

Department of Electrical and Computer Engineering

Graduate Program Guidelines

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1. INTRODUCTION

University requirements for graduate degrees are given in the University of Idaho General Catalog. While these requirements are quite specific in many instances, individual departments retain considerable discretion with respect to their interpretation and implementation. The purpose of the "Graduate Program Guidelines for the Department of Electrical and Computer Engineering" is to summarize and document policies and procedures followed in implementing the requirements of the General Catalog. These guidelines are intended for use by faculty, graduate students, and prospective graduate students in planning and executing graduate study programs in electrical engineering or computer engineering.

Additional information on the graduate program in electrical engineering and computer engineering may be obtained from the web at <http://www.ece.uidaho.edu>, or by contacting either of the following:

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2. GRADUATE DEGREES OFFERED

The Department of Electrical and Computer Engineering offers three graduate degrees in electrical engineering: Master of Engineering (MEngrEE), Master of Science (MSEE), and Doctor of Philosophy (PhDEE) and two graduate degrees in computer engineering: Master of Engineering (MECompE) and Master of Science (MSCompE). The Master of Engineering degree is a non-thesis degree. Students whose work experience is such that additional course work is more beneficial to them than the master's thesis frequently seek it. The master's degree requires a combination of course and thesis work and is most frequently sought by on-campus students. Most students take six credits of thesis work for the master's degree. The PhDEE degree is awarded for high achievement in scholarly and research activity.

3. ADMISSION REQUIREMENTS

Electrical Engineering	Computer Engineering																										
Regular enrollment may be granted by the graduate dean to a student who has a bachelor's degree in electrical engineering from an accredited institution and has an undergraduate grade point average (GPA) of 3.0 or higher. Students with a bachelor's degree from an unaccredited institution or from a non-engineering school must submit scores from the general portion of the Graduate Record Examination. Foreign students must have: 1) a TOEFL score of at least 79 (Internet or iBT version) or 550 (old written test) 2) a minimum quantitative reasoning score of 71%, a minimum verbal reasoning score of 50% and a 4.0 or higher analytical essay score on the GRE. Additional requirements for admission to the PhD program are given in Section 5.	Regular enrollment may be granted by the graduate dean to a student who has a bachelor's degree in computer engineering from an accredited institution and has an undergraduate grade point average (GPA) of 3.0 or higher. Students with a bachelor's degree from an unaccredited institution or from a non-engineering school must submit scores from the general portion of the Graduate Record Examination. Foreign students must have: 1) a TOEFL score of at least 79 (Internet or iBT version) or 550 (old written test) and 2) a minimum quantitative reasoning score of 71%, a minimum verbal reasoning score of 50% and a 4.0 or higher analytical essay score on the GRE.																										
Partial enrollment in the graduate program may be granted to electrical engineering seniors with a GPA of 2.8 or higher. (This will be raised to 3.0 or higher by Fall Semester 2010.)	Partial enrollment in the graduate program may be granted to computer engineering seniors with a GPA of 2.8 or higher. (This will be raised to 3.0 or higher by Fall Semester 2010.)																										
Students who are not BSEE graduates may be admitted to the graduate program if they meet the following minimum requirements: 1. Bachelor degree in any engineering discipline or in a supporting area of study such as mathematics or physics. 2. Demonstrated proficiency in the foundation areas of electrical engineering emphasized in the undergraduate curriculum. The basic areas and the courses whose passage demonstrate proficiency in those areas are listed below and are described in the University's General Catalog which is available on the university web page. <table> <tr> <th><u>Area</u></th><th><u>Courses</u></th></tr> <tr> <td>Circuits</td><td>ECE 210, 211, 212, 213</td></tr> <tr> <td>Chemistry</td><td>CHEM 111</td></tr> <tr> <td>Computer Science</td><td>CS 120</td></tr> <tr> <td>English</td><td>ENGL 102</td></tr> <tr> <td>Engineering Science</td><td>ENGR 210 & ENGR 220</td></tr> <tr> <td>Mathematics</td><td>MATH 310 & 330</td></tr> </table>	<u>Area</u>	<u>Courses</u>	Circuits	ECE 210, 211, 212, 213	Chemistry	CHEM 111	Computer Science	CS 120	English	ENGL 102	Engineering Science	ENGR 210 & ENGR 220	Mathematics	MATH 310 & 330	Students who are not BSCompE graduates may be admitted to the graduate program if they meet the following minimum requirements: 1. Bachelor's degree in electrical engineering, computer science, or another engineering discipline or in a supporting area of study such as mathematics or physics. 2. Demonstrated proficiency in the foundation areas of computer engineering emphasized in the undergraduate curriculum. The basic areas and the courses whose passage demonstrates proficiency in those areas are listed below and are described in the University's General Catalog which is available on the university web page. <table> <tr> <th><u>Area</u></th><th><u>Courses</u></th></tr> <tr> <td>Electronics</td><td>ECE 310, 311</td></tr> <tr> <td>Chemistry</td><td>CHEM 111</td></tr> <tr> <td>Computer Engineering</td><td>ECE 240, 241</td></tr> <tr> <td>Computer Science</td><td>CS 121</td></tr> <tr> <td>Mathematics</td><td>MATH 175, 176, 310</td></tr> </table>	<u>Area</u>	<u>Courses</u>	Electronics	ECE 310, 311	Chemistry	CHEM 111	Computer Engineering	ECE 240, 241	Computer Science	CS 121	Mathematics	MATH 175, 176, 310
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Physics Statistics PHYS 211, 212 STAT 301 3. Demonstrated proficiency in at least three of the following junior level background study courses: ECE 319 Electronics (lab not required) ECE 329 Electrical Machines (lab not required) ECE 339 Electromagnetic Theory ECE 349 Digital Computer Fundamentals ECE 359 Signals and Systems Analysis 4. Two 400's level courses as prescribed by the student's committee.	Physics Statistics PHYS 211, 212 STAT 301 3. At least two advanced courses in electrical engineering, computer engineering, or computer science. Students with undergraduate course deficiencies in any of the foundation areas of computer engineering must remove these deficiencies either prior to admission or in the first three semesters of graduate work. Such deficiency courses cannot be used for graduate credit.
With respect to making up deficiencies, the prospective student should be aware that: 1. While it is possible to take a required 300-level course without formally completing the course prerequisites, the student may wish to take some, or all, of the prerequisites to help ensure success in the required course. 2. It may be possible to substitute a vertically related 400-level course for a required 300-level course. For example: ECE 470 instead of ECE 359 or ECE 440 instead of ECE 349. 3. Deficiency courses do not satisfy any part of the credit requirements for a graduate degree. 4. Prospective students must finish all deficiency course work prior to graduate admission.	

4. DEGREE PROCEDURES

The procedural steps required in the master's and doctor's programs are summarized below. These tables have been adapted from the General Catalog and modified to reflect procedures followed in the Department of Electrical and Computer Engineering. For more detailed information please refer to the General Catalog.

REQUIREMENTS FOR A MASTER'S DEGREE (Adapted from the University's General Catalog)

STEP	PROCEDURE	TIME ELEMENT
Admission to the College of Graduate Studies	Contact the department office and Graduate Admissions Office.	At least three months before intended registration.
Appointment of major professor and committee	Prepared by student. File form, Appointment of Major Professor and/or Committee Form. Approval by major professor (and committee), departmental administrator, and graduate dean required. If a change is made, file form "Committee Change Form."	During first semester and whenever a change is needed.
Study Plan	Prepared by student, major professor and committee. Student creates form online in Vandal Web. Approval by major professor, departmental administrator, and graduate dean required and is done online.	Will not be processed unless the Appointment of Major Professor and/or Committee Form for the master's degree have/has been approved by the graduate dean.

	If a change is made, student does this online in the degree audit planner.	
Graduate Handbook for Theses & Dissertation	Student picks up from graduate college web page.	Shortly into your program to assist in preparation of your thesis.
Application for Degree (commencement excuse)	Student and major professor certify requirements completed or will do so by completion of current registration. Student applies online for graduation at the Registrar's website. You must notify graduate dean if you will not be participating in commencement.	Completed the semester prior to the one the student intends to graduate. Date appears in the graduation page of the Registrar's website.
Final Semester Registration	M.S. students must register for thesis credit during the semester of expected defense. M.E. students must register for non-research credit (ECE 599) during the semester of expected defense or completion of non-thesis requirements.	Date appears in the academic calendar on the Registrar's website.
Request to Proceed with Final Defense of Thesis	Students request this form from the graduate college. Form requires major professor and committee members' signatures. Students return form to graduate college before defense of thesis.	When ready to defend thesis.
Final Defense Report (for M.S. degree)	Issued by the graduate college upon receipt of the Request to Proceed with Final Defense form.	To be taken to final defense for completion and returned to graduate college following defense. Due date for results appears in the academic calendar on the Registrar's website.
Non-thesis Requirement (for M. Engr. Degree)	Major professor files forms, Non-thesis Requirement with graduate college and Report of Comprehensive Examinations with department.	After completion of most of degree requirements. Due date for results appears in the academic calendar on the Registrar's website.

REQUIREMENTS FOR A DOCTORAL DEGREE
(Adapted from the University's General Catalog)

STEP	PROCEDURE	TIME ELEMENT
Admission to the Graduate College	Contact the department office and the Graduate Admissions Office.	At least three months before intended registration.
Appointment of Major Professor and Committee.	Approval by departmental administrator and graduate dean is required. File form, Appointment of Major Professor and/or Committee Form. If a change is made, file form, Committee Change Form.	During first semester and whenever a change is needed.
Study Plan	Prepared by student and major professor. Student creates form online in Vandal Web. If a change is made, student does this online in the degree audit planner. Approved by graduate dean.	Will not be processed unless Appointment of Major Professor and/or Committee Form have/has been approved by the graduate dean.
Graduate Handbook for Theses & Dissertation	Student picks up from graduate college web page.	Shortly into your program to assist in preparation of your thesis.
Preliminary Examination	Time and place set by major professor.	When majority of courses on study plan are completed.
Advancement to Candidacy	Major professor certifies all requirements for advancement to candidacy have been	Immediately after successful completion of preliminary examination.

	met; file form, Report of Preliminary Examination and Advancement to Candidacy.	
Application for Degree (commencement excuse)	Student and major professor certify requirements completed or will do so by completion of current registration. Student applies online at the Registrar's website. You must notify graduate dean if you will not be participating in commencement.	Date appears on the graduation page of the Registrar's website.
Final Semester Registration	Student must register for dissertation credit during the semester of expected defense.	Date appears in the academic calendar of the Registrar's website.
Request to Proceed with Dissertation	Student will present the graduate college with the form by this name signed by the committee.	Must be filed with the Request to Proceed with Final Defense form of graduate college at least 10 working days before the scheduled defense.
Final Defense Report	Issued by the graduate college on receipt of the Request to Proceed with Final Defense.	To be taken to final defense for completion and returned to the graduate college following the defense. Due date for results appears in the academic calendar on the Registrar's website.

5. DEGREE REQUIREMENTS

Each student is required to prepare a study plan during his or her first semester in the program. The study plan is generally organized around one major, and two minor areas of study to provide depth and breadth is required for EE and optional for computer engineering. The major area normally encompasses about half, or more, of the student's course work, while each minor area includes about a quarter of the course work. The major and minor areas currently recognized by the department are: 1) Electronics, 2) Power, 3) Electromagnetics, 4) Digital, 5) Systems, and 6) Semiconductor Devices. In certain cases other minor specialty areas may be specified by the committee.

Students interested in entering the Ph.D. program are expected to have completed a master's program in engineering first. Exceptional cases will be considered for admission directly into the Ph.D. program.

Note that lower division and 300 level courses will not be given graduate credit or accepted toward any of the graduate degrees described below. Also, please see the specific degree requirements listed in the University's General Catalog.

5.1 Master of Engineering: The M.Engr. degree is a non-thesis degree requiring 30 credits of course work beyond an approved bachelor's degree. With the assistance of their major professor, students prepare their own program as soon as possible during their first semester and submit it to the faculty members for approval. To be approved, programs must satisfy both the university requirements governing the M.E. degree and the department requirements. At least 18 of the required 30 credits must be in courses numbered 500 and above. Three or more electrical engineering courses numbered above 500 in a given area for depth and at least one course in each of two areas (outside the areas selected for depth) to provide breadth are required. Enrollment in ECE 591 Electrical Engineering Research Colloquium, during each semester of on-campus enrollment, is also required. Students must contact the ECE 591 instructor if they have a time conflict with this course.

In addition to the formal course requirements, the non-thesis ME degree requires a professional quality technical presentation and oral examination. The presentation audience will include the student's supervisory committee, other interested faculty and students.

The supervisory committee will consist of the major professor and a minimum of two additional faculty members, at least one of which must also be from the Department of Electrical and Computer Engineering. For computer engineering students, the department requires that at least one of the three committee members be from the Department of Computer Science and one be from the Department of Electrical and Computer Engineering. The

committee may also conduct an oral examination on topics relevant to the ME degree, as the committee deems appropriate.

The subject matter for the presentation must be a technical topic relevant to the student's course of study and must be approved by the major professor. A literature search and bibliography are required, as part of the preparation for the presentation, and a brief written summary plus the bibliography must be submitted to the major professor for review prior to the presentation. Appropriate technical topics for the presentation may be suggested by the student's course work, such as exploring a course topic in greater depth than was covered in class, or investigating a related topic in the literature.

5.2 Master of Science: The M.S. degree requires 30 credits beyond an approved bachelor's degree (six credits are usually taken in ECE 500, Master's Research and Thesis). At least 24 credits of course work must be taken in addition to thesis credits and 18 of the required 30 credits must be in courses numbered 500 and above (including the six credits of ECE 500, Master's Research and Thesis). Two or more electrical engineering courses numbered above 500 in a given area for depth and at least one course in each of two areas (outside the areas selected for depth) to provide breadth are required. Enrollment in ECE 591 Electrical Engineering Research Colloquium, during each semester of on-campus enrollment is also required. No written final exam is required for the M.S. degree. However, an oral examination covering the student's course work is frequently an integral part of the student's thesis presentation. One copy of the final master's thesis must be supplied to the Department of Electrical and Computer Engineering.

5.3 Doctor of Philosophy: The Doctor of Philosophy degree is awarded in recognition of high achievement in scholarly research activity. Admission to the doctoral program is granted only to those who have a recognized potential for completing the degree. Admission is also based on the student's prior academic performance, potential for doing research, personal recommendations, TOEFL and GRE scores, and availability of research faculty in the student's area of interest. Students interested in entering the Ph.D. program are encouraged to complete a master's program in engineering first.

Credit Requirements: A minimum of 78 credits beyond the bachelor's degree is required. At least 52 of these credits must be in courses numbered 500 and above. At least 39 of the 78 credits must be in courses other than ECE 600 (Doctoral Research and Dissertation). Normally 18 to 30 credits are taken in ECE 600.

Advancement to Candidacy: A graduate student becomes a Ph.D. candidate only after the student submits all required forms and passes the preliminary examination and the committee approves the student's research proposal.

(a) Preliminary Examination: The preliminary examination is administered after completion of most of the course work. It is offered twice a year; once during the week following Thanksgiving break and once during the week following spring break. Consult the department secretary for exact dates. The examination includes both written and oral parts. The written examination in the major area is normally four hours in length, and each of the minor area examinations are normally two hours in length. The oral examination is normally two hours in length and covers the student's major and minor areas of study. Upon passing the examination, the student has shown competency in subject areas supporting his/her research field. A student may also retake the exam in accordance with policies stated in the University's General Catalog.

(b) Research Proposal: The research proposal describes the proposed research in a form similar to that used by the National Science Foundation. An oral presentation of the proposal to the committee is required.

Residency: In addition to the residency requirement of the College of Graduate Studies, the department requires a minimum of two semesters (excluding summer term) in residence on the Moscow campus beyond the master's degree level. The student shall carry a full load of graduate level course work and/or research. This period of intense study, reflection, and discussion with other scholars, without the distraction of outside responsibilities, is considered essential to provide an environment for creative research and to fulfill the spirit of the doctor of philosophy degree. In certain cases, all or part of the on-campus residency may be

satisfied at other graduate research centers such as the Idaho Falls Center for Higher Education and UI Engineering Education in Boise, provided that the intent of the residency is still met. Prior approval of the committee and the department chair is required in those cases.

Dissertation Copies: One copy of the final, signed and approved, version of the doctoral dissertation must be supplied to the Department of Electrical Engineering.

6. ENGINEERING OUTREACH PROGRAM

The University of Idaho Engineering Outreach Program provides an opportunity for students to take 400-level and 500-level DVD courses applicable to both master and doctoral degrees. For additional information, contact: Engineering Outreach, University of Idaho, Moscow, Idaho 83844-1014, by dialing 1-800-824-2889 or by going on the web at <https://eo.uidaho.edu>.

7. FINANCIAL ASSISTANCE

A number of teaching and research assistantships are available each year and are awarded on a competitive basis both spring and fall semesters. Written application should be made to the department chairman for one of these positions. Contact the Department of Electrical and Computer Engineering for more information by calling 208-885-6554 or email ece-info@uidaho.edu.

9. GRADUATE FACULTY

Suat U. Ay, Assistant Professor, Ph.D., 2005, University of Southern California, analog electronics, mixed signal VLSI design, image sensors (suatay@uidaho.edu)

Yacine Chakhchoukh, Assistant Professor, Ph.D., 2010, Paris-Sud XI University (France), Cyber-security for the smart grid, Power transmission and distribution systems, Phasor Measurement Units (PMUs) integration in the power systems, Power state estimation (yacinec@uidaho.edu)

Gregory W. Donohoe, Associate Professor, Ph.D., 1989, University of New Mexico, microelectronic system design, reconfigurable processors, signal and image processing applications (gdonohoe@uidaho.edu)

James F. Frenzel, Associate Professor, Ph.D., 1989, Duke University; digital systems design and testing (jfrenzel@uidaho.edu)

Karen Z. Frenzel, Assistant Professor, Ph.D., 1986, Duke University; signal processing and communications (kfrenzel@uidaho.edu)

Mohsen Guizani, Professor, Ph.D., 1990, Syracuse University; wireless communications and mobile computing, vehicular communications, mobile cloud computing, network security, Internet of Things (IoT), and smart grid communications (mguizani@uidaho.edu)

Saied Hemati, Assistant Professor, Ph.D., 2005, Carleton University; Novel Integrated Circuit Design for Communications Systems, IoT and Cyber-Physical Systems, Hardware Cybersecurity in Communication Systems, Information Theory and Channel Coding Applications, Low-Power/High-Speed Analog/Digital Integrated Circuit Design (shemati@uidaho.edu)

Herbert L. Hess, Professor, Ph.D., 1993, University of Wisconsin; power electronics, electric machine drives, power quality, and CMOS design of on-chip power circuitry (hhess@uidaho.edu)

Brian K. Johnson, SEL Endowed Professor, Ph.D., 1992, University of Wisconsin; power systems transients, power systems protection, utility applications of power electronics, power quality, T&D applications of superconductors, and intelligent transportation systems (bjohnson@uidaho.edu)

Joseph D. Law, Associate Professor, Ph.D., 1991, University of Wisconsin; electrical machines, power electronics, power systems stability, and electrical disturbances in power systems (joel@uidaho.edu)

Zouheir Rezki, Assistant Professor, Ph.D., 2008, Polytechnique Montreal; communications and networking including security of data networks, energy-efficient communications, networking Infrastructures, performance limits of communications at low power regime and low complexity detection algorithms in cellular networks (zrezki@uidaho.edu)

Vishal Saxena, Micron Endowed Associate Professor, Ph.D., 2010, Boise State University; CMOS Photonic integrated circuits, Hybrid Mixed-Signal Photonic architectures and Compact Modeling, CMOS-based RF and mmWave Photonic architectures, phased-arrays and free-space links, High-speed Analog-to-digital converters, High-density Neural-inspired computing ICs, and Heterogeneous cognitive computing architectures for ultra-low-power deep learning (vsaxena@uidaho.edu)

Sameh Sorour, Assistant Professor, Ph.D., 2011, University of Toronto; Network Coding, Device-to-Device (D2D) Communications, Internet of Things (IoT) and its Applications, Femtocaching and Cloud/Fog Networking, Management of Dense Cellular Networks, Mathematical Modeling and Optimization for Smart/complex Systems (samehsorour@uidaho.edu)

Dennis Sullivan, Professor, Ph.D., 1987, University of Utah; electromagnetic simulation, hyperthermia cancer therapy simulation, and quantum semiconductor simulation (dsullivan@uidaho.edu)

Ata Zadehghol, Assistant Professor, Ph.D., 2011, University of Illinois, Urbana/Champaign; Electromagnetics, Signal and power integrity of SoP/SoC, Control and optimization, Modeling and simulation of multi-physics phenomena (azadehghol@uidaho.edu)