RIT | Kate Gleason College of Engineering
Electrical and Computer Engineering Ph.D.

Ph.D. in Electrical and Computer Engineering

Student Manual 2024-2025

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Student Manual

The purpose of this Student Manual is to acquaint students with the requirements of the Electrical and Computer Engineering Ph.D. program and to help guide them through their course of study. The manual has been created to capture and clarify the policies and procedures governing graduate study and research in the Electrical and Computer Engineering Ph.D. program. If questions arise, the student can seek clarification from his/her advisor, the Electrical and Computer Engineering Ph.D. Program Office, or the program director.

This manual is to be accompanied by the KGCOE Graduate Student Manual, which applies to all graduate programs in the College of Engineering.

The PhD in Electrical and Computer Engineering forms independent researchers to be the next generation of the Information Age explorers, who expand and create knowledge to bring new transformative technological advances to our society.

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Introduction

The Kate Gleason College of Engineering (KGCOE) offers a graduate program leading to the Doctor of Philosophy (PhD) degree in Electrical and Computer Engineering.

The overarching goal for the PhD in Electrical and Computer Engineering program is to form independent researchers that, as experts in an area of electrical and computer engineering, are capable of creating new knowledge that bring the next transformational advances for our Information Age society. The program of study in the Electrical and Computer Engineering PhD has been developed to prepare its graduates to thrive and enjoy successful careers in academia, industry, or government research laboratories.

Ph.D. in Electrical and Computer Engineering Outcomes

The outcomes of the Ph.D. program are to produce graduates who:

1. can independently conduct the complete cycle of research to address compelling problems in the field of electrical and computer engineering.
2. will have a strong foundation in electrical and computer engineering knowledge, and the necessary specialized education in a concentrated area of study, to be able to successfully pursue careers or mentor others in their study of electrical and computer engineering. Our graduates will be valuable contributors to the global research community in an area of electrical and computer engineering, and
3. will be active in continuing their education and driven to remain up-to-date with the knowledge of their discipline, adapting to technological advances, and continuing expanding and creating knowledge to bring new technological advances to our society. Our graduates will be knowledgeable in the ethical and responsible conduct of research.

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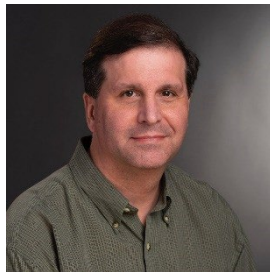
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Your Ph.D. Advisor

The PhD in Electrical and Computer Engineering program follows the education model of an apprenticeship. As such, your doctoral advisor should be the central relationship that you seek to build during your program of study. It is essential that you seek your advisor's input on all major decisions related to your program of study. Your advisor should become your most trusted mentor.

The Ph.D. Degree

RIT's Doctor of Philosophy degree in Electrical and Computer Engineering prepare the protagonists of the Information Age to venture into uncharted paths in the science and technology of electrical and computer engineering to expand and create knowledge. The plan of study is comprehensive and purposeful in preparing independent researchers capable of conducting the complete cycle of research to bring about transformational advances for society.

Curricular Requirements

The degree requires a minimum of 66 semester credits of study past a bachelor's degree from an accredited undergraduate engineering program. The program consists of the following elements and requirements:

Coursework

The courses are designed with the target entry students being graduates with a bachelor's degree. An entry student who has a Masters of Science or a Masters of Engineering degree can transfer credits from the Masters degree towards the PhD degree (see "Additional Conditions" and "Applying Coursework from other Schools toward the PhD" later in this manual). The following provides a summary of the curriculum that was designed to provide students both discipline-specific training and cross-disciplinary focus-area (problem) driven education.

- **ENGR-701 Interdisciplinary Research Methods:** Fundamental practices on trans-disciplinary research, research statistics, research ethics, and mock qualifying exam (technical communications: literature review, paper writing and presentations). Because this course helps student prepare for the Qualifying Exam it should be taken before attempting the exam (usually within the first year of studies in the program).

- **ENGR-702 Translating Discovery into Practice:** Fundamental practices on public policy as related to engineering research; technology commercialization; intellectual property; case studies on transportation, energy, communication, healthcare and others; technical communications: (patent literature review, paper writing and presentations).

- **ECEP-796 Research Methods in Electrical and Computer Engineering:** Introduction to foundational methods and skill to conduct research in electrical and computer engineering with a focus on deep critical thinking about a problem and the ability to create new knowledge by channeling technical knowledge into creative thinking. Because this course cover key skill that form the Qualifying Exam, it is strongly recommended to complete this course before attempting the exam (usually within the first year of studies in the program).

- **Engineering Foundation** (6 credits, 2 courses): Engineering analytics and mathematics such as advanced mathematics, optimization, stochastic processes, etc. Students may use one or more courses from prior Master's study. Select two courses from:
  - EEEE-707 Engineering Analysis
  - EEEE-709 Advanced Engineering Mathematics
  - CMPE-610 Analytical Topics in Computer Engineering
  - A similar course approved by the program director

- **Discipline Concentration Electives** (9 credits, 3 courses): Discipline-specific foundation courses from electrical and computer engineering courses. The intent of this requirement is to attain depth of expertise in the field of electrical and computer engineering.

- EEEE-6xx, EEEE-7xx, EEEEE-8xx
- CMPE-6xx, CMPE-7xx, CMPE-8xx
- MCEE-6xx, MCEE-7xx, MCEE-8xx
  (the above list of courses excludes capstone courses)

- **Focus Area Electives** (12 credits, 4 courses): Courses that are directly relevant to the student's area of research. The intent of this requirement is to demonstrate breadth of expertise across the research area of focus, by drawing upon graduate course work as appropriate from across the college of engineering.
  - KGCOE-aaaa-6xx, KGCOE-aaaa-7xx, KGCOE-aaaa-8xx (excluding capstone courses)
  - Pre-approved non-KGCOE courses:
    → BIO-672 Computational Statistics and Data Science Methods
    → CSCI-642 Secure Coding
    → CSCI-720 Big Data Analytics
    → CISC-863 Statistical Machine Learning
    → CSEC-600 Introduction to Computing Security
    → CSEC-604 Cryptography and Authentication
    → CSCI-662 Foundations of Cryptography
    → CSEC-630 Trusted Computing
    → CSEC-669 Wireless Security
    → CSEC-720 Deep Learning Security
    → CSEC-741 Internet of Things Security
    → CSEC-744 Network Security
    → CSEC-769 Emerging Topics in Wireless Security
    → DSCI-644 Software Engineering for Data Science
    → IMGS-633 Optics for Imaging
    → ISTE-780 Data Driven Knowledge Discovery
    → MATH-603 Optimization Theory
    → MATH-622 Mathematical Modeling I
    → MATH-645 Graph Theory
    → PHYS-614 Quantum Theory
    → PHYS-667 Quantum Optics
    → PHYS-732 Advanced Solid State Physics
    → TCET-740 Fiber Optic Communications
    → TCET-741 Fiber Optic Communications Lab
    → TCET-745 Advanced Fiber-Optic Comm.
    → TCET-748 Fiber-Optic Test & Measurement
    → TCET-752 Advanced Wireless Communication

  - A graduate course in the focus area from outside of KGCOE or the non-KGCOE pre-approved list that is approved by the program director.

- **ENGR-795 Doctoral Seminar** (Minimum 2 credits, maximum 5 credits, 1 credit at a time): Students may elect to take a focus area elective course worth 3 credits in place of 3 doctoral seminar credits. Students must attend doctoral seminar until reaching the required number of credits.

- **Research Credits** (Minimum 30 credits) Students may initiate their research prior to the candidacy exam.
  - ENGR-892 Graduate Research (Maximum 9 credits) Research credits *taken prior to*

passing the candidacy exam.

- ENGR-890 Doctoral Dissertation (Minimum 21 credits) Research credits *taken after passing the candidacy exam*. Enrollment is limited to 8 credits maximum each term.

Non Credit-Bearing Requirements

Additional Requirements
Peer Reviewed Publication   (Min 2)

Examination Requirements
Qualifying Exam (End of year 1, must be passed prior to start of year 3)

Candidacy Exam: consisting of a written dissertation proposal and an oral defense of the proposal (at least 6 months after the Qualifying Exam and no more than 24 months after the Qualifying Exam)

Research Review meetings with dissertation committee (every 6 months after Candidacy Exam)   (Min 1)

Dissertation Defense Exam (at least 12 months after Candidacy Exam)

Additional Conditions
→ The student's Program of Study must be approved by the advisor and program director.
→ The total number of credit hours taken toward the PhD degree depends upon the highest degree completed by the student before entering the program.
→ Students entering the program without any prior graduate work must complete a minimum of 36 credit hours of coursework.
→ All PhD students are required to maintain a cumulative grade point average of 3.0/4.0 to remain in good standing in the program.
→ Courses where the grade is less than a 'C' cannot be counted towards a degree requirement.
→ Students entering the PhD program with a Master's degree from RIT may be permitted to transfer all permitted degree-seeking graduate coursework toward the minimum 36 hours of coursework required for the degree. Capstone course credits cannot be transferred. Double-counted courses taken as part of a BS/MS RIT program cannot be transferred. Students entering the PhD program with a Master's degree from an institution other than RIT may be permitted to transfer up to 13 credit hours under the same conditions. Students entering the PhD program that have previously completed non-degree seeking graduate-level courses at RIT may be permitted to transfer up to 13 credit hours. A student may be permitted to transfer credits from a combination of a non-RIT Master's degree and non-degree seeking RIT graduate-level courses for up to 13 credits hours combined. All credit transfer is subject to the approval of the program director and granted on a course-by-course basis.
→ A maximum of 8 ENGR-890 "Dissertation and Research" credits may be taken any semester. No more than 9 research credits (coded as ENGR-892 "Graduate Research") may be taken prior to the preparation of the proposal and passing of the Candidacy Exam (a.k.a. Dissertation Proposal Exam).
→ After completing the required dissertation credits, each student must remain active by registering for at least one credit of ENGR-890 "Dissertation and Research" every semester.
→ Full time status for RIT graduate students is 9 to 18 credit hours per semester.
→ Any student taking more than 18 credit hours per semester is discouraged and must have the permission of both their advisor and the program director. Students may be charged additional tuition for more than 18 credits at the current credit hour rate.

Curricular Phases

The Ph.D. in Electrical and Computer Engineering program consists of four distinct phases, as shown in Figure 1.

Qualifying Exam
- Taken at the end of year 1
- Must be completed before the beginning of year 3 (second chance at end of year 2)
- After two unsuccessful attempts, the student is excused from the program
- Demonstrate the likelihood to be successful in conducting significant research

Proposal & Candidacy Exam
- Completion of all coursework credits and formation of The Advisory Committee
- A maximum of 9 credits of research (ENGR-892) while preparing a dissertation proposal
- Candidacy Exam (Written and Oral portions) at least 6 months after the Qualifying Exam
- Propose a significant research effort for the dissertation

Dissertation Research
- Conduct research, publish findings, write dissertation
- At least 30 credits of research (ENGR890 + ENGR892)
- Research Review Meetings - every 6 months after the Candidacy Exam
- Demonstrate sustained progress towards completion or be dis-enrolled

Dissertation Defense
- Public oral presentation and private oral examination
- At least 12 months after the Candidacy Exam
- After one unsuccessful attempt, the student is excused from the program
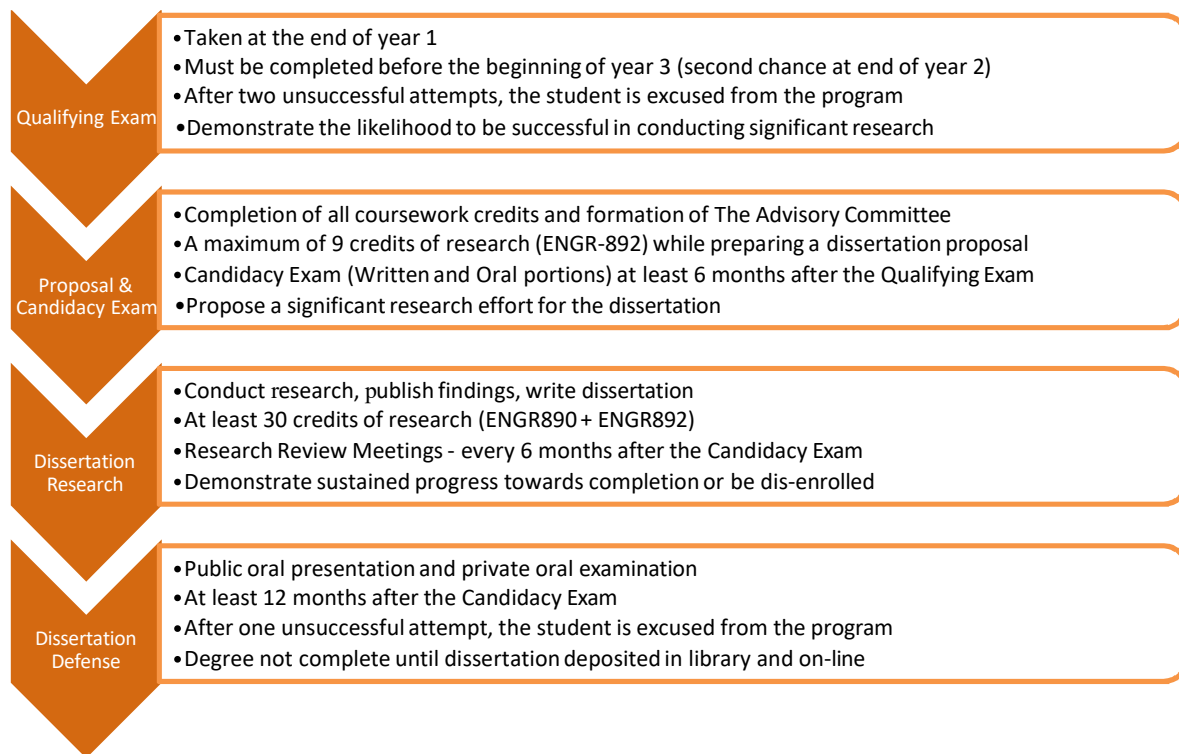- Degree not complete until dissertation deposited in library and on-line

Fig. 1 - The curricular phases of the PhD in ECE

The first phase of the Ph.D. program is to prepare the student with the foundation in engineering research required for the program as well as to determine the student's ability to do independent research. This includes the foundation and specialization courses taken during the first year together with the successful completion of the Qualifying Exam. The Qualifying Exam tests the student's ability to think and learn independently, to critically evaluate current research in engineering, and to use good judgment and creativity to determine appropriate directions for future research work.

The second phase of the Ph.D. program consists of course work in the Program of Study and preliminary dissertation research. The second phase includes the preparation of a dissertation proposal and concludes with the Candidacy Exam. A student typically publishes one or more papers in this phase.

The third phase program consists of the completion of the experimental and/or theoretical work needed to complete the student's dissertation along with the additional required publication of results. Research review meetings must be held with the dissertation committee at least once every 6 months. A student typically publishes one or more papers in this phase.

The fourth and final phase of the program consists of the degree completion activities. The student must satisfy all degree requirements, including publication. The student must successfully complete the Defense of the Dissertation, which consists of a public oral presentation and examination. The student must publish the dissertation in accordance with university requirements in force at the time of completion.

Electrical and Computer Engineering PhD Program Degree Completion Checklist

The following list summarizes key milestones toward an Electrical and Computer Engineering PhD at RIT:

☐ Successfully complete the first year courses
☐ Register to take the Qualifying Examination (After first two semesters)
☐ Pass the Qualifying Examination (Typically end of 1st year, must be passed prior to start of 3rd year)
☐ Submit a Program of Study form (After Qualifying Exam)
☐ Finish all required coursework (Prior to Candidacy Exam)
☐ Conduct preliminary research and define dissertation research topic
☐ Submit an Advisory Committee form to the program office
☐ Write the dissertation proposal
☐ Register to take the Candidacy Examination with the program office
☐ Pass the Candidacy Examination (no later than end of fourth year and at least six months after the Qualifying Exam)
☐ Continue your research
☐ Hold Research Review Meetings (every six months after the Candidacy Exam, until the dissertation defense). Provide minutes to the program office.
☐ Publish at least two peer-reviewed papers during the course of research
☐ Write the dissertation manuscript
☐ Register for graduation
☐ Register for the dissertation defense (at least twelve months after the Candidacy Exam) Pass the dissertation defense
☐ Submit dissertation (digital form) to the library, in accordance with library requirements. Submit completion receipt to the program office.
☐ Meet with program office to ensure completion of all certification requirements

Applying Coursework from other Schools toward the PhD

Students entering the PhD program with a Master's degree from RIT may be permitted to transfer all permitted degree-seeking graduate coursework toward the minimum 36 hours of coursework required for the degree. Capstone course credits cannot be transferred. Double-counted courses taken as part of a BS/MS RIT program cannot be transferred.

The transfer of credits from graduate programs at schools other than RIT is based on the approval of the program director. Requests are made through the Ph.D. program office. Upon approval of credit transfer, the Program of Study plan serves as an agreement between the student

and the Electrical and Computer Engineering Ph.D. program to permit the student to use classes from another school toward the Ph.D. requirements, up to a maximum of 13 credits. Students entering the PhD program that have previously completed non-degree seeking graduate-level courses at RIT may be permitted to transfer up to 13 credit hours. A student may be permitted to transfer credits from a combination of a non-RIT Master's degree and non-degree seeking RIT graduate-level courses for up to 13 credits hours combined.

→ Students who have completed graduate degree coursework from another university and wish to transfer credit must request credit transfer for each eligible class. Approval is given by the program director. This should be completed prior to the candidacy exam.

→ Pass/fail courses may not be counted toward course credit hour requirements.

→ All credit transfer is subject to the approval of the program director and granted on a course-by-course basis.

→ Courses which have been approved to count towards the PhD Program will appear in the student information system under the degree audit section.

Program Completion Guidelines

Registration for Courses

Students are responsible for course registration each semester. On-line registration takes place during each preceding semester. Students typically have the opportunity to register by July or early August of the summer prior to their first year.   It is the responsibility of students to make appointments with their advisor (or, for incoming students, the program director) at the time of early registration to facilitate course substitutions, elective requests and possible transfer credit requests.

Registration for Research Credits

It is the student's responsibility to plan for the number of research credits to take in each academic term. At the time of enrollment for the following academic term, students should discuss with their advisor their planned research activity in the upcoming term, as well as, overall intended timeline in the program. **The number of credits to enroll for the upcoming term should result from a concerted decisions between the student and the advisor based on these variables and should be communicated to the program staff**. Prior to registration, and after agreeing on a coursework plan with the advisor, students need to complete a "Registration for Credits Form", have it signed by the student and their advisor, and submitted to the Ph.D. program office.

Schedule Verification and Changes

Following early registration, students should verify their schedule on-line through the [Student Information System (SIS) (https://www.rit.edu/infocenter/)](https://www.rit.edu/infocenter/). The schedule should include all courses for which the student is registered as of the date of issue as well as the research credits, when applicable. A student may change their schedule at any time up to the end of the first six days of the semester (called the "Add/drop period"), following the procedure outlined by the RIT Registrar. Students **are strongly encouraged to consult with their advisor before adding or dropping classes**. Changes in a course schedule through this process are not reflected on a student's semester grade report or permanent record.

Course Withdrawal

If a student wishes to stop participating in a class following the six-day add/drop period, the student must officially withdraw from a course and will receive a grade of "W". Students should discuss any withdrawal with the instructor and their advisor. This "W" grade will be reflected on a grade report and permanent record. A course withdrawal resulting in a "W" grade may be obtained through the end of the twelfth week of the semester. After the twelfth week and up to the end of the semester, a "W" can only be assigned with the permission of the instructor, the program director and dean. In unusual situations, a "W" may be granted after the last official class day. Such an extraordinary request is administered through the Provost's Office. Students sponsored for tuition support or on sponsored projects must gain approval of the program director prior to course withdrawal, or financial support may be jeopardized. International students may need to consult with International Students Services before withdrawing from a course to prevent jeopardizing their visa status.

Repeating a Course

For graduate students, approval from the dean or dean's designee of the student's home

academic unit is required for any graduate courses a student wishes to take a second time. For a student whose program is housed outside the college structure, the approval of the director or director's designee of the student's academic unit is required. If permission to take a course a second time is granted, the grades of all courses attempted will count in calculating the graduate cumulative grade point average.

Schedule of Record

Official notification of a student's final course schedule for a current semester is issued by the Office of the Registrar approximately three weeks following the first day of classes. The student should check this information carefully. Inaccurate information should be reported to the Ph.D. program office for a correction to be made. It is the student's responsibility to check the accuracy of this information and to pursue the necessary corrections. Official registration for a course that a student does not attend could result in course overload, "F" grade, and loss of funding. Lack of registration for a course will result in a student receiving no credit for the course.

Responsibility

It is the student's responsibility to understand the requirements of the Electrical and Computer Engineering PhD degree program. Progress toward achievement of a degree is maintained by the Electrical and Computer Engineering Ph.D. program office. Access to that information is available to each student upon request. All degree requirements are published yearly in the RIT Graduate Bulletin. Questions regarding changes made in the curriculum during a student's program of study should be directed to the program office.

Time Limitations: the "Seven-Year Rule"

All candidates for the doctoral degree must maintain continuous enrollment during the research phase of the program. Such enrollment is not limited by the maximum number of research credits that apply to the degree. Normally, full-time students complete the course of study for the PhD in an average of four to six years, depending on the degree level upon entering the program, among other things. The seven-year rule requires that all courses used towards the Electrical and Computer Engineering PhD program be completed within seven (7) years of the date the student passes the Qualifying Exam. The purpose of the rule is to ensure that graduate students have current knowledge in their fields of study when certified by RIT. Prerequisites courses are excluded from this rule.

If a student does not complete all program requirements within the seven-year time period, course(s) more than seven years old can no longer be counted towards the requirements of the program of study. If this occurs, the student must complete additional course(s) to replace the credit that has expired. If extenuating circumstances prevent a student from completing within the 7-year timeframe, an appeal must be made to the Dean of the Graduate School for permission to complete the degree while retaining the expired course(s). In some cases, extensions of the seven-year rule may be granted. Petition for an extension is initiated via consultation with the student's advisor and written request to the Ph.D. program director.

Residency

All students in the program must spend at least two consecutive semesters as resident full-time students to be eligible to receive the doctoral degree. A full-time academic workload is defined as a minimum of nine academic credits per semester or an equivalent amount of research, as certified by the program director.

The Dissertation Committee

Ph.D. supervision and advising is carried out by the student's dissertation and research advisor, the dissertation advisory committee, and the program director. The role of each is described below.

The Program Director

The program director is responsible for overall management of the Ph.D. program. The program director is responsible for recruiting and admitting students, administering the program exams, conducting program assessment, and assisting students with assembling their dissertation committee. The program director may attend any or all examinations and review meetings during the program of study, to evaluate performance, quality, and compliance with program requirements. The program director will assist the student with course advising until a dissertation and research advisor is assigned.

The Dissertation and Research Advisor

The selection of Dissertation and Research Advisor (DRA) is a serious decision and represents a commitment on the part of both the student and the advisor to work together. In some cases, the assignment of a student to a DRA takes places during the admissions process, and the student is expected to work with the DRA who offered to mentor the student upon entry. In other cases, the student may be admitted to the program without a particular DRA being assigned. In cases when a DRA is not assigned at the time of admission, the program director will provide the student with a list of faculty members who are seeking to take on a Ph.D. student. It is then the student's responsibility to seek out those faculty members and identify one or more professors whom they would like to work with. Both the student and the DRA must agree to work together, and must declare their intent to establish the formal Ph.D. Student Advisee and DRA relationship by submitting a signed agreement to the program director. This agreement must be filed no later than the date when the student submits their application to take the qualifying examination. This agreement is generally an irrevocable decision. Should either the student or the DRA request release from the agreement, they must make a formal request in writing to the program director. Such requests will be approved only in the case of unusually extenuating circumstances.

The DRA will assist students with issues regarding curriculum requirements, elective choices, stipend support, presentations and publication, RIT support facilities, mentor all research efforts, and provide advice on concerns of a more personal nature (such as time management and career planning). The DRA is the supervisor of the student's research and dissertation effort, and must approve all research work completed by the student.

Ph.D. Dissertation Advisory Committee

After passing the Qualifying Examination, and during the process of formulating a dissertation research proposal, the student together with his/her DRA should form a dissertation advisory committee. The committee must include a minimum of four people including the DRA. The research committee will help supervise the student's research, review the dissertation research proposal, conduct all examinations, meet with the student during the course of the research, and conduct the dissertation defense.

The specific requirements for the dissertation advisory committee are:

- The Dissertation and Research Advisor (DRA) is the chair of the committee for all examinations, except the Dissertation Defense.
- Four or more members (including the DRA) are necessary. All members must hold a doctorate in a discipline relevant to the work in the dissertation.
- The committee must include at least two faculty members with expertise in the Discipline Concentration declared by the student.
- The committee must include faculty members from at least two KGCOE departments.
- The committee must include at least three KGCOE faculty members. At least two of these faculty members must be from the Department of Computer Engineering or the Department of Electrical and Microelectronic Engineering.
- The committee must include a majority of KGCOE faculty members.
- The committee may include one or more members from industry, academia, or government research labs.
- Must be composed of members approved by the program director. All changes in committee membership must be approved by the program director preceding any examination.
- Must have an additional external member appointed by the Dean of the Graduate School upon the nomination of the Program Director prior to the Dissertation Defense Examination. The external member must be a tenured member of the RIT faculty who holds a Ph.D. and is not a faculty member of the Electrical and Computer Engineering Ph.D. program.
- The external committee member is the representative of the Dean of the Graduate School in the Dissertation Defense proceedings and serves as the Dissertation Defense Chair. This external chair is responsible for reporting the outcome of the dissertation defense deliberation to the program director.
- All committee members must hold a doctoral or other equivalent terminal degree.

Program Examinations

The Qualifying Examination

Every student pursuing a PhD in Electrical and Computer Engineering must sit for the qualifying examination. The exam is used to assess the student's ability to think and learn independently, to critically evaluate current research work in the area of focus, place research within a global and societal context, and to use good judgment and creativity to determine appropriate directions for future research work. The exam must be passed successfully before a student can progress to the second phase of the Ph.D. program. All work completed for the qualifying exam must be the individual effort of the student being examined. The only person to whom the student may speak regarding the exam is the program director. All other communication about the examination is prohibited for the duration of the examination period.

- The qualifying exam is offered bi-annually, following the conclusion of the fall semester and the conclusion of the spring semester.
- Students intending to take the qualifying examination must register to take the exam by submitting a form to the program director no later than April 1 for the June qualifying exam and December 1 for the February qualifying exam.
- A student who registers for the exam but does not complete the exam will be assigned a "failure" for the exam.
- The exam must be completed before the beginning of the third year of study, or the student will be excused from the program.
- Students may attempt the exam a maximum of two times, once after the first year and once after the second year.
- Students who are unable to take the Qualifying Exam for reasons beyond their control should contact the program director.

The qualifying examination is based upon the student's critical evaluation of current research related to the student's area of focus within the PhD in Electrical and Computer Engineering program. The exam proceeds as outlined here:

- The examining committee will provide each student with three unique and substantive peer reviewed journal research articles that have been published within two and a half years prior to the exam date.
- The student will be given one work day to select one of the articles as the subject matter for their exam.
- The student will be given nominally three weeks to independently review the selected article and all material relevant to the article.
- The student must prepare a written evaluation report of the article and make an oral presentation to the examining committee.

The Qualifying Examination - Written Evaluation Report

A written evaluation report not exceeding 15 single-spaced pages (not counting the bibliographical references) is prepared and submitted to the program director, who presents the report to a faculty committee for evaluation. The student is advised to expand upon this minimum set of expectations as they determine necessary for a thorough evaluation of the article:

1. Identify the questions addressed by the author (*i.e.,* What are the author's hypotheses? What was unknown in the field of study prior to the author's work? What are the key issues that the author is investigating, and why are they important to the field?). Identify the novel contributions of the article.
2. Perform a critical appraisal of the author's contribution to the solution of those questions and the significance of the contribution. Perform a critical appraisal of the author's validation, analysis, evaluation, and justification of the novel contribution of the article and/or any other significant claim therein.
3. Uncover and understand other relevant work and references related to the research.
4. Propose in concrete terms the research that might be done to extend and (if necessary) improve upon the study discussed in the article.
5. The written report must be prepared using accepted standards of technical writing and be accompanied by relevant research citations. Any standard citation format approved by the program director is acceptable for citations.

The Qualifying Examination - Oral Presentation and Examination

After submitting the written evaluation report, the student makes an oral presentation (approximately 45 minutes) before a faculty examining committee appointed by the program director to elaborate on and defend the positions taken in the written evaluation report. The committee may ask questions during and following the oral presentation. There is no time limit on the amount of time allowed for questioning after the formal presentation. Question may vary in range from specific clarification of an item presented by the student, a defense of a position taken by the student, to assessment of the technical background of the student.

Qualifying Examination Assessment

The student's written evaluation report and oral presentation are used to assess the student's breadth and depth of background knowledge and his/her/their ability to:
- critically evaluate a current research work,
- think and learn independently,
- use good judgment and creativity to determine appropriate directions for future research work, and
- defend his/her point of view on the research and publication, and place research within a global and societal context.

The results of the Qualifying Exam are discussed by the examining committee immediately following the completion of the oral portion of the examination. An assessment of both the written and oral portion is made and recorded by the examining committee. The examining committee evaluates the Qualifying Exam and reports results to the program director, who shares the results with the program faculty. The evaluation by the committee will address the following criteria:

1. Quality of the written evaluation report (10%)
2. Quality and professionalism of the presentation and its delivery (15%)
3. Critical review of the selected paper (25%)
4. Student's ability to propose alternative approaches to solve the problem and extend the work presented in the paper (25%)
5. Student's understanding and handling of questions during the oral examination (25%)

An evaluation of the student's potential for continuation with the Ph.D. degree is made in a special meeting by the program faculty based on the results reported by the examining committee. The faculty reviews the student's grades, classroom performance, research progress, and performance in the Qualifying Examination to decide whether to encourage the student to continue in the PhD program, identify a research topic, and continue to the next phase of the PhD program. The faculty evaluates the student's overall performance and makes their decision to grant one of the following:

1. An unconditional pass. The student may progress to the next phase of the program.
2. A conditional pass with recommended or required remedial action(s), to be completed during the next phase of the program. The student cannot attempt the Candidacy Exam until the conditions have been met.
3. A failure. The student may not progress to the next phase of the program. The student may leave the program, may be offered a Master's degree, or may elect to take the exam a second time. The Qualifying Exam may be attempted a maximum of two times.

The decision is communicated to the student by the program director.

The Candidacy Examination

The Candidacy Exam is used to assess the student's readiness to progress to conducting independent research and begin the dissertation. The Candidacy Exam consists of two parts: a written dissertation proposal and an oral defense of the proposal.

- After the student and DRA identify a mutually satisfactory dissertation topic, the student should plan to take the Candidacy Examination, which is offered as needed.
- The student is expected to make reasonable and consistent progress toward identifying a PhD dissertation topic, which typically involves performing comprehensive research under the guidance of the advisor.
- The student must complete all course requirements for the PhD degree before taking the Candidacy Examination.
- The student mush form their dissertation advisory committee (except the additional external member) before scheduling the Candidacy Examination.
- A student is expected to schedule the Candidacy Examination within two years of passing the Qualifying Examination but it cannot be scheduled sooner than six months after the Qualifying Exam.
- A student should successfully complete their candidacy exam by the end of their third year in the PhD Program and must successfully complete their candidacy exam by the end of their fourth year in the program.
- Any student who has not successfully completed the candidacy exam by the end of their fourth year will be placed on probation. As a consequence, a student who has not successfully completed their candidacy exam two semesters into their fifth year will be suspended from the program.
- The Candidacy Examination must occur at least 12 months before the Dissertation Defense

Examination.
- Students desiring to complete the dissertation proposal examination must apply to take the exam by submitting a digital format of the written dissertation proposal and sufficient hard copies as required by the members of the dissertation committee and the program director no later than ten (10) business days before the oral portion of the examination.
- The student and the DRA are responsible for scheduling the examination, securing the examination room, and verifying that all committee members will be present.
- A student who registers for the exam but does not complete the exam will be assigned a "failure" for the exam.
- Students may attempt the Candidacy Exam a maximum of two times.
- Students who are unable to complete the Candidacy Exam (after being approved to take it) for reasons beyond their control should contact the program director.

The Candidacy Examination - Written Dissertation Proposal

A research topic is chosen by the student and their dissertation research advisor, which will be the basis for the dissertation. The dissertation proposal sets forth both the exact nature of the matter to be investigated and a detailed account of the methods to be employed. In addition, the proposal usually contains material supporting the importance of the topic selected and the appropriateness of the research methods to be employed. The proposal should not be construed as a "binding contract" between the committee and the student, but as a somewhat flexible agreement that is expected to evolve as the research progresses.

The dissertation proposal is a substantial document and its importance should not be underestimated. A proposal should demonstrate that the student has a thorough insight into the nature of a problem as well as the means to explore it. The proposal should clearly articulate the engineering research problem to be solved, or the research question to be answered, and the means by which the investigation will be conducted. The proposal should provide a clear significance context for the research problem, including the potential implications of the research outcomes. The proposal should provide a convincing plan for the research effort that will lead to a meaningful result in a reasonable amount of time. Although it is often necessary to show some preliminary results in the dissertation proposal, the bulk of the dissertation research is carried out after its acceptance. The general objectives of a well-written dissertation proposal are to:

1. Convince the student's dissertation and research advisor and members of the dissertation committee that the student is qualified to carry out the research project.
2. Convince the student's advisor and committee that the problem is academically and intellectually promising and will yield a meaningful contribution to the advancement of knowledge.
3. Convince the student's advisor and committee that the proposed research effort will be carried out successfully, with well-identified resources, and on time. This requires that the proposal include a detailed explanation of research objectives, the experimental and/or analytical approach to be followed, and timetable.

The following outline is suggested for the dissertation proposal. Modifications to the outline can be made based on the advice and the approval of the dissertation and research advisor.

1. **Cover page** – Adapt the standard dissertation cover page (as provided by the library) to reflect that this is a "Proposal for a Dissertation" rather than the "Dissertation" itself.
2. **Student C.V.** – Use a two-page format typical of those used for proposals to federal agencies

      such as NSF or NIH.

3. **Technical Abstract** – Prepare a one-page summary of the research question(s) to be investigated, the relevance of the research, the methods to be employed, and the anticipated outcomes.

4. **Introduction** – Prepare a one-chapter introduction to the problem. Orient the reader to understand the technical context and the expected contribution of the problem to be addressed through appropriate literature summary and citations, and summarize your proposed approach.

5. **Objectives** – Prepare a one-page statement of work and objectives to be achieved. It may be convenient to present the objectives either in bullet form or in graphical form as a series of interrelated tasks.

6. **Background** – Prepare a one-chapter literature review and, where necessary, a tutorial to orient the reader to the technical foundation upon which your research work will be built. The background should provide a clear introduction to the technical terminology and commonly accepted practices in the field. The literature review should provide a thorough assessment of the current state of the art, along with an assessment of unresolved questions in the research community. Use this foundation to clarify the unique contributions that will be made by the proposed dissertation research.

7. **Approach** – Prepare a one-chapter plan that articulates how the research will proceed in a methodical fashion from the foundation and context provided in the preceding sections. This chapter should clarify the materials, methods, models that are proposed to achieve the results expected.

8. **Preliminary Results and Discussion** – Some exploratory research may be needed to confirm that the research area is relevant or promising, or to determine whether the work can be carried out in the allotted time. Although the preliminary results should not represent a large portion of the dissertation proposal, it is important that relevant results to date be included in the proposal.

9. **Timetable** – Divide the work into major tasks, which may be listed in bullet form with descriptive detail. A Gantt chart is a very useful tool.

10. **Budget** – The previous task breakdown can be used to determine costs. For many proposals, this section can be an estimate of the cost of materials and equipment. Include the cost of any services and computing time as well as items that are available at no cost.

11. **Appendices** – Use appendices to report extensive data tables, charts, detailed mathematical proofs, source code, and large quantities of information that detract from the flow and continuity of the proposal body.

12. **References** – Your proposal should include a complete and thorough list of references that are relevant to your research topic. Follow reference guidelines established by IEEE, ACM, or others based on guidance from your research advisor and published in styles guides and manuals.

The Candidacy Examination - Oral Presentation and Defense of Dissertation Proposal

      The oral examination is based on the written dissertation research proposal. The purpose of the oral examination is to allow the dissertation advisory committee to judge the student's ability to execute a research task and to communicate the results. The exam also serves to evaluate the proposed topic to ensure that, if completed as posed; it constitutes an original contribution to knowledge. The oral portion of the exam typically follows these guidelines:

- The Dissertation and Research Advisor (DRA) serves as the chair of the Candidacy Examination committee.

- The student makes a formal presentation of his/her proposal in approximately 45 minutes but not exceeding 60 minutes. The presentation should focus on the background material pertinent to the proposed dissertation topic and the definition of the dissertation topic.
- The committee may ask questions during and following the oral presentation. There is no time limit on the amount of time allowed for questioning after the formal presentation but the student should not expect less than 60 minutes.
- Questions can be directly or indirectly related to the proposal subject.

The Candidacy Examination - Possible Outcomes

The dissertation advisory committee evaluates the (1) rigor, scope and relevance of the student's proposed dissertation and research, and (2) the student's ability to complete the proposed effort. The advisory committee will provide feedback to the student to help them focus on relevant, rigorous and reasonable research questions. The advisory committee evaluates the overall student's performance and makes their decision to grant one of the following:

1. An unconditional pass. The student may progress to the next phase of the program.
2. A conditional pass with recommended or required remedial action(s), to be completed during the next phase of the program. This is the most common outcome of the proposal examination. The committee will suggest changes to the scope, methods, or expected outcomes of the research effort, to help guide the student towards a successful outcome. Additional requirements may include items such as:
   - completion of additional courses that the committee feels are important for proper preparation,
   - continuing the research until a better definition of a proposed topic is presented,
   - improving oral presentation skills,
   - improving written communication skills, or
   - other concerns determined by the committee.
3. A failure. The student may not progress to the next phase of the program. In the event that the committee requires a significant change to the proposed work, the student may be asked to significantly revise the proposal or complete and entirely new proposal, based upon the feedback from the committee. The student may elect to leave the program, or may elect to revise the proposal and take the exam a second time. The Candidacy Exam may be attempted a maximum of two times.

The committee will report the results of the Candidacy Exam to the program director. The decision is communicated to the student by the dissertation and research advisor or program director. The student shall be informed of the outcome of the Candidacy Exam within five working days after the conclusion of the oral portion of the examination.

The Dissertation Defense Exam

The Dissertation Defense Exam consists of two parts: a written dissertation and an oral defense of the dissertation. The dissertation defense can be scheduled only after all other requirements for the degree have been successfully completed. The Dissertation Defense Examination may not be scheduled sooner than one year after the student passed the Candidacy Exam.

Prior to scheduling your defense, and when you and your advisor agree that you are ready for the defense of your dissertation, you should submit copies of your draft dissertation manuscript to all dissertation advisory committee members (including the external committee member) and the program director. You should expect that there could be considerable re-writing after this draft submission. You should allow at least three weeks for your committee members to read the manuscript and comment. Depending on the nature of the comments, you will need to plan sufficient time for revising. It is in your interest to keep in very close contact with all committee members so you can anticipate their remarks and accommodate them as much as possible during this revision stage. The program director may provide feedback on the content as well as format. Thus, the draft copy should conform to all the regulations regarding the dissertation manuscript presentation.

After the preliminary feedback from the committee has been incorporated, then it is time to schedule your formal defense. After making arrangements with your advisor and advisory committee, you should apply for the dissertation defense to the program director by:

- submitting the penultimate draft of the written dissertation (in hard copy form) to the advisor and committee members,
- scheduling of the final examination of the dissertation, and
- prepare a formal announcement with the title and abstract of the dissertation and the scheduled date, time, and location of the examination.

The examination must be scheduled no earlier than 20 working days after the formal announcement has been issued by the program director's office. It is the student's responsibility (not the advisors) to contact every committee member and complete all schedule arrangements, which may include travel for some members. In the event that a committee member is not able to travel for the defense, the scheduling of teleconferencing, video conferencing, or web conferencing is an option. It is the student's responsibility to post announcements of the defense in addition to the publicity that will be completed by the program office.

The Written Dissertation

The dissertation manuscript represents the culmination of your hard work toward the Ph.D. degree and is an archival publication of your research efforts. The faculty of the Electrical and Computer Engineering Ph.D. program has developed a set of guidelines that students should follow as they prepare their dissertation manuscript. It is the prerogative of the student's advisor to further tailor these to suit a particular situation and it is the responsibility of the student to follow these requirements. The format of the dissertation should conform to the requirements for publication set forth by RIT and the Electrical and Computer Engineering Ph.D. program.

A dissertation manuscript typically has three main components: (1) everything before the main body (the "front matter"), (2) the main body, and (3) everything after the main body (the "back matter"). Please be sure to follow the formatting requirements, particularly for the title page and front matter, consistent with those published by the Wallace library at the time of your defense. The following outline is suggested for the dissertation. Since the dissertation communicates to the research community your doctoral research work, and since research can take varied forms ranging from the purely theoretical to the decisively empirical, and everything in-between, you should take the following outline as a rough idea of how the main body may be organized. It is expected that you will structure the main body with sections and a flow that is consistent to the type of research that you have conducted and according to conventions in your research

community. Modifications to the outline can be made based on the advice and the approval of the dissertation and research advisor. The chapter and section names may be tailored to the research project and results.

Front Matter

1. **Cover page** – Use the standard dissertation cover page with all elements required by the library at the time of the defense.
2. **Author's Biography** – Use a two-page format typical of those used for proposals to federal agencies such as NSF or NIH.
3. **Abstract** – Prepare a one-page abstract of the dissertation.
4. **Acknowledgement** (Optional, or as required by a sponsor)
5. **Table of Contents**
6. **List of Figures**
7. **List of Tables**
8. **Nomenclature** (At the discretion of your advisor)

Main Body

9. **Introduction** – Present an introduction to the problem. Orient the reader to understand the context of the problem through appropriate literature summary and citations, and summarize your approach.
10. **Objectives and Novel Contributions** – Present a statement of work and objectives to be achieved and explicitly describe all the novel contributions in your thesis. It may be convenient to present this information either in bullet form or in graphical form as a series of interrelated outcomes.
11. **Background** – Present a literature review and, where necessary, a tutorial to orient the reader to the technical foundation upon which your research work is built. The background should provide a clear introduction to the technical terminology and commonly accepted practices in the field. The literature review should provide a thorough assessment of the current state of the art, along with an assessment of unresolved questions in the research community. Use this foundation to clarify the unique contributions that will be made by the dissertation. This section should provide a clear and explicit context of the novelty of the contributions in the thesis.
12. **Presentation of novel contributions** – This is the core block of the dissertation, usually involving multiple chapters that present the methodology used to conduct the research, be it through experiments or analysis based on a theoretical development. These chapters should clarify the materials, methods, and models employed to achieve the novel contribution. This block should also present all significant results of the research effort, whether they are analytical, numerical, experimental, or any other. A discussion of the results that serves the purpose of validating the claimed contributions is expected.
13. **Conclusions and Recommendations** – Articulate your conclusions drawn from your results. Answer the research questions originally posed. Provide a list of recommendations for future work, following from your analysis.

Back Matter

14. **References** – Include a complete and thorough list of references that are relevant to your research topic. Follow reference guidelines established by IEEE, ACM, or others based on guidance from your research advisor and published in styles guides and manuals.
15. **Appendices** – Use appendices to report extensive data tables, charts, detailed

mathematical/technical proofs, source code, and large quantities of information that detract from the flow and continuity of the body.

16. **Glossary** - Optional
17. **Index** – Optional

Formatting the Dissertation Manuscript

1. **Margins** (letter sized paper, 8.5"x11")
   Top edge: 1"
   Left edge: 1.5"
   Right edge: 1"
   Bottom edge: 1"
2. **Page Numbering**
   - The title page is considered to be page "i", but the number is not typed on it.
   - All of the front matter pages are numbered consecutively in lower case Roman numerals placed to the center of the page, 3/4" from the bottom edge.
   - The first page of the main text (i.e. the Introduction section) is numbered "1" and all subsequent pages are numbered consecutively.
   - Page numbering of the back matter should continue consecutively from the numbering of the main text.
3. **Spacing**
   Paragraphs should double spaced, no indentation of the first line, left justified, and with a hanging indent of 0.5 inch for each paragraph. Headings may be centered or left-aligned; do not fully justify or right-align headings. Single-spacing is allowed for footnotes, endnotes, references, lengthy quotations, bulleted or numbered lists, figure or table captions, or material in an appendix.
4. **Fonts**
   - Times Roman font is recommended. Script and ornamental fonts will not be accepted.
   - Font size should be from 11 or 12 point. Font size should remain consistent throughout the front matter and main text and must be easily legible.
   - Fonts for footnotes, figure captions, table data, references, and material in an appendix or biography are allowed to differ from the main text but style should be compatible.
5. **Headings**
   - The font size and style chosen for chapter titles must remain consistent for the titles of all chapters and chapter equivalents.
   - Headings may be centered or left-aligned.

   - Heading levels must be differentiated from each other. That is, a main-level heading within a chapter must be made readily distinguishable from a sub-level heading within the same chapter by changing alignment (left or center) or capitalization or using a boldface or italic font or through the combination of any of these. Example headings are illustrated in the table below:

CHAPTER 1. THIS IS A CHAPTER TITLE	CHAPTER 1. THIS IS A CHAPTER TITLE
1.1 THIS IS A MAIN HEADING	**1.1 THIS IS A MAIN HEADING**
1.1.1 This is a Sub-heading	*1.1.1 This is a Sub-heading*
1.1.1.1 Sub-sub-heading	*1.1.1.1 Sub-sub-heading*

A section must not have a sub-level heading without first having a main-level heading. Single sub-levels should be avoided. Headings at the bottom of a page (without at least one line of text below the heading) should be moved to the top of the following page.

6. **Figures and Tables**
   - All figures, tables, and other illustrative material must fit within the minimum margins.
   - Manuscript with any material extending beyond these margins will not be accepted.
   - Figures and tables must be numbered consecutively throughout the entire thesis. The figures may be numbers sequentially (1, 2, 3, *etc.*) or using the decimal system (1.1, 1.2, 1.3, 2.1, 2.2, *etc.*).
   - Figure numbering should be separate from table numbering.
   - Figures should be labeled using the fully typed capitalized word "Figure 1" and tables should be numbered with the fully typed capitalized word "Table 1" and so on.
   - Figure captions should be single-spaced and are not required to be set in the same font style or size as that of the main text. However, font style and size must remain consistent from one figure caption to the next.
   - Figure and tables captions should appear on the same page as the figure or table to which they refer.
   - Figures should not be placed out of the order in which they are numbered.
   - Tables should not be placed out of the order in which they are numbered.
   - Multiple figures may be placed on the same page as long as doing so does not compromise their legibility.
   - Every figure and table should be referenced within the text.

7. **References**

Use these guidelines unless your advisor requires an alternative format. Number citations consecutively in square brackets [1]. The sentence punctuation follows the brackets [2]. Multiple references [2], [3] are each numbered with separate brackets [1]-[3]. When citing a section in a book, give the relevant page numbers [2]. In sentences, refer simply to the reference number, as in [3]. Do not use "Ref. [3]" or "reference [3]" except at the beginning of a sentence: "Reference [3] shows   " Number footnotes separately in superscripts. Place the actual footnote at the bottom of the column in which it is cited; do not put footnotes in the reference list (endnotes). Use letters for table footnotes. Placing references at the end of this document are in the preferred referencing style. Give all authors' names; do not use "et al." unless there are six authors or more. Use a space after authors' initials. Papers that have not been published should be cited as "unpublished" [4]. Papers that have been submitted for publication should be cited as "submitted for publication" [5]. Papers that have been accepted for publication, but not specified for an issue should be cited as "to be published" [6]. Give affiliations and addresses for private communications [7]. Capitalize only the first word in a paper title, except for proper nouns and element symbols. For papers published in translation journals, please give the English citation first, followed by the original foreign-language citation [8]. Every reference that is listed should be cited in the text.

EXAMPLE REFERENCES

[1] G. O. Young, "Synthetic structure of industrial plastics (Book style with paper title and editor)," in Plastics, 2nd ed. vol. 3, J. Peters, Ed. New York: McGraw-Hill, 1964, pp. 15-64.
[2] W.-K. Chen, Linear Networks and Systems (Book style).Belmont, CA: Wadsworth, 1993, pp. 123-135.
[3] H. Poor, An Introduction to Signal Detection and Estimation.   New York: Springer-Verlag, 1985, ch. 4.
[4] B. Smith, "An approach to graphs of linear forms (Unpublished work style)," unpublished.
[5] E. H. Miller, "A note on reflector arrays (Periodical style–Accepted for publication)," IEEE Trans. Antennas Propagat., to be published.

[6] J. Wang, "Fundamentals of erbium-doped fiber amplifiers arrays (Periodical style—Submitted for publication)," IEEE J. Quantum Electron., submitted for publication.

[7] C. J. Kaufman, Rocky Mountain Research Lab., Boulder, CO, private communication, May 1995.

[8] Y. Yorozu, M. Hirano, K. Oka, and Y. Tagawa, "Electron spectroscopy studies on magneto-optical media and plastic substrate interfaces (Translation Journals style)," IEEE Transl. J. Magn. Jpn., vol. 2, Aug. 1987, pp. 740-741 [Dig. 9th Annu. Conf. Magnetics Japan, 1982, p. 301].

8. Appendices
   - Appendices may contain material such as detailed mathematical proofs tables, figures, photographs, raw data, computer programs that detract from the continuity of the main text or are too lengthy.
   - Appendix titles should be formatted like chapter titles and headings should be formatted in a manner consistent with headings found in the main text.
   - Appendices may be single-spaced to conserve space as appropriate.
   - Multiple appendices should be numbered as A, B, C, and so on. Each appendix should be started on a new page.

The Oral Defense of Dissertation

As the name indicates, the Dissertation Defense is an examination where you defend your research work that it is presented in your dissertation. **The Dissertation Defense is not the chronicling of what you did for your dissertation research**. The defense of your dissertation is based on the following four key components:

1) Stating of the contributions in the dissertation (where novel contributions is understood to be the new knowledge that you have created).

2) Presentation of the new knowledge that forms the contribution of the dissertation.

3) Justification of the decisions made and the approaches taken in the course of conducting the research (in the course of creating the new knowledge).

4) Validation of the value of the contributions through results that show what has been gained with the new knowledge (e.g. performance improvements).

The first part of the oral defense examination is open to the public and advertised in advance. It comprises a presentation and is primarily a defense of the dissertation research in the form of a seminar, with visual aids as appropriate. It is expected that the presentation should be approximately 45 minutes long, followed by 10 minutes of questions from the audience. The presentation must address the following points: definition of the problem and its relevance; objectives, novel contributions and accomplishments of the research; the approach taken and why; results of the work; conclusions, and recommendations for future work. The candidate is expected to make the verbal presentation with only very occasional reference to written notes. The committee will examine the candidate in closed session after the audience is excused. The program director may also attend the closed examination. The examination is primarily concerned with the research dissertation work, but also is the final assessment of the candidate's overall knowledge for the degree. Questions may relate to any aspect of the material in the research area and in the coursework of the degree program. There is no time limit for the closed examination. When the committee concludes questioning, the candidate will be asked to leave the examination room while the committee deliberates the exam and reaches an outcome decision. The dissertation defense will be chaired by the external committee member appointed by the Dean of the Graduate School upon the nomination of the Program Director. The candidate is invited back into the room after a decision is reached.

The Dissertation Defense Examination - Possible Outcomes

The dissertation defense is a Pass/Fail examination. In the event of a "Pass" the student must incorporate all corrections and revisions identified by the committee, prior to submitting the final dissertation for publication. A variation to the "Pass" outcome is a "Conditional Pass", where the committee indicates additional requirements to be met prior to submission of the final dissertation to the RIT Library and within 3 months of examination date. The submission of these additional requirements, and the removal of the conditional qualifier to the "Pass" outcome, is certified by the DRA. In the case of "Failure" the candidate will be advised by the advisor and the program director as to what actions can be pursued.

Other - Research Review Meetings

After passing the Candidacy Exam, students move into the third phase of the program of study. Students are expected to report and discuss research progress on a regular basis with their Dissertation and Research Advisor (DRA) as well as their advisory committee. These regular discussions should at a minimum include the research progress, milestones, modifications to direction, and plans for future work.

Students often seriously underestimate the time required to complete a dissertation. The student and DRA should work together to design a reasonable plan to meet milestones, publish results, complete the dissertation research, and prepare the dissertation manuscript. Many individuals, and often contractual commitments, depend on the timely completion of the tasks associated with the student's research project. These include the advisor, the committee, the funding organization, the program director, the dean, journal editors and conference committee chairs if the work is being published or presented, as well as family and friends. Time management is not only important for the tasks associated with the student's research project, it will be a necessary part of the student's professional career as well. The process of writing proposals, conducting research, and reporting results will continue to play a large role in a student's career after completion of the Ph.D. Different time management strategies work for different people. Below are suggestions that may be helpful when conducting research and writing the dissertation. It is recommended that the student and advisor discuss some of these strategies.

- With the help of your advisor, set deadlines for yourself and stick to them. Alternately, give yourself some leeway in your deadlines so that if the occasion arises, you have some of extra time built into your schedule.
- Map out your whole schedule in as detailed a manner as possible. Block out time for all your daily obligations, and include plenty of time for research and writing. If possible, make this a regular schedule.
- Be realistic about how much time you will need. This is a large project and high quality is expected so do not underestimate the time you will need to devote to this. If you know you are a slow writer, keep this in mind as you put together your schedule.
- Picture your research activity as an object of material existence with a mass which is, thus, subject to momentum. If you come to a complete stop on your research it becomes more difficult and time consuming to come back up to speed.
- Assume and plan for the presence of roadblocks and slowdowns.

Research Review meetings are administered by the student's advisor and advisory committee between the time of passing the Candidacy Exam and registering for the Dissertation Defense.

The student must schedule one Research Review meeting every six months following the conclusion of the Candidacy Exam, until the completion of the Dissertation Defense. The student and advisor should schedule the meeting with the advisory committee and a convenient time and location. The purpose of this meeting is to get the student together with his/her advisor and the entire advisory committee to discuss progress and future plans necessary to meet the final goals of the dissertation. This ensures that all involved agree on what is necessary for the student to complete the research and determine whether any additional work may be necessary. The Research Review meetings are not examinations. However, after each meeting the advisor and committee should file a report form with the Ph.D. program office, communicating the progress status of the dissertation along with the main recommendations for further action that were discussed in the meeting. When the committee and advisor believe the student is nearing completion of the dissertation and all associated degree requirements, the student may register to complete the Dissertation Defense Examination.

Concluding the Degree

After the dissertation defense, you still have several tasks to complete. These tasks may require several weeks to complete, particularly if any corrections are required as a result of your defense. *Corrections are almost always required.* Do not plan to leave the area until all elements of the degree are completed.

Final Revisions

Revisions may be required as a result of your defense. It is almost inevitable that you will discover typographical errors at this point. Every single edit or modification to your dissertation, following the defense, must be individually approved by your dissertation and research advisor and the program director.

Signatures and Copies

Upon successful completion of the examination and all required revisions, the necessary signature pages of each copy of the dissertation manuscript are signed by the appropriate persons. Original signatures must be on all copies. Securing the signatures is the student's responsibility and it is done once final revisions to the dissertation manuscript are accepted. Generally, separate copies are needed for the advisor and committee members, one for the Ph.D. program library any others desired by the student. These signatures grant permission to have the thesis bound. Follow the procedure for thesis binding as outlined below.

Publishing the Dissertation

There are several requirements and guidelines pertaining to the publication of the dissertation manuscript. Please follow the guidelines of the RIT library
https://infoguides.rit.edu/thesis-services

Copyright Law and Graduate Research

The graduate student dissertation is copyright protected material and some familiarity with copyright rules and responsibilities is a good idea. Copyright law establishes certain rights and ownership to the creator of original art, text, figures, *etc.* Additionally, during the course of research and publication, the meaning of "fair use" and "copyright infringement" should be understood. Copyright law will become increasingly important throughout a student's academic as well as professional career. Students should read and understand the materials on Copyright Law and Graduate Research available from RIT's Publishing and Scholarship Support Center.

Preparation of the Dissertation for Binding and Publication

Upon final approval from your committee, follow these steps to submit your dissertation for publication:

1. Pay for personal bound copies of dissertation, which are not required but students may want a physical printed copy of their dissertation: https://infoguides.rit.edu/thesis-services/binding or you can order bound printed copies from https://www.thesisondemand.com
2. If an embargo (a hold on publishing) is needed, fill out the necessary form and submit it to the Dean of Graduate Studies. An embargo will only be approved in rare cases, and should be discussed with the program director very early in the dissertation process, at least as early as the research review meeting. https://infoguides.rit.edu/thesis-services/embargoes

3. Submit your thesis/dissertation to ProQuest following the submission guidelines.   If you chose the Open Access Publishing option, you may be responsible for paying an additional fee. A PDF version of your thesis must be submitted to ProQuest for either Traditional or Open Access Publishing. Remember to exclude signatures from the electronic version of your paper. http://infoguides.rit.edu/thesis-services
4. Email receipt from ProQuest to the PhD program office.

Additional detailed information regarding the official library requirements for completion of your dissertation can be found at: http://infoguides.rit.edu/thesis-services

Degree Certification

The student must submit the electronic receipt for deposit of the ProQuest digital copy dissertation obtained from ProQuest to the Doctoral Program office. The program director will certify the degree *only* when *all* degree requirements have been satisfied.

RIT

Kate Gleason
College of
Engineering

**Electrical
and Computer
Engineering
Ph.D.**