

DEPARTMENT OF INDUSTRIAL ENGINEERING AND
MANAGEMENT SYSTEMS

College of Engineering and Computer Science

Graduate Program Handbook

2020-2021

Industrial Engineering Ph.D.

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Graduate Program Handbook 2020-2021

Industrial Engineering PhD

INDUSTRIAL ENGINEERING

Industrial Engineering and Management Systems is the engineering discipline that focuses on the design, management, and improvement of systems, products, and processes. Industrial engineers and engineering managers use many analytical approaches to improve productivity, safety, and quality of working life while reducing operating costs; they work to continuously improve the design of systems, processes, or products; and they design systems that translate a specific product design into a physical reality in the most productive manner and with highest possible quality. Industrial engineers and engineering managers are needed in all industry sectors such as manufacturing, healthcare, entertainment, information technology, and many others. The industrial engineer and engineering managers are responsible for making decisions regarding the utilization of people, materials, machines, and automation (including robotics). Industrial engineers and engineering management graduates are also skilled in Engineering Economic Analysis and Information Management, since they are generally considered to be the natural interface between the technical specialist and business management personnel.

The Industrial Engineering approach is characterized by a systematic evaluation of alternatives using quantitative analysis, modeling, physical, and computer simulations. As such, quantification and measurement play a key role in the day to day activities of the industrial engineer.

ADVISING AND MENTORING

The IEMS Graduate Program Director is assigned as the Graduate Advisor for all students first entering IEMS Master's and Doctoral programs. During the course of study, a student may develop a working relationship with a faculty member in the area of study he/she is pursuing and may request to the Graduate Advisor that the faculty member be assigned as his/her advisor.

A Master's or Doctoral student who pursues the thesis option or dissertation, respectively, will be responsible for developing the thesis/dissertation topic and convincing the potential advisor that it is a worthy topic and that the advisor should be willing to commit significant time to advising the student on the topic.

The student, with the guidance of the advisor, next identifies other faculty members to serve as Thesis Advisory Committee, consisting of at least three members who are approved members of the Graduate Faculty or Graduate Faculty Scholars. This

committee will recommend to the Dean of the college regarding the student's program of study, provide continual guidance for the student, and be the principal mechanism for the evaluation of the student's thesis and performance in any general examinations. At least two members of the Thesis Advisory Committee must be Graduate Faculty, one of whom must serve as the chair of the committee. Graduate Faculty Scholars may serve as a member or co-chair of a thesis advisory committee but may not serve as the chair.

The recommended course of action is to involve the committee members early in the process. This gives the student the advantage of being able to make use of his/her advisors expertise and avoids any surprises when the student may think the thesis/dissertation is completed.

The thesis/dissertation committee must be formed prior to the student registering for thesis/dissertation hours. With the case of a thesis committee, the chair of the committee and one other member must be from the IEMS Department. With a dissertation committee, three members must be from the IEMS Department, and one must be from outside the Department.

Committee membership must be approved by the program director and submitted to the College of Graduate Studies. All members must be in fields related to the thesis topic. The UCF College of Graduate Studies reserves the right to review appointments to a Thesis Advisory Committee, place a representative on any Thesis Advisory Committee, or appoint a co-chair. A student may request a change in membership of the Thesis Advisory Committee with the approval of the program director and re-submission to the College of Graduate Studies.

INTRODUCTION

Together, the [Graduate Student Handbook](#) and your graduate program handbook should serve as your main guide throughout your graduate career. The [Graduate Student Handbook](#) includes university information, policies, requirements and guidance for all graduate students. Your program handbook describes the details about graduate study and requirements in your specific program. While both of these handbooks are wonderful resources, know that you are always welcome to talk with faculty and staff in your program and in the Graduate College.

DEPARTMENT/GRADUATE ADMINISTRATION

Department Chair:

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- Liz Stalvey, Coordinator, Administrative Services and Assistant to the Chair, ENG2 312-E, (407) 823-5759, E-mail: Liz.Stalvey@ucf.edu
- Ricardo Scuotto, Graduate Student Services Coordinator, Eng. II – 312-G, (407) 823-2301, E-mail: Ricardo.Scuotto@ucf.edu

PROGRAM DESCRIPTION:

The Doctor of Philosophy in Industrial Engineering is primarily intended for a student with a master's degree in Industrial Engineering or a closely related discipline.

The PhD program is designed to produce highly skilled researchers with both broad knowledge of industrial engineering and in-depth knowledge of specialty fields for careers in academia, industry, and government. The program allows a candidate to thoroughly study some aspect of industrial engineering, such as engineering management, systems operations and modeling, quality systems engineering, interactive simulation and training systems, systems engineering, and human systems engineering/ergonomics.

The Industrial Engineering program is structured to support the emergence of Central Florida as a national center of high technology as well as supporting the diverse service industries in the region and throughout the nation.

Students in the Industrial engineering Ph.D. program can register for courses and do research in different areas such as:

Human Systems Engineering/Ergonomics

As technology has become more sophisticated, the need to design for the human user has become more difficult, yet even more important. Human engineering and ergonomics assist in ensuring that as technology advances, the abilities, limitations, and needs of humans are considered in the system design. This not only supports the needs of the user, it also optimizes the efficiency and usability of the system designed. Traditionally, ergonomics has been associated with biomechanical issues and work measurement and performance issues in physical system design, as well as occupational and industrial safety. The broader focus of human engineering encompasses those issues as well as incorporating the reaction and effectiveness of human interaction with systems, both physical systems and virtual systems such as computer-based models.

Research in the Human Systems Engineering and Ergonomics area provides students with the necessary knowledge in human engineering and ergonomics to effectively design tasks, industrial systems, and work environments that maximize human performance, safety, and overall productivity.

Interactive Simulation and Training Systems

The Interactive Simulation and Training Systems research within the Industrial Engineering PhD program focuses on providing a fundamental understanding of significant topics relative to simulation systems and the requirements, design, development, and use of such systems for knowledge transfer in the technical environment. Courses in this area address the evolving and multiple discipline application of interactive simulation by providing a wealth of electives to support development of individual student interests and talents. In conjunction with UCF's Institute for Simulation and Training, industrial organizations involved in simulation in the Central Florida region, military organizations, and other governmental organizations, ISTS research in

the PhD program provides exposure to both military and commercial interactive simulation and training systems.

The emphasis is on the application and development of interactive simulation and training systems to meet various requirements including, but not limited to: simulators, skill trainers, organizational learning systems, computer and web-based interactive simulation systems and other novel interactive simulation efforts.

Management Systems/Engineering management

The Management Systems/Engineering Management research focuses on providing the knowledge for improving organizational systems. Engineering Management focuses on effective decision-making and successful project delivery in engineering and technological organizations. With technological advancements comes a new level of organizational complexity. As a result new knowledge is needed to help the technical organization understand how to improve. The Management Systems/Engineering Management studies and research in the Industrial Engineering program are intended for individuals of all engineering disciplines. Research and coursework focus on a systems view of engineering problems related to the management of complex industrial, military, government, and social systems.

Operations Research

The Operations Research courses in the Industrial Engineering PhD program uses mathematics and computer-based systems to model operational processes and decisions in order to develop and evaluate alternatives that will lead to gains in efficiency and effectiveness. Drawing on probability, statistics, simulation, optimization, and stochastic processes, Operations Research provides many of the analytic tools used by industrial engineers as well as by other analysts to improve processes, decision-making, and management by individuals and organizations.

Quality Engineering and Management

Quality Engineering research in the Industrial Engineering PhD program focuses on providing the knowledge for improving product and process quality in manufacturing and service industries. Quality Systems Engineering provides both the quantitative tools for measuring quality and the managerial focus and organizational insight required to implement effective continuous improvement programs and incorporate the voice of the customer. The Quality Systems Engineering courses provide the necessary knowledge to plan, control, and improve the product assurance function in government, military, service, or manufacturing organizations.

Simulation Modeling and Analysis

The Simulation Modeling and Analysis research and studies in the Industrial Engineering PhD program focus on providing a fundamental understanding of the functional and technical design requirements for simulation in manufacturing and service industries. Research in this area is based on a systems modeling paradigm and provides coding and development capability in the context of a broader systems framework. Significant exposure to design and analysis aspects is a core element of the track.

Systems Engineering

Intelligence is being infused into everyday systems, processes and infrastructure that enable physical goods to be developed, manufactured, bought and sold. These same systems also facilitate the movement and delivery of global products and services that support worldwide markets such as finance, energy resources and healthcare systems.

With these technological advancements, comes a new level of complexity as organizations struggle to integrate systems, processes and data feeds. As a result, the demand for systems engineering and related skills is expected to grow significantly.

Systems engineers design and implement computer systems, software and networks, including defining complex system requirements, and determining system specifications, processes and working parameters.

The Systems Engineering studies and research in the Industrial Engineering PhD program are intended for individuals of all engineering disciplines. Research and coursework focus on a systems view of engineering problems related to the management of complex industrial, military, government, and social systems.

PROGRAM CURRICULUM:

The Industrial Engineering PhD program requires a minimum of 72 credit hours beyond the bachelor's degree. Beyond the master's degree, students must complete at least 27 credit hours of required coursework, in addition to 15 credit hours of dissertation.

Of the total course work taken, 27 hours must be formal course work exclusive of independent study and 15 credit hours must consist of dissertation research (EIN 7980). The program has a six-credit hour requirement. All remaining hours are determined with a faculty adviser and approved by the department.

As a pre-doctoral student at the beginning of the PhD program, a preliminary program of study must be developed by the student and approved by the graduate program director. At this time transfer credit will be evaluated on a course-by-course basis. The student's program of study itemizing the study plan must be approved prior to the end of the first semester of studies by the Graduate Director of the IEMS department. After completion of the Qualifying Examination and admission as a doctoral student, the program of study may be revised based on the recommendation of the dissertation adviser and/or the dissertation committee and approved by the Graduate Director of the IEMS department.

Students must pass the Qualifying Examination by their second year in the program. The degree must be completed within seven years from the date of admission as a pre-doctoral student and within four years of passing the Candidacy Examination.

The Department of Industrial Engineering and Management Systems monitors student progress and may dismiss a student if performance standards or academic progress are not maintained.

Satisfactory academic performance in a program includes, but is not limited to, maintaining at least a 3.0 GPA in all graduate work taken as part of (or transferred into) the program of study. Satisfactory performance also involves maintaining the standards of academic progress and professional integrity expected in our discipline. Failure to maintain these standards may result in dismissal from the program.

REQUIRED COURSES - 57 CREDIT HOURS

Doctoral Core Courses - 6 Credit Hours

- ESI 6891 IEMS Research Methods (3 credit hours)
- ESI 6247 Experimental Design and Taguchi Methods (3 credit hours)

Elective Courses - 51 Credit Hours

- At least seventeen unrestricted electives
- A maximum of 30 semester credit hours from an earned master's degree may be applied toward these requirements. Waived credits are evaluated on a course-by-course basis.

DISSERTATION - 15 CREDIT HOURS

- EIN 7980 Dissertation (15 credits hours minimum)

LIST OF ELECTIVES

Students, with the approval of their advisors and/or the program graduates director, may select from the following groups of courses to satisfy the needs of their research goals or career objectives. To assist the students achieve such goals and objectives, courses are grouped below to suggest focus areas, only as guides to assist in advising and course selection. The listing of these courses does not guarantee that they will be offered by the department in a particular year or semester.

In addition to the courses listed below, students may be allowed to take courses from the following disciplines, with the approval of the Graduate program Director, as an elective in their Graduate Program of Study:

- Other Engineering Programs
- Computer Science
- Mathematics and Statistics
- Business Administration/Management

Group A: Human System Engineering/Ergonomics

- EIN 5248 Ergonomics
- EIN 5251 Usability Engineering
- EIN 6935 Advanced Ergonomics Topics

- EIN 6271 Human Reliability

Group B: Quality and Production Systems

- ESI 6225 Quality Design and Control
- ESI 6224 Quality Management
- EIN 6336 Production and Inventory Systems
- EIN 5356 Cost Engineering
- ESI 5227 Total Quality Improvement
- ESI 5236 Reliability Engineering

Group C: Management Systems

- EIN 6182 Engineering Management
- EIN 5117 Management Information Systems I
- EIN 5140 Project Engineering
- EIN 6370 Innovation in Engineering Design
- EIN 6357 Advanced Engineering Economic Analysis
- EIN 6326 - Technology Strategy
- EIN 6339 Operations Engineering
- EIN 5108 The Environment of Technical Organizations

Group D: Simulation, Optimization, and Modeling

- ESI 6336 Queuing Systems
- ESI 5306 Operations Research
- ESI 6418 Linear Programming and Extensions
- ESI 6532 Object-Oriented Simulation
- ESI 5531 Discrete System Simulation
- EIN 5255C Interactive Simulation
- EIN 6936 Seminar in Advanced Industrial Engineering
- ESI 6217 Statistical Aspects of Digital Simulation
- ESI 6529 Advanced Systems Simulation
- ESI 6921 Seminar in Advanced Operations Research

Group E: Industrial and Systems Engineering

- ESI 5219 Engineering Statistics
- ESI 6358 Decision Analysis
- ESI 5359 Risk Assessment and Management
- EIN 6215 Systems Safety Engineering and Management
- EIN 5346 Engineering Logistics
- EIN 6936 Seminar in Advanced Industrial Engineering
- EIN 6950 Industrial and Systems Engineering Capstone

- ESI 6552 Systems Architecture
- ESI 7480 Optimization and Data Mining for Industrial Engineers

ACADEMIC INTEGRITY TRAINING

This section is taken from the Graduate Catalog

All students newly admitted to doctoral programs must complete training designed to inculcate awareness and understanding of the fundamental issues of academic integrity and the responsible conduct of research (RCR) in a manner that is consistent with federal regulations. This required training includes: (1) the online Collaborative Institutional Training Initiative (CITI) “Responsible Conduct of Research” training module in the appropriate disciplinary area; and (2) four face-to-face ethics/RCR workshops coordinated by the College of Graduate Studies and the Office of Research and Commercialization, or an approved alternative training offered as a program requirement for all students in the program. Students in a program that has approved alternative ethics/RCR training must still complete the online CITI Responsible Conduct of Research training in the appropriate disciplinary area.

The workshops and CITI training modules are open to all UCF graduate students and postdoctoral fellows and associates. For the ethics/RCR workshops, priority is given to doctoral students who are required to complete these workshops prior to advancement to candidacy.

Deadlines:

1. All academic integrity/RCR training requirements must be completed prior to a student’s advancement to candidacy.
2. The CITI module should be completed by the end of a student’s second major (Fall/Spring) term of enrollment.
3. All academic integrity and RCR training requirements must be completed in a manner that is consistent with federal regulations.

A doctoral student who has not completed the required training in academic integrity and the responsible conduct of research will not be advanced to candidacy.

Workshops:

The College of Graduate Studies and the Office of Research and Commercialization offer a series of workshops to enable students to fulfill the four workshop requirement. Students must take at least two workshops from a set of core workshops which focus on: personal integrity in the classroom; plagiarism; data management (including fabrication, falsification, and confidentiality); authorship and peer review; mentor and trainee responsibilities; collaborative research; and conflicts of interest. Students must complete two additional workshops from among the set of core workshops or a series of additional workshops, which will provide more specialized training such as human subjects, animal welfare; and other areas of ethical concern unique to a discipline or research area.

Programs may develop alternatives for the training workshops that focus on issues of particular relevance to their specific disciplines and fields, or that better accommodate the schedules of their students. Alternative training must be offered as a program requirement for all students in the program. The training content must be specified in the syllabus/syllabi of required formal courses and include the core topics listed above as well as other topics appropriate to the specific discipline. Alternative training content must be submitted for review and approval by the College of Graduate Studies and the Office of Research and Commercialization prior to student attendance.

Further information concerning workshop sessions and registration and how to complete the CITI training module may be found at the UCF [Academic Integrity](#) page.

EXAMINATIONS

This section outlines the exams that students must take and successfully pass during the course of their Ph.D. Studies. In addition to the Qualifying Examination, the student must pass a Candidacy/Proposal Examination and a Dissertation Defense Examination.

QUALIFYING EXAMINATION

While thinking about taking the Qualifying Examination, students are strongly encouraged to evaluate their options for research and make informed decisions about their area of research interests. It is recommended that students, with guidance from the Graduate Director, seek advice from faculty members whose research interest match their own research areas in order to properly select their electives and develop the appropriate plan of study.

Students are encouraged to take the qualifying examination soon after their first year beyond the master's degree. Students must take the qualifying exam no later than their second year in the program.

The qualifying exam is a take-home examination designed to achieve two objectives:

1. Test the student's knowledge of fundamentals with the discipline, and
2. To assess the student's ability to think analytically, creatively, and independently.

Qualifying & Dissertation Committees

A **Qualifying Committee**, overseeing the Qualifying Examination of a prospective Ph.D. student, must consist of a minimum of three graduate faculty members from within the IEMS department.

The **Dissertation Committee**, overseeing Candidacy and Defense of a prospective Ph.D. student, must consist of a minimum of four members: at least three must be graduate faculty members from within the student's department, and one must be at large, from graduate faculty scholars outside the Industrial Engineering faculty - - see below more details about the Dissertation Committee.

Preparation for the Qualifying Exam:

1. Students meet with Graduate Director to evaluate options and make informed decisions about their area of research interests.
2. Student's plan of study should be developed by the student and approved by graduate director - - see the role of dissertation Advisor and committee members later in this document.
3. Graduate Director will direct student to faculty members whose research interests match the student's research areas. The student may also look for a faculty member who will be serving as the student's Advisor.
4. The student will discuss his/her plans for taking the degree exams and details the timeline for these activities with his/her advisor.

Taking the Qualifying Exam:

1. In general, the Qualifying Committee has control over the administration and conduct of the qualifying exam for the student whose Advisor is the Committee Chair.
2. The qualifying exam must emphasize research that addresses the student's area of interest. Implementation options may include:
 - The first option is to present and discuss a journal or conference publication whose lead author is the Ph.D. student during an oral presentation of the content.
 - The second option is taking a Qualifying Committee generated exam. Qualifying Committee generated questions will have the following characteristics:
 - address the fundamentals of an industrial engineering topic area
 - address global research awareness
 - analytical thinking and research potential
 - evaluate student's communication skills
3. Qualifying examinations are offered in Fall, Spring, or Summer Semesters.
 - Exam dates will be scheduled by the Committee Chair.
 - Committee Chair **MUST** inform the IEMS Graduate office of the Date of the exam. Assessment forms must be filled out by each committee member upon completion of the exam!
 - For the **journal or conference publication option**, the Qualifying Committee Chair of the prospective Ph.D. will submit the student lead-author article to his committee. Committee members will prepare questions for the prospective Ph.D. related to the topic of the article at least one week before the exam date and return them to the Committee Chair.

- For the **Qualifying Committee generated questions option**, the Committee Chair of the prospective Ph.D. will consult with other members of the Qualifying Committee to prepare questions for the examination. It is recommended that the student should prepare a document (white paper) describing the intended area of research to the Committee Chair.
- Once the exam questions are agreed to, the Committee Chair hands the exam questions to the prospective student at least one week before the exam date.
- The student will take one week to answer the exam questions and hand the answers back to the committee chair.
- The committee chair distributes the student's responses to the questions to the committee members. After grading the student's responses to the questions, the Qualifying Committee Chair consults with the committee members with regards to the students responses to the exam questions*.

* There will be an option for an oral presentation at the discretion of the committee and committee chair.

4. Assessment of the QE will be recorded on a Graduate Coordinator generated assessment form and may include three outcomes:
 - Pass
 - Fail
 - Conditional Pass. This requires the student to complete additional tasks prior to passing. Examples include taking additional courses or preparing additional documents
5. A memo of the exam results will be sent to the Graduate Director.
6. Graduate Director will inform the student of the result with copies to committee members.

Candidacy Examination

The Candidacy Examination may be taken any time after successful completion of the qualifying exam, but not in the same semester.

The objective of the candidacy examination is to determine if the student has the breadth and depth of knowledge required to conduct independent research in the proposed area. The candidacy examination includes an oral presentation of a **detailed dissertation proposal** and the written component of the candidacy examination is satisfied by the proposal document.

Admission to Candidacy

The following are required to be admitted to candidacy and enroll in dissertation hours. Evidence of successful completion of these requirements must be received by the College of graduate studies

one day prior to the start of classes for the semester in which a student wishes to enroll in dissertation hours.

- Completion or near completion of course work, except for dissertation hours.
- Successful completion of the candidacy examination, including successful defense of the written dissertation proposal.
- The dissertation advisory committee is formed, consisting of approved graduate faculty and graduate faculty scholars.
- Submittal of an approved program of study.
- Completion of the university's Academic Integrity Training requirement.

In addition to the above requirements, the following requirement must be satisfied for admission to Candidacy:

- The student must have one journal paper submission at the time he/she is taking the candidacy exam.

Dissertation Defense

The Dissertation Defense Examination is an oral examination taken in defense of the written dissertation. The College of Engineering and Computer Science requires that all dissertation defense announcements are approved by the student's adviser and posted on the college's website (<http://www.cecs.ucf.edu/current-students/grad-defenses/>) at least two weeks before the defense date.

Dissertation Committee Requirement

The doctoral committee must consist of a minimum of four members: at least three must be graduate faculty members from within the student's department, and one must be at large, from UCF's graduate faculty or Graduate Faculty Scholars outside the Industrial Engineering faculty. The committee chair must be a member of the graduate faculty who is approved to direct dissertations. Faculty members with joint appointments in IEMS may serve as department-faculty committee members. Adjunct faculty and off-campus experts who are graduate faculty scholars may serve as the outside-the-department person on the committee, as well as serve as co-chairs of the committee with the approval of the department Chair. The College of Graduate Studies reserves the right to review appointments to advisory committees, place a representative on any advisory committee, or appoint a co-adviser.

Joint faculty members may serve as committee chairs. Off-campus experts and adjunct faculty who are graduate faculty scholars may not serve as committee chairs, but may serve as co-chairs. A regularly updated list of UCF's Graduate Faculty and Graduate Faculty Scholars are listed within the [Graduate Faculty](#) as part of the graduate catalog.

All committee members vote on acceptance or rejection of the dissertation proposal and the final dissertation. The dissertation proposal or final dissertation must be approved by the advisory committee with no more than one dissenting vote.

RESPONSIBILITIES OF MEMBERS OF DOCTORAL ADVISORY COMMITTEES

This section is taken from the 2019 – 2020 Graduate Catalog

Responsibilities of Members of Dissertation Committees

1. To meet at regular intervals at least once per year to: (i) discuss and approve the proposed dissertation research and the plans for carrying out the research; and (ii) to assess progress towards the dissertation and give the student a yearly letter of evaluation in addition to S/U grades awarded for 7980 courses.
2. To review iThenticate results from dissertation submittals.
3. To participate in the candidacy and/or dissertation prospectus examination.
4. To participate in the dissertation defense to assure: (i) that the dissertation is acceptable as original research and a contribution to the discipline; and (ii) that it meets the standards of the University.

Responsibilities of the Chair (and Co-Chair) of Dissertation Committees

1. In cooperation with the program director, to review the program of study, the research, and all other degree requirements by meeting with the student early in the program and immediately after appointment as chair/co-chair.
2. To suggest to the student possible committee members who could serve on the dissertation committee.
3. To establish timelines for the research, set expectations, and evaluate the student progress based upon these.
4. To meet at regular intervals with the student to discuss the proposed dissertation research and the plans for carrying out research.
5. To review in a timely manner all written materials submitted by the student and offer suggested revisions.
6. To meet at least once per year with the student and the dissertation committee to assess progress toward the dissertation and give the student an annual review in addition to the S/U grades awarded for 7980 courses. The chair shall send the annual review to the program director after consultation with the dissertation committee.
7. To coordinate the ongoing efforts of the committee as its chair, and to participate fully in the responsibilities of the committee members as a member of the dissertation committee.
8. To chair the candidacy and/or dissertation prospectus examinations.
9. To be physically present and chair the dissertation defense, ensure its proper conduct as described above, and submit to the program director for the student's records all necessary grades, forms and other materials.
10. In disciplines where funding is essential to the success of the thesis or dissertation work, to acquire funds (and appropriate facilities) sufficient to support the research of the student.

Responsibilities of the External Committee Member of a Dissertation Advisory Committee

1. External committee membership will entail the full responsibilities of other committee membership
2. External committee members should bring specific disciplinary knowledge or research expertise to the committee.

3. External committee members may be appointed from outside of the university or outside of the college (if the committee is for a college-wide program). The external committee member may not be affiliated in any way with the department of the committee, such as through joint or secondary joint appointments.
4. Graduate faculty scholars are external members.

Dissertation Committee Procedures

1. For on-campus defenses, no fewer than four faculty members, including all members of the dissertation committee, shall be in attendance with the student during the dissertation defense, and at least half of the committee must be physically present.
2. Graduate programs may elect to offer the option of a virtual dissertation defense (student off-campus defense) upon approval of the graduate program director, the department, and the college. If the student defends virtually, at minimum the dissertation committee chair will be present at the campus location of the public defense. No fewer than four faculty members, including all members of the dissertation committee, shall be in attendance during the dissertation defense.
3. Only members of the dissertation committee may sign the dissertation, and a majority must approve the dissertation.

INDEPENDENT LEARNING

The Independent Learning requirement is met by successful completion of the student's **candidacy and dissertation defense examinations**.

TIME LIMITATION AND CONTINUOUS ENROLLMENT

A student has seven years from the date of admission to the doctoral program to complete the dissertation and the doctoral degree. This is not affected by earning a master's degree along the way.

Credits that are part of an earned master's degree can be transferred into the plan of study upon approval of the program. Transfer credits from an unearned degree that are seven years or older at the time of admission, will not be transferred into a student's Program of Study.

Extenuating circumstances may arise that hinder a student's progress towards program completion and ability to maintain continuous enrollment. If such a need arises, the student may petition for a Special Leave of Absence. Leaves are classified as medical (e.g., illness, injury) or a non-medical (e.g., family needs, military deployment).

Students should be proactive in maintaining accurate records with the university and petition for a Special Leave of Absence prior to the need. When this is not possible, students should do so promptly after the need arises. Students are required to complete and submit the Leave of Absence form with all relevant supporting documents.

Students may be granted a Special Leave of Absence for up to one year or 3 consecutive academic terms. Course registration during the granted leave is not required. Time to degree completion will be extended to account for the duration of the approved leave.

Students who do not maintain continuous enrollment without a Special Leave of Absence (see Continuous Attendance and Special Leave of Absence in the [General Graduate Policies](#)) or exceed the period allowed in the leave request must file for readmission to the university.

APPLICATION REQUIREMENTS

For information on general UCF graduate admissions requirements that apply to all prospective students, please visit the [Admissions](#) section of the Graduate Catalog. Applicants must apply online. All requested materials must be submitted by the established deadline.

The College of Engineering and Computer Science strongly encourages prospective applicants to request a free pre-screening (www.cecs.ucf.edu/prescreen) of their qualifications prior to submitting an online application for graduate admission. However, a pre-screening is not required; rather, it is offered as a courtesy to all prospective applicants before they commit to submitting a complete online application and paying an application processing fee.

Admissions decisions are made on the basis of a complete online application only, and not on the basis of any pre-screening. Prospective applicants who are encouraged to apply to their intended graduate program based on the information provided for their pre-screening are not assured of admission or financial assistance when they submit a complete online application. Although it is possible, it is not likely, that prospective applicants who are discouraged from formally applying to a graduate program at the pre-screening stage will be admitted if they elect to submit a complete online application anyway.

In addition to the [general UCF graduate application requirements](#), applicants to this program must provide:

- One official transcript (in a sealed envelope) from each college/university attended
- Official, competitive score on the GRE taken within the last five years
- Résumé or Curriculum Vita
- Goal Statement
 - The Goal Statement should discuss all relevant professional background and any previous research experience. The statement should explain the motivation behind the pursuit of a doctoral degree in Industrial Engineering at UCF. Future career goals after the completion of the applicant's doctoral study should be discussed.
 - Most importantly, the applicant must clearly describe the particular area(s) of research interest. The applicant should identify at least one UCF faculty member who shares a similar research focus and is believed to be best suited to serve as a potential dissertation advisor.
 - The goal statement should be between 500 and 1,000 words.
- Three letters of recommendation
 - The letters of recommendation should be from faculty members, university administrators and employers with a supervisory role of the applicant. The letters, which must be current to the application and must not be for another degree program, should address the educational and career goals of applicant. The letter writers should also know the applicant well enough to discuss the applicant's capacity to perform, excel and succeed in a graduate program. Letters for PhD applicants must discuss the applicant's ability to perform graduate-level research. At least two of the letters should be furnished by college or university professors who are acquainted with the applicant.

- Applicants to this program are strongly encouraged to complete the necessary information requested for the ETS PPI (Personal Potential Index) report that is available during the GRE examination. All official PPI reports must be submitted directly to the UCF College of Graduate Studies (use UCF Institution Code:5233).
- Applicants applying to this program who have attended a college/university outside the United States must provide a course-by-course credential evaluation with GPA calculation. Credential evaluations are accepted from [World Education Services \(WES\)](#) or [Josef Silny and Associates, Inc.](#) only.
- Applications are accepted for the fall and spring terms only.

Selected outstanding applicants who have a GPA of at least 3.4 in the last 60 attempted semester hours of their undergraduate degrees and have GRE scores above the 80th percentile in both the verbal and quantitative sections of the GRE may be considered for direct entrance as pre-doctoral students with only bachelor's degrees.

Fellowships and assistantships may be awarded based on the student's GPA, GRE scores, letters of recommendation, curriculum vitae/resume, and goals statement.

Students must complete any needed articulation course work and pass a PhD Qualifying Examination in order to be admitted as a regular doctoral student. This exam is normally taken within the first year after all articulation work is completed.

FINANCIALS

Graduate students may receive financial assistance through fellowships, assistantships, tuition support, or loans. For more information, see [Student Finances](#), which describes the types of financial assistance available at UCF and provides general guidance in planning your graduate finances. The [Financial Information](#) section of the Graduate Catalog is another key resource.

Fellowships

Fellowships are awarded based on academic merit to highly qualified students. They are paid to students through the Office of Student Financial Assistance, based on instructions provided by the College of Graduate Studies. Fellowships are given to support a student's graduate study and do not have a work obligation. For more information, see [Fellowships](#), which includes descriptions of UCF fellowships and what you should do to be considered for a fellowship.

Graduate Assistantships

The Department of Industrial Engineering and Management Systems employs a number of graduate teaching assistants and researchers in order to aid students financially during their academic careers. IEMS holds potential graduate assistants to the same application requirements as all other University departments. Applicants can find this information in the [UCF Graduate Catalog](#) online.

Graduate Teaching Assistant applicants who have English as their second language will be evaluated for the English-speaking skills by the Center for Multilingual Multicultural Studies,

using the SPEAK Test. Students who have GTA assistantships must complete the university GTA Training requirements before beginning their assignments. For more information, see [GTA Information](#) and the Financial Information section of the Graduate Catalog.

It is expected that graduate teaching assistants pursue research opportunities within two years of their employment as teaching assistants for the department. Employment as Graduate Teaching Assistants is limited to a maximum of two years.

Students employed as Graduate Assistants, Graduate Teaching Assistants, or in any other paid position serving the University of Central Florida are wholly responsible for assuring timely receipt of financial support. Within the Department of Industrial Engineering and Management Systems students must follow the pay periods established by the University. The duration of the student's financial support correlates with his or her status as either a student or student worker within IEMS; it is up to the discretion of the Department to determine the full duration of a student's financial support.

All international students attending the University of Central Florida are encouraged to apply for employment within the school. For information about the types of employment available to international students, and the requirements and restrictions based on visa type, see the [UCF Global](#) website.

GRADUATE RESEARCH

The University of Central Florida has strict guidelines for graduate students conducting research that involves human and animal subjects. All theses and dissertations that use research involving human subjects, including surveys, must obtain approval from an independent board, the Institutional Review Board (IRB), prior to starting the research. It is imperative that proper procedures are followed when using human subjects in research projects. Information about this process can be obtained from the [Office of Research](#). Failure to obtain this prior approval could jeopardize receipt of the student's degree.

All graduate students conducting research while attending the University of Central Florida must be familiar with the school's "Patent and Invention Policy." The full content of the Patent and Invention Policy is located online in the Graduate Catalog. The university has three fundamental responsibilities with regard to graduate student research:

1. Support an academic environment that stimulates the spirit of inquiry.
2. Develop the intellectual property stemming from research.
3. Disseminate the intellectual property to the general public.

The University of Central Florida owns the intellectual property developed using university resources. The graduate-student-as-inventor will, according to this policy, share in the proceeds of the invention.

GRADUATE STUDENT ASSOCIATION

The Graduate Student Association (GSA) is UCF's graduate organization committed to enrich graduate students' personal, educational and professional experience. To learn more or get involved, please visit <https://ucfsga.com/graduate-student-association/>. For individual department or graduate program organizations, please see program advisor.

FACULTY RESEARCH

The Department of Industrial Engineering and Management Systems faculty members are all actively involved in research projects and collaborations in addition to their teaching responsibilities.

The following table represents current faculty research projects and interests.

DEPARTMENT OF INDUSTRIAL ENGINEERING AND MANAGEMENT SYSTEMS
GRADUATE OFFICE

FACULTY RESEARCH INTERESTS 2020 - 2021

FACULTY MEMBER	RESEARCH INTERESTS
RICHARD BIEHL	<ol style="list-style-type: none"> 1. Healthcare systems, data, & informatics 2. Quality management & engineering 3. Process maturity, capability, & standards 4. Social-scale systems & ecosystems
VLADIMIR BOGINSKI	<ol style="list-style-type: none"> 1. Network science and engineering 2. Operations research 3. Big data 4. Systems engineering
MARK CALABRESE	<ol style="list-style-type: none"> 1. Optimization 2. Business process reengineering 3. Quality systems and performance excellence 4. Financial management and systems 5. Strategic management and planning 6. Leadership
AHMAD ELSHENNAWY	<ol style="list-style-type: none"> 1. Quality management and performance excellence 2. Lean six sigma applications in manufacturing, service and healthcare organizations 3. Business process reengineering 4. Manufacturing systems engineering 5. Lean 3P
IVAN GARIBAY	<ol style="list-style-type: none"> 1. Big data 2. Data analytics 3. Innovation, simulation, and agent-based models. 4. Complex systems, computational economics, evolutionary computation, complex adaptive systems, economic modeling, computational social sciences, game theory with particular focus on: <ol style="list-style-type: none"> i. innovation ecosystems computational analysis and modeling; ii. entrepreneurship education and innovation;

	<ul style="list-style-type: none"> iii. mathematical modeling and agent-based modeling of complex systems including co-adaptive systems, autonomous agents systems, multi-agents systems, and self-organizing systems.
ROBERT HOEKSTRA	<ul style="list-style-type: none"> 1. Creativity 2. Innovation 3. Product design
WALDEMAR KARWOWSKI	<ul style="list-style-type: none"> 1. Human-systems integration 2. Engineering management 3. Ergonomics and safety 4. Complex systems and chaos 5. Human performance: modeling and simulation 6. Neuroergonomics
HEATHER KEATHLEY	<ul style="list-style-type: none"> 1. Management systems engineering 2. Organizational change and transformation. 3. Implementation and function of management systems 4. Organizational performance measurement systems 5. Applications in the healthcare and defense sectors.
TIM KOTNOUR	<ul style="list-style-type: none"> 1. Strategic management 2. Strategic planning 3. Organizational transformations and change management 4. Program/project management.
GENE LEE	<ul style="list-style-type: none"> 1. Modeling & simulation 2. Ergonomics/human factors 3. An interoperability technology for LVC components 4. Biological and chemical Isolation suit for bio-terrorism response 5. Research on implementation Issues in multi-Resolution combat modeling
PAMELA MCCAULEY	<ul style="list-style-type: none"> 1. Human centric models for applying m-health Innovations in healthcare service delivery for developing nations 2. Human factors and ergonomics in disaster management 3. Fuzzy set theory based mathematical model development 4. Ergonomics/human factors and biomechanics 5. Engineering leadership & innovation 6. Leadership for women in STEM
MANSOOREH MOLLAGHASSEMI	<ul style="list-style-type: none"> 1. Modeling and simulation 2. Multicriteria optimization 3. Data analysis

<p>THOMAS O'NEAL</p>	<ol style="list-style-type: none"> 1. Strategic management 2. Technology management and commercialization 3. Engineering entrepreneurship 4. Innovation
<p>MICHAEL PROCTOR</p>	<ol style="list-style-type: none"> 1. Interactive simulation 2. Real time agents (virtual humans) 3. Intelligent tutoring 4. Synthetic natural environments 5. Simulation-based life cycle engineering 6. Advanced engineering & behavioral economics
<p>LUIS RABELO</p>	<ol style="list-style-type: none"> 1. Hybrid/enterprise simulation and agent-based simulation 2. Advanced engineering economics using advanced simulation 3. Leadership and change management using advanced simulation 4. Parallel discrete-event simulation 5. LVC simulation
<p>CHARLES REILLY</p>	<ol style="list-style-type: none"> 1. Random generation of synthetic optimization problems 2. Impact of entropy and coefficient correlation on the performance of exact and approximate optimization methods 3. Input models for bivariate and multivariate discrete random variables 4. Applications of operations research
<p>BEN SAWYER</p>	<ol style="list-style-type: none"> 1. Human Factors Engineering 2. Neuroergonomics 3. Human-systems Integration
<p>ADAN VELA</p>	<ol style="list-style-type: none"> 1. Modeling, optimization, control and simulation of stochastic dynamic systems 2. Machine learning and artificial intelligence 3. Big-data systems and predictive analytics 4. Air transportation systems 5. Unmanned aerial systems (UAS/UAV) 6. Human-in-the-loop control
<p>QIPENG ZHENG</p>	<ol style="list-style-type: none"> 1. Applied optimization and operations research 2. Stochastic programming 3. Network optimization 4. Energy and power systems, management and economics 5. Transportation planning and evacuation planning 6. Healthcare management

FORMS

Any or all of the following forms may be required by a student during their academic careers at IEMS. All forms listed below may be obtained on the IEMS website under the 'Forms' section or from Graduate Studies.

CECS Course Override Form

The course override form is primarily used in the following situations: an undergraduate student registering in a graduate level course, a graduate student registering in an undergraduate level course, overriding a class size limit, overriding pre-requisites, overriding scheduling time conflicts, and overriding maximum hour limits. Students will need to fill out this form if they are requesting registration into a course for which they cannot currently register. The course instructor must approve the override form before it is turned in to the department advisor.

[CECS Course Override Form](#)

Graduate Petition Form

This is a required form for graduate students who wish to request an exception to university policy. Students must submit an up-to-date program of study with the petition and rationale for the exception.

[Graduate Petition Form](#)

Program of Study Templates

This is a contract between the student and the university specifying the courses necessary for graduation in a major. All students should fill out the appropriate POS and return it to the IEMS office for approval. This should be done before the end of the first semester. A student's Program of Study can be continually updated as course choice change and a student's plan evolves.

Please see Graduate Coordinator for Program of Study.

Graduate Special Registration Access Form

(Independent Study, Research, Thesis, and Dissertation)

This form is used to sign up for independent study, an internship, a research project, a thesis, and/or dissertation hours. The form must be completed and signed by the student and also by the instructor. The signed form goes to the Associate Chair and

then to the Academic Affairs office (located in ENGI, Room 107) where the student is registered for the course under the specific faculty member and agreed upon number of credit hours. The student must complete this form at least one week prior to beginning of classes, in case of unforeseen registration complications.

[Graduate Special Registration Access Form](#)

Special Leave of Absence Form

This form is required for students requesting a special leave of absence in order to temporarily waive the continuous attendance requirement. Students can request a maximum of 6 consecutive semesters of absence. Approval of this form will suspend the continuous enrollment in dissertation and/or thesis hours or before a student misses their third, consecutive term of enrollment. Students that are discontinued due to non-enrollment will have to be re-admitted into the program and follow the new catalog's curriculum for the doctoral program.

[Special Leave of Absence Form](#)

Doctoral Committee/Candidacy Status Form

Students must fill out this form once they have passed the candidacy exam and before enrolling in dissertation hours. The absolutely latest this form can be filed with the department is the Thursday before the first day of classes. It will require approval of several people before being submitted to Graduate Studies and they must have the paperwork by noon on the Friday preceding the beginning of a term. At the time of Candidacy all integrity training must be complete and the majority of a student's courses complete.

If a student has a change in his or her committee membership, then this form will need to be re-filed with the department prior to their submission of their dissertation defense posting. All committee member must re-initial the form to reaffirm their commitment to serving on the student's new committee.

Please see Graduate Coordinator for Doctoral Committee/Candidacy Status Form.

Traveling Scholar Request Form

This is a required form for graduate students who wish to attend another institution as a traveling scholar. The course work completed as a traveling scholar will add to a student's total transfer work. According to graduate policy, no more than half of a student's total program can be transfer work.

[Traveling Scholar Request Form](#)

USEFUL LINKS

- [Academic Calendar](#)
- [UCF Financial Aid](#)
- [UCF Golden Rule](#)
- [College of Graduate Studies](#)
- [IEMS Department](#)
- [Institute of Industrial Engineers](#)
- [American Society for Quality](#)
- [UCF Office of Research](#)
- [Thesis and Dissertation \(ETD\)](#)
- [UCF Library](#)

