

MARQUETTE UNIVERSITY
DEPARTMENT OF ELECTRICAL AND
COMPUTER ENGINEERING

GRADUATE STUDENT
HANDBOOK

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AUGUST 2011

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I. INTRODUCTION

The purpose of this handbook is to summarize and explain the various procedures, policies, and requirements as they apply to graduate students in Electrical and Computer Engineering (EECE). While much of the material presented here duplicates information available in the Marquette University *Graduate Bulletin*, it is not intended that this handbook replace the *Bulletin*. Rather it is hoped that it provides a convenient and concise statement of the numerous procedures specifically as they apply to Electrical and Computer Engineering students.

In addition to the EECE requirements listed in this handbook, graduate students must meet all Graduate School requirements as outlined in the Marquette University *Graduate Bulletin*. If there is a conflict between EECE requirements and Graduate School requirements, Graduate School requirements take precedence.

Students having questions not clearly answered in this document are urged to also consult:

- (1) the latest Marquette University Graduate Bulletin and list of deadlines
www.mu.edu/grad/current_bulletin.shtml
www.mu.edu/grad/current_datesanddeadlines.shtml
- (2) the Marquette University web page www.mu.edu
Marquette University academic policies web page www.mu.edu/registrar/policies
Graduate School web page www.marquette.edu/grad
College of Engineering web page www.mu.edu/engineering
Department of Electrical and Computer Engineering web page
www.mu.edu/engineering/pages/AllYouNeed/Electrical_Computer/electric.html
- (3) their academic advisors
- (4) the EECE Director of Graduate Studies (DGS)
Contact information available at EECE web page (see above)
or by phone from EECE department office, (414) 288-6820
- (5) the Graduate School
Email mugs@mu.edu, more contact information available at Graduate School web page (see above) or by phone from Graduate School office at, (414) 288-7137

Programs are offered in EECE at the master's level (thesis and non-thesis options) and the doctoral level. These may be pursued on a full-time or part-time basis. A five-year B.S./M.S. program and non-degree certificate programs are also offered.

Although no formal specializations are offered, there are several research focus areas within the program, including: Signal processing, Control theory, Electromagnetic fields and waves, Power and energy systems, Solid-state devices, Sensor systems, and Algorithms and machine learning. Students may, by selection of courses taken and their research, choose to concentrate in one or more of these areas, with the approval of their advisors.

II. GRADUATE STUDENT CLASSIFICATIONS

A. **Academic Status**

A graduate student may be classified as full-time, half-time or less than half-time. For more details on these classifications, please refer to the Marquette University *Graduate Bulletin* under “Academic Status”.

B. **Admission Status**

A graduate student may be classified as having degree status, probationary degree status, temporary non-degree status, non-degree status, or visiting non-degree status. For more details on these classifications, please refer to the Marquette University *Graduate Bulletin* under “Academic Status”.

III. GENERAL REQUIREMENTS

A. **Academic Load**

Refer to the Marquette University *Graduate Bulletin* for academic load requirements.

B. **Course Designations**

Courses numbered in the 6000 and 8000 series designate strictly graduate level courses. Courses numbered in the 5000 series designate undergraduate level courses taken for graduate credit. It is required that graduate students in a 5000 level course do extra work beyond that required for the equivalent undergraduate (4000 level) course. 4000 level undergraduate courses do not include this additional work and thus may *not* be used later for graduate credit.

C. **Required Courses**

The courses EECE 6010 Advanced Engineering Mathematics and EECE 6020 Probability and Random Processes in Engineering are required of all degree-program (master's and doctoral) students. These courses are offered each year in the fall and spring semesters, respectively. Students are normally expected to take these courses in their first year of graduate studies. When appropriate, substitutions for these required courses may be allowed. Students requesting such exceptions should formally submit all appropriate arguments and documentation to the EECE Director of Graduate Studies for consideration by the EECE graduate committee.

D. **Department Colloquium**

All full-time graduate students are required to take EECE 6952 Department Colloquium each semester. This course involves mandatory attendance at the EECE Department Colloquium Series. A grade of “Unsatisfactory (U) in this course may result in loss of financial aid or dismissal from the program.

E. Independent Study and Seminar Courses

Independent study courses (EECE 6995 Independent Study) may be offered on occasion from individual faculty members. Independent study courses must be approved in advance using the *Approval for Independent Study Course 6995* form and an *Independent Study Course Contract (EECE 6995)* form. Students taking EECE 6995 courses must have a quality point average of at least 3.25 and a minimum of 6 completed credit hours at Marquette. Approval is required in advance from the course director, the student's advisor, and the DGS.

Independent study courses must be curricular in nature, covering specific material not available within existing courses. Independent study courses are specifically *not* allowed for research activities and experimental work.

Similarly, research seminar courses (EECE 6953 Research Seminar) may be offered on occasion from individual faculty members.

The total number of independent study (EECE 6995) and research seminar (EECE 6953) credits that may be applied to one student's degree program(s) is limited to a maximum of 6 credit hours in the M.S. Plan A (Thesis option) program, a maximum of 6 credit hours in the Ph.D. program, and an overall maximum of 9 credit hours total for a combined M.S./Ph.D. program. Students in the M.S. Plan B (Non-Thesis option) program may not apply independent study or research seminar credits toward their degree program.

F. Undergraduate Students in Graduate Courses

An undergraduate senior may, with appropriate permissions, register for a 5000-level graduate course for either undergraduate credit or future graduate credit. Refer to the Marquette University *Graduate Bulletin* for details on obtaining approval.

G. Continuous Enrollment

All graduate students admitted to a degree program must be continuously enrolled each semester (except summer sessions) to maintain graduate student status. Students are advised to consult with their advisors and the Marquette University *Graduate Bulletin* for continuous enrollment processes and appropriate course designations.

H. Quality Point Average Requirement

All graduate students must maintain a quality point average of at least 3.0 in Marquette course work to graduate, as specified in the Marquette University *Graduate Bulletin*.

I. Prerequisite Courses

To make up for lack of appropriate background knowledge, students are sometimes required to take certain prerequisite courses (students are notified of these prerequisites upon admission). These prerequisites are normally specified from the following list of courses: MATH 1450, 1451, 2450, 2451; EECE 1610, ELEN 3001; and three of the five courses EECE 2030, ELEN 3030, ELEN 3020, ELEN 3110, and EECE 1610. These courses must be taken early in the student's graduate program. Grades obtained in these courses must average at least 3.0, with no grade less than a C. These courses are not used to meet regular degree requirements and are not included in

graduate quality point average calculations, but their completion is necessary to be eligible for graduation.

J. Graduation Application

Each student planning to graduate in the current semester must file a *Graduation Application* with the Graduate School Office early in the semester. Refer to the Marquette University *Graduate Bulletin* for details on graduation deadlines.

K. Graduate School Requirements

In addition to the EECE requirements listed above, graduate students must meet all Graduate School requirements as outlined in the Marquette University *Graduate Bulletin*. If there is a conflict between EECE requirements and Graduate School requirements, Graduate School requirements take precedence.

IV. ADVISING SYSTEM

The advising system intends to assist and guide a graduate student from the first day he or she enters Graduate School. The mechanism consists of an orientation meeting, the assignment of a temporary advisor, and the selection of a permanent advisor.

A. Orientation Meeting

At the beginning of each academic year, all graduate students are required to attend an orientation meeting. During this meeting, topics such as financial aid, program requirements, and research areas are discussed.

B. Temporary Advisor

After a student is admitted to the graduate program in Electrical and Computer Engineering, a temporary advisor will be assigned by the department.

C. Permanent Advisor

Each graduate student is required to select a permanent advisor in his/her area of interest as soon as possible, during the first semester of study in the case of the master's program and prior to taking the Written Qualifying Examination in the case of the doctoral program. The advisor will guide and supervise the graduate student's course work and research. The proper selection of a permanent advisor is very important and should be done only after careful consideration and discussions with all faculty members in the student's area of interest. Upon selection, the student must complete a *Request for Advisor Assignment / Selection / Change* form and submit it to the EECE DGS for approval. It is emphasized that the permanent advisor selected by the student does not have to be the same person as the temporary advisor.

D. Change of Permanent Advisor

A student wishing to change permanent advisor must complete a *Request for Advisor Assignment / Selection / Change* form. This form states his/her reason for desiring to make the change and the present and proposed advisors' recommendations (both obtained by the student). This form is then submitted to the DGS for approval.

In cases where the present or proposed advisor recommends against the change, the DGS will consult with all parties involved and attempt to reach an amicable decision. Should this process fail, the department chairperson will appoint a committee of three regular faculty members of the department to resolve the matter. The chairperson may be a member of this committee. The decision of this committee shall be the final action on this matter within the department.

In those instances in which an advisor is changed after submission of an *Outline for Dissertation, Thesis, Professional Project, or Essay*, and/or a *Doctoral Program Planning Form*, the student is required to submit new versions of the appropriate forms.

E. Registration

For most courses, registration is accomplished using the University's Internet-based system CheckMarq. A student must have both a username and a password to use CheckMarq. Information Technology Services (ITS) assigns usernames and passwords to all new students for the duration of their studies at Marquette. Certain courses (EECE 6090, 6092, 6932/8932, 6953, 6995, 6999, and 8999) require consent of the instructor. This is obtained by completing a *Request for Consent of Instructor* form, which must be returned to the Electrical and Computer Engineering department office prior to registration through CheckMarq. Other forms must be completed in order to register for continuous enrollment (see Section III.G) or independent study courses (see Section III.E).

All students are expected to consult with their advisors and obtain their approval prior to registering for courses each semester. In addition to fulfilling minimal program requirements, course selections must form a cohesive overall plan of study as determined mutually by students and their advisors and must be consistent with approved program outline forms. Courses selected without advisor approval are not guaranteed to count toward a degree program.

Students wishing to add or drop a course, change a course to audit status, or drop all courses, must complete the appropriate form, available from the Graduate School web page.

V. CERTIFICATE PROGRAM

The department offers several 12-credit non-degree Graduate Certificate Programs. The certificate program is designed for practicing engineers and other qualified individuals with bachelor's degrees, who wish to update and/or expand their knowledge in specific areas, but do not necessarily wish to pursue a master's or doctoral degree. A student may complete more than one certificate program; however, credits used toward one certificate may not be used to meet the requirements of another. Up to a total of 12 credits earned in all certificate programs completed may also be used to meet master's or doctoral degree requirements.

Graduate Certificates are offered in the following four areas: Digital Signal Processing; Sensors and Smart Sensor Systems; Electric Machines, Drives, and Controls; and Microwaves and Antennas. Detailed requirements for these certificates are available from the department chairperson. In addition, certificates can be individually tailored to the needs of the student with the aid of an advisor and approval of the EECE graduate committee.

A. Admission Requirements

1. Educational Background

Graduates of accredited colleges or universities with bachelor's degree in Electrical Engineering, Computer Engineering, or equivalent are eligible for admission. Only those applicants whose undergraduate records show promise of success in graduate study are admitted. To qualify for admission, applicants must have, as a minimum, approximately a B average in their total post-secondary school education.

2. Application for Admission

All applicants should file the following documents at least six weeks in advance of registration with the office of the Graduate School. No file is considered for admission until it is complete. See the Marquette University *Graduate Bulletin* for further details.

- (1) A completed application form and fee.
- (2) Official transcripts from all current and previous colleges/universities, except Marquette.
- (3) Three letters of recommendation.
- (4) A Certificate Program Planning Form, typically completed with the aid of a faculty member or the DGS, to be submitted for approval by the EECE graduate committee.
- (5) (For international applicants only) a TOEFL score or other acceptable proof of English proficiency.
- (6) (For international applicants only) GRE Scores (general test only). The GRE test is also recommended for, and may be requested of, applicant's with undergraduate grade point averages of less than 3.00 out of 4.00.

Admission is not official until the student is notified in writing of acceptance by the Graduate School. Admission cannot be made final until an official transcript has been received indicating the conferral of an undergraduate degree.

Admission is valid for one year beyond the desired entry date requested on the application for admission. If a student fails to register for courses within two years after the date of application for admission, the student's file will be discarded.

B. Course Requirements

Each graduate certificate program requires completion of four courses (12 credits) selected from a prescribed list of courses pertinent to the area of study, as indicated below. All courses taken must be approved for graduate credit, and at least two of the courses must be strictly graduate level (6000 or 8000 level courses). Students must complete all courses within a three-year time period and must earn a quality point average of at least 3.0 with no grade below a C.

DIGITAL SIGNAL PROCESING

COEN 5860, COEN 5870, COEN 5650, EECE 5510, EECE 6010, EECE 6020, EECE 6820, EECE 6830, EECE 6840, EECE 6510, EECE 6520, EECE 6530, EECE 6540

ELECTRIC MACHINES, DRIVES, AND CONTROLS

EECE 5310, EECE 5320, EECE 5210, EECE 5220, EECE 5230, EECE 5240, EECE 5250, EECE 6010, EECE 6020, EECE 6310, EECE 6320, EECE 6330, EECE 6210, EECE 6220, EECE 6230

MICROWAVES AND ANTENNAS

EECE 5130, EECE 5150, EECE 5570, EECE 6110, EECE 6120, EECE 6130, EECE 6010, EECE 6020

SENSORS AND SMART SENSOR SYSTEMS

EECE 5460, EECE 6010, EECE 6020, EECE 6420, EECE 6430, EECE 6450

VI. MASTER'S DEGREE PROGRAM

A. Admission Requirements

1. Educational Background

Graduates of accredited colleges or universities with bachelor's degree in Electrical Engineering, Computer Engineering, or equivalent are eligible for admission. Only those applicants whose undergraduate records show promise of success in graduate study are admitted. To qualify for admission, applicants must have, as a minimum, a B average in their total post-secondary school education.

2. Application for Admission

All applicants should file the following documents at least six weeks in advance of registration with the office of the Graduate School. No file is considered for admission until it is complete. See the Marquette University *Graduate Bulletin* for further details.

- (1) A completed application form and fee.
- (2) Transcripts from all current and previous colleges/universities, except Marquette.
- (3) Three letters of recommendation.
- (4) GRE Scores (general test only).
- (5) A statement of purpose indicating the student's reasons for seeking the doctoral degree, and declaring the student's general area of interest (Communications and signal processing, Control theory, Electromagnetic fields and waves, Power and energy systems, Solid-state devices and sensor systems, or Algorithms and machine learning).

- (6) (For international applicants only) TOEFL score or other acceptable proof of English proficiency.

Admission is not official until the student is notified in writing of acceptance by the Graduate School. Admission cannot be made final until an official transcript has been received indicating the conferral of an undergraduate degree.

Admission is valid for one year beyond the desired entry date requested on the application for admission.

B. *Master's Program Planning Form*

The EECE department offers two options for earning a Master's degree, a Thesis Option (Plan A) and a Non-Thesis Option (Plan B). By the end of the second semester of full-time studies, all Master's students must select and meet with their academic advisor, and together complete a "Master's Program Planning Form", including identifying whether they wish to pursue the Thesis or Non-Thesis Option as well as listing a proposed set of courses for their program of study. This program of study must be approved by the advisor and the EECE Director of Graduate Studies (DGS), as well as the Graduate School.

The student, advisor, and DGS will work together to ensure that the program conforms to departmental and Graduate School requirements, and that the program has appropriate breadth and depth. Changes between Thesis and Non-Thesis options may be requested using the "Master's Program Change of Plan".

C. *Plan A (Thesis Option)*

1. *Course Requirements*

Thirty semester hours are required, 24 coursework hours plus 6 hours of EECE 6999 Master's Thesis. At least 18 of the 24 coursework hours must be taken in EECE. At least one half of the minimum total course program (i.e., 12 hours exclusive of thesis) and of the EECE course program (i.e. 9 hours exclusive of thesis, but including the required courses EECE 6010 and EECE 6020) must be taken at the strictly graduate level (6000 or 8000 level). The remaining courses must be selected in consultation with the student's faculty advisor from among those that are eligible for graduate credit. Courses must form a cohesive overall plan of study as determined mutually by each student and his or her advisor.

With prior approval, a maximum of eight semester hours of course work from other institutions or other programs may be transferred into a student's master's program. A course will be considered for transfer credit only if the grade is B or better and the course is acceptable for graduate credit at the institution at which it was taken. Students applying for transfer credit must complete a *Request for Transfer of Credit* form available from the Graduate School.

2. Thesis Requirements

By the end of the third semester, each Plan A master's degree student must submit an outline of the proposed thesis on an *Outline for Dissertation, Thesis, Professional Project, or Essay* form for approval. As part of this process a master's committee, which consists of no fewer than three faculty members (including the advisor as director), is established for the purpose of evaluating the thesis and conducting the comprehensive examination. After the outline is approved the student should register for six hours of thesis credit (EECE 6999).

An acceptable master's degree thesis must meet each of the following three conditions:

1. The thesis must reflect the student's originality, creativity, and imaginative work.
2. The thesis must demonstrate the student's research ability. This includes (a) literature study and (b) some contribution to the state of the art or originality in problem solving. Old methods applied to new problems, new methods applied to old or new problems are acceptable. But old methods applied to old problems are not generally acceptable.
3. The format of the thesis must follow the Graduate School Thesis Directives.

When the student and his/her advisor consider the thesis to be in final form, the student should submit a copy to each member of his/her master's committee. This should be done at least two weeks before the scheduled comprehensive examination. It is assumed that a thesis will be reviewed until it meets the approval of all committee members. However, when complete consensus seems impossible to achieve, it will be accepted if the advisor and one other committee member approve it. Upon approval, all copies of the thesis in final form and the *Thesis Approval* form are signed by the members of the committee. The student then submits three signed copies of the thesis to the Graduate School. It is also the student's responsibility to provide a final copy of the thesis for each member of the master's committee.

3. Thesis Defense

At the end of the master's program, upon completion of the thesis, an oral final comprehensive examination (thesis defense) is given. The advisor will inform the EECE department chairperson of the outcome of the examination, who in turn files this information with the Graduate School on a *Master's Comprehensive Exam Report* form.

Students who fail this examination on their first attempt are permitted to take it a second time, with department approval. It is the obligation of the student to arrange a time and place on campus for the comprehensive examination suitable for all committee members, and to meet all appropriate deadlines indicated in the Graduate School academic calendar.

4. Master's Committee Membership

Each master's committee consists of at least three members, mutually selected by the student and his/her advisor. The advisor is the committee director, and must have a regular faculty appointment in EECE at Marquette University. At least two members of the committee (including the director) must have regular faculty appointments in EECE at Marquette University.

D. Plan B (Non-Thesis Option)

1. Course Requirements

Thirty (30) semester hours, at least 21 of which must be in EECE, are required. At least 18 credits of the total program coursework and at least 12 credits of the EECE coursework (including EECE 6010 and 6020) must be taken at the strictly graduate level (6000 or 8000 level). The remaining courses must be selected in consultation with the student's faculty advisor from among those that are eligible for graduate credit. In addition, as noted in Section III.E, independent study and research seminar credits are not permitted in this program option. Courses must form a cohesive overall plan of study as determined mutually by each student and his or her advisor.

The regulations for transfer of credit from other institutions or programs are the same as those for Plan A, except that, with approval, up to nine semester hours may be transferred.

2. Other Requirements

Neither a thesis, nor comprehensive examination is required in Plan B (Non-Thesis Option).

3. Comprehensive Exam

Students in the Master's Non-Thesis Option program must successfully pass a written comprehensive examination prior to graduation. The exam covers material from the two required core courses EECE6010 and EECE6020, plus one additional area identified by students and their advisor. The comprehensive exam is administered simultaneously with the PhD Written Qualifying Exam, and is offered twice a year in January and August. Students may take the comprehensive exam at the first available exam offering after completing the necessary courses in their area of study. A full description of the exam content, rules and procedures are detailed in the *Rules and Procedures for the EECE Master's Non-Thesis Option Comprehensive Examination* document, available from the EECE office and webpage.

E. Five-Year B.S./M.S. Program

1. Program Eligibility

The EECE Department offers a Five Year BS/MS Program where eligible students may obtain both a Bachelor's degree and a MSEE degree in five years. Students with a QPA of 3.5 or better in their Mathematics, Science and Engineering courses are eligible to apply to this program in their junior year. This program is available to undergraduate students in EECE or Physics.

Students wishing to participate in the Five Year Program must apply and be admitted to the program before their senior year, using the same procedures outlined in Section VI.A. Students need to fill out an *Application for Graduate Admission and Financial Aid* form (available from the Graduate School) and follow the guidelines in both the Marquette Graduate Bulletin and the EECE Department's Graduate Student Handbook (available from the department office or online) for admission to the program. On the application, in the section "Graduate School Plans", students should check "BS to MS".

2. Requirements

Students in the program may take graduate courses in their junior or senior undergraduate year (up to 12 credits total, minimum grade of B required). Up to nine graduate credits count toward both degrees. Remaining courses and credits toward the M.S. degree are completed during the fifth year. For students following Plan A (Thesis Option), work on the thesis research should begin during the summer between the junior and senior undergraduate years. Students following Plan B (Non-Thesis Option) can also complete the program in five years.

Undergraduate students wishing to take courses for graduate credit must fill out a *Permission to Enroll in a Graduate Course* form, available from the Graduate School. This is done for both 5000-level and 6000-level courses. Students in the Five-Year Program wishing to apply course(s) toward both degrees must check the box "5 year program" in the "Additional Information" section of the form. Permission forms for courses applied only to the M.S. degree should check the box "I do not intend to use this course to satisfy undergraduate requirements". For 5000-level courses, students must also fill out a "Graduate Credits Requested for Undergraduate Course" form.

Once the undergraduate degree is completed, students must fill out a *Master's Degree Transfer of Credit Request* form to formally transfer the coursework taken into their MS program. All coursework taken as an undergraduate must meet university transfer guidelines before it can be used toward the Master's degree, including a maximum of 12 transfer credits and a minimum grade of B in all courses.

Students having interest in this program should consult with the DGS.

F. General Electric Healthcare Master's Program

This program is available only to employees of G.E. Healthcare and includes the courses EECE 6090 Advanced Engineering I, EECE 6092 Advanced Engineering II, and EECE 6094 Advanced Engineering III., as well as the required courses EECE 6010 and EECE 6020. In addition, the following regulations apply to students in this program:

- (1) Students in Master's Plan A receiving credit for EECE 6010, 6020, 6090, 6092 and 6999 are also required to take at least one additional 6000 or 8000 level course.
- (2) Students in Master's Plan B receiving credit for EECE 6010, 6020, 6090, 6092 are also required to take at least two additional 6000 or 8000 level courses.
- (3) EECE 6090, 6092, and 6094 cannot be used towards course requirements in a Ph.D. program.

G. Time Limitations

All work for master's degrees degree must be completed within 6 years, in accordance with the time limitations outlined in the Marquette University *Graduate Bulletin*.

In certain appropriate circumstances, extensions of time may be granted. Students requiring such extensions must complete a *Request for Extension of Time* form.

VII. DOCTORAL DEGREE PROGRAM

A. *Admission Requirements*

1. **Educational Background**

An M.S. degree or equivalent in an appropriate field of study is required for admission to the EECE Ph.D. program. (Applicants with Bachelor's degrees must first be admitted to and successfully complete the M.S. degree program and may then continue into the Ph.D. program.)

2. **Application for Admission**

All applicants should file the following documents at least six weeks in advance of registration with the office of the Graduate School. No file is considered for admission until it is complete. See the Marquette University *Graduate Bulletin* for further details.

- (1) A completed application form and fee.
- (2) Transcripts from all current and previous colleges/universities, except Marquette.
- (3) Three letters of recommendation
- (4) GRE Scores (general test only).
- (5) A statement of purpose indicating the student's reasons for seeking the doctoral degree, and declaring the student's general area of interest (Communications and signal processing, Control theory, Electromagnetic fields and waves, Power and energy systems, Solid-state devices and sensor systems, or Algorithms and machine learning.).
- (6) (For international applicants only) TOEFL score or other acceptable proof of English proficiency.

Admission is not official until the student is notified in writing of acceptance by the Graduate School.

Admission is valid for one year beyond the desired entry date requested on the application for admission.

B. *Program Requirements*

1. **Course Requirements**

The Ph.D. program requires a total of 24 post-master's credit hours of coursework, plus an additional 12 dissertation credits. (Note that a master's degree is considered to be the equivalent of 24 coursework credits, so that the coursework requirement is the equivalent of 48 credits beyond the bachelor's degree, exclusive of dissertation credits.)

The only required courses for the Ph.D. program are EECE 6010 Advanced Engineering Mathematics, and EECE 6020 Probability and Random Processes in Engineering, typically taken in the first year of study. Courses must form a cohesive overall plan of study as determined mutually by each student and his or her advisor. Although there are no formal course requirements beyond EECE 6010 and EECE 6020, the requirements of the Ph.D. Written Qualifying Exam (WQE), discussed in detail in Section VII.B.3, should be considered carefully in selecting an appropriate program of study. Please note again that EECE 6090 and 6092 cannot be used towards course requirements in a Ph.D. program.

With prior approval, a maximum of 12 semester hours of course work from other institutions or other programs may be transferred into a student's doctoral program. A course will be considered for transfer credit only if the grade is B or better and the course is acceptable for graduate credit at the institution at which it was taken. Students applying for transfer credit must complete a *Request for Transfer of Credit* form available from the Graduate School Office after completion of at least six semester hours at Marquette (nine if on probation). All transfer credit for doctoral programs is approved on a case-by-case basis, in consultation with the Director of Graduate Studies and the student's Ph.D. advisor. Once approved, transfer credits should be listed with other coursework on the *Doctoral Program Planning Form* for formal committee approval.

2. Doctoral Program Planning Form

By the end of the first year of full-time studies, doctoral students must formally identify a research advisor and with their advisor's assistance complete a *Doctoral Program Planning Form* indicating a proposed set of courses for their program of study. This program of study must be approved by the advisor and the Director of Graduate Studies as well as the Graduate School.

The doctoral student, the advisor, and the DGS will work together to ensure that the program conforms to departmental and Graduate School requirements, and that the program has appropriate and cohesive breadth and depth for advanced study.

Changes to the program of study may be made using the *Doctoral Program Planning Form Amendment*.

3. Written Qualifying Examination

Doctoral students are required to take the Doctoral Qualifying Examination, the EECE Ph.D. Written Qualifying Examination (WQE), by the beginning of their fourth semester of study. The WQE is a written exam, administered twice a year, which must be passed to become a doctoral candidate and continue in the program.

All details and procedures for the WQE are contained in the *Department of Electrical and Computer Engineering Rules and Procedures for the Ph.D. Written Qualifying Examination* document (available online and in EECE department office)

Eligibility for Ph.D. Written Qualifying Exam

All EECE M.S. or Ph.D. graduate students are eligible to register for and take the Ph.D. WQE at any time. It is highly recommended that Ph.D. students and M.S. students planning to apply to the Ph.D. program plan their coursework in accordance with the exam requirements and take the exam as soon as they have taken the recommended courses.

Time Requirement for Ph.D. Written Qualifying Exam

Full-time Ph.D. students are required to take the WQE no later than the beginning of their fourth semester in the doctoral program. (Note that this implicitly requires all full-time Ph.D. students to take EECE 6010, EECE 6020, and at least one 6000 or 8000 level course in their major area, during their three semesters of study.)

4. Doctoral Committee Membership

Each doctoral committee consists of at least five members, mutually selected by the student and his/her advisor. The advisor is the committee director, and must have a regular faculty appointment in EECE at Marquette University. At least four members of the committee (including the director) must have regular or adjunct faculty appointments at M.U., of which at least three must have regular primary faculty appointments in EECE at Marquette University.

5. Doctoral Dissertation Outline and Oral Proposal

Ph.D. candidates are required to complete an *Outline for Dissertation, Thesis, Professional Project or Essay* and present an oral dissertation proposal to their committee by the end of their fourth semester of study. The dissertation outline must clearly convey the original research contribution of the proposed work. Following the dissertation proposal, the outline is approved via the *Outline for Dissertation, Thesis, Professional Project or Essay* form, by the dissertation advisor, the committee members, the DGS, and the Graduate School.

After the outline is approved the student may register for the required twelve hours of dissertation credit (EECE 8999).

6. Final Examination

Upon completion of the dissertation work and formal dissertation document, a public oral final examination is given. The candidate must arrange a time and place on campus for the final examination and submit an *Announcement of Final Public Examination for Doctoral Degree* to the Graduate School at least four weeks in advance.

Approval of the dissertation final exam is conveyed by the committee using the *Dissertation Approval* form.

7. Dissertation Document

Upon approval of the final dissertation document, all copies of the dissertation in final form and a *Dissertation Approval* form are signed by the members of the committee. Official approval requires approval of the dissertation director and at least three additional committee

members. It is also the student's responsibility to provide a final copy of the dissertation for each member of the doctoral committee

An acceptable doctoral dissertation must meet each of the following three conditions:

1. The dissertation must represent an original research contribution.
2. The dissertation must show clear ability to do independent research.
3. The dissertation format must follow the Graduate School *Dissertation Directives*".

8. Graduate School Requirements

In addition to the EECE requirements listed above, Ph.D. students must meet all Graduate School requirements as outlined in the Marquette University *Graduate Bulletin*.

C. Time Limitations

All work for doctoral degrees, including the final examination and submission of dissertation document, must be completed in accordance with the time limitations outlined in the Marquette University *Graduate Bulletin*.

In certain appropriate circumstances, extensions of time may be granted. Students requiring such extensions must complete a *Request for Extension of Time* form.

VIII. GRADING AND EVALUATION OF PERFORMANCE

A. Grading System

The letter grades A, AB, B, BC, C, F, W, UW, S, U, CR, AU, I, X, and IX will be assigned for graduate course work at the end of each semester. Grades of CD and D are not issued in 5000, 6000 or 8000 level courses. F grades are included in quality point average calculations. Detailed explanations of letter grades are given in the Marquette University *Graduate Bulletin*.

B. Performance Evaluation

All graduate students are required to submit a progress report to the EECE department at the end of each academic year.

C. Academic Review

The department evaluates the academic performance of all students at the close of each semester and/or academic year. In order to graduate, a quality point average of at least 3.0 is required, so all graduate students are expected to maintain a quality point average of at least 3.0. Details regarding failure to meet this criteria, including warnings, academic probation and dismissal, are outlined in the Marquette University *Graduate Bulletin*.

Satisfactory academic work is not determined exclusively by course grades, but by an overall assessment of academic performance. Grades are, however, an important factor in the evaluation process. Multiple BC's or C's, or a single F, are indications of serious academic concern. A grade of F in the department required courses EECE 6010 and 6020 will require the student to

suspend graduate studies and successfully complete a remedial course before continuing in the program.

D. Appeals

As specified in the Marquette University *Graduate Bulletin*, students have the right to appeal the imposition of any sanctions due to unsatisfactory academic performance or findings of academic dishonesty. Responsibility to decide appeals rests with the Dean of the Graduate School advised by the Board of Graduate Studies. Before an appeal is made to the Graduate School, every effort must have been made to resolve the matter informally, and appeal procedures at the department level must have been exhausted. Appeals should be made in writing to the Dean of the Graduate School.

E. Grade Appeals

As specified in the Marquette University *Graduate Bulletin*, grade appeals for graduate courses are heard by the school or college that teaches the course. The grade appeals process for courses taught by the College of Engineering is published on the COE web site, and students who wish to appeal their grade in an EECE course should consult this document and follow the outlined process. Students are strongly advised to discuss grading concerns with their course instructor and their academic advisor prior to making an official appeal.

F. Academic Dishonesty

Academic dishonesty includes, but is not limited to, such practices as dishonesty in the completion of class assignments and examinations, the presentation of research done by another as one's own research, falsification of research data or results, or the presentation of any written material done by others as one's own writing. Any student who is found to have engaged in academic dishonesty is subject to appropriate academic discipline, as specified by the *College of Engineering Academic Honesty Policy*, and the *Marquette University Academic Honesty* and *Marquette University Research Misconduct* policies.

IX. FINANCIAL AID

Five major categories of financial aid are available to degree-status graduate students in Electrical and Computer Engineering: scholarships, fellowships, teaching assistantships, research assistantships, and loans. Students admitted on probation are not eligible for financial aid, but may be considered once probation has been removed. The term of financial aid is normally an academic year (10 months), but in some instances may be one semester (5 months), or one year (12 months). Only very limited amounts of financial aid are available during the summer.

Graduate students receiving financial aid may accept no outside employment, and must be enrolled full-time either by virtue of course work or continuous enrollment. Master's students receiving any financial aid must follow Plan A. Continued support is not guaranteed, but is based on academic performance and performance of assigned duties (for teaching and research assistants). Master's students will normally be supported for no more than four semesters and doctoral students for no more than six semesters. Teaching and research assistants are expected to be involved with assigned duties and/or graduate research during the full term of their assistantships, not just when classes are in session.

Students seeking financial aid other than loans are required to submit an application for financial aid to the Graduate School no later than February 15 of the academic year prior to the one for which aid is being sought (November 15 for the spring semester and April 15 for summer sessions). See the Marquette University *Graduate Bulletin* for additional details.

A. Scholarships

Tuition scholarships are available on a very limited basis through the EECE department. These cover tuition only and range from 1 to 12 credit hours per semester. No service is required of the student in return for a scholarship.

B. Fellowships

Fellowships typically provide a stipend and, in some instances, tuition remission. No service is required of the student. Fellowships and traineeships may also be available from individual faculty members having external grants. Students are also urged to seek fellowship assistance available from various outside agencies, foundations, and other organizations.

C. Teaching Assistantships

Teaching assistantships typically provide students with a stipend and 9 credit hours of tuition remission per semester. In return the students are expected to perform satisfactorily 20 hours of teaching-related assignments per week. Students with teaching assistantships are normally limited to a 10 credit-hour load per semester.

D. Research Assistantships

Research assistantships typically provide students with a stipend and 9 credit hours of tuition remission per semester. In return the students are expected to satisfactorily perform 20 hours of research-related assignments per week. Students with research assistantships are normally limited to a 9 credit-hour load per semester. Research assistantships may also be available from individual faculty members having external research grants and contracts (stipend levels and tuition remission will vary with the funding agency).

E. Loans

Limited loan assistance is available to assist qualified students who, without such aid, would be unable to attend the University. Students are eligible for student loans if they are attending the University at least half-time and are in good academic standing. No applicant will be considered for loan assistance until he/she has been formally admitted to the Graduate School.

For specific information on loans and other resources available to graduate students attending Marquette, contact the Office of Student Financial Aid.

APPENDIX A. SUMMARY OF PROGRAM REQUIREMENTS

The following sections briefly summarize the requirements for each of the graduate programs. Students are also urged to consult with the DGS for questions they may have regarding program requirements.

All full-time students must take EECE 6952 each semester. Students must be enrolled every semester (either in regular course work or via continuous enrollment). All graduate programs must be completed in 6 years (plus any approved time extensions) with a QPA of at least 3.0. All prerequisite requirements must be satisfied, if applicable.

A. *Master's Degree - Plan A (Thesis Option)*

EECE 6010

EECE 6020

18 credits of additional course work, of which

at least 3 credits must be at the 6000 or 8000 level in EECE*,

at least 6 credits must be at the 6000 or 8000 level*,

at least 6 credits must be in EECE*

* a given course may satisfy more than one of these requirements

EECE 6999 (dissertation credits, 6 credit hours total)

Advisor Selection

Outline for Dissertation, Thesis, Professional Project, or Essay

Master's Program Change of Plan (optional, only if changes to outline needed)

Graduation Application

Thesis document

Thesis checklist

Comprehensive Examination (oral, concentrated on thesis)

Thesis Approval Form (completed by advisor)

Master's Comprehensive Exam Report (completed by advisor)

B. *Master's Degree - Plan B (Non-Thesis Option)*

EECE 6010

EECE 6020

24 credits of additional course work, of which

at least 12 credits must be at the 6000 or 8000 level*,

at least 15 credits must be in EECE*

at least 6 credits must be in EECE at the 6000 or 8000 level*

* a given course may apply towards one, two, or all three of these requirements

Advisor Selection Form

Comprehensive Exam

Graduation Application

C. *Doctoral Degree*

EECE 6010

EECE 6020

24 credits of total post-M.S. coursework (may include EECE 6010 and 6020 if not previously taken)

EECE 8999 (dissertation credits, 12 credit hours total)

Residency (1 year)

Advisor Selection form

Doctoral Program Planning form

Doctoral Program Planning form amendment (optional, if changes needed)

Written Qualifying Examination (administered by department)

Doctoral Qualifying Examination Committee Chairperson's Summary (completed by DGS)

Advancement to Doctoral Candidacy (completed by DGS)

Outline for Dissertation, Thesis, Professional Project, or Essay

Graduation Application

Dissertation

Dissertations Directives

Dissertation checklist

Announcement for Public Defense of the Dissertation (30 days in advance)

Dissertation Defense (oral, public, on dissertation)

Dissertation Approval Form (completed by advisor and committee)