# Graduate Handbook

## Department of Electrical and Computer Engineering

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# 1 Electrical and Computer Engineering Graduate Program Overview

Electrical Engineering has its origins in the study and application of electrical phenomena. However, in recent years the field has grown to embrace a diverse range of problems in applied physics and mathematics. The department currently offers advanced study in four broad areas:

- ***Computer Engineering*** concentrates on the architecture and implementation of digital logic and computing systems.
- ***Electromagnetics*** explores the theory, physical properties, and applications of electromagnetic radiation and includes emphases in optics, remote sensing, and numerical computation.
- ***Microelectronics*** focuses on the design and fabrication of microelectronic circuits for digital and analog applications, including device physics, modeling, processing, and fabrication.
- ***Signals and Systems*** studies fundamental and applied issues in information processing and includes emphases in communication theory, linear and nonlinear control systems, digital signal processing, and estimation theory.

As described in the University Graduate Catalog, the department offers two degrees at the graduate level:

1. Master of Science (MS) in Electrical and Computer Engineering
2. Doctor of Philosophy (PhD) in Electrical and Computer Engineering

This handbook provides department graduate program policies associated with these degrees. The outlined policy complements and extends but does not replace the University policy on graduate programs, which can be found in the University Graduate Catalog available from the University Home Page. Other information regarding graduate education at Brigham Young University can be obtained from the University Graduate Studies Home Page. Also, additional information about the department graduate program and research areas can be found at the department graduate program home page.

# 2 Educational Objectives

## 2.1 MS Degree

- Apply knowledge in service to community and family and engage in lifelong learning through personal study and continuing education.
- Obtain employment appropriate for the M.S. Degree, engage in technology-based entrepreneurship, government lab service, or complete further graduate study.
- Play a meaningful role in research or technical development leading to significant contributions to engineering and technology; serve in responsible positions of technical leadership.
- Be examples of faith, character, and high professional ethics.

## 2.2 PhD Degree

- Apply knowledge in service to community and family and engage in lifelong learning through personal study and education.
- Obtain employment that utilizes PhD level training, including positions such as academic faculty appointment, post-doctoral research, research within industrial or government laboratories, and other principal positions of technical creativity, leadership, and management.
- Play a leading role in making significant contributions to engineering and technology.
- Be examples of faith, character, and high professional ethics.

# 3 General Information

The Graduate Studies Home Page provides significant information regarding general University policies, with which students are expected to be familiar. The following information will also be useful to potential or current graduate students.

## 3.1 Admissions

All applicants must meet the general university minimum standards for admission as a graduate student. Student who fails to meet these standards will not be considered for admission to our program. These university requirements include the following:

- Complete and submit application before the deadline.
- Agree to live BYU's standards of personal conduct as stated in the Honor Code.
- Earn a bachelor's degree in electrical or computer engineering or allied discipline from an accredited U.S. university or the equivalent from a university outside the United States.
- Receive at least a 3.0/4.0 grade-point average in the last 60 credit hours of course work from an accredited university in the United States, or a comprehensive grade-point average of 3.0/4.0 from an equivalent foreign university.
- If your native language is not English, and you have not received a four-year bachelor's degree (or higher) from an educational institution within the United States, you must take the IELTS or TOEFL and satisfy the minimum score requirements for admission.
- *New International applicant simplified policy for Fall 2015 ECEn*:
  International students will submit electronic or scanned copies of all marksheets, transcripts, diplomas, and graduation certificates with their online applications. Admission decisions will be made using these document copies. Upon acceptance for admission to the program, official and/or original copies of these documents are to be sent for credential evaluation and authentication to one of the following agencies: IERF, or WES. The application for a student visa will be submitted by BYU to the US government upon completion of this credential evaluation. In nations where the accepted academic credential documentary practice makes it difficult to send official documents for credential evaluation (for example when the student is given the only existing official copy of a diploma) then these original documents may be presented for authenticity verification upon arrival at BYU.

More details on the university requirements can be found on the graduate studies home page.

In addition to the university requirements, applicants applying to the graduate program in Electrical and Computer Engineering must complete the Graduate Record Examination (GRE).

### *3.1.1 Application Deadline*

All applications must use university online application for graduate students. The ECEN Department application deadline for Fall and Winter semesters are as follows:

- Fall Semester: January 15
- Winter Semester: August 15

Note that these application deadlines are *earlier* than the university deadlines.

### *3.1.2 GRE*

The Graduate Record Exam (GRE) is required for all applicants including applicants with a BS degree from BYU. Information regarding the GRE can be obtained from the GRE Home Page. While the department does not publish minimum scores for the GRE, the average GRE scores of students accepted into our program are as follows:

| | Old Format: | New Format: | Percentile: |
|---|---|---|---|
| • Quantitative | 760 | 160 | 81 |
| • Verbal | 565 | 75 | 70 |

### *3.1.3 International Students*

International applicants are required to demonstrate an acceptable level of proficiency in the English language to satisfy the university's requirements for admission to graduate study. All applicants who have not received a bachelor's degree (or higher) from an educational institution in the United States or from one of the exempt countries (Canada, the U.K., the Republic of Ireland, New Zealand, or Australia) are required to submit official IELTS or TOEFL scores in order to be considered for admission.

*IELTS:* There are two types of reading and writing modules: Academic and General Training. Candidates applying for admission to a graduate program at BYU are required take the Academic reading and writing modules of the test. The minimum score for the IELTS is 7.0 with a minimum band score of 6.0 in each module.

*TOEFL*: The TOEFL test measures English language proficiency in reading, listening, writing, and speaking. The test is administered by Educational Testing Service. The TOEFL is only required of applicants from countries where English is not the official language. Information regarding the TOEFL exam is available from the TOEFL Home Page. The minimum TOEFL scores are as follows:

- Computer Based: 237
- Paper Based: 580
- iBT: 85 (min score of 22 in speaking and 21 in listening, reading, and writing)

*Credential Evaluation*: International applicants must also send all marksheets, transcripts, and diplomas for a credential evaluation to one of the following: IERF, and WES. Evaluations should include a course-by-course review. Applicants should request an electronic copy be sent to BYU Graduate Studies.

### *3.1.4 Admission Qualifications for non-ECEN Applicants*

Graduate studies in Electrical and Computer Engineering requires a significant background in a range of technical, mathematical, and scientific subject areas. We welcome applicants from non-ECEN graduates provided that there is sufficient evidence from their transcripts that they have adequate preparation to succeed in our program.

The following programs are considered sufficiently related to ECEN that those with such a degree may apply for ECEN graduate admission without additional coursework preparation:

Any ABET accredited engineering program,
Computer Science, Mathematics, Physics Chemistry, or Statistics.

Those who do not qualify under the above related degree policy may apply for ECEN graduate admission if their transcripts includes graded credit for at least 15 hours from the following list of technical courses:

> Any BYU ECEN 3XX or 4XX course, PHY 121, Math 113, 313, 314, 334,
> CS 3XX or 4XX, or equivalent from another accredited institution
> (where XX indicates any 2 digit number).

All non-ECEN applicants are encouraged to identify in their personal statement an intended general area of specialty for their coursework and thesis or dissertation research, and a list of potential advisors in that area selected from our faculty. The actual research topic will be selected after enrollment under direction of your advisor, but we need enough information in the application to indicate that your study interests align with our faculty expertise. Applications lacking this detail may not be reviewed favorably. It also strengthens an application if prior contact has been made with one or more faculty to explore common research interests, and to lay foundations for selecting an advisor.

Undergraduate prerequisite requirements for non ECEN applicants

In addition to the qualifications listed above, most non-ECEN applicants will, upon enrolment, be required to include some ECEN undergraduate preparatory courses on their approved study lists (programs of study). These courses will be selected by the student's graduate committee and will be based on the applicant's preparation and background. They will cover prerequisite material needed for follow-on graduate courses also on the study list, but since they are not graduate courses these prerequisites will not count toward the degree program credit hour requirements. Even with these required undergraduate prerequisite courses, a student may still find it necessary to seek other self-study learning opportunities to be fully prepared for the graduate courses on his or her program of study.

The study list, including any needed undergraduate prerequisites, is completed under direction of the student's major advisor. Since the official advisor may not be identified until near to end of the first semester of enrolment, it is not possible to provide a prior list of undergraduate courses a non-ECEN applicant should take in advance to satisfy the prerequisites. This depends on the chosen specialty and the ultimate decisions of an advisor. A student may seek prior advice from a faculty member in the intended area of research as to what undergraduate courses would likely be good preparation. However, no commitment of satisfying prerequisites can be made until completion of the study list after enrolment.

## 3.2 Financial Assistance from the Department of Electrical and Computer Engineering

For more information on financial aid at the University level consult the BYU Office of Financial Aid Home Page.

The department provides as much financial assistance to graduate students as is available within departmental and university guidelines, with ***all awards granted on a competitive basis***. Applicants may indicate their desire to be considered for financial assistance by checking the box on the University application form. Types of aid available include:

- *Tuition Awards*: The department offers a limited number of full and partial tuition awards on a competitive basis. PhD students receive priority for tuition awards.
- *Teaching Assistantships:* The department employs a limited number of teaching assistanceships to well-qualified graduate students. Duties include helping with labs, mentoring, recitations, and grading for undergraduate courses. Teaching assistants are paid on an hourly basis and must

apply at the beginning of each semester. You may apply for a TA position if you have been unsuccessful in arranging paid RA support from a faculty advisor.

- *Research Assistantships*: Graduate students may be awarded research assistantships by individual faculty members to assist them with externally funded research. If you desire a research assistantship you must make arrangements with faculty members.
- *Fellowships*: The department awards a limited number of research fellowships to graduate students engaged in productive research under the advisement of a faculty.

## 3.3 Graduate Academic Standard

### *3.3.1 Bi-Annual Reviews of Graduate Students*

Your performance as a graduate student will be evaluated twice a year. The first evaluation occurs in January after fall semester grades have posted. The second evaluation occurs in July after winter and spring grades are posted. The evaluation will be based on:

1. Timely submission of the Program of Study ("study list") *during the first semester of enrollment*.
2. Previous semester grades.
3. Acceptability of the Program of Study GPA.
4. Timely completion of and performance on the PhD examinations (PhD only).
5. Progress toward completion of the degree.
6. Attend at least two graduate seminars each semester.

The result of the evaluation is a rating chosen from the following possibilities:

**S** **Satisfactory**: This is self explanatory.

**S/W** **Satisfactory with Warning:** You need to improve in some area. Failure to comply by the next bi-annual review will result in a marginal or unsatisfactory rating.

**M** **Marginal**: Your performance is less than satisfactory and you need to improve in some area. Failure to change your status to satisfactory by the next bi-annual review will result in termination of your graduate program.

**U** **Unsatisfactory**: Your performance is clearly substandard. There are corrective measures you need to take. Failure to change your status to satisfactory by the next bi-annual review will result in termination of your graduate program.

In the event you receive an **S/W, M** or **U** rating, you will be informed by letter from the department. The letter will indicate the reason for the low rating and an invitation to comply with a set of stated conditions for remaining in the program. Two consecutive ratings of marginal or unsatisfactory *will* result in the automatic termination of your graduate program.

### *3.3.2 Grade Point Average (GPA) Requirements*

Graduate students whose graduate (program of study) GPA falls below 3.0 will not be allowed to graduate and may be dismissed from their graduate programs. No D credit may apply toward a graduate degree. In addition, sub-standard grades in courses not on the program of study may be used by the department graduate committee to evaluate your standing. A graduate student that receives a C grade or a semester GPA below 3.0 will be rated marginal even if the program of study GPA is above a 3.0.

Students that receive a D grade in any class on the program of study or whose program of study GPA falls below 3.0 will be rated unsatisfactory. Further, the study list is now invalid and the student must meet with their committee to discuss possibilities for continuing graduate work. Possible outcomes of this meeting include termination of the student's graduate program, formation of a new study list, or the student may be required to retake the course

## 3.4 Department Graduate Program Registration Information

The official University Registration Policies are available from the University Home Page. Policies regarding minimum registration requirements are repeated here for convenience. You should carefully plan your graduate studies to ensure that you do not violate these policies.

*U.S. Students, Semester or Term*: U.S. graduate students are required to register for at least 2 credit hours during any semester or term in which they use any university facilities, consult with faculty, or take comprehensive or oral examinations. The number of graduate credit hours for which they register must, in the judgment of the faculty advisor, accurately reflect the student's involvement in graduate study and use of university resources such as libraries, laboratories, and computer facilities. In no case will the registration be for fewer than 2 credit hours per semester.

*U.S. Students, Academic Year*: To retain active status and to qualify for subsequent registration, graduate students *must register for at least 6 semester hours each school year* and receive acceptable grades (no D, E, UW, NS, or I grades are allowed, nor are audits or correspondence courses). Students who do not fulfill this yearly requirement are dropped from their graduate programs, lose their graduate status, and must apply for readmission if they wish to continue.

*International Students*: International students must normally register for at least 9 semester hours each fall and each winter semester to fulfill U.S. Immigration and Naturalization Service requirements. When a student nears completion of his/her program and only has 1-2 classes or thesis work left to complete, it is possible to register for fewer than 9 credits and still be considered full-time. To do this, a petition must be filed by the department on behalf of the student and submitted to the International Services office. If you fall in this category, see the department graduate secretary to file the necessary petition. Other questions should be directed to International Services (1351 WSC, Brigham Young University, Provo, UT 84602, telephone [801] 422-2695).

*Final Semester Registration*: Before applying for graduation, a graduate student should have completed all course work on his or her approved program of study or be currently registered for the remaining requirements. During the final semester of the graduate program, a graduate student must register for at least 2 semester hours of credit. Audit and independent study credits do not count.

# 4 Graduate Advisory Committees and Programs of Study

All graduate students within the Electrical and Computer Engineering Department must form a graduate advisory committee and submit an approved program of study, as discussed below.

## 4.1 Graduate Advisory Committee

*Faculty Advisor*: You must select an advisor who will assume the primary role of advisement during your graduate residency and will monitor your research efforts. This advisor *must*:

1. Be selected during first semester of graduate residency
2. Be from major department
3. Be a member of the graduate faculty
4. Serve as chair of your graduate advisory committee

At the time of your first arrival on campus, and if you have not made prior arrangements with a faculty member to server as your advisor, the department graduate coordinator will assign you a temporary advisor. He will assist you in selecting appropriate courses during your first semester, and guide you in selecting an advisor and forming your graduate advisory committee. By the end of your first semester you must make arrangements with a permanent advisor and submit your Program of Study form.

*Advisory Committee*: Master's and Doctoral advisory committees consist of a minimum of three and five members, respectively, including the Faculty Advisor. All committee members must have graduate faculty status. All committee members share in the responsibility for advisement concerning program of study, degree requirements, research, comprehensive and qualifying examinations, and final oral examinations. The individual contribution of your committee members may vary by kind, effort, and intensity, and the most active role is assumed by the committee chair (faculty advisor).

In consultation with your Faculty Advisor, you should select additional faculty members for your committee whose areas of expertise match closely with the emphasis of your research. You must ask these individuals if they are willing to serve on your committee. These committee members will be formally entered into the University records following approval by the departmental graduate committee when your initial Program of Study (with their signatures) has been submitted and approved. For an MS, at least two members of the committee (including advisor) must be from the ECEn Department. For a PhD, at least three members of the committee (including advisor) must be from the ECEn Department.

*Course Work MS Degree*: For students completing a Course Work MS Degree, members of the department graduate committee will be assigned by the department to serve as the graduate advisory committee. The department graduate coordinator will serve as the committee chair.

*Changing Committee Members*: If you desire to change your focus to an area where a different faculty member would be a more appropriate advisor, a change of advisor may be accomplished. It may also be necessary to change the committee composition. These changes can be accomplished using the *Request for Change of Program of Study Form for MS Degree* or *Request for Change of Program of Study Form for PhD Degree*. If you already have an approved program of study and the new committee does not require changes to the program of study courses, then no course information must be included on this form. The full new committee must sign the change form.

## 4.2 Program of Study

The *Graduate Program of Study* or "study list" is an approved course of study for your degree. Each degree program has specific course requirements that must be followed. Specific choices of courses to

satisfy these requirements should be made in consultation with your advisor and graduate advisory committee. The study list forms should be completed, signed by your entire graduate advisory committee, and submitted to the graduate secretary in the department office 459 CB. All submitted study lists will be reviewed by the department graduate committee for final approval. Once approved and entered into the University computer database you will be able to view your program of study on line in your graduate progress report. Unapproved lists will be returned to you.

*Prerequisite Undergraduate Degree*: Students who do not have a BS in Electrical and Computer Engineering, or who's ECE BS degree provides inadequate preparation for their chosen area of specialty, may be required to take prerequisite classes before pursuing graduate courses as outlined in the Admissions section of this document. These courses will not count toward the credit hours required for the graduate degree, but may be included formally as part of the program of study as determined by the graduate advisory committee.

### *4.2.1 MS Program of Study*

The *MS Program of Study* must be submitted during the **first semester** of graduate study. Failure to submit an approved study list on time will result in an unsatisfactory progress rating from the department and a hold placed on your registration privileges.

The Master's degree implies a rigorous theoretical foundation, a mastery of a body of knowledge in a well-defined focus, and an understanding of fundamental concepts in a breadth of topics.

*Thesis Option*: A minimum of 32 total credit hours satisfying the following:

1. 6 credit hours of ECEn 699R: Master's Thesis
2. 2 credit hours of ECEn 692: Professional writing.
3. A minimum of 12 additional graduate credit hours from Electrical and Computer Engineering .
4. Remaining credit hours from graduate courses in ECEn or related disciplines, subject to approval by the graduate committee.

*Course Work Option*: A minimum of 32 total credit hours satisfying the following:

1. 2 credit hours of ECEn 692: Professional writing.
2. A minimum of 18 additional graduate credit hours from Electrical and Computer Engineering.
3. Remaining credit hours from graduate courses in ECEn or related disciplines, subject to approval by the graduate committee.

A good program of study will include both depth and breadth. As you choose courses, you should choose a sufficient number of courses in your research area to allow you to develop expertise in your field. However, you are also encouraged to take 1-2 classes outside of your area of emphasis to facilitate greater understanding of the discipline as a whole.

*Changes to Program of Study*: Changes to the study list can be performed using the *Request for Change of Program of Study Form for MS Degree*. This form must be completed, signed by your graduate advisory committee, and submitted to the graduate secretary in the department office 459 CB for departmental graduate committee review. You must attach a program of study form which indicates the new program of study.

### *4.2.2 PhD Program of Study*

The *PhD Program of Study* must be submitted during the **first semester** of graduate study. Failure to comply will result in an unsatisfactory progress rating from the department and a registration hold.

The *Program of Study Form for the PhD Degree* should be completed, signed by the entire graduate advisory committee, and submitted to the graduate secretary in the department office 459 CB. The Program of Study should satisfy the following requirements:

*For students entering with a BS degree*: A minimum of 56 total credit hours beyond the Baccalaureate degree:

1. 18 credit hours of ECEn 799R: Doctoral Dissertation.
2. 2 credit hours of ECEn 692: Professional writing.
3. 36 credit hours of graduate *Specialization courses* as determined in consultation with your advisory committee and the graduate committee.

*For students entering with an MS degree*: A minimum of 38 total credit hours beyond the Master's degree:

1. 18 credit hours of ECEn 799R: Doctoral Dissertation.
2. 2 credit hours of ECEn 692: Professional writing.
3. 18 credit hours of graduate *Specialization courses* as determined in consultation with your advisory committee and the graduate committee

*For students entering with an MS degree from BYU*: A minimum of 30 total credit hours beyond the Master's degree:

1. 18 credit hours of ECEn 799R: Doctoral Dissertation
2. 12 credit hours of graduate *Specialization courses* as determined in consultation with your advisory committee and the graduate committee.

*Changes to Program of Study*: Changes to the study list can be performed using the *Request for Change of Program of Study Form for PhD Degree*. This form must be completed, signed by the graduate committee, and submitted to the graduate secretary in the department office 459 CB for departmental graduate committee review. You must attach a program of study form which indicates the new program of study

# 5 Doctor of Philosophy (PhD) Degree: Competency Exam, Qualifying Exam, and Advancement to Candidacy

In addition to the requirements outlined in this document, doctoral students must pass certain examinations as part of their progress toward their degree. This section outlines these examinations as well as the process for advancing to doctoral candidacy.

## 5.1 The PhD Competency Exam

The purpose of the PhD Competency exam is to test your understanding of fundamental principles in your chosen area of study. The exam consists of three 30 minute oral interviews with members of the ECEn faculty. The exam will focus on material from your study list courses which you have already taken, from undergraduate prerequisite courses, and from your prior MS program (if any).

The exam will be administered each Fall and Winter semester as posted by the Department. Students who enter the PhD program with an ECEn MS degree must take the exam the semester immediately following completion of three technical courses from their PhD study list, but no later than the 4th semester of enrollment. Those who enter without an ECEn MS degree must take the exam the semester immediately following completion of six technical courses from their PhD study list, but no later than the 6th semester of enrollment.

Each examiner will grade your performance, and a pass/fail decision on the entire exam will be made by the faculty. If you fail the competency exam you must retake it the next time that it is offered. Failure to pass the exam the second time it is taken will result in dismissal from the PhD program.

## 5.2 The PhD Qualifying Examination

The PhD Qualifying Examination assesses your ability to conduct independent research and complete your PhD dissertation. This examination should take place no later than your *third* year of graduate study. The procedure for taking this exam is outlined in the following steps:

1. The student must have previously completed the Ph.D. competency exam.
2. The form “Scheduling of Oral Qualifying Examination and Prospectus Defense” must be submitted with an attached copy of the prospectus to the graduate secretary 14 days prior to the scheduled exam date. This document must be signed by all advisory committee members to acknowledge acceptance of the scheduled date and receipt of a printed copy of the prospectus.
3. The student's program of study must be up to date and approved by the committee at the time of scheduling.
4. The student is responsible for scheduling the examination room for a two-hour time block.
5. Oral presentation of the prospectus should be limited to 30 minutes (barring questions). The entire exam, including presentations and question and answer periods, should take approximately one hour.
6. Following the exam, a vote is held to determine whether or not you have passed the oral examination.

The written prospectus and oral presentation will be graded based on the following criteria:

1. *A substantial written prospectus*. This serves to document current progress and future plans, and allows the committee to assess the student's ability to write at the Ph.D. level. Content may be drawn in part from the student's existing conference or journal papers, but must address requirements 2-6 below.
2. *Problem statement and literature review.* The problem being addressed by the thesis should be clearly explained. The current literature that is relevant to the problem should be surveyed so that the research plan is placed in the context of existing results.

3. *A clear and detailed plan for future research.* This plan must establish a research approach likely to lead to a successful dissertation. The target topic, research goals, and proposed methodologies must be thoroughly and convincingly presented.
4. *Evidence of progress in the proposed research plan.* Preliminary results are most convincing here. It is not expected that all, or even most of the proposed research goals will have been met, but the preliminary work should build confidence that the chosen topic is viable and that the student is capable.
5. *Evidence that the work will be publishable*. Papers on preliminary work that have been peer reviewed and accepted for publication are most convincing. Papers currently in review, or accepted conference papers with less than full paper review provide some evidence. A case should also be presented that future work will lead to important novel contributions that will likely be published.
6. *Evidence that the student can think, present, write, and respond to questioning at a Ph.D. level*.

## 5.3 Advancement to Candidacy

Advancement to Candidacy is an important step in your progress toward the PhD degree. You will be advanced to Candidacy based on the following criteria:

1. The grades you have received in your graduate courses (i.e. the Program of Study GPA).
2. Your performance on the PhD Competency Exam.
3. Your performance on the PhD Qualifying Exam.
4. Recommendation of your graduate advisory committee.

# 6 Theses, Dissertations, and Graduation

## 6.1 MS Thesis Preparation

The master's thesis should display original work suitable for publication but its scope and depth are not as great as those of the PhD dissertation. Format and style guidelines are available under the Minimum Standards for Dissertations and Theses section below.

## 6.2 PhD Dissertation Preparation

Preparation of your Doctoral dissertation should be completed under the close supervision of your advisor and committee. Format and style guidelines are available under the Minimum Standards for Dissertations and Theses section below.

The PhD dissertation represents a serious scholarly work that must be a contribution to knowledge. Given the breadth of the discipline, there is a wide range of acceptable dissertations. Some general guidelines, however, may be of value in ascertaining the appropriateness of a proposed dissertation.

1. Excerpts from the dissertation should be publishable in a peer-reviewed archival journal. While actual acceptance for publication is not a criterion for acceptance of the dissertation, it is anticipated that all students will submit materials from their dissertation for publication to appropriate journals. Acceptance of papers in journals or by technical conferences may constitute external evidence of quality research work, and will strengthen claims of originality and significance of results. Publications in popular and trade journals, however, are not considered evidence of academic contributions.
2. The research should be pursued to a successful conclusion. Research that ends in the failure to achieve meaningful goals will usually be considered inadequate for satisfying the dissertation requirements. Though a student may follow the methods outlined in the prospectus, if the results are disappointing, the research may not be found acceptable. This is one of the risks of doing research. All decisions regarding the acceptability of negative results, however, ultimately lie with your doctoral committee.
3. You must be able to identify specific contributions of the research, which should be explicitly stated in the dissertation. Tutorial efforts, product development, applications software, etc., though perhaps indispensable to the research, are not, by themselves, adequate contributions. New theoretical developments, experimental results and conclusions, generalizations, new viewpoints, etc., are examples of contributions to knowledge.
4. The commercial or industrial benefit of the work is considered incidental to the academic value of the research, and has no bearing on the acceptability of the dissertation. The patentability of any research result does not constitute evidence of its acceptability for fulfilling the dissertation requirements.

## 6.3 Thesis or Dissertation Submission and Scheduling the Final Oral Examination

When your advisor agrees that your PhD dissertation or MS thesis is complete, you should submit the manuscript to your committee by providing each of them with a hard copy. *After* your committee has reviewed your manuscript, you may invite them to sign the *Department Scheduling of Final Oral Examination* (ADV Form 8c). The defense oral examination cannot be scheduled for a date any sooner than two weeks after completing and submitting ADV Form 8c.

It is the student's responsibility to communicate in advance with each advisory committee member to determine how much time the member will require to review the thesis or dissertation before being

prepared to sign ADV Form 8c and schedule the examination. This advance time requirement is the prerogative of the committee member, and can vary between faculty members and from student to student. However, it should not be more than two weeks. If you do not allow a faculty member his or her requested time for review, you could receive an unfavorable review and/or your graduation may need to be delayed a semester.

If during the review period, any committee member feels the document needs further work before a defense can be scheduled, you will need to work with him or her and your advisor to address the concerns. The following steps should be followed in sequence for scheduling your final oral exam:

1. Communicate with each advisory committee member to determine how much time they will each need to review your thesis or dissertation.
2. Apply for graduation. You will not be allowed to schedule your examination until this step has been completed.
3. Provide each advisory committee member with a complete draft of your thesis or dissertation. This must be done with enough advance time prior to obtaining scheduling form signatures (step 5) that each committee member will be allowed their requested time period for review.
4. Communicate with your advisory committee to determine a time when all are available for the final defense. Given the busy schedules of faculty members, this step can take some time and effort. It is appropriate to begin gathering available time window information from them as soon as you give them the manuscript for review, but no firm date should be fixed until the end of the committee review, and only if all committee members have approved the thesis.
5. Fill in the agreed upon date and time of the exam on the *Departmental Scheduling of Final Oral Examination* form. Obtain the necessary signatures from your graduate advisory committee.
6. Turn the *Departmental Scheduling of Final Oral Examination* form to the graduate secretary into the department office (459 CB). This scheduling form *must* be submitted at least two weeks prior to your final oral examination. The information will be entered into the University data base on the date submitted. This schedules your defense with the University.
7. Submit a hardcopy of your complete manuscript to the department by turning it in to the graduate secretary in 459 CB along with your *Departmental Scheduling of Final Oral Examination* form. This copy of your manuscript must adhere to the standards set by the university and college and include all required university pages. See Section 0 for more information about manuscript standards.

*Scheduling Requirements*

1. The final exam must take place at least **two weeks** after the date scheduling form (ADV 8c) is signed by the full committee *and* a copy of the manuscript is placed with the department. The final oral exam must take place no later than the published university deadline for such exams in the semester of graduation.
2. Calendars available from the *Resources* link on the Graduate Studies Home Page provide the deadline for taking the exam to allow graduation in a given semester or term.
3. No examinations can be held during interim periods between semesters.

## 6.4 Final Oral Examination

The Final Oral Examination (or "defense") is open to the public. During this examination, you will present to the faculty committee and public attendees a summary of your research work. You should

consult with your advisor in preparing this presentation to ensure it is appropriate in length and scope. We recommend the following general outline for the presentation:

1. Problem statement and motivation for topic
2. Background including other approaches
3. Approach to the problem solution
4. Discussion of the results, comparing to results from existing approaches when applicable
5. Summarize contributions
6. Discussion including limitations, applications, possible extensions, conclusions

At the conclusion of your presentation, the public will be excused and your committee may explore with you any technical issues, clarifications, or possible additional requirements. The committee will then excuse you and vote for one of the following options:

1. Pass.
2. Qualified pass – you must complete minor revisions specified by the committee, who upon completion will send a written approval to the Graduate School.
3. Recess – you must retake the defense from the same committee no sooner than one month later. Only one recess will be granted to a candidate.
4. Fail – the graduate degree program of the student is terminated.

## 6.5 Filing Manuscript for Binding

After appropriate revisions of the manuscript, complete the following:

1. Make sure your manuscript adheres to the published standards (Minimum Standards for Dissertations and Theses).
2. Create a PDF file of your thesis that satisfies the requirements for electronic submission as outlined on the ETD Home Page.
3. An *Approval for Final Dissertation, Thesis, or Selected Project (ADV Form 8d)* must be completed and signed by all committee members, the graduate coordinator, and the college dean. To obtain the graduate coordinator and Dean's signature, turn in your completed thesis/dissertation to the department graduate secretary. Your thesis/dissertation must be pre-approved by the department graduate secretary before it is sent to the dean of the college. This process requires a minimum of 48 hours.
4. After the department graduate secretary has obtained the college dean's signature, submit your thesis electronically per the instructions on the Office of Graduates Studies website gradstudies.byu.edu..You should receive an email confirmation indicating department and college approval. You will be required to pay for printing and binding fee at the time of final submission to cover the cost of printing and binding copies for your advisor, the department, and any personal copies you want.
5. Submit the signed ADV Form 8d to the office of Graduate Studies. Deadlines for submission to enable graduation in a given semester or term are posted in the University Calendar.

In rare circumstances, the University permits a student to have his or her thesis/dissertation secured for a designated period of time. What this means is that the thesis is bound and secured; it is not catalogued or placed on the University shelves until after the designated period of time has elapsed. These cases are exceptions to policy and are permitted only in extenuating circumstances (e.g., pending patent, sensitive subject, etc.).

The following procedure should be used in securing theses and dissertations:

6. Complete the Request to Secure Theses and Dissertations Form available from the *Forms* section of the Graduate Studies Home Page and submit the completed form to the Office of Graduate Studies. The petition is reviewed. If approved, submit the thesis with the accompanying form to the HBLL..
7. Theses and dissertations are secured by the Office of Graduate Studies until the date of their release, at which time they are released to the library for cataloging.

If the thesis or dissertation is submitted to the library without the accompanying approved form, it will not be secured – the ETD will be released immediately. Retroactive approval is not possible.

## 6.6 Application for Graduation

Early in the semester in which you plan to graduate you must complete a *Graduation Application* form (see the Graduate Studies Home Page to obtain this form). This form should be submitted directly to the departmental graduate secretary (there is no fee associated with the application for graduation).

Once this form is received and reviewed by the Office of Graduate Studies, a status report will be issued and you will be notified of any deficiencies in your graduate requirements. This application is necessary for you to be included on the official graduation list. It is wise to submit this form even if there is the possibility of a delay in your graduation. If you do not graduate during the semester in which you intended, you will need to complete a new graduation application and reapply for your new intended graduation date.

A *current* ecclesiastical endorsement at the time of graduation is a graduation requirement. If you are not on campus at the time of graduation, you are still required to have a current ecclesiastical endorsement to graduate.

## 6.7 Minimum Standards for Dissertations and Theses

Requirements regarding the format of theses and dissertations have been created to ensure uniformity and continuity of style. The University standards can be obtained from the *Resources* link available from the Graduate Studies Home Page. Copyright information can be obtained from the same site.

Additional dissertation and thesis standards are imposed by the Ira Fulton College of Engineering and Technology. Details on theses standards along with standard templates can be found at the following college link (http://www.et.byu.edu/current-students/node/800). Additional information for Latex users can be found on the department graduate page.

# 7 Web Links

Additional information can be obtained from the following URLs:

**Electrical and Computer Engineering Department**

| | |
|---|---|
| Home Page | http://www.ee.byu.edu |
| Graduate Home Page | http://www.ee.byu.edu/grad/ |
| Graduate Secretary Email | grad@ee.byu.edu |

**Brigham Young University**

| | |
|---|---|
| Home Page | http://www.byu.edu |
| Graduate Studies Home Page | http://www.byu.edu/gradstudies/ |
| On-Line Graduate Application | http://www.byu.edu/gradstudies/admissions/onlineapp.php |
| Financial Aid Home Page | http://financialaid.byu.edu/ |
| Electronic Thesis and Dissertation Page | http://www.etd.byu.edu |

**Other Resources**

| | |
|---|---|
| GRE Home Page | http://www.gre.org |
| TOEFL Home Page | http://www.toefl.org |