Ph.D. in Interdisciplinary Engineering

PROGRAM HANDBOOK

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Preface

This handbook describes the expectations, requirements, and policies pertaining to the Ph.D. in Interdisciplinary Engineering (PhD.IE) program at Kennesaw State University (KSU). The information provided in this handbook consists of information specific to the PhD.IE program and other relevant University and Graduate College policies.

All KSU graduate students are expected to be familiar with all university policies in the University Graduate Catalog, as well as other pertinent university requirements and policies. In the case of any inconsistencies, current university policies take precedence over the information presented in this handbook. Where possible, summaries of and/or links to these policies, procedures, and requirements are included.

Certain information in this handbook (e.g., credits, names, places, times, course numbers, and URLs) is subject to change. Students are encouraged to maintain regular contact with the Program Director, Program Faculty, and their Dissertation Committee to ask any questions about program requirements or other program-related issues.

This handbook is organized into seven sections. **Section 1** provides an overview of the program, including its mission statement and learning outcomes. **Section 2** describes the program administrative structure, program faculty, and research focus areas. **Section 3** describes the procedure of admission into the program and the application evaluation process. **Section 4** describes the different types of financial aid available to the students admitted into the program. **Section 5** presents the requirements specific to the PhD.IE program. Lastly, **section 6** and **section 7** provide details about the coursework and research requirements, respectively, for obtaining the PhD.IE degree. At the end of this manual are two appendices: **Appendix A** contains the recommended program timelines, and **Appendix B** contains all the forms currently used in the program.

Quick Links and Resources

Program Office and Contacts

PROGRAM DIRECTOR

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ADMINISTRATING DEPARTMENT CHAIR

Benjamin Klein, PhD

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Graduate College Orientation

Students enrolled in the PhD.IE program can explore valuable information about Graduate College policies and resources in the Graduate College On-line Orientation: http://gradorientation.kennesaw.edu

Other Resources

Below is a list of the most frequently accessed websites for information that will be important over the course of the Interdisciplinary Engineering doctoral studies. This list, which complements the information provided in this handbook, should be consulted when questions about policies and procedures arise.

- Ph.D. in Interdisciplinary Engineering Program: https://www.kennesaw.edu/phdengineering
- Southern Polytechnic College of Engineering and Engineering Technology: https://engineering.kennesaw.edu
- KSU Graduate College Student Portal: https://graduate.kennesaw.edu/student-resources/
- Kennesaw State Student Portal: https://www.kennesaw.edu/currentstudents.php
- The Graduate Catalog: http://catalog.kennesaw.edu/index.php
- Office of the Registrar: https://registrar.kennesaw.edu/
- Graduate Program Forms: https://graduate.kennesaw.edu/forms/student-forms.php
- The Graduate Library: https://libguides.kennesaw.edu/graduateportal
- Graduate Student Writing Center: https://writingcenter.kennesaw.edu/gwp/index.php
- Tuition & Fee Information: http://graduate.kennesaw.edu/admissions/resources/financials.php

- Parking & Transportation: https://parking.kennesaw.edu
- Student Health Insurance: https://registrar.kennesaw.edu/student-resources/student-insurance.php
- Commencement/graduation information: https://graduate.kennesaw.edu/student-resources/

Additional Resources for International Students

- International Student and Scholar Services: http://dga.kennesaw.edu/isss/
- English Language Program: http://uc.kennesaw.edu/academicinitiatives/esl/
- International Student Health Insurance: http://dga.kennesaw.edu/isss/insurance.php
- Cultural Awareness Resource Center: https://carc.kennesaw.edu/index.php
- International Student Association: https://kennesawisa.wixsite.com/kennesawisa

1. Program Overview

1.1. Program Description

Today's engineers face complex problems that require interdisciplinary approaches. Industries are particularly interested in interdisciplinary graduate education that emphasizes both breadth of knowledge and depth in a particular field. The Ph.D. in Interdisciplinary Engineering (PhD.IE) is a unique thematic doctoral program designed specifically to meet these needs.

As compared to traditional engineering doctoral programs, which specialize students in one engineering area, the PhD.IE transcends the boundaries of traditional engineering disciplines, creating an educational experience that serves as a strong foundation for exciting, rewarding research and development careers in industry, government, and academia.

The program takes advantage of unique resources and strengths from all six departments in the Southern Polytechnic College of Engineering and Engineering Technology to provide students with opportunities to work on interdisciplinary research in *Intelligent Robotic Systems*, *Smart Infrastructure*, and *Biomedical and Health Systems*, and to contribute to groundbreaking research, new technologies, and innovative solutions that can transform lives.

1.2. Program Mission and Highlights

The PhD.IE provides students with opportunities to work across multiple disciplines in a subject area that extends their knowledge base outside their core undergraduate expertise to equip them with a well-defined research expertise in a subject area and a broad-based expertise in technological innovation.

This program differs from other doctoral engineering programs in four ways:

i. **Interdisciplinary thematic degree –** The Ph.D. in Interdisciplinary Engineering program is an interdisciplinary collaboration between the six departments within the Southern Polytechnic College of Engineering and Engineering Technology. Students conduct dissertation research in one of three research areas, which draw on faculty resources throughout the college. The coursework also uniquely transcends the boundaries of traditional engineering disciplines, creating an educational experience that serves as a strong foundation for exciting, rewarding research and development careers in industry, government, and academia.
ii. **Industry-focused program –** The unique and innovative curriculum offered under the PhD.IE program includes two courses that equip the doctoral students with the personal and professional skills needed to launch a successful career path in industry or entrepreneurship yet will still have utility in academia. The courses cover topics important for all career paths, including engineering education, grant writing, self-awareness and personal SWOT (Strengths-Weaknesses-Opportunities-Threats) analysis, and entrepreneurship.

iii. **Defined timeline to graduation –** The structure and course sequence of the PhD.IE program were designed to provide a defined timeline to completion. This Ph.D. degree clearly defines and manages pathways to graduation from either a Bachelor of Science (B.Sc.) or a Master of Science (M.Sc.) degrees with a maximum of four (4) or three (3) years, respectively, pending satisfactory progress on the dissertation research.
iv. **Externally funded program through grants and contracts –** Students enrolled in the PhD.IE program conduct meaningful research with societal impact at the forefront of engineering innovation and technology. Most projects are externally funded through federal grants and contracts, and provide most admitted eligible students with a Graduate Research Assistantship consisting of a stipend and a tuition waiver.

1.3. Program Outcomes

The PhD.IE is designed to help students achieve the following learning outcomes:

i. Synthesize and develop advanced engineering knowledge from multiple disciplines across colleges and external partners
ii. Conduct research independently in unexplored fields for innovative research or new applications of knowledge to advance the engineering sector
iii. Effectively communicate and disseminate the results of their research both in writing and through oral presentations
iv. Develop professional competencies in ethics, pedagogy, proposal writing, patenting, research team organization, entrepreneurship, etc.
v. Collaborate with researchers from diverse backgrounds in a variety of circumstances
vi. Acquire and apply new knowledge as needed, using appropriate learning strategies, for the rapidly evolving challenges of the 21st century

2. Program Structure

2.1. Program Administration

2.1.1. Program Director

The PhD.IE program is managed by the Program Director, who is responsible for coordinating all aspects of the program, enforcing the policies and procedures of the program, providing guidance for drafting new policies and procedures necessary to run the program, and representing the Program Faculty as well as the students enrolled in the program within and outside of the university.

2.1.2. Program Affairs Committee

The PhD.IE program is administered by the Program Affairs Committee. The main responsibilities of this committee include:

i. Providing guidance for drafting new policies and procedures
ii. Reviewing applications to the program and providing admission recommendations to the Program Director
iii. Reviewing and approving students' Dissertation Committees
iv. Reviewing students' petitions

2.1.3. Program Faculty

The Program Faculty consists of faculty members who hold full graduate faculty status with the Graduate College and who contribute to the PhD.IE program. Program Faculty members may supervise students enrolled in the program, participate in candidacy exams, proposal defense and dissertation defense, and serve on dissertation committees.

2.2. Research Areas

The PhD.IE program is articulated around three (3) research focus areas:

- Intelligent Robotic Systems
- Smart Infrastructure
- Biomedical and Health Systems

Descriptions of those research focus area are provided in the following subsections.

2.2.1. Intelligent Robotic Systems (IRS)

IRS is an interdisciplinary field of research interfacing engineering disciplines of Mechanical Engineering, Electrical Engineering, and Computer Engineering. Traditionally, robotic systems are pre-programed to perform certain tasks and mainly used in factories. However, the next generation of robotics systems will be more intelligent and adaptable to their environment as well as safer to interact with humans. Therefore, this focus area has all the traditional elements of robotics including kinematics, dynamics, system theory and control as well as modern elements such as artificial intelligence and soft robotics. This area requires a multidisciplinary approach to

cover traditional robotic topics coupled with the latest advances. The IRS focus area provides comprehensive interdisciplinary training in research through advanced educational programs and hands-on research experience, using the state-of-the-art labs and facilities across the university. The core faculty of this concentration area have expertise in broad range of advanced robotics topics including kinematics, dynamics, advanced control theory, soft robotics, robust control, biomedical device development, compliant mechanisms, collaboration of heterogenous team of robots, path planning and avoiding obstacles, and AI algorithms for localization of robots in complex and dynamic environments.

2.2.2. Smart Infrastructure (SI)

A continuous evolution in computing and communication technologies is changing how we live our day-to-day lives, how we interact with components of existing systems and sub-systems, and how various systems and sub-systems interact with each other to improve quality of life. These interactions between users, users and systems, and systems and sub-systems have resulted in massive amounts of data that can benefit current and future generations. While there is a potential to fundamentally change how society will survive and thrive, current research, innovation, development, and deployment activities are fragmented. The SI focus area focuses on a comprehensive approach by: 1) blending expertise in multiple disciplines to research and develop solutions for smart, connected, and adaptive infrastructure systems; 2) harnessing available data and/or generating new data to develop solutions that can convert existing infrastructure into an intelligent, resilient, and sustainable systems of systems; and 3) identifying research and innovation opportunities in optimizing existing resources to support future technologies.

2.2.3. Biomedical and Health Systems (BHS)

The BHS focus area aims at pushing the traditional boundaries of engineering (mechanics, thermal and fluid sciences, materials science, mechatronics, industrial and systems engineering, electrical engineering technology, mechanical engineering technology), science and medicine to increase fundamental biomedical knowledge and improve healthcare. The interactions between these disciplines at KSU result in a wide range of biomedical engineering studies with applications in cardiovascular biomechanics, mechanobiology, tissue engineering, biophysics modeling, electrophysiology, medical devices and prostheses, biomaterials, medical imaging, rehabilitation, and human factors engineering. The BHS focus area builds upon the strong foundation of successful research and educational programs in the Southern Polytechnic College of Engineering and Engineering Technology. It also leverages multidisciplinary approaches and state-of-the-art equipment across four engineering departments and three departments in the College of Science and Mathematics to provide excellent collaborative opportunities and an outstanding environment for training the next generation of leaders in bioengineering.

3. Admission

3.1. Admission Requirements

3.1.1. Qualifications and eligibility

The Program Affairs Committee considers several factors when making admissions decisions, including academic performance at prior institutions, statement of purpose, and letters of recommendation. GRE scores are not required but will be considered if submitted. Applicants' undergraduate and graduate records and recommendation letters will be given greater consideration.

To be considered for admission into the PhD.IE program, a student must satisfy the program eligibility requirements described below:

i. Hold an undergraduate or graduate degree in engineering, or a related degree (e.g., physics, mathematics, computer science) from an accredited college or university
ii. Have a minimum undergraduate degree grade point average (GPA) of 3.0 on a 4.0 scale or its equivalent. The average undergraduate and graduate GPAs of students accepted into the program are 3.3 and 3.6 on a 4.0 scale, respectively.
iii. Have successfully completed Calculus I and Calculus II and at least one higher-level mathematics course (e.g., Calculus III, Linear Algebra, Differential Equations, Discrete Mathematics)

Notes:

- *Preference in admission will be given to applicants having relevant engineering or project management experience after earning B.S. degree or a Professional Engineering license.*
- *Applicants who possess an undergraduate degree outside of engineering will be considered on a case-by-case basis.*

3.1.2. Application deadlines

The program accepts applications for Fall and Spring; the deadline for Fall is July 1; for Spring November 1.

3.1.3. General Requirements

Applicants must submit the following to the Office of Graduate Admissions no later than the published deadline date for the semester in which they plan to enroll:

i. **Online graduate application** – There is a non-refundable application fee
ii. **Transcripts** – Official transcripts from each College or University attended. Must be in a sealed envelope from the institution or sent electronically from the institution directly to ksugrad@kennesaw.edu
iii. **Statement of Purpose** – A one-to-two-page Statement of Purpose describing career and educational goals, recent accomplishments and activities, research interest, and the targeted program concentration area (*Intelligent Robotic Systems* or *Smart Infrastructure* or *Biomedical and Health Systems*).

iv. **Resume** – Documented relevant engineering or project management experience (preferably research focused) after earning B.S. degree or Professional Engineering license will strengthen the application.
v. **Letters of recommendation** – Three (3) letters of recommendation from academic or professional contacts; at least two (2) recommendation letters must be from an academic contact.
vi. **English proficiency (International students only)** – Official TOEFL or IELTS Scores (exemption of the TOEFL or IELTS test is determined by the College of Graduate and Professional Education.

Notes:

- *CV/resume documenting relevant engineering or project management experience after earning B.S. degree or Professional Engineering license will strengthen the application.*
- *Applicants can supplement their application with an official copy of their Graduate Record Examination (GRE) general test results. High quantitative scores will strengthen the application.*
- *It is strongly recommended that the applicants contact potential advisors among the Program Faculty in order to assess funding availability and faculty's interest prior to applying to the program. In cases where a mutual agreement is found between an applicant and a faculty advisor, the submission of a letter of support from the faculty advisor describing his/her commitment to advise the student and all funding sources that will be used to support the student should be submitted along with all the application material described above.*

3.1.4. Additional Requirements for International Students

International students should provide official TOEFL or IELTS scores. Exemption of the TOEFL or IELTS test is determined by the College of Graduate and Professional Education. International students should also consult the Office of Graduate Admissions – International Students website for additional requirements.

3.2. Admission Application Evaluation Process

The applications for admission are submitted to the Office of Graduate Admissions. All applications are then received by the PhD.IE Program Director and reviewed for meeting the expected requirements as established by the program.

If all requirements are met:

i. The application is forwarded to the Program Affairs Committee for evaluation following the receipt of the application by the Program Director.
ii. The Program Affairs Committee reviews the application and provides an initial recommendation on admission, research area (based on the applicant's educational background and experience), and financial aid (based on funding availability) to the Program Director.
iii. The Program Director reviews the Program Affairs Committee recommendation and provides the final decision on admission to the Office of Graduate Admissions.

4. Financial Aid

4.1. Overview

The PhD.IE program is primarily an externally funded program. Students enrolled in the PhD.IE program conduct meaningful research with societal impact at the forefront of engineering innovation and technology. Most projects are externally funded through federal grants and contracts, and provide most admitted eligible students with a Graduate Research Assistantship (GRA) consisting of a stipend and a tuition waiver. Doctoral students are also encouraged to apply to externally funded grants and fellowships.

4.2. Graduate Research Assistantship

4.2.1. Description

GRA is the term used at KSU to refer to graduate assistantships that work on campus in research-related positions. GRA students gain the experience of working alongside faculty members on cutting edge research. GRA students are generally funded through competitive faculty grants and contracts.

The type of GRA awarded by Program Faculty in the PhD.IE program consists of:

i. funding at a level of $24,000/academic year
ii. a tuition waiver for up to 12 credit hours per semester

4.2.2. Responsibilities

GRA responsibilities vary greatly and may include, but are not limited to:

- collecting, coding, and/or analyzing data
- conducting literature reviews or library research
- preparing materials for submission to funding agencies and foundations
- writing reports
- preparing materials for IRB review

Notes:

- *Graduate Research Assistants should also not be engaged in work unrelated to their academic program or that does not further their educational experience and objectives.*
- *GRA positions are considered exempt employees of the university, which means they are to utilize content knowledge that requires at least a bachelor's degree, and as a result are paid as exempt professionals. Under the federal Fair Labor Standards Act (FLSA), exempt work is performed by:*
  - *executives/administrators*
  - *professionals, and is paid on a salaried basis regardless of the specific number of hours worked in a given week.*

4.2.3. Graduate School Policy

To continue the assistantship, the student must maintain good academic standing and an acceptable job performance. However, should a student's grade point average

(GPA) fall below 3.0 (academic warning), the student will have one semester to improve and return to academic good standing before the assistantship is terminated. Should a student fail to return to good standing after one semester, or should a student receive academic exclusion and be dismissed from the degree program, the assistantship would be terminated at once. For more details on Graduate School policies, please visit: https://gradassistantships.kennesaw.edu/policies.php

4.3. External Funding

Competing for external funding is part of the professional development of doctoral candidates. Receiving a competitive external fellowship is an honor that stays with students throughout their career and can improve their professional prospects. Therefore, all Doctoral students are strongly encouraged to seek external financial support in the form of dissertation fellowships and grants to cover the dissertation related expenses.

Applications to external funding opportunities should be discussed with the student's Dissertation Advisor. All proposals for external funding (grants, subawards, contracts, consulting agreements) must be routed through the Office of Research, and the Kennesaw State University Research and Service Foundation (KSURSF) is the legal applicant. It is recommended to work closely with the Office of Research staff to verify funding eligibility and ensure on-time submission of all required application material.

5. Program Requirements

5.1. Dissertation Committee

The Dissertation Committee is responsible for administering the Candidacy Exam, Dissertation Proposal Defense, and Dissertation Defense.

By the end of the first year of study, the student, in consultation with the Dissertation Advisor, should select a Dissertation Committee of at least five members, including the Dissertation Advisor, who will serve as the Dissertation Committee Chair.

5.1.1. Dissertation Advisor

The Dissertation Advisor serves as Chair of the student's Dissertation Committee and directs the research study.

- The Dissertation Advisor must be a member of the Program Faculty.
- The Dissertation Advisor is responsible for the overall direction of the research, the regular advising of the student, and the continuing progress of the student in completing his/her Program of Study in a timely manner.
- It is permissible to have two committee members co-advise a dissertation. The two co-advisors must hold full graduate faculty status. One of the two co-advisors must be designated as primary advisor and should be affiliated with the Southern Polytechnic College of Engineering and Engineering Technology.

Students are required to identify a Dissertation Advisor, with mutual consent, by the end of the first semester following admission in order to remain in the program. To facilitate the selection of a Dissertation Advisor, it is recommended that the students discuss their educational objectives with several Program Faculty members within their research area prior to submitting their application.

5.1.2. Dissertation Committee Members

The composition of the dissertation committee should include a minimum of four members in addition to the Dissertation Advisor as follows:

- Two (2) faculty members from the Southern Polytechnic College of Engineering and Engineering Technology at KSU with full graduate faculty status
- At least one (1) external member from a Carnegie-classification doctoral research university, having full graduate faculty status at their home institution
- A final member of the committee can be from KSU, another research university, a government laboratory, industry, or a non-academic research institution
- One of the committee members can serve as a co-advisor
- Exceptions to the committee composition as specified above can be made on a case-by-case basis through a petition by the dissertation advisor to the Program Affairs Committee.

Once the members have been selected, the student must submit a *Dissertation Committee Approval Form* (see **B-1 Dissertation Committee Approval Form**) for approval by the Program Director and the Dean of the College of Graduate and

Professional Education. In the event a member can no longer serve on the Dissertation Committee due to unforeseen circumstances, a suitable replacement must be found, and the student must submit a new *Dissertation Committee Approval Form*.

5.2. Recommended Timelines

Students and advisors are strongly encouraged to follow the recommended timeline for meeting program milestones (see **A-1 Recommended Timeline (students with a B.Sc.)** and **A-2 Recommended Timeline (students with a M.Sc.)**). In addition, certain program milestones carry deadlines for completion. Milestone deadlines for students entering the program with a B.Sc and M.Sc are discussed below.

5.2.1. Milestone Deadlines for Students with a BS.c

- **Milestone 1 –** By the time a student has completed 18 credit hours* after the B.Sc. degree, the student is required to apply for the Program Qualifying Review.
- **Milestone 2 –** By the time a student has completed 36 credit hours* after the B.Sc. degree, the student is required to take the Candidacy Exam.
- **Milestone 3 –** By the time a student has completed 54 credit hours* after the B.Sc. degree, the student is required to defend the Dissertation Proposal.
- **Milestone 4 –** Within completion of 72 credit hours* after the B.Sc. degree, the student is required to present the Dissertation Defense.

5.2.2. Milestone Deadlines for Students with a MS.c

- **Milestone 1 –** By the time a student has completed 27 credit hours* after the M.Sc. degree, the student is required to take the Candidacy Exam.
- **Milestone 2 –** By the time a student has completed 42 credit hours* after the M.Sc. degree, the student is required to defend the Dissertation Proposal.
- **Milestone 3 –** Within completion of 60 credit hours* after the M.Sc. degree, the student is required to present the Dissertation Defense.

5.2.3. Consequences of not meeting Milestone Deadlines

If a student fails to meet a milestone:

i. financial support, including GRA and tuition waiver, from any University source may be stopped;
ii. in the following summer, the student may not be permitted to register for graduate or dissertation research hours;

until the student is in compliance with the objective of the milestone.

For any exceptions that would delay the required program milestones, the student may petition to the Program Affairs Committee.

* coursework plus research hours

5.3. Program of Study

Students must complete the *Program of Study Form* (see **B-2 Program of Study**) under the supervision of their Dissertation Advisor and in coordination with their Dissertation Committee. The purpose of the Program of Study is to design an appropriate program to meet the specific needs of a given student in his or her chosen research area as determined by the Dissertation Committee. Ideally, a tentative plan should be formulated no later than the end of the second semester of study. Failure to comply with this requirement may jeopardize further registration in the PhD.IE program.

After being signed by the student and Dissertation Advisor, the form must be submitted to the PhD.IE Program Director for final signature. Once the form has been approved and signed by all parties, the student is responsible for entering their program of study in DegreeWorks (https://academicaffairs.kennesaw.edu/owladvising/focus-areas/understanding_degreeworks.php).

Minor changes in the Program of Study can be made in case of course offering deletions or schedule conflicts. These changes must also be approved by the Program Director and filed one week prior to the start of the final semester of graduate study. The coursework must be selected to form a unified program of study.

5.4. Grade Standards

Grade standards in the PhD.IE program are identical to those of the Graduate College. Students in the Program must maintain at least a 3.0 grade point average in all graduate courses in which a letter grade is assigned. Students who do not meet these requirements are subject to probation or dismissal.

- If the GPA falls below 3.0, the student will be placed on probation and will have two semesters to get the GPA back to at least 3.0. If after two semesters the GPA remains below 3.0, the student may be dismissed.
- During the probation period, the student must achieve at least a 3.0 GPA every semester during the probation period. Otherwise, the student may be dismissed.
- If the GPA falls below 2.0 in any semester, the student may be dismissed.

Note: Failure to maintain the minimum GPA and good academic standing may affect financial aid and eligibility to hold a GRA.

5.5. Credit for Previous Graduate Work

Graduate work taken at other regionally accredited institutions must be evaluated and approved by the Program Director and the Program Affairs Committee in order to satisfy degree requirements. Such transfer credit cannot exceed 25% of the total semester hours required for the degree and cannot reduce residency requirements. No grade below B may be accepted. Transfer grades are not used in calculating semester, summer term, or cumulative grade-point averages.

Students who wish to have graduate level credits transferred from another university or another graduate degree completed at KSU into the Ph.D.IE program should discuss this

with the Dissertation Advisor and Program Director as soon as possible and shall comply with the following policies:

- Students may not substitute any transfer credits for concentration courses.
- A course can only be transferred if the student earned a grade of “B” or better.
- All requests for course substitutions must be accompanied by an official transcript, a course syllabus, a narrative describing the rationale for the request, and a sample of the work produced for each course.
- Applicability of transfer credits are determined by the Ph.D.IE Program Director, the Program Affairs Committee, ideally during the student’s first semester.

Accepted credit hours are conveyed to the student in writing and forwarded to the Registrar’s office at the end of the first academic year.

6. Degree Coursework Requirements

6.1. Program of Study

To obtain the Ph.D. in Interdisciplinary Engineering degree, the student must complete an approved Program of Study that contains at least 72 semester graduate credit hours beyond a B.Sc. degree in engineering or an equivalent degree, or 60 semester credit hours beyond a M.Sc. degree in engineering. The PhD.IE program course consists of: 1) common courses, 2) electives, 3) research credits, and 4) concentration courses, as described below.

6.1.1. Common Courses (15 credit hours)

- ENGR 8001 Research Seminar (3 credit hours)
- ENGR 8002 Research Methods (3 credit hours)
- ENGR 8004 Proposal Development Workshop (3 credit hours)
- ENGR 8006 Professional Practice Workshop (3 credit hours)
- ENGR 8120 Advanced Engineering Mathematics (3 credit hours)

6.1.2. Electives (9 credit hours)*

- Nine credit hours from any 6000- or higher-level courses from the following prefixes: ENGR, CE, EE, ME, MTRE, SYE

6.1.3. Research (36 credit hours)

- ENGR 8860 Graduate research
- ENGR 9900 Ph.D. Dissertation research

6.1.4. Concentration Courses (9 credit hours† or 12 credit hours*)

Choose one (1) concentration:

6.1.4.1. Intelligent Robotic Systems

- MTRE 8100 Advanced Robot Programming (3 credit hours)
- MTRE 8400 Advanced Topics in Mobile Robots (3 credit hours)
- CS 8267 Advanced Machine Learning (3 credit hours)
- ENGR 8130 Dynamics of Discrete and Continuous Systems (3 credit hours)

6.1.4.2. Smart Infrastructure

- SYE 8005 Advanced Systems Engineering
- CE 8201 Advanced Transportation Planning
- ENGR 8210 Urban Network Modeling and Optimization
- ENGR 8220 Software Defined Radio for Internet of Things

6.1.4.3. Biomedical and Health Systems

- ENGR 8300 Introduction to Biomedical and Health Systems Engineering

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* For students entering the program with a B.Sc.
† For students entering the program with a M.Sc.

- ENGR 8310 Biomedical and Health Systems Modeling and Numerical Methods
- ENGR 8320 Systems Pathology and Pathophysiology
- ENGR 8330 Biomedical Product Design and Development

Note: Students having non-engineering backgrounds are required to successfully complete the equivalent of the relevant math sequence required for an undergraduate engineering degree. These courses cannot be used to satisfy degree requirements.

6.2. Common Course Requirement

The purpose of the common course requirement is to assure that the student gains a strong knowledge of engineering research fundamentals. This includes the ability to 1) conduct research independently, 2) effectively communicate and disseminate research results, and 3) develop professional competencies in ethics, pedagogy, proposal writing, patenting, research team organization, and entrepreneurship. To satisfy this requirement, the student must complete the following five common courses:

ENGR 8101 Research Seminar (3 credit hours)
Prerequisite: admission to the Ph.D. in Interdisciplinary Engineering
This is a seminar to discuss current research and investigations in areas of interdisciplinary engineering. Students read literature in advance of the scheduled speakers and then have discussion after listening to the speaker. Promotes cross-disciplinary thinking while teaching research and communication skills.

ENGR 8102 Research Methods (3 credit hours)
Prerequisite: admission to the Ph.D. in Interdisciplinary Engineering
This course addresses interdisciplinary research questions and their relevance to engineering theory and design practices. It is intended to develop the techniques and skills necessary to complete an original academic research thesis or project report. The development of critical thinking skills relevant to interdisciplinary research is an essential element of this course.

ENGR 8104 Proposal Development Workshop (3 credit hours)
Prerequisite: ENGR 8102 Research Methods
In this course, students are introduced to the preparation and writing of the proposal documents. Students will learn the issues of research design such as data collection and appropriate methodological choices for analysis. Each topic is introduced through selected papers, and students must come prepared to discuss their own research ideas.

ENGR 8106 Professional Practice Workshop (3 credit hours)
Prerequisite: ENGR 8104 Proposal Development Workshop
In today's competitive job market earning a Ph.D. degree alone is not enough to be successful. This course equips the doctoral students with the personal and professional skills needed to launch a successful career path. The focus of the course is the three main career paths that most Ph.D. graduates enter: academia; industry; and entrepreneurship. The course covers topics important for these three career paths, including engineering education, patents, intellectual property, self-awareness and personal SWOT, and entrepreneurship.

ENGR 8120 Advanced Engineering Mathematics (3 credit hours)
Prerequisite: admission to the Ph.D. in Interdisciplinary Engineering
This course covers analytical and numerical analysis methods that can be used to solve engineering problems. Topics may include linear algebra, systems of ordinary differential equations, complex analysis, Laplace transforms, numerical methods, partial differential equations, and probability and statistics.

6.3. Elective Course Requirement[*]

Elective credit, selected with the Dissertation Advisor, is required to ensure depth and breadth of an interdisciplinary engineering degree.

6.4. Research Credit Requirement

To satisfy the research requirement, the student must complete a minimum of 36 credit hours of research. Prior to passing the Candidacy Exam, the student may register for Graduate Research credits. After being admitted as a Ph.D. Candidate, the student may register for Dissertation Research credits.

ENGR 8860 Graduate Research
Prerequisite: Permission of the advisor
This course will result in a research paper, grant proposal, or scholarly project developed under the guidance of a graduate engineering faculty.

ENGR 9900 Ph.D. Dissertation Research
Prerequisite: Admission to the Ph.D in Interdisciplinary Engineering, completion of 9 hours graduate level research course ENGR 8860, and permission of the advisor
This course includes dissertation writing under the direction of the major professor (dissertation advisor). The course is taught using a non-traditional format of independent research and preparation of the doctoral dissertation.

Notes:

- *ENGR 8860 is encouraged from the first semester to develop research skills that will be applied to the student's dissertation research.*
- *Students should register for ENGR 9900 only after admission to candidacy.*

6.5. Concentration Course Requirement

The purpose of the concentration course requirement is to provide the student with a strong and interdisciplinary technical skillset in the chosen research concentration area. To satisfy this requirement, the student must complete the sequence of four courses listed below for his/her concentration area:

6.5.1. Intelligent Robotic Systems

MTRE 8100 Advanced Robot Programming (3 credit hours)
Prerequisite: admission to the Ph.D. in Interdisciplinary Engineering

[*] For students entering the program with a B.Sc.

The key aim of the course is to provide students with a multidisciplinary, creative approach to program the control and development of new robotic components and technologies. This covers activities from both the hard and soft systems areas of robotics. The explicit emphasis will be the use of sensors, such as touch, ultrasonic, or light sensors that allow a robot to interact with the real world around it to how to design and develop complex software for intelligent robotic systems. The course will further provide a rationale for considering emerging cutting-edge approaches and software development systems.

MTRE 8400 Advanced Topics in Mobile Robots (3 credit hours)
Prerequisite: MTRE 8100 Advanced Robot Programming
Autonomous mobile robot research is one of the most important branches in robotics. In this course, the basic principles and technologies of autonomous mobile robots are covered. The topics include kinematics and dynamics, sensors and actuators, control system design, localization, mapping, and path planning of mobile robots. Experiments and/or simulations are utilized to validate the learned knowledge. Significant programming skills are expected.

CS 8267 Advanced Machine Learning (3 credit hours)
Prerequisite: MTRE 8100 Advanced Robot Programming
This course covers the-state-of-the-art machine learning techniques. Topics cover unsupervised learning, supervised learning, evaluation of machine learning algorithms and ensemble methods. Students will learn applying advanced machine learning techniques to solve challenging problems in various areas. The course includes a literature search of current advances and their applications in machine learning and reading of research papers and presentation of research findings.

ENGR 8130 Dynamics of Discrete and Continuous Systems (3 credit hours)
Prerequisite: ENGR 8120 Advanced Engineering Mathematics
This course introduces the concepts of dynamical modeling of particles, rigid bodies and continuous systems. The course focuses on formulating and simulating the equations of motion of rigid and flexible body mechanical systems using Lagrange Equations, Hamilton's principle, Lagrange multipliers method, and variational methods for systems of continuous bodies. In addition, the course integrates the classical fundamentals of dynamics and state-of-the-art engineering applications.

6.5.2. Smart Infrastructure

CE 8201 Advanced Transportation Planning (3 credit hours)
Prerequisite: admission to the Ph.D. in Interdisciplinary Engineering
This course focuses on urban travel characteristics and activity analysis, travel demand and supply analysis, transportation system and project evaluation, and program and project implementation strategies. Principle topics covered in this course may include: Decision Oriented Transportation Planning (DOTP), Travel-Demand Forecasting, and Benefit Cost Analysis.

ENGR 8210 Urban Network Modeling and Optimization (3 credit hours)
Prerequisite: ENGR 8120 Advanced Engineering Mathematics
The course objectives are for students to understand mathematical network models and optimization techniques. Upon completing the course, students should be familiar with the concepts of user equilibrium, system optimum, and heuristic algorithms. Students should be able to develop demand generation, trip distribution, modal split, and traffic assignment models for urban networks. The student will leave the class with mathematical programming skills that have wide applications in the network modeling field.

ENGR 8220 Software Defined Radios for Internet of Things (3 credit hours)
Prerequisite: admission to the Ph.D. in Interdisciplinary Engineering
This course has a research focus that prepares the student for the latest wireless communication techniques and regimens. Of particular focus will be on Internet of Things that have high mobility, including but not limited to vehicles and unmanned aerial vehicles.

SYE 8005 Advanced Systems Engineering (3 credit hours)
Prerequisite: admission to the Ph.D. in Interdisciplinary Engineering
This course covers the essential principles, processes, and practices associated with the application of Systems Engineering. The applicability and use of Process Standards will be examined. Emphasis will focus on defining the problem to be solved, establishing the initial system architecture, understanding the role of system life-cycles, requirements development, and verification and validation of the realized system.

6.5.3. Biomedical and Health Systems

ENGR 8300 Introduction to Biomedical and Health Systems Engineering (3 credit hours)
Prerequisite: admission to the Ph.D. in Interdisciplinary Engineering
This course provides an overview of methods and applications in biomedical and health systems engineering. Samples from a wide variety of topics will provide students the exposure to engineering problems of living mechanism and healthcare systems delivery. Topics covered will include 1) biomaterials and biomechanics, 2) biomedical sensors, instrumentation and devices, 3) biomedical imaging and diagnosis, 4) clinical and healthcare systems engineering, 5) physiological modeling, and the science and engineering concepts associated with these topics. The course also provides a glimpse of emerging trends in biomedical and health systems engineering such as neural engineering, data-driven healthcare and drug delivery systems.

ENGR 8310 Biomedical and Health Systems Modeling and Numerical Methods (3 credit hours)
Prerequisite: admission to the Ph.D. in Interdisciplinary Engineering
The course introduces the student to a representative set of models used to study biological, medical, and health systems phenomena. Topics covered may include computational fluid dynamics (CFD), finite element analysis (FEA), fluid-

structure interaction (FSI) modeling, statistical regression and Monte Carlo simulation.

ENGR 8320 Systems Pathology and Pathophysiology (3 credit hours)
Prerequisite: admission to the Ph.D. in Interdisciplinary Engineering
The course provides an overview of the physiology and pathophysiology of various systems in the human body, and describes the implementation of engineering approaches and techniques for understanding function, disease and therapeutic design. It covers the basic terminology of the disease process and disease etiology, and provides basic descriptions of diagnostic methods and treatment modalities. The topics and systems covered may include cellular processes, musculoskeletal function and disease (osteoporosis, joint disease), aging, inflammation, cancer biology and treatments, cardiovascular physiology and pathology (atherosclerosis, thrombosis, aneurysm, heart valve disease, congenital heart disease), and neurobiology, degenerative diseases and neuropathies.

ENGR 8330 Biomedical Product Design and Development (3 credit hours)
Prerequisite: admission to the Ph.D. in Interdisciplinary Engineering
For decades, biomedical products and devices have been an enormous aid in saving and improving patients' lives and are vital components of any healthcare system. Nonetheless, biomedical product design and development is a complex process that involves the interplay of science, design principles, and FDA design regulation. This course introduces structured integrative methods focusing on biomedical product design and development activities from entrepreneurship and interdisciplinary perspectives. The integrative methods facilitate problem-solving and decision making among people with different disciplinary perspectives, reflecting the current industry toward designing and developing products in cross-functional teams. The course will cover biomedical product design and development steps, from conceptualization to design to manufacturing to regulatory approval and commercialization.

7. Degree Research Requirements

7.1. Overview

In addition to the coursework requirements described in Section 6, the student must also pass a number of research milestones and examinations consisting of: 1) the program qualifying review (only for students entering the program with a B.Sc.), 2) the candidacy examination, 3) the proposal defense, and 4) the dissertation defense.

7.2. Program Qualifying Review

7.2.1. Purpose

The objective of the Program Qualification Review is to evaluate the student's knowledge and skills acquired in the early stage of the doctoral studies, and the student's progress toward its dissertation research.

Note: The Program Qualification Review is required for all students entering the program with a B.Sc. Students entering the program with a M.Sc. are exempt.

7.2.2. Eligibility

Before registering for the Program Qualification Review, the student must have:

i. an approved Program of Study on file;
ii. an approved Dissertation Committee Approval form on file;
iii. an approved Request for Program Qualification Review Form on file;
iv. completed at least six (6) credit hours of graduate research and twelve (12) credit hours of coursework in the PhD.IE program

7.2.3. Examination Format

7.2.3.1. Program Qualifying Review Committee

The Program Qualifying Review Committee is comprised of the Dissertation Advisor, two members of the Program Affairs Committee and is chaired by the Program Director.

7.2.3.2. Examination Content

The Program Qualifying Review consists of an assessment of the student's early academic performance and research progress as documented by the completion and approval of program documents, the submission of a Research Progress document and a Coursework Progress document, and an assessment from the Dissertation Advisor.

7.2.4. Required Action

The student must complete and submit a Request for Program Qualification Review Form (see **B-3 Request for Program Qualifying Review**) no later than 30 days before the intended examination date. The student needs to collect the signatures of the Dissertation Advisor prior to submitting the form to the Program Director, who will then schedule the review meeting.

At least two (2) weeks prior to the examination date, the student should provide the following material in a single pdf document to the Program Director:

i. a copy of the approved Program of Study;
ii. a copy of the approved Dissertation Committee Approval Form;
iii. a *Research Progress* document (2-page limit) describing:
    a. the topic being investigated
    b. the research progress made to date
    c. the research products generated to date (publications, conference presentations, proposal submissions)
    d. a self-assessment paragraph reflecting on the overall research performance
iv. a *Coursework Progress* document (2-page limit) including:
    a. the description of all graduate-level courses taken since joining the program
    b. the semester grade obtained in each course
    c. a self-assessment paragraph reflecting on the overall performance in coursework

Along with those documents, the student's Dissertation Advisor should provide a document (2-page limit) including:

i. an assessment of the student performance in both coursework and research;
ii. a reflection on whether the student is qualified to pursue the doctoral program of study

7.2.5. Examination Outcome

The Program Qualifying Review Committee will convene on the scheduled meeting date and will review the documents provided by the student and the Dissertation Advisor. The committee will decide on one of two outcomes:

- pass
- did not pass, repeat exam or part thereof after strengthening specific areas of weakness
- fail

At the end of the Qualifying Review meeting, a *Record of Program Qualifying Review Form* (see **B-4 Record of Program Qualifying Review**) is signed by all members of the review committee and forwarded to the Program Director.

Students who pass provisionally must remedy their deficiencies and be re-assessed by the end of the semester following that of the first Program Qualification Review. If they are not successful, they are dismissed from the Program.

7.3. Candidacy Examination

7.3.1. Purpose

The purpose of the Candidacy Examination is to evaluate the student's capability to synthesize and integrate material as applied to the research concentration area. It is

expected that the student demonstrates a certain breadth of knowledge and is able to apply this knowledge to a problem.

7.3.2. Eligibility

Eligibility criteria differ for students entering the program with a B.Sc. and those entering with a M.Sc. Usually, students entering with a B.Sc. will register for the Candidacy Examination before the end of the second year of study. Students entering with a M.Sc. will register before the end of the first year of study.

Before registering for the Candidacy Examination, the student must have:

i. an approved Program of Study on file
ii. an approved Dissertation Committee Approval form on file
iii. an approved Request for Program Qualification Form on file
iv. a Record of Program Qualifying Review on file (for students entering with a B.Sc.)
v. completed at least two (2) concentration courses and twelve (12) credit hours of graduate research (for students entering with a B.Sc.); at least one (1) concentration course and six (6) credit hours of graduate research (for students entering with a M.Sc.)

7.3.3. Examination Format

7.3.3.1. Examination Committee

The Candidacy Examination Committee is comprised of members of the student's Dissertation Committee and is chaired by the Dissertation Advisor.

7.3.3.2. Examination Content

The exam contains a written part followed by an oral part, usually taken within one week of each other. The scope of the exam is determined by the Dissertation Advisor who selects one (1) format among the following: topic-based examination, or a literature-based examination. The details of each form are given below.

- Topic-Based Examination: The Dissertation advisor chooses a set of topics, not defined by the curriculum, but covering the fundamentals of the broad field in which the student is working. The expectation would be for the selection of three (3) general areas, and examination in applied mathematics within at least one of those.
- Literature-Based Examination: The Dissertation Advisor chooses a seminal paper in the broad research field of the student, the student reviews this paper orally for the committee, and is tested on the underlying principles that allowed the author to make the research advance. Knowledge of applied mathematics must be tested, either in the context of the paper, or separately.

7.3.3.3. Written Exam

The Candidacy Examination Committee decides which questions are to be answered in a take-home exam, what supporting materials are allowed, and how much time is allowed to create the answers to the questions. The student receives the questions and prepares written responses to each question. The Dissertation Advisor will collect all written answers.

The responses for all questions are distributed to the Dissertation Committee the day following their receipt. Evaluation of these answers represents the written component of the Candidacy Examination.

7.3.3.4. Oral Exam

The oral exam takes place approximately one week after the written exam. The duration of the oral exam is determined by the Candidacy Examination Committee.

Based on a composite evaluation of the student's written and oral components of the examination, the Candidacy Examination Committee determines the student's capability to continue his or her doctoral studies.

7.3.3.5. Examination Deadlines

The student submits a request for the Candidacy Examination to the Dissertation Advisor for submittal to the Program Director. This should be done at least 30 days prior to the expected oral examination date. Along with the request, the student will submit a five-page, double-spaced description of a proposed area of research.

Within one week after the request, the student's description of the proposed area of research will be distributed to the Candidacy Examination Committee by the student's Dissertation Advisor.

7.3.4. Required Action

The candidate must complete and submit a *Request for Candidacy Examination Form* (see **B-4** Request for Candidacy Examination) to the Program Director no later than 30 days before the scheduled examination. The dissertation advisor and Program Director must sign this form.

7.3.5. Examination Outcome

At the conclusion of the oral component, the committee will decide on one of three outcomes:

- pass
- did not pass, repeat exam or part thereof after strengthening specific areas of weakness
- fail

The deliberations and vote concerning the outcome of the exam take place immediately following the oral exam. The examination outcome requires a two-third (2/3) majority of all members of the examination committee for pass and fail. Any other vote results in a repeat of the exam or part thereof.

When the Candidacy Examination is completed, a *Record of Candidacy Examination Form* (see **B-5 Record of Candidacy Examination**) is signed by all members of the examination committee and forwarded to the Program Director.

7.3.6. Repeat of Candidacy Examination

If the outcome of the first Candidacy Examination was "repeat exam or part thereof after strengthening specific areas of weakness," the student may submit another request for

a Candidacy Examination. This request is to be submitted no earlier than three months and usually no later than one semester after completion of the first attempt. Only one repeat of the Candidacy Examination is permitted.

7.4. Research Proposal Defense

The Research Proposal Defense is an oral examination administered by the candidate's Dissertation Committee.

7.4.1. Purpose

The purpose of the Research Proposal Defense is to test the validity of the dissertation proposal and the candidate's fitness to carry out the research work proposed.

7.4.2. Eligibility

Before registering for the Proposal Defense, the student must have:

i. passed the Program Qualifying Review
ii. passed the Candidacy Examination
iii. completed at least three (3) concentration courses and fifteen (15) credit hours of graduate/dissertation research (for students entering with a B.Sc.); at least two (2) concentration courses and twelve (12) credit hours of graduate/dissertation research (for students entering with a M.Sc.)

7.4.3. Required Actions

The candidate must complete and submit a *Request for Proposal Defense Form* (see **B-7 Request for Research Proposal Defense**) to the Program Director no later than 30 days before the scheduled defense. The Dissertation Advisor and Program Director must sign this form.

7.4.4. Examination Format

The exam contains a written part followed by an oral part, usually taken within two weeks of each other.

7.4.4.1. Examination Committee

The Proposal Defense Committee is comprised of members of the student's Dissertation Committee.

7.4.4.2. Examination Deadlines

The student submits a request for Research Proposal Defense to the Dissertation Advisor for submittal to the Program Director. This should be done at least 30 days prior to the scheduled proposal defense date. The Research Proposal must be submitted to the candidate's Dissertation Committee at least two weeks prior to the scheduled defense.

7.4.4.3. Written Exam

The substance of the written proposal forms a major part of the oral portion of the examination. As such, it must be a complete document with a thoughtful, in-depth treatment of the dissertation topic. It should be substantial enough to form the basis of a meaningful oral examination, establish a worthy research problem and develop

an effective research plan. It should only be written after the student has done enough work on the problem to speak meaningfully about it, including discussion of the preliminary investigations. Above all, it should be a technically sound and scholarly document.

7.4.4.4. Oral Exam

On the day of the defense, the examination begins with a short presentation by the candidate outlining the problem chosen, the procedures and methods to be used, the work already completed, and the additional work proposed to be completed for the Ph.D. degree. The Dissertation Committee then questions the candidate. The committee may also ask questions of a more general nature in order to the test the adequacy of the candidate's preparation for the proposed research.

7.4.5. Proposal Defense Outcome

At the conclusion of the proposal defense, the Dissertation Committee will decide on one of four outcomes:

- Passed; the candidate passed the Research Proposal Defense and may proceed to independent study and research for the doctoral degree.
- The examination is temporarily adjourned; the candidate must revise the Research Proposal and be examined again within the next six months.
- Failed, but may submit a new Research Proposal and submit to another Research Proposal Defense after completing additional course work, independent study, or research.
- Failed, and will not be readmitted to another examination.

Members of the Dissertation Committee must sign a *Record of Research Proposal Defense Form* (see **B-7 Record of Research Proposal Defense**).

7.5. Dissertation Defense

The dissertation research must be a significant, unique contribution to the field of engineering, and should provide an important creative experience for the student.

The Dissertation Defense is the final examination for the Ph.D. in Interdisciplinary Engineering degree. It is a public, oral examination that is administered by the candidate's Dissertation Committee.

The Dissertation Advisor is responsible for preparing and distributing the Dissertation Defense announcement. Announcements, including the abstract, must be posted in the departments of the College of Engineering and Engineering Technology and distributed to College faculty and students at least one week prior to the defense via postings in SPCEET Screech and KSU Today.

7.5.1. Purpose

The purpose of the Dissertation Defense is to examine the candidate's depth of engineering knowledge, mastery of research techniques, and the application of both in conducting the research.

7.5.2. Eligibility

After successfully defending the Research Proposal, the candidate must devote at least one semester to research before being eligible for the Dissertation Defense examination.

7.5.3. Required Actions

The candidate must complete and submit a *Request for Dissertation Defense Form* (see **B-9 Request for Dissertation Defense**) to the Program Director no later than 30 days before the scheduled defense. The Dissertation Advisor and Program Director must sign this form.

At least two weeks prior to the scheduled defense date, the candidate must submit the dissertation to all members of the Dissertation Committee.

7.5.4. Examination Format

On the day of the defense, the examination begins with a public presentation by the candidate, followed by a closed-door question period by the Dissertation Committee. The public defense provides a formal opportunity for the Ph.D. candidate to present his/her research questions, design, methods, findings, and conclusions to those in attendance. Generally, this presentation by the candidate will last between 45 and 60 minutes. Once the candidate has completed his/her public presentation, the audience is given the opportunity to ask questions. The dissertation chair can then dismiss the audience in order to conduct a private questioning of the candidate. At the conclusion of the private examination, the committee excuses the candidate and deliberates on the results of the defense in private. The members of the Dissertation Committee sign a *Record of Dissertation Defense* Form (see **B-9 Record of Dissertation Defense**) and the Dissertation Advisor announces one of four decisions:

- The candidate passed the final examination and the dissertation is accepted as submitted.
- The candidate passed the final examination, but the dissertation will not be accepted and signed by the committee unless various specified corrections and revisions have been made.
- The examination is temporarily adjourned. The candidate must revise the dissertation, complete any additional independent study or research required by the Dissertation Committee, and be examined again. The second examination must take place within six months of the first.
- The candidate failed and will not be readmitted to another examination.

Students are responsible for the formatting and submission of their final dissertations to the Graduate College.

7.6. Dissertation Submission

Students are responsible for the formatting and submission of their final dissertation to the Digital Commons by the final grades due date. Refer to the instructions posted in the Digital Commons to upload the dissertation. The Digital Commons will notify the Graduate College when the submission is complete.

7.7. Dissertation Defense Assessment and Exit Interviews

The University requires a yearly assessment of the Ph.D. in Interdisciplinary Engineering Program, focusing primarily on coursework, dissertation research, and student learning. After a Dissertation Defense, the committee members are requested to complete a *Dissertation Assessment Form* (see **B-11 Dissertation Assessment Form**) to assess the quality of the research that was performed by the student.

In addition, prior to when the student is ready to submit his/her dissertation to the Graduate College, the Program Director will conduct an exit interview with the student to gain information about the student's learning outcomes and complete an *Exit Interview Form* (see **B-12 Exit Interview**).

Recommended Timeline (students with a B.Sc.)

Semester	Course work (credits)	Degree Milestones
Year 1 Fall	ENGR 8001 Research Seminar (3) ENGR 8002 Research Methods (3) ENGR 8860 Graduate Research (3) **Total: 9 credits**	• Submit a *Program of Study*
Year 1 Spring	ENGR 8120 Advanced Engineering Mathematics (3) Concentration Course 1 (3) ENGR 8860 Graduate Research (3) **Total: 9 credits**	• Form a *Dissertation Committee* • Pass the *Qualifying Review*
Year 2 Fall	ENGR 8004 Proposal Development Workshop (3) Concentration Course 2 (3) ENGR 8860 Graduate Research (3) **Total: 9 credits**	
Year 2 Spring	ENGR 8006 Professional Practice Workshop (3) Elective (3) ENGR 8860 Graduate Research (3) **Total: 9 credits**	• Pass the *Candidacy Examination*
Year 3 Fall	ENGR 9900 Dissertation Research (3) Concentration Course 3 (3) Elective (3) **Total: 9 credits**	
Year 3 Spring	ENGR 9900 Dissertation Research (3) Concentration Course 4 (3) Elective (3) **Total: 9 credits**	• Pass the *Research Proposal Defense*
Year 4 Fall	ENGR 9900 Dissertation Research (9) **Total: 9 credits**	
Year 4 Spring	ENGR 9900 Dissertation Research (9) **Total: 9 credits**	• Apply for graduation (within first 3 weeks of semester) • Distribute Dissertation to Dissertation Committee (2 weeks before defense) • Pass the *Dissertation Defense*

Recommended Timeline (students with a M.Sc.)

Semester	Course work (credits)	Degree Milestones
Year 1 Fall	ENGR 8001 Research Seminar (3) ENGR 8002 Research Methods (3) ENGR 8860 Graduate Research (3) **Total: 9 credits**	• Submit a *Program of Study*
Year 1 Spring	ENGR 8120 Advanced Engineering Mathematics (3) Concentration Course 1 (3) ENGR 8860 Graduate Research (3) **Total: 9 credits**	• Form a *Dissertation Committee*
Year 1 Summer	ENGR 8860 Dissertation Research (0) **Total: 3 credits**	
Year 2 Fall	ENGR 8004 Proposal Development Workshop (3) Concentration Course 2 (3) ENGR 8860 Graduate Research (3) **Total: 9 credits**	• Pass the *Candidacy Examination*
Year 2 Spring	ENGR 8006 Professional Practice Workshop (3) Concentration Course 3 (3) ENGR 9900 Dissertation Research (3) **Total: 9 credits**	
Year 2 Summer	ENGR 9900 Dissertation Research (6) **Total: 6 credits**	• Pass the *Research Proposal Defense*
Year 3 Fall	ENGR 9900 Dissertation Research (9) **Total: 9 credits**	
Year 3 Spring	ENGR 9900 Dissertation Research (9) **Total: 9 credits**	• Apply for graduation (within first 3 weeks of semester) • Distribute Dissertation to Dissertation Committee (2 weeks before defense) • Pass the *Dissertation Defense*

Dissertation Committee Approval Form

Student Name: _____ KSU ID Number: _____

Focus Area (select one):

☐ Intelligent Robotic Systems ☐ Smart Infrastructure ☐ Biomedical and Health Systems

Tentative Dissertation Title: _____

_____

Committee Member 1 (Chair)

_____
Name

_____
Institution/Affiliation

_____
Signature Date

Committee Member 2

_____
Name

_____
Institution/Affiliation

_____
Signature Date

Committee Member 3

_____
Name

_____
Institution/Affiliation

_____
Signature Date

Committee Member 4

_____
Name

_____
Institution/Affiliation

_____
Signature Date

Committee Member 5

_____
Name

_____
Institution/Affiliation

_____
Signature Date

Signatures:

_____
Dissertation Advisor Date

_____
Program Director Date

_____
Graduate College Date

Program of Study

Student Name: _____ Date: _____

Dissertation Advisor: _____

Focus Area (select one):

☐ Intelligent Robotic Systems ☐ Smart Infrastructure ☐ Biomedical and Health Systems

Date entered the PhD.IE program (term/yr): _____

Entered program after (select one): ☐ BS ☐ MS

Category	Course number	Course Title	Credit Hours	Date Taken (Term/Yr)	Grade	Other/ Transfer (✓)
Common Courses (15 CR)						
		Subtotal				
Concentration Courses (BS: 12 CR; MS: 9 CR)						
		Subtotal				
Electives (BS: 9 CR; MS: 0 CR)						
		Subtotal				
Research (36 CR)						

Category	Course number	Course Title	Credit Hours	Date Taken (Term/Yr)	Grade	Other/ Transfer (✓)
Research (cont.) **(36 CR)**						
		Subtotal				
		Total CR (BS: ≥72; MS: ≥60)				

Student's signature Date

Approved by:

Dissertation Advisor Date

Program Director Date

Request for Program Qualifying Review

Student Name: _____

Dissertation Advisor: _____

Focus Area (select one):

☐ Intelligent Robotic Systems ☐ Smart Infrastructure ☐ Biomedical and Health Systems

Tentative Dissertation Title: _____

_____

The members of my committee are:

Name	Institution/Affiliation
1.	
2.	
3.	
4.	
5.	

_____

Student's signature Date

(office use only)

The qualifying review is scheduled for:

Date: _____

Approved by:

_____

Dissertation Advisor Date

_____

Program Director Date

Record of Program Qualifying Review

Student Name: _____

Dissertation Advisor: _____

Focus Area (select one):

☐ Intelligent Robotic Systems ☐ Smart Infrastructure ☐ Biomedical and Health Systems

Date of Qualifying Review: _____

Coursework score: _____/50 Research score: _____/50 Aggregate score: _____/100

We testify that the candidate was evaluated and

- ☐ Passed
- ☐ Failed
- ☐ Did not pass, repeat exam or part thereof after strengthening specific areas of weakness (details provided below):

Approved by:

_____

Dissertation Advisor Date

_____

Program Director Date

Request for Candidacy Examination

Student Name: _____

Focus Area (select one):

☐ Intelligent Robotic Systems ☐ Smart Infrastructure ☐ Biomedical and Health Systems

Tentative Dissertation Title: _____

_____

Candidacy Examination format (select one):

☐ Topic-based examination ☐ Literature-based examination

The members of my committee are:

Name	Institution/Affiliation
1.	
2.	
3.	
4.	
5.	

The oral examination is scheduled for:

Date: _____ Time: _____ Location: _____

_____

Student's signature Date

Approved by:

_____

Dissertation Advisor Date

_____

Program Director Date

Record of Candidacy Examination

Name: _____ Date: _____

Dissertation Advisor: _____

Dissertation Title: _____

_____

We testify that the candidate was evaluated and

- ☐ Passed
- ☐ Failed
- ☐ Did not pass, may repeat after strengthening specific areas of weakness:

Examination committee members:

Dr. (Advisor) Kennesaw State University	_____ Signature	_____ Date
Dr. Kennesaw State University	_____ Signature	_____ Date
Dr. Kennesaw State University	_____ Signature	_____ Date
Dr.	_____ Signature	_____ Date
Dr.	_____ Signature	_____ Date

Request for Research Proposal Defense

Student Name: _____

Concentration Area (select one):

☐ Intelligent Robotic Systems ☐ Smart Infrastructure ☐ Biomedical and Health Systems

Dissertation Title: _____

_____

The members of my committee are:

Name	Institution/Affiliation
1.	
2.	
3.	
4.	
5.	

The proposal defense is scheduled for:

Date: _____ Time: _____ Location: _____

_____

Student's signature Date

Approved by:

_____

Dissertation Advisor Date

_____

Program Director Date

Record of Research Proposal Defense

Name: _____ Date: _____

Dissertation Advisor: _____

Dissertation Title: _____

_____

We testify that the candidate was evaluated and

- ☐ Passed; candidate may proceed to independent study and research for the doctoral degree
- ☐ The examination is temporarily adjourned. The candidate must revise the Research Proposal and be examined again within the next six months
- ☐ Failed but may submit a new Research Proposal and submit to another Research Proposal Defense after completing additional course work, independent study, or research
- ☐ Failed and will not be readmitted to another examination

Dissertation committee members:

Dr. (Advisor) Kennesaw State University	_____ Signature	_____ Date
Dr. Kennesaw State University	_____ Signature	_____ Date
Dr. Kennesaw State University	_____ Signature	_____ Date
Dr.	_____ Signature	_____ Date
Dr.	_____ Signature	_____ Date

Request for Dissertation Defense

Name: _____

Concentration Area (select one):

☐ Intelligent Robotic Systems ☐ Smart Infrastructure ☐ Biomedical and Health Systems

Dissertation Title: _____

_____

The members of my committee are:

Name	Institution/Affiliation
1.	
2.	
3.	
4.	
5.	

The dissertation defense is scheduled for:

Date: _____ Time: _____ Location: _____

_____

Student's signature Date

Approved by:

_____

Dissertation Advisor Date

_____

Program Director Date

Record of Dissertation Defense

Name: _____ Date: _____

Dissertation Advisor: _____

Dissertation Title: _____

_____

We testify that the candidate was evaluated and

- ☐ Passed; Dissertation accepted
- ☐ Passed; Dissertation will be accepted after specific revisions have been made
- ☐ The committee is temporarily adjourned; candidate will be examined again
- ☐ Did not pass, may not repeat

Dissertation committee members:

Dr. (Advisor) Kennesaw State University	_____ Signature	_____ Date
Dr. Kennesaw State University	_____ Signature	_____ Date
Dr. Kennesaw State University	_____ Signature	_____ Date
Dr.	_____ Signature	_____ Date
Dr.	_____ Signature	_____ Date

Dissertation Assessment Form

Name: _____ Term/Year: _____

Dissertation Advisor: _____

Dissertation Title: _____

_____

Please evaluate the following aspects of the dissertation research. This evaluation does not supplant the overall assessment of the student's research determined by dissertation approval to be competent and passable. This information is collected and processed as a component of the program assessment process.

1. Communication. To what extent are the student's oral and written presentations effective and professional?

   ☐ Superior ☐ Excellent ☐ Good ☐ Marginal ☐ Poor ☐ N/A

2. Quality of Problem. To what extent does the topic of this dissertation represent a legitimate and significant area of research?

   ☐ Superior ☐ Excellent ☐ Good ☐ Marginal ☐ Poor ☐ N/A

3. Experimental Methodology. To what extent did the strategies and methodologies employed provide for the successful execution and development of this research?

   ☐ Superior ☐ Excellent ☐ Good ☐ Marginal ☐ Poor ☐ N/A

4. Technical Merit. To what extent did the application of technical concepts and theories meet acceptable standards for the field?

☐ Superior ☐ Excellent ☐ Good ☐ Marginal ☐ Poor ☐ N/A

5. Contribution. To what extent did this research represent an original contribution to the field?

☐ Superior ☐ Excellent ☐ Good ☐ Marginal ☐ Poor ☐ N/A

Optional. Additional comments or assessments:

Exit Interview

Name: _____ Date: _____

Concentration Area (select one):

☐ Intelligent Robotic Systems ☐ Smart Infrastructure ☐ Biomedical and Health Systems

Career Plans: (Are you currently employed? Have you applied for a position, been interviewed, received any offers, or accepted a position in industry, in academia, or with the government?)

Curriculum: (How well has the independent research experience prepared you for real-world challenges? How well have the graduate courses prepared you in gaining advanced knowledge in the field? What are the top three courses in the program perceived as providing the knowledge and skills necessary to solve technical problems in the concentration area?)

Interactions: (During the course of your research, have you interacted with other faculty at KSU, other schools, government sponsors, others?)

Assessment of Abilities Related to Outcomes: (How many articles have you written or co-authored? How many conference papers have you presented? What honors/awards/recognition have you received for your work?)

Faculty: (Did you perceive the dissertation advisor to be competent, caring, and supportive?)

Facilities: (What are the best and worst things about the College, labs and research

Other Comments:

Current contact information:

Address

Phone number

Email address