

GENERAL INFORMATION CONCERNING ECSE DOCTORAL PROGRAM*

The purpose of this brochure is to anticipate and answer a number of questions which you might have about the Electrical, Computer, and Systems Engineering Doctoral Program.** As indicated in Figure 1, there are six steps in the ECSE Doctoral Program. Additional information can be found in the RPI Graduate Catalog, which is available online. Since this brochure presents the policies and procedures of the ECSE doctoral program, it is expected that each student will carefully review and follow it.

- What types of Doctor's degree are awarded?

Rensselaer awards two types of Doctor's degrees. The Doctor of Philosophy degree, under the auspices of the Graduate School, is awarded when the thesis is directed toward making an original contribution to fundamental knowledge in a particular field or in an interdisciplinary field. The Doctor of Engineering degree, under the auspices of the Professional School of the School of Engineering, is awarded when the thesis proposes an engineering problem of substance and develops a solution to it in a creative and distinguished manner.

- When is a student officially enrolled in the ECSE Doctoral Program?

By being accepted as an ECSE graduate student and by passing the Doctoral Qualifying Examination (DQE). If a student was admitted as an ECSE Masters degree student only and wants to continue on for a doctorate, he/she may use the Change of Status form (under certain circumstances) to apply for admission to the ECSE doctoral degree program.

1. DOCTORAL QUALIFYING EXAMINATION

- What is the purpose of the DQE?

The purpose of the DQE is to determine the potential that you will be able to complete the doctoral requirements, including original and independent research of high quality. The DQE consists of three parts:

4 oral exams: 1 Basic area exam, 2 in the Major area, and 1 Minor area exam

Course grades: Your grades in the courses you have taken at Rensselaer.
This serves as the "written" part of the DQE.

Research Advisor's Recommendation: Your thesis advisor will evaluate your research-to-date.

*Professor Alan Desrochers, ECSE Doctoral Program Director, JEC-7020, x6718, Email, aad@ecse.rpi.edu, and Ms. Priscilla Magilligan, ECSE Doctoral Program Secretary, JEC-6049, X6225, Email, pris@ecse.rpi.edu.

**Additionally, there is an open meeting at the beginning of the Spring and Fall semesters at which the ECSE Doctoral Program is discussed.

- What constitutes the DQE?

The DQE is uniquely structured for each student; it consists of four (4) oral exams. Each oral exam is approximately one hour in length and conducted by an ECSE faculty member in a student selected subject area. Specifically, one oral exam is given in the selected Basic Area (i.e., an area selected from the "Basic Group": Physics, Mathematics, and Computer Science). Two oral exams are given in the selected Major Area (i.e., an area selected from the "Elective Group": Circuits and Electronics, Control, Communications, Plasma and Electromagnetics, Microelectronics Technology and Design, Computer Systems, Computer Design, Image Analysis and Computer Vision, Electric Power Engineering). One oral exam is given in the selected Minor Area (i.e. an area selected from either the "Basic Group" or the "Elective Group" but not duplicating a Basic Area or Major Area selection). Refer to the "DQE Subject Areas" shown below.

Two important points should be made concerning the DQE. First, the student should not select an exam area unless he/she is familiar with the material of the three courses listed in the area, as well as the material contained in the prerequisite courses. (For example, a student selecting the Circuits and Electronics Area must also be competent in course ECSE-2100 Electric Circuits -- which is a prerequisite for two of the three courses listed in the Circuits and Electronics Area.) Second, the three listed courses per subject area are provided only to guide the student in his/her DQE preparation; the courses serve only as a focus for examination, which might also touch upon other related material in the subject area. It should be noted that the oral examiner's primary objective is not to determine how much material a student knows in a given subject area, but how well the student is able to use or apply that knowledge.

ORAL EXAMS

Basic Group

1. Physics

PHYS-4100 Introductory Quantum Mechanics

PHYS-4210 Electromagnetic Theory

PHYS-4720 Solid-State Physics

2. Mathematics

MATH-4100 Linear Algebra

MATH-4300 Introduction to Complex Variables

MATH-4600 Advanced Calculus

3. Computer Science

CSCI-2300 Data Structures and Algorithms
CSCI-4050 Computability, Compilers, and Complexity
CSCI-4430 Programming Languages

Elective Group

4. Circuits and Electronics

ECSE-2010 Electric Circuits
ECSE-2050 Intro to Electronics
ECSE-4040 Digital Electronics

5. Control

ECSE-4440 Control Systems Engineering
ECSE-4510 Discrete-Time Systems
ECSE-2410 Signals and Systems

6. Communications

ECSE-4500 Probability for Engineering Applications
ECSE-4520 Communication Systems
ECSE-2410 Signals and Systems

7. Plasmas and Electromagnetics

ECSE-4320 Plasma Engineering
PHYS-4210 Electromagnetic Theory
PHYS-6590 Statistical Mechanics

8. Microelectronics Technology and Design

ECSE-2210 Microelectronics Technology
ECSE-4240 Solid State Electronics (or PHYS-4720 Solid State Physics)
ECSE-4250 Integrated Circuit Processes and Design

9. Computer Systems

CSCI-4210 Operating Systems
ECSE-2660 Computer Architecture, Networks, and Operating Systems
ECSE-4670 Computer Communication Networks

10. Computer Design

ECSE-2610 Computer Components and Operations
ECSE-4770 Computer Hardware Design
ECSE-4220 VLSI Design

11. Image Analysis and Computer Vision

ECSE-6610 Pattern Recognition
ECSE-4510 Discrete-Time Systems
ECSE-4540 Introduction to Voice and Image Processing

12. Electric Power Engineering

EPOW-4010 Power Engineering Fundamentals
EPOW-4080 Semiconductor Power Electronics
ECSE-2100 Fields and Waves I

Oral Exam Selection

Basic exam - select one from the Basic Group

Major exams - select one area from the Elective Group

Minor exam - select one from the Basic or Elective Group without duplicating the basic or major exam.

● When is the DQE given?

The DQE is given twice each academic year -- usually during a two-week period in September and January.

● When should a student take the DQE?

Full-time Masters level students are expected to take the DQE in the third semester after entering the ECSE graduate program. Full-time Doctoral level students, who already hold a Masters degree, are expected to take the DQE in the second semester after entering the ECSE graduate program. All other ECSE graduate students should take the DQE prior to completing 15 credits beyond the Master's degree. Beginning graduate students are urged to take the DQE before completing their Master's degree, but after having made a significant start on their Master's thesis or project. Specifically, students who enter Rensselaer in September with a Master's degree, or who expect to obtain a Master's degree by the following September, are encouraged to take the DQE in January, prior to the March awarding of financial aid. It should be noted that in the awarding of financial aid (including research and teaching assistantships), preference is given to those students who have passed the DQE. (Additionally, the stipend level is also higher for those who have passed their DQE). Questions about how the DQE impacts graduate financial aid should be directed to the Manager of ECSE Graduate Admissions and Financial Aid.

- How does a student apply to take the DQE?

By completing the appended "Application for Doctoral Qualifying Examination" form and submitting it to the Doctoral Program Secretary in JEC 6049 at least one (1) week prior to the examination week. If a student applies to take the DQE and fails to show up, the examination is counted as having been taken and the student is assumed to have failed the exam.

- How many times is a student allowed to take the DQE?

A student is allowed to take the DQE at most twice.

- What is the decision process for passing the DQE?

The decision as to whether or not a student passes the DQE is made by the entire department faculty after reviewing i) the student's performance on the four (4) oral exams, ii) the student's academic record, and iii) recommendation by the student's research or project adviser(s) concerning the student's ability to conduct independent research of high quality. (Since research is an important aspect of the doctoral program, the student is strongly encouraged to engage in research activities with a faculty adviser, either at the master's or doctoral level, prior to taking the DQE.)

2. DOCTORAL PLAN OF STUDY

- What is a Doctoral Plan of Study?

In consultation with his/her academic adviser, a doctoral student must submit a Plan of Study form which lists the courses and thesis credits needed to satisfy the degree requirements. A sample form is appended). In fact, during the entire period that the student is enrolled as a graduate student at Rensselaer, the student should update his/her Plan of Study whenever changes occur to the previously submitted plan. The Plan of Study is signed by the student's academic adviser who must be a full-time ECSE faculty member and by the Doctoral Program Director.

A Doctoral Plan of Study must contain a minimum of 90 credit hours beyond the Bachelor's degree or 60 credit hours beyond the Master's degree. In satisfying the 90 credit hour requirement, the student's program cannot include any more courses from the 400-499 range than one-third of the total credit hours in all courses excluding doctoral thesis, with the further limitation that a maximum of twenty-one credits at the 400 level is allowable. (Depending on the level of effort, the total credit hours for the doctoral thesis typically range between 26 to 34 credit hours.) The normal ECSE doctoral plan of study will be a minimum of 50% ECSE courses and will display a reasonable "core sequence" in one of the Department's established research areas.

3. FORMING A DOCTORAL COMMITTEE

As soon as the student has chosen a thesis area, the student should arrange to conduct the thesis work with a thesis adviser. If the thesis adviser is not a full-time ECSE faculty member, then there must be a separate academic advisor from ECSE. If the student's thesis advisor is not a full-time Rensselaer faculty member, then a full-time ECSE faculty member must be Co-chair of the doctoral committee with him/her.

The thesis adviser then recommends to the Doctoral Program Director the nomination of a doctoral committee. Subsequently, the student completes a "Nomination of Doctoral Committee" form (a sample of which is appended) and submits it to the Doctoral Program Secretary, at least one month prior to taking the DCE. After departmental approval, it is forwarded to the Graduate School which officially appoints the student's doctoral committee. The committee should include at least four (4) full-time Rensselaer faculty members, all with the rank of assistant professor or higher, one of whom is designated the Committee Chair or Co-Chair (usually, the student's thesis adviser). Furthermore, either i) at least one of the faculty on the committee is from outside the ECSE Department, or ii) the committee includes an additional member from outside Rensselaer. At least two of the members must be full-time ECSE faculty members. The committee members should represent the principal areas included in the student's Plan of Study; they will conduct the student's DCE and the final thesis defense examination. If any members of the doctoral committee change, see the Doctoral Program secretary. A memo from the Doctoral Program Director will be submitted to the Graduate School with the change(s).

4. DOCTORAL CANDIDACY EXAMINATION

- What is the purpose of the Doctoral Candidacy Examination (DCE)?

The purpose of the DCE is to determine whether the student has made satisfactory progress in his/her doctoral program, including progress in the chosen doctoral thesis area, and whether he/she demonstrates the ability to pursue the doctoral dissertation with distinction.

- What constitutes the DCE?

The DCE is usually an oral examination following submission of a written Thesis Proposal. The oral examination is conducted by the student's appointed doctoral committee. The exact content and nature of the DCE is determined by the student's doctoral committee.

The student should prepare a Thesis Proposal which has been approved by the thesis adviser. Copies of the proposal should be given to the student's doctoral committee at least one (1) week prior to the scheduled DCE. The thesis proposal should include i) a concise discussion of the proposed thesis effort; ii) an in-depth review of the pertinent literature (together with how the proposed effort would build on and extend existing knowledge, either theoretically and/or practically); and iii) a brief presentation of some preliminary results which would suggest that the effort can be successfully undertaken. However, the scope of the DCE is not limited to the thesis proposal.

- When should a student take the DCE?

A student may apply for the candidacy examination, given by the doctoral committee, when his/her course work nears completion and he/she has the approval of the doctoral committee. The request should be coordinated with the student's thesis adviser. Additionally, doctoral candidates must pass appropriate examinations within two (2) years of registration for the first credits toward the PhD.

- How many times is a student allowed to take the DCE?

Normally, a student is allowed to take the DCE at most twice. However, the student's doctoral committee, in consultation with the Doctoral Program Director and the Graduate School, decides this issue.

- What is the decision process for passing the DCE?

The student's doctoral committee decides whether or not the student passes the DCE.

- What form should be completed after passing the DCE?

The student's doctoral committee should complete a "Record of Candidacy Examination" form (a sample of which is appended) and submit it to the Doctoral Program Secretary. Furthermore, it should be noted that after passing the DCE, the student is formally identified as a doctoral candidate.

5. THESIS DEFENSE EXAMINATION

- What is the purpose of the thesis defense examination (TDE)?

The purpose of the TDE is for the candidate to present and defend his/her doctoral thesis. (It is assumed that the student has kept in close touch with his/her thesis adviser throughout his/her doctoral research.)

- What constitutes the TDE?

The TDE is conducted by the student's doctoral committee. Typically, the thesis presentation is open to the public, while the ensuing committee deliberation is not.

- How many times is a candidate allowed to take the TDE?

The candidate's doctoral committee, in consultation with the Doctoral Program Director and the Graduate School, determines if and when a candidate may retake the TDE.

- Is your doctoral committee still valid?

The Graduate School will check to see that your doctoral committee still meets all the Institute requirements at time of TDE. If not, it must be modified. See the Doctoral Program Secretary to address this.

- When should a candidate take the TDE?

The TDE is given whenever i) the candidate has already registered for the number of doctoral thesis credits shown on the Plan of Study, and ii) the candidate's doctoral committee approves the student's request for a TDE. The request should be coordinated with the student's thesis adviser.

The TDE should be held by the date listed in the academic calendar for the semester. Furthermore, i) the completed thesis must be presented to the candidate's thesis adviser at least one month before the end of the term in which it is expected that the degree will be awarded, and ii) each member of the doctoral committee must be given an unbound copy of the thesis at least two weeks before the scheduled TDE. An announcement - INCLUDING AN ABSTRACT - of the TDE must be distributed to all ECSE faculty members at least one week prior to the TDE; furthermore, the announcement should be prominently posted and an electronic copy should be sent to the Doctoral Program Secretary. At the same time, a copy of the Thesis should be on display in the ECSE headquarters office (JEC 6003) and should also be posted on your website (students are encouraged to create one) with a link indicated on the announcement.

- What is the decision process for passing the TDE?

The candidate's doctoral committee decides whether the candidate passes the TDE.

- What forms should be completed after passing the TDE?

After passing the TDE, the thesis adviser should complete a Record of Thesis Examination form (sample of which is appended) and submit it to the Doctoral Program Secretary.

6. OTHER DOCTORAL PROGRAM REQUIREMENTS (ALSO, REFER TO GRADUATE CATALOG)

- Thesis Submission

You may obtain a copy of the Thesis Writing manual directly from the Graduate School or access it from the World Wide Web. The site is:

<http://www.rpi.edu/dept/grad/gradschool.html>

- Diploma and Graduation

After passing the TDE, the candidate graduates at the next official graduation date (i.e., in May, August, or December), provided all doctoral program requirements are satisfied.

Students should obtain a degree application form from the Registrar's Office at the beginning of the term in which they plan to graduate. The completed form is returned to the Registrar's Office. (Refer to the Academic Calendar in the Catalog for the exact deadline date.)

Students who plan to graduate in a specific term must be registered for course credits or thesis credits during the term in which they intend to graduate.

A copy of the approved thesis should be distributed to the Graduate School, the student's thesis adviser and the ECSE Doctoral Program Secretary.

- "Resident" Restriction

A student working for the doctor's degree is required to take at least 45 credits of course and/or thesis work beyond the Bachelors degree from Rensselaer.

- Time Limit

For full-time students, all work for the doctorate must be completed within seven years of registration for the first credits applied toward the 90 credits required for the Ph.D. All doctoral candidates must pass the appropriate examinations as determined by their department within two years of registration for the first credits applied toward the Ph.D. Full-time students entering with a master's degree in their field of study must finish all degree requirements for the PhD within a continuous five-year time period. Students who have not met their applicable time limit will be dismissed from the program unless the Office of Graduate Education has given advanced approval for additional time to complete the degree. Extensions are granted for only the most compelling reasons and are extremely rare.

- Financial

Any outstanding fees must be paid.

APPENDIX

The following is a checklist of forms which are required as part the successful completion of an ECSE doctoral program.

FORMS	REFERENCE PAGE
Change of Status	1
Application for Doctoral Qualifying Examination	5
Doctoral Plan of Study	5
Nomination of Doctoral Committee	6
Record of Candidacy Examination	7
Record of Thesis Examination	8