**ORIE Program Guide – PhD Track**
**Graduate Program in Operations Research & Industrial Engineering**
**Effective Starting Summer 2019**

**Summary:** In order to obtain a PhD degree in ORIE students must complete these steps: (1) pass the qualifying exam, (2) identify a research advisor, (3) become a PhD candidate, (4) complete the PhD course work requirements, (5) defend and complete a PhD dissertation. By definition, a PhD student must be in the MS/PhD or PhD track.

## Qualifying Exam

**Description and Purpose:** There are two components to the Ph.D. qualifying examination: an "in-class" written exam and an open-ended one week "take-home" exam. The written exam tests technical competency in material fundamental to operations research and industrial engineering. The take-home exam tests a student's ability to think creatively and to solve unstructured problems. It is used to assess a student's potential as a successful doctoral candidate and researcher.

**Timing:** There is no formal prerequisite coursework. A prospective Ph.D. student is encouraged to submit an application to take the qualifier exam as soon as obtaining competence in the material covered in the coursework of Linear Programming, Decision Analysis, Stochastic Processes and Integer Programming. In any case, the exam should be taken no later than after completion of the student's third long semester in the program and must be passed within two years of beginning graduate study (before the fifth long semester). A student who wishes to take the qualifying exam after this point must appeal to the ORIE Graduate Studies Committee (GSC). The exam is offered twice a year (August and January).

**Admission to the Qualifying Exam:** Only students admitted to the PhD program may apply to take the qualifying exam. Students in the MS-only program may not take the qualifying exam. Students must fill out a qualifying exam application following the procedure detailed in the exam announcement.

Although there are no course requirements for the exam, PhD students with an appropriate background and a graduate GPA of at least 3.65 in coursework at UT relevant to OR will be approved automatically; PhD students whose background is incomplete or who have a graduate GPA less than 3.65 in OR coursework may be denied permission to take the exam and should consult the graduate advisor well in advance.

Examples of typical questions and syllabi for each part of the Qualifying Examination are available as detailed in the exam announcement. Answers to these questions will not be provided. However, a student interested in more detail is encouraged to meet with faculty that will be preparing the qualify examination questions.

**Examination Format:** The in-class part the qualifying exam typically takes place over two days and lasts 3 hours each day. The take-home exam follows immediately after this and takes place over a one week period. Students should consult the exam announcement for specific details of dates and names of faculty preparing the exam.

**Grading:** The exam will be graded as a whole. Performance on the exam and the student's complete academic record will be considered in evaluating the student's potential to successfully conduct doctoral level research. When the exams are graded, the Graduate Advisor will inform the students of their results but their graded solutions will *not* be returned to them.

A student who is not successful at passing the qualifying exam on their first attempt will be allowed to take the exam for a second time at the discretion of the ORIE GSC. Those receiving permission will receive a set of conditions they have to satisfy to pass the exam on their second attempt—these can vary from student to student. For example, the conditions may be: "Try again, and you have to pass all three sections of the qualifying exam." or "You only have to take and pass the optimization part, at your second try." or "You have to take <this> additional class, to fill in gaps in your knowledge." These conditions are customized for each student.

**Recourse:** A student unsuccessful in two attempts on the exam will be denied continued enrollment in the doctoral program. Recourse available is to formally petition the ORIE Graduate Studies Committee requesting further consideration.

## Identifying a Research Advisor

**First-year Advisor:** At the beginning of a PhD student's first semester in the ORIE graduate program, the GSC will assign the student a first-year advisor. This advisor arrangement is not permanent and the student may switch advisors in subsequent semesters. Students should focus on identifying a permanent research advisor after passing the qualifying exam (see below).

**PhD Advisor Requirement after the Qualifying Exam:** Every PhD student who passes all parts of the qualifying exam must identify a research advisor during the semester in which they pass the exam.

Students identify a research advisor by discussing research interests and funding opportunities with faculty on the ORIE GSC When a faculty member (or members) formally agrees to serve as a research advisor, the student should ask his or her advisor to send an email to the ORIE graduate advisor indicating so. Note that the advisor and advisee arrangement is not necessarily permanent. A student may change advisors if research interests change or for other reasons. An advisor may decide to cease advising a student if adequate progress is not made, or research interests change. Students and research advisors should notify the graduate advisor when there is a change in status.

## Advancing to Candidacy

**Advancement to Candidacy:** A PhD student should work with their research advisor to progress to candidacy. This involves first progressing in research work, based on the advisor's direction. Second, it involves creating an appropriate dissertation committee that the advisor will chair. A committee must be composed of at least four members. A minimum of three members must be on the ORIE GSC and at least one must be selected from elsewhere in the University or from the professional community. Students may have more than four committee members if this is deemed necessary by the advisor. Once the student, in conjunction with the advisor, has decided on a research topic and committee he/she should submit paperwork to the graduate school to become a PhD candidate.

The next step is for the student to give a presentation on the proposed PhD work to the committee. Prior to the presentation, the PhD candidate is required to submit a formal written dissertation proposal to the committee. The committee judges the scope and importance of the selected topic and the adequacy of the student's background to pursue such research. In reaching a decision, the committee will consider the coursework completed by the student and will specify additional coursework if necessary.

The ORIE GSC requires that a student pass the qualifying exam and be admitted to candidacy before accumulating 50 credit hours towards their Ph.D. degree (this includes research and seminar hours). This rule was adopted to promote a timely completion of the Ph.D. degree consistent with the University's "99" hour rule.

Scheduling the Proposal Presentation: See the section on Scheduling the Final Defense for general guidelines.

If a student has failed to advance to PhD candidacy within four years of the passing the qualifying exam, he or she must retake and pass the qualifying exam before being admitted to candidacy.

## Completing PhD Course Requirements

Curricular requirements for the PhD can be divided into three categories: master's level certification, PhD coursework, dissertation coursework.

**Master's Level Certification**: Students must be deemed to have obtained a master's level knowledge of ORIE as part of the PhD degree. This can be done in two ways. (1) A student may have a master's degree in operation research, industrial engineering, or equivalent discipline from an approved institution. If a student is unsure if they satisfy this requirement, they should check with the graduate advisor. (2) A student may obtain a master's degree in ORIE at UT-Austin.

**PhD Coursework**: A student must also complete PhD coursework, also known as the program of work. This work is comprised of 24 credit hours of approved graduate or upper level undergraduate courses. There is no fixed requirement on the number of ORIE credits among the 24 hours, but the graduate advisor will generally require that a significant portion be

in ORIE. No course used for the master's degree can count toward the PhD coursework requirement. Furthermore, no "core" ORIE course can count toward the PhD course work requirement. The ORIE core courses are: Linear Programming, Linear & Integer Programming, Stochastic Processes, Integer Programming, and Applied Probability.

A maximum of 3 hours of the 24 hours may be taken on a credit/no credit basis. No ORIE course may be taken on a credit/no credit basis, if it is to be counted towards the program of work.

Each PhD student must take Emerging Topics in ORIE before advancing to candidacy. This course requirement applies to doctoral students entering the program in August 2016, or later. However, all current PhD students are encouraged to enroll in the course before graduating. Like any other ORIE course, this course must be taken on a letter grade basis and it may count toward either the master's or PhD program of work. Students may repeat the course, on a CR/NC basis, although it will not count for degree credit when repeated. All graduate students can take this course at any time on a CR/NC basis.

Dissertation Coursework: As required by the graduate school each student must take dissertation reading (ORI *99R) and dissertation writing (ORI *99W) at least once. These courses can only be taken after a student has advanced to PhD candidacy.

## Completing the PhD Dissertation

**Final Requirements:** Once admitted to doctoral candidacy, a student must complete their dissertation, working with their advisor, based on the work outlined in the proposal. The student is required to give a final dissertation defense to the dissertation committee, obtain their approval for completion of the PhD program, and submit a dissertation as required by the graduate school. All members of the committee must agree and sign a document stating that the student's research work is of sufficient quality to receive a PhD in ORIE.

**Final Defense Scheduling**: Students are responsible for scheduling and organizing the final defense. Students should check faculty schedules 2 to 3 months in advance of the defense, especially if the defense will take place during the summer term. When proposing dates and times, students should check the committee members teaching schedule in advance.

The proposal defense is typically scheduled for a two-hour time slot. After obtaining agreement from the committee on the time and date, students need to reserve an appropriate room and make all the necessary arrangements. Students should consult their advisor for specific requirements. Students should also note that there are two options for the final defense: the traditional option and the electronic option. The graduate school website has details on each option and these should be checked carefully.

Scheduling the defense, submitting the dissertation, and applying for graduation with the PhD degree involve multiple forms and deadlines. Students are responsible for checking and completing these requirements in a timely manner. Students should consult their research advisor or graduate advisor if they require clarification on final paperwork.

## General Registration and TA/RA Information

The "99 hour" rule: after accumulating 99 credit hours towards their Ph.D. degree, students will be charged non-resident tuition. The 99 credit hours include seminar, research, and dissertation hours.

If you are a continuing student, we strongly recommend that you pre-register. If you do not pre-register or if your registration is canceled (due to non-payment), your appointment as a TA or GRA will be delayed. If you are a full time student, you must enroll for at least nine credit hours in each long semester (Spring and Fall).

If you are a Ph.D. student, you cannot sign up for dissertation (ORI x99R) unless you are admitted to candidacy by the Graduate School. There are two sections of dissertation; the first is "R" for research and the second is "W" for writing. A student registers for "R" only once and registers for "W" each semester fall and spring semester after that until he/she graduates. A doctoral student must be enrolled in dissertation during his/her last semester in order to graduate.

In order to be appointed for a TA or GRA you must be in good standing (not on academic probation). If you are interested in being a TA, you must complete a TA application. The application is available at the end of each semester for the following semester. This must be done every semester, even if you have served previously. An international student must

be certified as competent in the English language before he or she can be appointed as a TA. Non-exempt international students (depending on country of origin) must pass the ITA English Assessment, which is administered by the International Office.

Graduate Research Assistants are assigned by faculty members holding research grants or contracts. If you are interested in a particular research program, you must contact the faculty member directly.

You cannot be appointed as a TA/GRA more than 14 long semesters (7 years). In general, there is low priority for appointing a student to a teaching assistantship after the student has had a TA appointment for 2 long semesters.