

IOWA STATE UNIVERSITY SUPPLEMENTARY RULES FOR GRADUATE STUDENTS IN ELECTRICAL ENGINEERING OR COMPUTER ENGINEERING

(In addition to the rules of the Graduate College)

This document together with the [Graduate College Handbook](#) summarizes rules and regulations governing graduate study in the Department of Electrical and Computer Engineering (ECpE). Students pursuing a graduate program in the Department are strongly urged to be conversant with these rules.

Departmental Admission Policy

1. Admission Criteria for Study toward the Master's Degree

The Department of Electrical and Computer Engineering offers both a Master of Science (MS) with thesis and a Master of Science Degree (MS) without thesis (primarily offered for distance students). A student with the appropriate qualifications may apply for admission to the Master's program for either option; however, students pursuing the non-thesis option are unlikely to receive financial aid. The student may change the degree option with the approval of the Director of Graduate Education (DOGE).

The Master of Science degree with thesis is the normally expected preparation for Ph.D. study.

All applications are evaluated on the basis of academic record, letters of recommendation, and GRE and TOEFL test scores when required. The area in which the applicant proposes to work, as well as other considerations such as the ability of the department to provide the necessary instruction, research supervision, and financial support, is also considered. The general policy is to admit only those applicants judged to have the highest potential for success as graduate students consistent with the department's resources.

a. Graduates of domestic engineering schools.

Applicants with undergraduate degrees from ABET accredited electrical or computer engineering curricula who are in the upper half of their graduating class are eligible. Applicants are required to submit a recent GRE test result to be considered for full admission. This is not in itself a guarantee of admission as other factors are considered in the evaluation of applications. Graduates of non-accredited electrical and computer engineering curricula may be considered for restricted admission if they meet all other requirements and show outstanding potential for graduate study. Graduates of accredited electrical and computer engineering curricula who fail to meet some admission requirement but otherwise show outstanding potential may also be considered for restricted admission.

All applicants are required to submit a recent GRE test result.

b. Graduates of foreign engineering schools.

Applicants with undergraduate degrees in electrical or computer engineering from foreign universities are required to submit recent TOEFL and GRE test results. They are expected to have a TOEFL score of at least 570 (230 computer based), a GRE Quantitative test score of at least 700 and be in the upper quarter of their graduating class to be considered for admission. These are not in themselves a guarantee of admission as other factors are considered in the evaluation process. All applicants whose native language is not English will be expected to submit evidence of English proficiency prior to admission. This may be affected with a recent TOEFL score of 570 (230 computer based) or above or other evidence that may be judged relevant by the review committee.

c. Other applicants.

Applicants with undergraduate degrees in engineering disciplines other than electrical or computer engineering or applicants with non-engineering degrees in some closely related science who meet all other requirements in a) or b) above may be considered for provisional admission. A letter containing details of the student's provisional admission and the program for meeting all deficiencies should be signed by the student's advisor and made part of the student's file.

d. Concurrent enrollment for undergraduate students.

Students currently enrolled at ISU in either the undergraduate computer engineering or electrical engineering programs and classified as a senior may be eligible to apply for a Concurrent Degree Program. Students will be expected to have a 3.5 or higher grade point average. [Application procedures are available on the ECpE website.](#)

2. Admission Criteria for Study toward the Ph.D. Degree

ECpE offers a traditional doctoral program for a student with a master's degree in engineering or a closely related science. Students with a master's degree from a foreign engineering school shall submit GRE and TOEFL test results as stipulated in 1b. Graduates from domestic schools are required to submit GRE scores. Admission will be either full or provisional depending on the applicant's background. Applicants will be evaluated on the basis of their master's program, their potential for doctoral-level research, and the availability of a major professor in their area of specialization in addition to the previous criteria for admission to the master's program. Only the most outstanding applicants are admitted.

Also, students with good credentials with a Bachelor of Science degree are encouraged to apply for direct entry to the Ph.D. degree program. Direct Entry students may be able to complete one year of graduate preparation prior to taking the Ph.D. Qualifying Examination.

Graduates of the department's master's degree program wishing to work towards a Ph.D. degree must apply for readmission to the doctoral program and should consult the Graduate Secretary for information on the procedures to be followed. The request should be made to the Director of Graduate Education.

Upper-Half Rule

It is the department policy that undergraduates must be in the upper-half of their class in order to enroll in 500-level courses.

Departmental Policy on Advising On-Campus Graduate Students

1. All students will be admitted with a temporary advisor. The advisor will make recommendations on courses to be taken and may also help the student in initiating a research program. It is the student's responsibility to keep the advisor fully informed of plans to secure a major professor.
2. Students admitted for a Master of Science degree are required to secure a Program of Study committee and file a Program of Study by no later than the end of the 2nd semester of enrollment. Students admitted for the Ph.D. degree should secure a Program of Study committee by the end of their second semester and file a Program of Study by no later than the end of their fourth semester. Students failing to have an approved Program of Study by the specified time will have a registration hold placed for future terms.
3. Each Program of Study committee formed for a M.S. student will contain at least one tenured or tenure-track faculty member of the ECpE faculty. Each Program of Study committee formed for a Ph.D. student will contain at least two tenured or tenure-track faculty members of the ECpE faculty.
4. A faculty member with adjunct or courtesy appointment may serve as major professor. The Department Chair will make this decision for each courtesy or adjunct faculty at time of appointment or renewal. The factors to consider in making this decision include prior graduate advising experience and the degree of overlap between the department and the faculty member's research.
5. Students are expected to discuss their registration plans with their major professor/advisor. Course registration numbers for research 599, 699, and independent study 590 sections can be obtained from the Graduate Secretary.

Restricted to Full Admission

Transfer from restricted admission to full admission requires either a GPA of 3.2 or better on 10 hours of graduate credit or a GPA of 3.0 or better on 18 hours, and the recommendation of the student's major professor.

Provisional to Full Admission

Transfer from provisional to full admission should occur at the earliest possible time after the student satisfactorily remedies the deficiencies that resulted in provisional admission. Students should download the [Request to Transfer from Provisional to Full Admission form from the departmental website](#). Complete the form and obtain major professor's signature. Bring the form to the ECpE Student Services Office for approval.

Electrical engineering majors admitted provisionally must, in order to be changed to full admission, have successfully completed one of the following: successful completion, had equivalent material, have subsequent courses, or tested out of EE 201, EE 230, EE 224, EE 311, EE 322 and CprE 281.

Computer engineering majors admitted provisionally must, in order to be changed to full admission, establish competence in the core topics of logic design, computer organization, computer architecture, high level programming (e.g. Pascal or C), machine level programming (e.g. assembly language), and electric circuits. These topics correspond to the following courses: EE 230, CprE 281, CprE 381, CprE 308, and CprE 310. Completing any four of these five courses will satisfy in meeting the deficiency requirement.

Credit Hours

All on-campus graduate students are required to be registered for no fewer than 12 credit hours per semester, or 6 credit hours during summer session, for any semester or session in which they are enrolled. Exceptions to this requirement are:

1. *During their first semester on-campus, students should register for no fewer than nine credits.*
2. *During their last semester on-campus, students who are on an assistantship for less than 3 months (or 6 weeks for summer term) may register for a minimum number of credits if approved by their major professor.* The student shall inform the Graduate Secretary before registering to ensure that the Graduate College is notified. The student will be billed for a full course load if the Graduate College is not notified. International students must also complete a reduced course load form available through the International Students and Scholars website.
3. *Self supported on-campus students may register for a minimum number of credits at anytime if approved by their major professor.*

It is the responsibility of the individual graduate student to ensure that registration meets this standard and that all necessary approvals are documented.

Supplemental Program of Study Requirements

In addition to the credit hours requirements described above, there are departmental requirements for graduate degrees at both the M.S. and the Ph.D. levels.

Master of Science with thesis option

- Of the 30 credits required, a minimum of 21 credits on the Program of Study need to be formal class credits with the remaining credits in thesis EE/CprE 699. No fewer than 22 of these credits shall be earned at ISU.
- The Program of Study must include no fewer than twelve (12) 500-level credit hours in the major area of Electrical Engineering or Computer Engineering.
- All out-of-department (major) courses included on all Programs of Study must at least be at the 400 level. All courses within the major field shall be at the 500-level or higher.
- Students may enroll for Electrical Engineering or Computer Engineering seminar courses as often as desired, however, only one credit may be counted toward the course credit requirements on the Program of Study.
- Independent Study credits, Electrical Engineering 590 or Computer Engineering 590, can be taken as often as desired. However, only 3 credits may be counted towards course credit requirements on the Program of Study. A report summarizing the work completed needs to be submitted to the Graduate Student Office before credit will be allowed on the Program of Study. The work performed shall be commensurate with the number of credit hours.
- Students are expected to perform original and creative research and report their research results in a thesis.
- Each student is required to attend 2 Ph.D. or M.S. defenses during her/his tenure as requirements for graduation.
- Each student needs to fulfill the publication requirement of at least 1 journal or peer-reviewed conference paper submission.

Master of Science with non-thesis option

- Of the 30 credits required, a minimum of 27 credits on the Program of Study need to be formal class credits with the remaining credits in creative component EE/CprE 599. No fewer than 22 of these credits shall be earned at ISU.
- The Program of Study must include no fewer than twelve (12) 500-level credit hours in the major area of Electrical Engineering or Computer Engineering.
- All out-of-department (major) courses included on all Programs of Study must at least be at the 400 level. All courses within the major field shall be at the 500-level or higher.
- Students may enroll for Electrical Engineering or Computer Engineering seminar courses as often as desired, however, only one credit may be counted toward the course credit requirements on the Program of Study.
- Independent Study credits, Electrical Engineering 590 or Computer Engineering 590, can be taken as often as desired. However, only 3 credits may be counted towards course credit requirements on the Program of Study. A report summarizing the work completed needs to be submitted to the Graduate Student Office before credit will be allowed on the Program of Study. The work performed shall be commensurate with the number of credit hours.
- Requires the satisfactory completion of a final oral examination and a report summarizing work done.

Ph.D.

- Requires a minimum of 72 graduate credits of which at least 36 graduate credits, including all dissertation research, must be at ISU. At least 24 semester credits must be earned during two consecutive semesters or during a continuous period including two semesters and a summer session for the Ph.D.
- All out-of-department (major) courses included on all Programs of Study must at least be at the 400 level. All courses within the major field shall be at the 500-level or higher.
- The Program of Study must include no fewer than twelve (12) 500-level credit hours in the major area of Electrical Engineering or Computer Engineering.
- The Program of Study must include a minimum of 6 credit hours of courses from outside of the department. These outside department courses shall cover material that is not closely related to the area of study such as Electrical Engineering, Computer Engineering, and Computer Science.
- Students may enroll for Electrical Engineering or Computer Engineering seminar courses as often as desired, however, only one credit may be counted toward the course credit requirements on the Program of Study.
- Independent Study credits, Electrical Engineering 590 or Computer Engineering 590, can be taken as often as desired. However, only 6 credits may be counted towards course credit requirements on the Program of Study. A report summarizing the work completed needs to be submitted to the Graduate Student Office before credit will be allowed on the Program of Study. The work performed shall be commensurate with the number of credit hours.
- Each student is required to attend 5 Ph.D. defenses during her/his tenure as requirements for graduation.

Minor and Co-Major Requirements

For students in other departments, a master's level minor in Electrical Engineering or in Computer Engineering shall consist of 9 credits minimum (10 credits typical) of courses acceptable for minor or major graduate credit. A Ph.D. minor shall consist of 12 credits minimum, of which at least 6 must be at the 500-level or higher.

A joint or co-major in Electrical Engineering or Computer Engineering at the M.S. or Ph.D. level requires at least 12 credit hours (500-level courses) in Electrical Engineering or Computer Engineering. Students seeking a co-major must have a co-major professor from the ECpE department. A joint or co-major in Electrical Engineering or Computer Engineering at the Ph.D. level requires two members from the department on the student's committee with one of these being a full member of the graduate faculty. One of these shall serve as co-chair of the committee.

Off-Campus Students

This department has no restrictions on the amount of off-campus instruction allowed in a program. (Individual committees may, of course, institute special requirements.)

Off-campus students are often admitted as non-degree (with an undeclared major) students. Such students should seek regular admission at an early date if they wish to become degree candidates since a total of only nine credits earned in non-degree status can be used subsequently to meet the credit hour requirements of a degree program.

An off-campus student with non-thesis option will be assigned a department appointed program of study committee. These students will be advised by a departmental advisor. A Program of Study needs to be submitted during the second semester following regular admission. If the student wishes to write a thesis, the student and the major professor should reach an early agreement on the details of how the research and thesis writing are to be supervised.

Designation of Area Specialty

Computer Engineering and Electrical Engineering M.S. and Ph.D. candidates do not specify an area of specialization on their Program of Study (POS).

Ph.D. Examinations

All students working towards a Ph.D. must complete the Qualifying Process and pass the preliminary examination prior to taking the Final Oral Examination. The requirements, listed in order, are:

Qualifying Process

- Course Work Requirement
- Problem-Solving Component

Preliminary Examination

A student is admitted to candidacy for the Ph.D. degree after he/she passes the Preliminary Examination.

Qualifying Process

The process for this certification is to ensure that the graduate student has acquired research area knowledge and general research methodology skills and has applied them to solving a problem in the area of study. The certification process consists of a course work requirement and a problem-solving component.

1. *Course Work Requirement:* Take two research area courses and two skill/methodology courses with an overall grade point average of 3.5 or higher on these courses. Each individual course grade must be B+ or higher. These courses will be listed on the Ph.D. Qualifying Process form and submitted the first semester.
2. *Problem-Solving Component:* Work with the advisor or prospective advisor on a research problem. It is expected that the advisor guides this research. The product will be a written report, an oral presentation of this report, and an oral examination following the presentation.

Additional Information Regarding the Qualifying Process

1. Completion Timeline

All the requirements must be completed by the fourth (4) semester for post-BS students and by the third (3) semester for post-MS students. A post-MS student can start this certification process as early as possible if the appropriate research area and skills courses have been taken at another university or ISU with a grade of A- or better. The third or fourth semester guideline is an upper bound.

2. Course Guidelines

The course guidelines are minimal guidelines. Students may take additional research area foundation and skills courses in consultation with their advisors.

3. Examination

- a. Examining Committee Constitution:** The area committees designate the examiners. Each examining committee must consist of at least four (4) members.
- b. Oral Examination:** The oral examination will emphasize the declared two area courses, two skills courses, the written report, and the presentation. The focus should be on establishing connections between the area courses and skills course and the problem solution rather than on the research product itself. A desirable outcome at this stage may be a conference or journal submission of this work.

Research Area (Knowledge) and Skills Development Courses

The knowledge courses are offered by ECpE. The basic skill courses are most likely offered by other departments like statistics, mathematics, computer science, or physics.

Communications and Signal Processing

Research Area : EE 521, EE 524, EE 527, EE 528, EE 547, EE 621, EE 622

Skills: EE 523, Stat 542, Stat 543, EE 570

Computing and Networking Systems

Research Area: CprE 541, CprE 581, CprE 583

Skills: (at least two from different groups)

Group 1 (probability, statistics, etc.): EE 523, Stat 430, Stat 447, Stat 500, Stat 512

Group 2 (algorithms, modeling, etc.): CprE 528, CprE 582, ComS 511

Group 3 (optimization, graph theory, etc.): EE 570, IE 510, IE 519, IE 534

Electric Power and Energy Systems

Research Area: EE 553, EE 554, EE 653 (EE 590F from Spring 2008)

Skills: EE 547, EE 577, EE 578, CprE 558, CprE 588, ComS 561, Math 503, Math 525, Math 554, Math 557, IE 631, IE 632, Econ 500, Econ 502, Stat 447 Stat 451, Stat 500, Stat 537

Electromagnetic, Microwave, and Nondestructive Evaluation

Research Area: EE 512, EE 513, EE 514, EE 518, EE 588X

Skills: Math 426, Math 465, Math 471, Math 481, Stat 447, Stat 401

Microelectronics and Photonics

Research Area: EE 532, EE 535, EE 536, EE 538

Skills: Phys 480, Phys 481, Phys 511, MSE 510, MSE 552, Math 426, Math 481, Math 502, Stat 401, Stat 402

Secure and Reliable Computing

Research Area: CprE 530, CprE 531, CprE 532, CprE 536

Skills: CprE 528, CprE 582, Stat 401, Stat 402, Stat 430, Stat 551, Stat 554, ComS 511, ComS 531, ComS 540, IE 510, IE 519, IE 534, Math 547

Software Systems

Research Area: CprE 526, CprE 548, CprE 550, CprE 554, CprE 556, CprE 557, CprE 558

Skills: CprE 528X, CprE 582, EE 570, ComS 511, IE 510, IE 519, IE 534, Math 547

Systems and Controls

Research Area: EE 572, EE 575, EE 577, EE 578, EE 674

Skills: EE 523, EE 570, Math 414 or 515, Math 503, Math 525, Math 554, Math 557, IE 510 or Math 607, IE 534, IE 631, IE 632

VLSI

Research Area: CprE/EE 435, CprE/EE 465, CprE/EE 501, CprE/EE 505, CprE/EE 507, CprE 563, CprE 564, CprE 566

Skills: CprE 526, EE 570, ComS 511, IE 312*, IE 510, IE 534, Math 304*, Math 307*, Math 314*, Math 317*, Math 510, Math 547

*While 300-level coursework will fulfill this skills development Qualifying requirement, the credits may not be listed on the program of study.

Preliminary Examination Format and Requirements

The objective of the Preliminary Examination is to evaluate and test the graduate student's knowledge of the subject area and review his/her research plans. Two weeks prior to the preliminary examination, the student must provide each POS Committee member with a dossier, including a resume, copies of published reports and/or papers, and a written prospectus of the proposed research. The research prospectus should be typically 20 double-spaced typed pages, and should include:

- 1. a concise statement of the problem,**
- 2. a review of relevant literature,**
- 3. a well-formulated work plan detailing the approach to the problem, and**
- 4. the expected contribution.**

The POS Committee, as part of the preliminary examination, may also elect to have the student a) review and critique appropriate technical publications, b) provide an oral presentation of his/her research plan, and c) face any test deemed appropriate by the POS Committee. The Committee may, as a consequence of the examination, decide to (i) pass the student and admit his/her candidacy, (ii) have the student retake the examination, or (iii) terminate the student's Ph.D. program.

Thesis or Dissertation Quality

The Department of Electrical and Computer Engineering maintains strict standards regarding thesis quality. The Director of Graduate Education in consultation with the Graduate Committee has the right to reject theses that do not meet these standards. As stated in the [Iowa State University Graduate College Handbook](#):

*A **master's thesis** is a scholarly composition that demonstrates the ability of the author to do independent and creative work. It*

explores in some depth a problem or issue related to the major field of study. Although considerable variations in format and style are acceptable, precise expression, logical construction, and meticulous attention to detail are essential.

A doctoral dissertation must demonstrate conclusively the ability of the author to conceive, design, conduct, and interpret independent, original, and creative research. It must attempt to describe significant original contributions to the advancement of knowledge and must demonstrate the ability to organize, analyze, and interpret data.

Completion Requirements

Each degree candidate is responsible for initiating the Request for Final Examination by submitting to the ECpE Student Services Office the date, time and place of the final examination at least three (3) weeks in advance of that date. The Graduate Secretary will distribute this information to the Electrical and Computer Engineering faculty. In addition,

1. *Every student who completes a thesis or dissertation shall submit an abstract, not exceeding one page in length, to the ECpE Student Services Office.* The Graduate Secretary will distribute the abstract electronically to the Electrical and Computer Engineering faculty and graduate students.
2. *Records of final exam attendance are maintained in the ECpE Student Services Office to verify the attendance requirement of two final examinations for M.S. level students or 5 for Ph.D. level students.*
3. *[“Attendance and Publication Requirements for M.S. \(thesis\) and Ph.D. Students”](#) is a form on our departmental website and needs to be submitted prior to final submission of the thesis or dissertation.* A copy of each publication needs to be submitted along with the form. The Supplemental Program of Study Requirements section states the M.S. (thesis) and Ph.D. publication requirement.

The ECpE Student Services Office will not forward the “Graduate Student Approval Slip for Graduation” for signature approval to the Department’s Director of Graduate Studies until the above requirements have been met.

All thesis and dissertation defenses are open to the public and shall include an opportunity for questions from the public. A minimum of one hard copy of the student’s thesis or dissertation shall be deposited in the ECpE Student Services Office prior to submission of the Graduation Approval Slip. Students are also required either to pay a fee for binding the copy or have the theses bound strictly in accordance with standards established by the department. Information relating to the cost of binding and standards can be obtained by contacting the Graduate Secretary and fees will be charged on your university bill.

Creative Component

A student who elects not to write a thesis shall be required to demonstrate ability to do independent work in one of two ways: (1) by studying literature on a topic of current interest and presenting a written and oral report on that topic, or (2) by completing an assigned task of measurements, design, construction, or computation, and presenting a written and oral report of the results. The students shall seek the approval of the major professor in choosing the creative component work. This work will be conducted under EE 599 or CprE 599 and graded either as Satisfactory or Unsatisfactory. The written report is to be distributed to the student’s committee at least one week prior to the final examination. Also, the written report must be submitted to the Student Services Office following the final examination. The report should demonstrate substantial evidence of creative endeavor.

Dismissal and Grievance Procedures

The Director of Graduate Education works with the ECpE Graduate Committee to resolve student appeals and grievances. The ECpE Graduate Committee is authorized by the department chair and the faculty to serve as the final appeals committee to hear and act on appeals including exceptions to the department’s rules for the qualifying examination and on the results. Students may be dismissed from the Computer Engineering or Electrical Engineering degree programs for the following reasons:

1. Failure to progress satisfactorily in his/her degree program including lack of research progress, a lack of aptitude or a failure to maintain satisfactory academic standing, as defined by the [Iowa State University Graduate College Handbook](#).
2. Students must work with a major professor to progress through the program. On occasion, students and/or major professors make a decision to terminate their working relationship. In this case, every effort will be made to assist the student in finding a new major professor. However, the ultimate responsibility for this rests with the student.