

IOWA STATE UNIVERSITY
SUPPLEMENTARY RULES FOR GRADUATE STUDENTS
IN ELECTRICAL ENGINEERING OR COMPUTER ENGINEERING
(In addition to the rules of the Graduate College)

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This document together with the Graduate College Handbook summarizes information, 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.

1 Graduate Programs

1.1 Degree programs

The Department of Electrical and Computer Engineering (ECpE) offers the following graduate degree programs:

(a) Master of Science (MS)

The Master of Science degree program is offered with two options:

- Master of Science with thesis
- Master of Science with creative component (without thesis)

(b) Master of Engineering (MEng)

Our Master of Engineering programs are based on coursework credits only (no thesis or creative component is required). Students can pursue this option by taking courses offered via our online streaming media education.

(c) Doctor of Philosophy (Ph.D.)

1.2 Concurrent Bachelor/Master Programs

The Department of Electrical and Computer Engineering (ECpE) provides concurrent undergraduate/graduate degree programs that allow well-qualified students to be admitted to either the electrical engineering or computer engineering graduate program while still working on their undergraduate degree during their senior year. Students can double count up to 6 credits of coursework towards both degree programs, allowing them to finish their master's degree faster. Two concurrent Bachelor/Master programs are offered:

- Concurrent Bachelor of Science and Master of Science (BS/MS)
- Concurrent Bachelor of Science and Master of Engineering (BS/MEng)

1.3 Graduate Certificates

The department offers online graduate certificates in a number of areas:

- Certificate in Computer Networking
- Certificate in Embedded Systems
- Certificate in Power Systems Engineering
- Certificate in Software Systems

Students may also be interested in the online graduate certificates offered through interdepartmental graduate programs:

- Certificate in Human Computer Interaction

- Certificate in Information Assurance
- Certificate in Nondestructive Evaluation

1.4 Majors and Academic Areas

Students can major in Electrical Engineering (EE) or Computer Engineering (CprE). Students can pursue graduate research in the following academic areas:

- Bioengineering (EE and CprE)
- Communications and signal processing (EE)
- Computing and networking systems (CprE)
- Electric power and energy systems (EE)
- Electromagnetic, microwave, and nondestructive evaluation (EE)
- Microelectronics and photonics (EE)
- Secure and reliable computing (information assurance) (CprE)
- Software systems (CprE)
- Systems and controls (EE)
- VLSI (EE and CprE)

These academic areas are also known as research areas, or areas of specialization.

1.5 Interdepartmental Programs

Student may select the ECpE department as their home department to pursue graduate degrees in one of the following interdepartmental programs:

- Bioinformatics and Computational Biology
- Information Assurance
- Human-Computer Interaction.

2 Departmental Admission Policy

2.1 Admission Criteria for Study toward the Masters Degree

The Department of Electrical and Computer Engineering offers three masters options:

- Master of Science with thesis (MS) — normally expected preparation for Ph.D. study
- Master of Science without thesis (MS)
- Master of Engineering (M.Eng.) — primarily offered for distance students

A student with the appropriate qualifications may apply for admission to the Master's programs for these options. Students pursuing the non-thesis and Masters of Engineering are unlikely to receive financial aid. The student may change the degree option with the approval of the Director of Graduate Education (DOGE).

All applications are evaluated on the basis of academic record, letters of recommendation, GRE*, and statement of purpose. 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 academic and financial 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.

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 that fail to meet some admission requirement but otherwise show outstanding potential may also be considered for restricted admission.

(b) Graduates of international 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 79 internet based (230 computer based or 570 paper 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.

(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 requirements in a) or b) above may be considered for provisional admission.

(d) Concurrent enrollment for undergraduate students

Students currently enrolled in either the undergraduate Computer Engineering or Electrical Engineering programs at ISU and classified as a senior may be eligible to apply for a Concurrent BS/MS or Concurrent BS/MEng Degree Program. For concurrent BS/MS admission, the student must have a cumulative GPA of 3.3 or better. For concurrent BS/MEng admission, the student must have a cumulative GPA of 3.0 or better, and be within 18 credits of completing requirements for their bachelor's degree. Application procedures are available on the ECpE website.

2.2 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 Masters Degree from a foreign engineering school shall submit GRE and TOEFL test results as stipulated in 2.1.(b) 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. A direct entry Ph.D. student will typically take less time to a Ph.D. compared to someone who enters MS first.

*GRE scores for Master of Engineering will be waived for applicants with an undergraduate GPA of 3.0 or above or 2 years of industrial experience.

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.

2.3 Admissions Criteria for Graduate Certificate

Entry into the Graduate Certificate Program requires a bachelor's degree in science or engineering from a four-year college, with a grade point average of 3.0 or higher.

2.4 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.

2.5 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.

2.6 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 complete the *Request to Transfer from Provisional to Full Admission* form, obtain major professor's signature, and 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.

3 Departmental Policy on Advising Graduate Students

3.1 Advising On-Campus Ph.D. and Master of Science

- (a) All students will be admitted with a temporary advisor, the Director of Graduate Education (DOGE). 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.
- (b) Students admitted for a Master of Science degree are required to secure a Program of Study committee and file a Program of Study 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 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.

- (c) Each Program of Study committee formed for a MS student will contain at least one tenured or tenure-track faculty member in ECpE . Each Program of Study committee formed for a Ph.D. student will contain at least two tenured or tenure-track faculty members in ECpE.
- (d) 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.
- (e) 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.

3.2 Advising On-Campus Master of Engineering

- (a) All Master of Engineering (M.Eng.) students will be advised by the Director of Graduate Education (DOGE).
- (b) The Master of Engineering student who is within one semester of graduation will request a formal committee and complete the Program of Study paper work. To request a Committee assignment, the student will contact the advisor to initiate the paper work.

3.3 Advising Off-Campus Graduate Students

- (a) All off-campus masters students will be advised by the Director of Graduate Education (DOGE). The advisor will make recommendations on courses to be taken and may also help the student decide on thesis, non-thesis, or a course-based degree option.
 - (i) If the student wishes to write a creative component or thesis, the student will choose a major professor and will reach an early agreement on the details of the final project or thesis.
 - (ii) Students admitted for a Master of Science (thesis or non-thesis) must have a Committee Appointment and a Program of Study approved by the Graduate College one semester prior to graduation.
 - (iii) Master of Engineering committees will be assigned by the department and the Program of Study will be approved during the final semester.
- (b) All off-campus Ph.D. students must establish residency. (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.)

4 Supplemental Program of Study (POS) Requirements

The following requirements are to be met for Masters and Ph.D. degrees and Graduate Certificates in ECpE.

4.1 Master of Science with thesis option

- (a) Requires 30 credits. No fewer than 22 of these credits shall be earned at ISU. A minimum of 21 credits must be coursework and a minimum of 6 must be research/thesis credits.

- (b) Of the 21 course credit hours, eighteen (18) credits must be from within Electrical Engineering or Computer Engineering. Twelve (12) credits must be from a single academic area (see Appendix A: Academic Area Courses). Six (6) credits must be from outside this academic area.
- (c) All out-of-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.
- (d) Students may enroll for Electrical Engineering or Computer Engineering seminar courses as often as desired, however, only one credit may be counted towards the course credit requirements on the Program of Study.
- (e) 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.
- (f) Students are expected to perform original and creative research and report their research results in a thesis.
- (g) Each student is required to attend 2 Ph.D. or MS defenses during her/his tenure as requirements for graduation.
- (h) Each student is required to attend 2 departmental seminars per semester.
- (i) Each student needs to fulfill the publication requirement of at least 1 journal or peer-reviewed conference paper submission.
- (j) Requires the satisfactory completion of a final oral examination.

4.2 Master of Science with non-thesis option (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 should demonstrate substantial evidence of creative endeavor. Additional requirements are as follows:

- (a) Requires 30 credits. No fewer than 22 of these credits shall be earned at ISU. A minimum of 27 credits must be coursework and a minimum of 2 must be creative component (599) credits.
- (b) Of the 27 course credit hours, eighteen (18) credits must be from within Electrical Engineering or Computer Engineering. Twelve (12) credits must be from a single academic area (see Appendix A: Academic Area Courses). Six (6) credits must be from outside this academic area.
- (c) 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.
- (d) Students may enroll for Electrical Engineering or Computer Engineering seminar courses as often as desired, however, only one credit may be counted towards the course credit requirements on the Program of Study.
- (e) 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.

- (f) Each student is required to attend 2 departmental seminars per semester.
- (g) Requires the satisfactory completion of a final oral examination and a report summarizing the work.

4.3 Master of Engineering

- (a) Requires 30 course credits. No fewer than 22 of these credits shall be earned at ISU.
- (b) Twenty-four (24) credits must be from within Electrical Engineering or Computer Engineering. Twelve (12) credits must be from a single academic area (see Appendix A: Academic Area Courses). Six (6) credits must be from outside this academic area.
- (c) Independent Study credits, EE or Cpr E 590, can be taken as often as desired. However, only 3 credits may be counted towards course credit requirements on the Program of Study.

4.4 Ph.D.

- (a) Requires 72 graduate credits of which no fewer than 36 graduate credits must be from Iowa State University. A minimum of twenty-four (24) of these ISU credits must be course work and a minimum of 12 must be dissertation/research credits .
- (b) For the qualifying process, a student must have taken four courses from the Research Area (Knowledge) and Skills Development Course list. Two courses must be from the research area (knowledge) and two from the skills development. (See Appendix B: Research Area [Knowledge] and Skills Development Courses).
- (c) Twelve (12) credits must be from a single academic area within Electrical Engineering or Computer Engineering (see Appendix A: Academic Area Courses). Six (6) credits must be from outside this academic area and outside the qualifying courses for breadth.
- (d) A maximum of 12 credits of coursework may be transferred from another graduate institution.
- (e) 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.
- (f) Students may enroll for Electrical Engineering or Computer Engineering seminar courses as often as desired, however, only one credit may be counted towards the course credit requirements on the Program of Study.
- (g) 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.
- (h) Each student is to attend 5 Ph.D. defenses during her/his tenure as requirements for graduation.
- (i) Each student is required to attend 2 departmental seminars per semester.
- (j) Each student is required to make one departmental presentation seminar during her/his tenure.
- (k) Each student needs to fulfill the publication requirement of at least 1 journal or 2 peer-reviewed conference papers published or accepted for publication.

4.5 Additional Information and Requirement for Concurrent Bachelor/Master Programs

For concurrent BS/MS:

- (a) Up to 6 credits of graduate level coursework taken while an undergraduate during the semester of concurrent enrollment may be double counted toward both their undergraduate and graduate program of study
- (b) Up to 9 credits of graduate level coursework taken while an undergraduate that will NOT be counted toward their undergraduate program of study may be transferred; the coursework must have a grade of B or better
- (c) Concurrent enrollment can be no longer than one semester

For concurrent BS/MEng:

- (a) Up to 1 semester of concurrent enrollment is allowed (the semester in which the student has both undergraduate and graduate standing)
- (b) Up to 6 credits of graduate level courses in Electrical Engineering or Computer Engineering can be used for both the BS and MEng degrees, which are to be taken during the concurrent enrollment
- (c) Student will take at least 3 credits of graduate level courses during concurrent enrollment
- (d) Concurrent enrollment can be no longer than one semester

4.6 Requirements for Graduate Certificates

- To obtain the Computer Networking Graduate Certificate, students must complete 12 total credit hours of courses, including a 3 credit hour required course and 9 credit hours of elective courses.
- To obtain the Embedded Systems Graduate Certificate, students must complete 12 total credit hours of courses, including 9 credit hours of required courses and 3 credit hours of elective courses.
- To obtain a Power Systems Graduate Certificate, students must complete 12 total credit hours of required courses.
- To obtain a Software Systems Graduate Certificate, students must complete 12 total credit hours of courses, including 3-credit hours of required courses, and 9 credits of elective courses.

See the Appendix C for a listing of Required Courses and Elective Courses for Graduate Certificates.

4.7 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 MS 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.

4.8 Designation of Area of Specialization

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

5 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:

- (a) Qualifying Process
 - Course Work Requirement
 - Problem Solving Component
- (b) Preliminary Examination

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

5.1 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.

- (a) 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.
- (b) 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.

5.2 Additional Information Regarding the Qualifying Process

- (a) 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.
- (b) Course Guidelines

The course guidelines are minimal guidelines. Students may take additional research area foundation and skills courses in consultation with their advisors.
- (c) Examination
 - (i) Examining Committee Constitution: The area committees designate the examiners. Each examining committee must consist of at least four (4) members.

- (ii) 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.

5.3 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. See Appendix B for a listing of possible courses that could be used to meet this requirement.

5.4 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;

- (a) a concise statement of the problem,
- (b) a review of relevant literature,
- (c) a well-formulated work plan detailing the approach to the problem, and
- (d) 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 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.

6 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.

7 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,

- (a) 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.
- (b) Records of final exam and seminar attendance are maintained in the ECpE Student Services Office to verify the attendance requirement of two final examinations for MS level students or 5 for Ph.D. level students, two seminar attendance for MS and Ph.D. level students, and one departmental seminar presentation for Ph.D. level students.
- (c) *Publication Requirements for MS (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. The Supplemental Program of Study Requirements section states the MS (thesis) and Ph.D. publication requirement.

The ECpE Student Services Office will not forward for signature approval to the Department's Director of Graduate Studies the "Graduate Student Approval Slip for Graduation" 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 the student's university bill.

8 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:

- (a) 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.
- (b) 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.

9 Ethics

All students in the Department of Electrical and Computer Engineering are expected to follow the Institute of Electrical and Electronics Engineers (IEEE) Code of Ethics, as outlined below.

IEEE Code of Ethics

We, the members of the IEEE, in recognition of the importance of our technologies in affecting the quality of life throughout the world, and in accepting a personal obligation to our profession, its members and the communities we serve, do hereby commit ourselves to the highest ethical and professional conduct and agree to:

1. accept responsibility in making engineering decisions consistent with the safety, health, and welfare of the public, and to disclose promptly factors that might endanger the public or the environment;
2. avoid real or perceived conflicts of interest whenever possible, and to disclose them to affected parties when they do exist;
3. be honest and realistic in stating claims or estimates based on available data;
4. reject bribery in all its forms;
5. improve the understanding of technology, its appropriate application, and potential consequences;
6. maintain and improve our technical competence and to undertake technological tasks for others only if qualified by training or experience, or after full disclosure of pertinent limitations;
7. seek, accept, and offer honest criticism of technical work, to acknowledge and correct errors, and credit properly the contributions of others;
8. treat fairly all persons regardless of such factors as race, religion, gender, disability, age, or national origin;
9. avoid injuring others, their property, reputation, or employment by false or malicious action;
10. assist colleagues and co-workers in their professional development and to support them in following this code of ethics.

Approved by the IEEE Board of Directors, August 1990, IEEE SSIT Ethics Committee

10 Internships

Approval and Guidelines for Internships is a departmental form to be completed when students have secured an internship position during the graduate program. International students will also need to complete the form *Curricular Practical Training for F-1 Students* located at the International Students and Scholars website. The appropriate forms require approval from the adviser and the Manager of Student Services. All students finishing internships are required to write a one-page reflection on competencies acquired through the experience.

11 Leave and Conference Travel Policies

11.1 Absence Request for Personal or Professional Leave

Research Assistants (RAs) and Teaching Assistants (TAs) who want to leave campus during semester breaks and/or for professional development/meetings must seek approval from their major professors prior to leave using the *ECpE Graduate Student Absence Request Form*.

11.2 Graduate College Professional Advancement Grant (PAG)

Graduate students who take professional development leave are encouraged to complete a *Request for Professional Advancement Grant (PAG) Form* and submit directly to the Graduate College, 1137 Pearson Hall. The Graduate College requires students to submit requests for Professional Advancement Grants at least two weeks prior to departure. For additional information, visit the Graduate Colleges PAG web page.

11.3 ECpE Professional Development Support Request

Graduate students who take professional development leave are also encouraged to complete a *Professional Development Support Request* and submit to Main Office, 2215 Coover Hall. A student presenter may receive up to \$500 from the department to attend one conference per fiscal year.

11.4 Travel Reimbursement

It is imperative for graduate students to keep all expense receipts, including detailed meals, lodging, and transportation receipts, to ensure full reimbursement. Completed *ECpE Travel Reimbursement Form* should be submitted to the Main Office, 2215 Coover Hall. Reimbursements must be completed within 1 month from the last date of travel. Reimbursements received after the deadline will be denied.

Appendix A: Academic Area Courses for Program of Study

(from 2007–2009 ISU Catalog)

A.1 Electrical Engineering (EE) Majors

Communications and Signal Processing

EE 520, EE 521, EE 523, EE 524, EE 527, EE 528, EE 545, EE 547, EE 573, EE 621, EE 622

Electric Power and Energy Systems

EE 552X, EE 553, EE 554, EE 555, EE 556, EE 559X, EE 590[†], EE 653

Electromagnetics, Microwave, and Nondestructive Evaluation

EE 510, EE 511, EE 512, EE 513, EE 514, EE 516, EE 517, EE 518, EE 588X

Microelectronics and Photonics

EE 530[‡] EE 532, EE 535, EE 536, EE 538

Systems and Controls

EE 565, EE 566, EE 570, EE 574, EE 575, EE 576, EE 577, EE 578

VLSI (EE or CprE majors)

EE 501, EE 504, EE 505, EE 506, EE 507, EE 508, CprE 563, CprE 564, CprE 566

A.2 Computer Engineering (CprE) Majors

Computing and Networking Systems

Cpr E 511, Cpr E 526, Cpr E 541, Cpr E 542, Cpr E 543, Cpr E 545, Cpr E 546,
Cpr E 547, Cpr E 550, Cpr E 554, Cpr E 558, Cpr E 581, Cpr E 582, Cpr E 583,
Cpr E 584, Cpr E 588, Cpr E 589, Cpr E 626, Cpr E 681

Secure and Reliable Computing

Cpr E 530, Cpr E 531, Cpr E 532, Cpr E 534, Cpr E 536, Cpr E 537

Software Systems

Cpr E 511, Cpr E 525, Cpr E 526, Cpr E 546, Cpr E 550, Cpr E 554, Cpr E 556, Cpr E 557,
Cpr E 558, Cpr E 582, Cpr E 626

[†]EE 590 in Fall 2008 (This was an actual course rather than an independent study.)

[‡]EE 530 in Fall 2008 and Spring 2009 (These were actual courses rather than seminar.)

Appendix B: Research Area (Knowledge) and Skills Development Courses for Ph.D. Qualifying Exam

(Students must take two research area courses and two skills courses from one academic area.)

Bioengineering

Research Area: (at least one from graduate level) BioE 450, BioE 428, GDCB 542, BIOL 436, BIOL 423, GDCB 536, Stat 565, PHYS 432/532, PHYS 461, BIOL 444, Cpr E 567, Cpr E 570

Skills: E E 524, E E 528, E E 532, E E 536, E E 538, EE 527, E E 517, E E 523, E E 527, E E 570, E E 530, E E 535, ME 552, Stat 401, Stat 402, Stat 430, Stat 542, Stat 543, ComS 511, CprE 526

Communications and Signal Processing

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

Skills: EE 523, CprE 547, Stat 642, Stat 543, Stat 570

Computing and Networking Systems

Research Area: CprE 541, CprE 543, 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 519, EE 558X

Skills: Math 426, Math 471, Math 481, Math 510, Math 511, Math 517, Math 519, Math 520, Math 525, Math 561, Math 562, Stat 401, Stat 447

Microelectronics and Photonics

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

Skills: (one from each group)

Group 1: Phys 480, Phys 481, Phys 511, MSE 510, MSE 552

Group 2: Math 426, Math 481, Stat 401, Stat 402

Secure and Reliable Computing

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

Skills: CprE 528, CprE 533, 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, ComS 512, ComS 531, ComS 572, 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 564, CprE 566

Skills: CprE 526, EE 527, EE 570, EE 573, ComS 511, IE 312[§], IE 510, IE 534, Math 304[§], Math 307[§], Math 314[§], Math 317[§], Math 510, Math 547, Stat 542, Stat 533.

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

Appendix C: Required Courses and Elective Courses for Graduate Certificates

Computer Networking

Required Courses: CprE 541

Elective Courses: CprE 582, CprE 542, CprE 543, CprE 546, CprE 547

Embedded Systems

Required Courses: CprE 558, CprE 583, CprE 588

Elective Courses: CprE 581, CprE 541, CprE 546, CprE 556

Power Systems

Required Courses: EE 553, EE 554, EE 653, EE 590[¶]

Software Systems

Required Courses: CprE 556

Elective Courses: CprE 526, CprE 545, CprE 550, CprE 558, CprE 586x

[¶]Special Topics in Electric Power (some EE 590 offerings may be used towards the certificate)

Appendix D: List of Forms Referred to In the Document

Request to Transfer from Provisional to Full Admission

Ph.D. Qualifying Process

Publication Requirements for MS (thesis) and Ph.D. Students

Approval and Guidelines for Internships

Curricular Practical Training for F-1 Students

ECpE Graduate Student Absence Request Form

Request for Professional Advancement Grant (PAG) Form

ECpE Travel Reimbursement Form

Appendix E: List of Changes

Dec. 2011: added sections on Graduate Programs, Ethics, Leave and Conference Travel Policies, Appendices C & D. Removed requirement on Credit Hours. Added Table of Contents. Added two seminar requirements for grad students, and presentation requirement for PhD students.

Jan. 2012: Changed Phys 432 to Phys 432/532 in the Research Area courses list for Bioengineering Area per request of area chair.

Feb. 2012: Added EE 527 and Stat 542 to VLSI skills courses in Appendix B per request from area chair. Added Appendix E.

Apr. 2012: Added EE 573 and Stat 533 to VLSI skills courses in Appendix B per request from area chair.

Apr. 2012: Added ComS 512, ComS 531, ComS 572 to skills courses in Software Systems in Appendix B per area chair.