greater. Research hours are not normally graded.

Courses Taken for Master's in Passing Degree

	Course	Course Title	Class Hours	Semester Year	Grade	School
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
		<b>TOTAL</b>	<b>30</b>			

<b>PROGRAM TOTAL</b>	<b>84</b>	
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