



Georgia Tech College of Engineering

**H. Milton Stewart School of  
Industrial and Systems Engineering**

# **Graduate Handbook 2023 — 2024**

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## Introduction

This handbook has been designed to help you plan and implement your graduate program of study and to inform you of the various policies and regulations of the H. Milton Stewart School of Industrial and Systems Engineering (ISyE).

Several resources are available to you to help you plan and execute your graduate study here at Georgia Tech. A good source of information is the [Office of Graduate Studies](#), which provides a high-level overview of graduate programs and contains useful links to various online resources. The Georgia Tech [General Catalog](#) describes common requirements and policies for all graduate programs. Graduate students should refer to the Catalog sections that cover relevant topics, including specific degree requirements. It is important to note that this handbook does not replace the Catalog. However, this handbook describes policies and procedures specific to ISyE graduate students; in general, your academic program is guided by the handbook version for the semester of your matriculation at Georgia Tech. In addition to this guide, your faculty advisor, the Director of Master's Programs, the Associate Chair for Graduate Studies, and the Academic Office staff are available to help you with questions pertaining to your program.

## ISyE Building Complex

The ISyE complex is located on the west side of campus, directly across the street from the Campus Recreational Center (CRC). Three buildings, connected by glass-enclosed walkways, comprise the complex: the Instructional Center (IC) houses classrooms for many ISyE classes; the Groseclose Building is where the majority of faculty have their offices and also houses some conference and seminar rooms; the ISyE Main Building houses the School Chair's Office, some administrative and support staff and the majority of offices for Ph.D. students. The Academic Office is in the Groseclose Building. You can view [online floor plans](#) for Groseclose and ISyE Main.

Several common-use study areas are available for you within the complex. The first floor of Groseclose and the first floor of ISyE Main have study areas open to all ISyE students. A special study hall for MS Supply Chain Engineering students is in Groseclose 213. Ph.D. students can use the Ph.D. Lounge in ISyE Main 445, which also houses a kitchenette.

Soon after your first term registration, your BuzzCard will be activated to allow you access to the ISyE buildings and computer labs. Please be sure to immediately report a lost or stolen card to the BuzzCard Center to prevent security problems (as soon as the BuzzCard Center has issued a replacement card, [facilities@isye.gatech.edu](mailto:facilities@isye.gatech.edu) should also be notified so that you can regain access to buildings and labs).

## Communications

The primary mechanism by which ISyE faculty and staff and Georgia Tech staff communicate with students is your official Georgia Tech email address. The Institute [Office of Information Technology](#) (OIT) provides every student and every employee with a Georgia Tech (GT) account. Your GT account username and password identify you to the GT campus network and enable you to use a variety of web-based resources and services outside of ISyE. Your official campus e-mail address is initially your GT account username but can be modified using the [Passport](#) website. This e-mail address is the official means of communication between you and the Institute.

If you wish to receive U.S. postal mail at Georgia Tech, please consider renting a [student mailbox](#) at the Georgia Tech Student Center. If you live in Georgia Tech Graduate Student Housing, your building should have separate mail facilities.

### ISyE Common-use Computing

In addition to your GT account, graduate students can also apply for an ISyE UNIX account. An ISyE UNIX account provides a centralized home directory within our common-use computing infrastructure and access to the appropriate UNIX and Linux resources within ISyE. The [ISyE website](#) includes information about our [computing resources](#) and instructions about how to apply for an ISyE UNIX account.

ISyE operates its own general-use high performance computing system. This is a large Linux cluster that shares network-mounted home directories and is managed using the Condor workload management system. This system is accessible from anywhere in the world via secure shell for those with an ISyE UNIX account. We have a central helpdesk system where you can submit any questions you may have about computing resources. Email [helpdesk@isye.gatech.edu](mailto:helpdesk@isye.gatech.edu) for computing questions.

### Student Records Maintenance Responsibilities

Each student is responsible for the various requirements specified in the *General Catalog*, the Master's and Ph.D. policy statements, and other information in this handbook. Students are responsible for seeing that their records are complete and accurate and that all program requirements are met and recorded. It is the student's responsibility to meet any deadlines specified in this document, the *General Catalog*, or any other School or Institute policy.

Information for students in the Ph.D. degree program is kept largely within the ISyE [Gradtracker](#) system. For each semester of enrollment (including summers), Ph.D. students are required to confirm or update certain information by submitting a Census Form. When degree milestones are passed, Gradtracker records will be updated and students will be informed via email or written letter. Master's students can track degree progress primarily through Georgia Tech's [DegreeWorks](#) system. Completed courses are listed in required program categories. Any courses listed in the "fallthrough" area do not currently count toward any program requirement unless an exception is approved. Ph.D. students can also track coursework and some program requirements in DegreeWorks.

### Registration; Starting and Stopping

To register, you will need to refer to the schedule of classes bulletin within the On-line Student Computer Assisted Registration ([OSCAR](#)) system. The information published on OSCAR is prepared by the Office of the Registrar and contains all of the information necessary for registration, including the official school calendar, course catalog links and the final exam schedules.

At the end of your graduate program, you must have certain academic and administrative paperwork completed and filed, most electronically. To graduate and receive a Georgia Tech Master's or Ph.D. degree, you must submit an Online Application for Graduation (OAG) during the semester **prior** to graduation. Deadlines for submission can be found in the [calendar](#) published by the Registrar. Submit your OAG using the OSCAR registration system. You can find instructions [here](#).

Before applying for graduation, Master's students should ensure that program course requirements are satisfied. Master's students can check if course requirements are satisfied using [DegreeWorks](#). Additionally, Ph.D. students can check whether other milestone requirements have been satisfied and recorded with the Registrar. Be sure to review your DegreeWorks account once a semester and communicate with the ISyE Academic Office if you see any discrepancies.

Finally, be sure to carefully read emails and follow instructions from the ISyE Academic Office staff during your final semester of enrollment to ensure that you are cleared for graduation.

## Enrollment

The Georgia Tech catalog includes [policies on graduate student enrollment](#) and workloads. Full-time enrollment during any semester, including summer semesters, is for at least 12 credit hours on a letter grade or pass-fail basis. Maximum enrollment is 21 hours in fall or spring semester and 16 hours in summer semester.

International students on F-1 and J-1 student visas must be enrolled full-time for at least 12 credit hours during each fall and spring semester. Please ensure your compliance with visa regulations by visiting the [Office of International Education](#). Students with graduate research assistantships, graduate teaching assistantships, or fellowships during any semester (fall, spring, or summer) must also be enrolled full-time.

## Graduate Assistantships and On-campus Employment

Most Ph.D. students and some Master's students are employed on campus during their graduate programs. The most common employment options are the *Graduate Research Assistantship* (GRA) and the *Graduate Teaching Assistantship* (GTA). Graduate Teaching Assistantships are offered only to Ph.D. students and provide standardized stipends for appointments up to 33%-time (13 hours per week). Graduate Research Assistantships provide different standardized stipends for Ph.D. students and Master's students, and appointments are for 40%-time to 50%-time (16 to 20 hours per week). A GRA position is provided directly by a faculty member on a contract for a single semester and hiring steps must be completed by the student and faculty member prior to the beginning of the semester. Ph.D. students request GRA or GTA positions prior to deadlines announced by the Academic Office using the [Gradtracker](#) and [GradWorks](#) systems. Master's students who are offered graduate student employment positions should also submit a position request in [GradWorks](#). Finally, GRA and GTA students are provided a tuition waiver for the semester of hire. The tuition waiver covers base in-state or out-of-state tuition, but does not cover any fees or the *premium tuition differential* for certain Master's students. GRA and GTA students must be enrolled full-time (12+ hours) during the semester of hire, including summer semesters.

Graduate students are sometimes hired into different roles on campus, including as Graduate Assistants. A Graduate Assistant (GA) is paid hourly for a certain number of maximum hours per week, agreed upon in advance. A Graduate Assistant must be enrolled during the semester of hire, and the maximum hours per week is limited by the number of enrolled hours. Some Master's students may be hired to help with certain limited teaching duties in these roles.

All graduate student hiring is coordinated through the Academic Office. Graduate students are hired on a semester-by-semester basis and rehires are required each semester. Please note that if a faculty member offers you a GRA or a GA position but you have not completed hiring steps before the semester begins, then you will not receive stipend payments or wages, and you should not work. Improperly hired GRA students may also have tuition waivers revoked by the Georgia Tech Bursar.

## Special Problems and Research Courses

Graduate students may sometimes conduct research with faculty members or may study specialized material not available in classroom courses. ISyE graduate students may seek course credit for such experiences, when necessary or otherwise appropriate, by registering for special problems or research courses. Special problems and research courses carry regular credit-hours and can be used to meet minimum enrollment requirements in any given semester.

Ph.D. students performing research should generally register for pass/fail ISyE 9000 credit-hours. Each ISyE faculty member has an ISyE 9000 section, and students should seek permission from the faculty member before enrolling.

Master's students performing research may wish to register for pass/fail ISyE 8900 or ISyE 8901 credit-hours, again choosing the section associated with the faculty advisor. Pass/fail ISyE 8900 or ISyE 8901 credit-hours cannot be used to satisfy any Master's degree requirements. Graduate students studying a special course with a faculty member should register for letter-graded ISyE 8900 or 8901 credit-hours. Generally, letter-graded 8900 or 8901 courses may only be used for free elective degree credit.

Registration for ISyE 8900 and 8901 is by permit only. Students must [submit a permit request](#) no later than Wednesday of the final week of course registration. Permit requests are approved first by the faculty advisor/instructor and second by the Associate Chair for Graduate Studies or the Director of Master's Programs. Letter-graded course requests are limited to 3 credit-hours and must include a course syllabus and a document describing the course grading procedure.

### **Course Grading Policies and Academic Grievances**

Information regarding registration, grading, course withdrawal, and other related topics can be found on the [Registrar's website](#). Students who wish to file academic grievances should refer to the Institute's [grievance process](#) described in the Catalog.

### **Honor Code**

Georgia Tech has an honor code, and ISyE vigorously enforces all of its tenets. At its core, the Georgia Tech Honor Code establishes principles of personal and academic integrity that all members of the Georgia Tech community—staff, faculty, and students—must use to guide their conduct. Students that are not interested in participating in such a community should reconsider their decision to enroll at Georgia Tech. You are advised to familiarize yourself with the [Honor Code](#).



## Master's Degree Programs (Atlanta and Video Campuses)

ISyE offers four degree options at the Master's level<sup>1</sup>:

**Master of Science in Industrial Engineering (MSIE)**  
**Master of Science in Operations Research (MSOR)**  
**Master of Science in Supply Chain Engineering (MSSCE)**  
**Master of Science in Health Systems (MSHS)**

and jointly offers five additional interdisciplinary degrees with other Georgia Tech academic units:

**Master of Science in Analytics (MSANLT)**  
**Master of Science in Statistics (MSSTAT)**  
**Master of Science in Quantitative and Computational Finance (MSQCF)**  
**Master of Science in Computational Science and Engineering (MSCSE)**  
**Master of Science in Urban Analytics (MSUA)**

The School also offers a BS/MS program for Georgia Tech undergraduates:

**BS/MS Program in Supply Chain Engineering**  
**BS/MS Program in Industrial Engineering**  
**BS/MS Program in Operations Research**  
**BS/MS Program in Health Systems**

### Admission

A student seeking admission to a Master's program should complete the application process described on the Institute Graduate Studies [website](#). Applicants to all programs except MS Analytics must complete the Graduate Record Examination (GRE) General Test and provide official scores to Georgia Tech. MS Analytics applicants may submit Graduate Management Admission Test (GMAT) scores as a substitute, although the GRE is preferred. Georgia Tech also requires all international students from countries in which English is not the primary native language to demonstrate proficiency in English, except international students who have attended a college or university in the United States for at least one academic year (two semesters or three quarters). Please refer to the Graduate Studies website for more information.

Georgia Tech undergraduates seeking admission to the BS/MS Program in Supply Chain Engineering must apply via a special procedure. The GRE requirement is waived for BS/MS program applicants. Admitted students will enter the MS in Supply Chain Engineering program immediately after graduation with the BS in Industrial Engineering degree. During the BSIE graduation semester, students must apply for a level change into the Master's program.

### Changing Degree Program

Prior to beginning a degree program, students interested in switching from one program to another may discuss their requirement with the ISyE Associate Chair for Graduate Studies. Since admission requirements vary by program, and programs have different student capacities, such requests may not be granted.

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<sup>1</sup> Several ISyE MS programs have the option for a practicum track. Please see the Institute Catalog for details.

Students who seek to change degree programs after beginning a program will not be granted admission into the new program before they have completed a full semester at Georgia Tech. Students seeking to change primary or secondary degree programs must submit an application to the ISyE Graduate Programs Manager at least 4 weeks prior to the semester for which the change is sought.

Current Georgia Tech students pursuing a Master's degree may apply to change their **primary** major degree program into MSIE, MSOR, MSCSE-ISYE, MSHS, or MS Statistics-ISYE by submitting an updated CV, a statement of purpose, and at least one letter of reference from a Georgia Tech faculty member directly to the ISyE Graduate Programs Manager for approval by the Associate Chair for Graduate Studies. Master of Science students at Georgia Tech will not be permitted to add a secondary major in any ISyE degree program. Furthermore, students who have completed a Master of Science degree at Georgia Tech will not be typically admitted into an ISyE Master's degree program subsequently.

Georgia Tech graduate students pursuing the Ph.D. degree in other schools across campus can seek a secondary major within our MSIE, MSOR, MSCSE-ISYE, MSHS, or MS Statistics-ISYE programs to earn a Master of Science degree in addition to the Ph.D. Such students should submit a [Change of Major form](#) to the ISyE Graduate Programs Manager and have their dissertation research advisors email the Graduate Programs Manager with their approval.

Current Georgia Tech MS students interested in changing majors into MS Analytics, MS Supply Chain Engineering, MSUA, or MS QCF should consult directly with the Faculty Director of the appropriate program about opportunities for transfer.

#### **Follow-on MBA Study**

Students pursuing MS or Ph.D. degrees from Georgia Tech are eligible to apply to the [MBA Dual Degree program](#), offered by Georgia Tech's Scheller College of Business. Students admitted to the dual degree program can earn a follow-on Master of Business Administration (MBA) by double counting 15 hours of core and technical elective MS coursework as electives for the MBA program. Doing so allows the student to earn an MBA degree by completing 39 additional credit-hours of coursework in the MBA program, including the traditional MBA core. The follow-on MBA can be completed in the full-time or evening program.

Students interested in this option must apply before graduating from the MS program and should generally do so no later than their first semester on campus. Application instructions are available at the Scheller MBA Dual Degree website.

#### **Follow-on Ph.D. Study**

A student pursuing a Master's degree in an ISyE program who seeks admission for a follow-on Ph.D. degree from an ISyE program must follow the regular admissions process for Ph.D. programs and adhere to all stated deadlines. The application requires recommendation letters, and it is best if one of these letters is written by the student's prospective thesis research advisor in ISyE and expresses very strong support.

#### **Student Advising**

Each Master's student is assigned an advisor prior to enrollment, as noted on the admission letter. The advisor is your first point of contact for questions about your degree program and can help you create a program of study that conforms to our requirements while satisfying your interests.

### Preliminary Preparation

A student seeking a Master's degree must have a bachelor's degree and typically one earned in engineering, science, mathematics, or some other field that provides an adequate background for the successful completion of an ISyE program. For students who arrive without an engineering or mathematics degree, adequate preparation minimally includes a mathematics background equivalent to that provided during the first two years of an accredited engineering degree. Exposure to linear algebra, computer programming, and calculus-based probability and statistics will be assumed. Students who have significant gaps in background preparation will be advised to complete preliminary undergraduate coursework upon arrival to Georgia Tech or to attain background through additional self-study.

Many graduate level courses list prerequisite courses. We do not rigidly enforce prerequisites by preventing enrollment. However, students should be advised that a strong understanding of the content of listed prerequisite courses will be assumed by the instructor. Please consult with individual instructors if you have any concerns.

### General Requirements

Most Master's degrees in ISyE require 30 semester hours of course credit; MS QCF and MS Analytics both require 36 hours. In very rare cases, prior graduate coursework completed at another institution that was **not used toward another degree** (graduate or undergraduate) may be transferred for credit. A syllabus for a transfer course must be provided and must demonstrate equivalence to a numbered ISyE catalog course. No more than 6 hours of credit may be transferred, and all transfer credit must be approved prior to the end of the student's first enrolled semester by the Associate Chair for Graduate Studies.

Students wishing to pursue a thesis can do so, and a thesis will count for six (6) hours of free or unrestricted elective credit. It is very rare for a student to pursue a thesis, and you should consult with the Associate Chair for Graduate Studies during your first semester of study if you are interested in doing so.

### Undergraduate Courses

Credit earned for undergraduate courses taken as remedial work to satisfy a program's prerequisites cannot apply toward a Master's degree. In general, undergraduate courses, with the exception of those specified in certain Master's programs described below, cannot be used to satisfy degree requirements. In some cases, a student may take a 4000-level course for degree credit, subject to approval by the Associate Chair for Graduate Studies; required courses in our BS in Industrial Engineering curriculum will not be approved. Do not register for any unspecified undergraduate courses expecting degree program credit until approval has been granted. Courses at the 3000-level and below are not permitted.

### Core Courses

Each ISyE Master's degree program includes a set of required core courses. In general, no substitutions will be allowed for core courses except when a student successfully completes a Ph.D. level course covering the same material.

### Elective Courses

Some degree programs also allow electives to be included in the Program of Study.

Technical and other electives must be at the 6000-level or higher and need not be restricted to ISyE offerings. These may include courses from other fields such as mathematics, computer science, or other engineering disciplines. Above all, the intent is that these courses have strong technical content. Most programs have a restricted list of courses that can be used as technical or

track electives. Students [must seek approval](#) of courses not on the approved list from the Associate Chair for Graduate Studies, and such approvals are very rarely granted. Do not enroll in a class you expect to use as an elective prior to approval.

Some MS programs include free electives. Free electives need not be selected from approved technical elective lists, although many students will select such courses. A free elective course can be chosen among any of Georgia Tech's colleges and should be chosen to complement your graduate study program. If a chosen free elective does not clearly align with your degree program, then you may be asked to provide a written explanation identifying how the course complements your study. The Associate Chair for Graduate Studies reserves the right to deny a request for free elective credit for any course not on a technical elective list that appears unrelated to or does not materially contribute to your degree interest. For instance, it is rare for a non-technical MGMT course to be accepted as a free elective course; and it is never the case that two such courses would be allowed. In addition, Special Problems courses (ISyE 8900/8901) taken for a letter grade can only be used for free electives, and a maximum of 3 credit-hours of such coursework is allowed to count toward your degree.

### Apply for a Degree

A student is responsible for seeing that his/her graduate records are up-to-date and that all requirements and deadlines are met. Some important requirements that apply to all Master's students include:

1. No course listed on a degree petition was counted toward requirements of another master's degree.
2. Not more than two undergraduate 4000-level courses may be listed on a degree petition.
3. All courses on the degree petition must be letter graded.

Follow the procedures listed in the earlier *Registration; Starting and Stopping* section to apply for your degree. Remember that applications are due during the semester *prior to* the graduation semester.

### Grades Required

Only courses with letter grades of *C or better* may be used to satisfy degree requirements for ISyE Master's degrees, and the Georgia Tech final Institute graduate GPA requirement of 2.7 must also be satisfied. All required courses in a Master's program of study must be taken for a letter grade. Courses taken with a pass/fail grading option cannot be counted toward a degree.

If you receive a *D* or *F* in a program course, it may be repeated. Please note that since courses are generally offered at most once per year, this can delay graduation significantly. When a course is repeated, the original course and grade remains on the transcript and is still counted toward your Institute GPA unless you are approved for [Grade Substitution](#), in which case the grade remains on your transcript but is not counted towards the Institute GPA.

### Academic Standing

Students should familiarize themselves with the [Registrar's Academic Standing](#) system. A student in a Master's program will be placed on *Warning* standing if the GPA at the end of any semester falls below the 2.7 graduation threshold. If a student fails to improve performance, or if performance in a single semester is very unsatisfactory, *Probation* standing may result. *Drop/Dismissal* standing results from academic deficiency; once dropped, a student must be absent for a complete semester before a readmission application will be considered. Students who do not maintain *Good* standing may be subject to registration restrictions.

### Progress Toward a Degree

As a full-time student, you are encouraged to schedule coursework that provides clear evidence that you are making progress toward your degree requirements. Delaying progress by scheduling courses with the apparent intent of delaying graduation is not allowed. Students who appear to be violating the spirit of this guideline will receive a registration hold for the subsequent semester; particularly serious cases will be forwarded to the Office of the Dean of Students.

International students on F-1 and J-1 visas must be particularly careful with course planning. I-20 extensions are not issued when a student fails to make a proper plan for course completions. Extensions are also not issued to enable students to complete multiple internship or co-op semesters. Generally, Master's degree students have a one semester opportunity for internship or co-op during the summer semester following the first program year.

### Master's Degree Program Requirements

For a complete list of requirements for all Master's degrees, please refer to the Institute Catalog: <https://catalog.gatech.edu/programs/>.

### Ph.D. Course Substitutions

Any course in a Master's degree program of study can be substituted for higher-level Ph.D. courses covering the same material. Please note that Ph.D. courses can be very challenging without appropriate preparation:

- ISyE 6412 Theoretical Statistics substitutes for Math 4261/4262
- ISyE 6661 Optimization I or ISyE 6662 Optimization II substitutes for ISyE 6669
- ISyE 6761 Stochastic Processes I substitutes for ISyE 6650
- ISyE 6832 Simulation Theory substitutes for ISyE 6644
- ISyE 7201 Production and Service Systems Engineering substitutes for ISyE 6201
- ISyE 7203 Logistics Systems Engineering substitutes for ISyE 6203
- ISyE 7400 Advanced Design of Experiments substitutes for ISyE 6413
- ISyE 7401 Advanced Statistical Modeling substitutes for ISyE 6414

### Master's Degree Faculty Advisors

Master of Science in Industrial Engineering (MSIE) - Dr. David Goldsman

Master of Science in Operations Research (MSOR) - Dr. David Goldsman

Master of Science in Supply Chain Engineering (MSSCE) - Dr. Alan Erera

Master of Science in Health Systems (MSHS) - Dr. Pinar Keskinocak

Master of Science in Analytics (MSANLT) - Dr. Joel Sokol

Master of Science in Statistics (MS STAT) - Dr. Yajun Mei

Master of Science in Quantitative and Computational Finance (MSQCF) – Dr. Sudheer Chava  
(Scheller College of Business) <http://www.qcf.gatech.edu/>

Master of Science in Computational Science and Engineering (MSCSE) - Dr. Christos Alexopoulos (ISyE Unit Coordinator) <https://cse.gatech.edu/academics/ms-cse>

Master of Science in Urban Analytics (MSUA) - <https://planning.gatech.edu/master-science-urban-analytics>

## Ph.D. Degree Programs

The degree Doctor of Philosophy (Ph.D.) earned via an ISyE doctoral program recognizes students with demonstrated proficiency and high achievement in research within the disciplines represented in the School faculty. After adequate preparation, the successful Ph.D. candidate must complete a searching and authoritative investigation of a special area in their chosen field, culminating in a written dissertation describing the unique contributions created by that investigation.

### Admission Requirements

Each applicant is required to submit a written statement describing motivation for pursuing the Ph.D. in ISyE, including a description of current research interests. Transcripts of prior academic work are required as are scores on the general portion of the Graduate Record Examination (GRE). All applicants must request that credible letters of reference be submitted on their behalf which attest to their ability to perform rigorous Ph.D. level course and research work. To be considered for admission into the Ph.D. program, an applicant need not possess a Master's degree.

### Office Space

Each Ph.D. student in ISyE will receive office space, beginning around the second week of class in the fall semester. First-year Ph.D. students will receive a desk assignment in ISyE Main 340/341/309. These large rooms will allow you to meet and socialize with other first-year students and to form study groups. First-year students serving as Graduate Teaching Assistants (GTAs) should not hold office hours in 340/341/309. For office hours or other discussion meetings, please use ISyE Main 342/344/347/348/349 or similar rooms in our complex.

Continuing Ph.D. students will be assigned a smaller shared office beginning in their second year. Office space will be provided for you while you maintain adequate progress toward your degree. We cannot guarantee office space for students who have completed 5 program years, but we will try to accommodate all requests.

Ph.D. student office space is expected to be maintained as professional office space. Please keep your space tidy. A separate document will describe office maintenance expectations. Failure to maintain your office space to standards will result first in a warning, and second with removal of your office space privilege.

### Program Structure

Doctoral students in ISyE can pursue 6 different Ph.D. degrees, including the 4 interdisciplinary degrees marked with an asterisk (\*) below. The Ph.D. in Industrial Engineering degree offers four different specializations, and each student must select one prior to the Comprehensive Examination. Students wishing to switch between the IE, OR, or CSE degree must seek permission from the Associate Chair for Graduate Studies. Switching into the Ph.D. degrees in ACO, Bioinformatics, or Machine Learning is only possible after permission is granted from the directors of those programs.

#### **Doctor of Philosophy in Industrial Engineering**

*Specialization in Supply Chain Engineering*

*Specialization in Statistics*

*Specialization in Economic Decision Analysis*

*Specialization in System Informatics and Control*

*General Industrial Engineering*

**Doctor of Philosophy in Operations Research**

**Doctor of Philosophy in Algorithms, Combinatorics, and Optimization (ACO)\***

**Doctor of Philosophy in Computational Science and Engineering (CSE)\***

**Doctor of Philosophy in Bioinformatics\***

**Doctor of Philosophy in Machine Learning\***

### **Enrollment**

Each Ph.D. student in an ISyE program is supported by an assistantship or a fellowship during Fall and Spring semesters during the first four program years, with the exception of students who are supported via external fellowship programs. During any semester in which a student is supported by assistantship, full-time enrollment is required.

Since Ph.D. students usually do not take a full-time load of classroom coursework, enrollment is supplemented by registering for research credit-hours (typically ISYE 9000). During each semester of full-time enrollment, we expect Ph.D. students to enroll for maximum credit hours (classroom plus research); 21 credit-hours for Fall or Spring semesters, and 16 credit-hours for Summer semesters.

Ph.D. students should register for ISyE 9000 research credit-hours in the course section offered by the Ph.D. research advisor. In the first year of the program, students may not have settled yet on a research advisor, but we still expect enrollment in the ISyE 9000 section associated with the prospective research advisor. In rare cases, a faculty member may ask instead that you enroll in pass-fail special problems research courses ISyE 8900 or ISyE 8901, but these requests will not be typically approved.

### **Responsible Conduct of Research (RCR) Training**

Each Ph.D. student who enrolled for graduate study at Georgia Tech during or after Fall 2011 must complete Responsible Conduct of Research (RCR) training. The training consists of two required components:

1. Online CITI RCR training course
2. In-person PHIL 6000: Responsible Conduct of Research course

Each student needs to complete the CITI RCR online course within 90 days of enrolling at Georgia Tech. A registration hold will be placed after 90 days and will not be removed until this requirement is met.

PHIL 6000 can be taken during the first Summer semester or during any Fall or Spring semester. This course requirement should be completed as early as possible and no later than the 3<sup>rd</sup> enrolled semester. Students in the CSE program can also take CSE 6001 as an alternative to PHIL 6000.

### **First-Year Review**

The performance for each Ph.D. student will be reviewed after the first two non-Summer semesters of study. This assessment will be based on course performance, a report from the thesis advisor, and feedback from instructors on graduate teaching assistants (if applicable). The review will be conducted by the Associate Chair for Graduate Studies and the ISyE Faculty Graduate Committee.

If the review reveals some concerns, the student may pass, but with these concerns clearly described including possibly some suggested remediation. Finally, if the review reveals that performance in the first year is unsatisfactory, the student will be informed that they are not permitted to continue in the program.

Students in the ACO program are also subject to a separate review that is performed by the ACO Coordinating Committee.

### **Comprehensive Examination**

The Comprehensive Examination is an Institute requirement for Ph.D. students and must be completed prior to advancing to Ph.D. degree candidacy. Comprehensive exams are designed to assess both general and specialized knowledge in the student's area of study and to assess student readiness for research. Students in ISyE are expected to complete a comprehensive examination no later than their second full year of Ph.D. study.

Students are admitted to a comprehensive examination by the Associate Chair for Graduate Studies via a sign-up process managed by the Academic Office. A box.com [site](#) is used to manage sign-ups and announcements regarding the exams and serves as a repository for previous exams.

Each academic year, faculty examining committees for Operations Research and each of the specializations within Industrial Engineering are formed. Examination schedules and formats are also announced and may differ by committee. At the completion of the examination, the faculty examining committee recommends one of the following outcomes for each examinee: (i) pass, (ii) pass with condition(s), (iii) failed, or for exceptional cases, (iv) failed but with an opportunity to re-take the examination. An exam outcome must be agreed upon by 2/3 of the members of the faculty examining committee.

Comprehensive Examinations are organized separately for Ph.D. students seeking the ACO, CSE, Machine Learning, and Bioinformatics degrees. Students in these programs should consult with the program directors for more information.

Currently, the schedule for exams is:

Operations Research: August

Industrial Engineering, Statistics: May

Industrial Engineering, Supply Chain Engineering: August

Industrial Engineering, System Informatics and Control: August

Industrial Engineering, Economic Decision Analysis: August

Industrial Engineering, General: August

A student who has not passed a comprehensive examination by the end of the 6<sup>th</sup> enrolled semester in the Ph.D. program may not continue in the program. Any student failing two comprehensive exams may not continue in the program, regardless of the number of semesters completed.

More information on the Comprehensive Exams for each program can be found in the [Institute Catalog](#).

### **Second Year Paper**

Students in the Ph.D. in Operations Research program are required to submit a second year paper no later than the end of Spring semester of their second full program year. Paper requirements are described elsewhere.



## Minor

Each Georgia Tech Ph.D. candidate must complete a minor consisting of at least six hours (two courses) in a field of study distinct from the student's primary concentration. The spirit of the minor is to provide breadth to the student's program. Students should design a minor in consultation with the faculty advisor immediately after successful completion of the Comprehensive Examination. Each minor must be approved by the Associate Chair for Graduate Studies, in consultation when necessary with the Faculty Graduate Committee.

While our goal is to give students flexibility in designing minors, it must be noted that it is critical that the minor be coherent (representing a single defined field of study) and distinct from the primary concentration. Minor courses should be at the 6000 level or higher, although certain 4000 courses may be approved. Typical minors for ISyE Ph.D. students are computer science, mathematics, economics, finance, operations management, and statistics, or subfields within those fields.

When designing a minor, please adhere to the following rules:

1. A minor must be different from the major and cannot be simply a subfield of the major.
2. No course listed in the Program Requirements for the primary Ph.D. program may be included.
3. All minor courses must be letter-graded.
4. Not more than one 4000 level course may be included.
5. The GPA for a minor must be 3.0 or higher.

## Ph.D. Students Earning Master's Degrees at Georgia Tech

It is common for Ph.D. students to earn a Master's degree as they progress through their Ph.D. program of study. That is, appropriate courses taken as part of their Ph.D. program are applied to satisfy relevant degree requirements for a single Master's degree. Any course completed within a Ph.D. program of study that is an advanced version of a corresponding Master's degree requirement can certainly be used as a substitute. Some such substitutions are listed in this handbook, and all must be approved by the Associate Chair for Graduate Studies.

Ph.D. students will not be granted multiple Master's degrees from ISyE. Ph.D. students are eligible to apply for follow-on MBA study through the [MBA Dual Degree program](#), offered by Georgia Tech's Scheller College of Business.

## Dissertations

The primary requirement of a Ph.D. program is the completion of a dissertation, a written work documenting the research findings of a searching and authoritative investigation of a topic in the chosen primary field of study. The dissertation must either extend the boundaries of fundamental knowledge in a field or provide a new and better understanding or interpretation of facts already known. It should demonstrate that the candidate possesses powers of original thought, a talent for scholarship and research, and an ability to organize and present his/her findings.

The Office of Graduate Studies maintains a [website](#) that discusses policies and requirements for Ph.D. dissertations at Georgia Tech.

## Faculty Research Advisor

Ph.D. students are encouraged to select a research advisor to guide their dissertation research as soon as appropriate. If a student beginning the first year has not yet settled on an area of concentration, it is recommended that the student select an initial research advisor in an area of interest.

The research advisor will work with the student during all phases of Ph.D. dissertation research. If a student requires financial assistance to complete doctoral study, it is expected that the research advisor will provide a Graduate Research Assistantship (GRA). Limited funding opportunities in the form of Graduate Teaching Assistantships (GTA) or Graduate Student Instructors (GSI) are available from the School but should not be relied upon.

A student who does not have a willing faculty research advisor after the completion of three Ph.D. semesters (not including summers) will generally not be eligible for GTA or GSI funding from ISyE.

### **Thesis Advisory and Final Doctoral Exam Committee Membership**

There are two committees that function to advise, approve, and conduct the final doctoral oral examination of the dissertation and the student's knowledge of the field in which it lies.

The first committee is called the *Thesis Advisory Committee* or the *Thesis Reading Committee* and consists of at least three Georgia Tech academic faculty members, one of whom is the Thesis Advisor. The majority of the Thesis Advisory Committee shall be tenure-track or tenured members of the Academic Faculty. It is expected that the Thesis Advisor is a tenure-track or tenured member of the Academic Faculty, preferably from the home unit of the student. Approval from the ISyE Faculty Graduate Committee is required prior to the Dissertation Research Proposal if a student seeks to appoint a Thesis Advisor who is not a tenure-track or tenured member of the Academic Faculty.

The Thesis Advisory Committee approves the research topic, provides advice and guidance during the research, and is charged with approving the thesis when the research is completed and ready to be presented as the doctoral thesis (*i.e.*, dissertation). When the committee considers the dissertation to be satisfactory, a recommendation is made to the Vice-Provost for Graduate Studies and Faculty Affairs for the appointment of the second committee, which is called the *Final Doctoral Examination Committee*. This committee consists of five individuals.

The Final Doctoral Examination Committee always contains the Thesis Advisory Committee members and other members of the Georgia Tech tenure-track and tenured Academic Faculty, as appropriate, who are recommended by the School or College to the Vice-Provost for approval. At least one member of the Final Doctoral Examination Committee must be from a unit distinct from the unit in which the student is enrolled. At least three members of the Final Doctoral Examination Committee should be members of the ISyE Academic Faculty, including adjunct faculty. It is most common for a student to select a Thesis Advisory Committee with five members that will also serve as the Final Doctoral Examination Committee.

Occasionally, a request is made to have a non-Georgia Tech individual included as a member of the Final Doctoral Examination Committee. The proposed member must have a Ph.D. in a related research area and should be active in research. The credentials of such an individual must be submitted to the Associate Chair for Graduate Studies and will be scrutinized to verify that the individual has a background that approximates that of a member of the Academic Faculty. The Final Doctoral Examination Committee must always have at least four members from the Georgia Tech Academic Faculty.

### **Dissertation Research Proposal**

The first step toward completing a dissertation is to receive formal approval of a dissertation research topic. This is accomplished via the Dissertation Research Proposal. Students must present their dissertation research proposal to the Thesis Advisory Committee no later than the end of Spring semester of the student's third full year in the program.

Each Ph.D. student must prepare a cogent, self-contained written research proposal that should describe the research to be addressed, demonstrate an understanding of existing work, describe intended research approaches, and present initial and anticipated results. The student must deliver this proposal, along with an oral presentation, to the Thesis Advisory Committee. The content expected in the written research proposal should be discussed with the research advisor and Thesis Advisory Committee members.

If judged to be satisfactory, the Thesis Advisory Committee signs the appropriate section of the [Request for Admission to Ph.D. Candidacy form](#) approving the thesis topic. Each member of the Thesis Advisory Committee must also complete the *Dissertation Proposal Assessment Form*, available on the ISyE website. The student should bring copies of all forms to the proposal presentation and is responsible for returning all forms to the Academic Office.

A student must present the thesis proposal at least one semester prior to the Final Doctoral Examination. Ideally, the thesis proposal must be completed before the end of third year. Advisors may expect a longer period between proposal and Final Doctoral Examination. A student who fails to obtain approval of the thesis proposal must modify the existing proposal and, if required by the Thesis Advisory Committee, must defend the modified proposal in a subsequent oral presentation. If this second thesis proposal is not successful, the student will have not more than 6 months to identify a new research topic and, if necessary, a new research advisor, and to report this information to the Associate Chair for Graduate Studies. Failing to do so will prevent a student from continuing in the program.

### Candidacy

To qualify for candidacy students must have completed any formal coursework requirements as stated in their Program concentration, achieved a satisfactory scholastic record, passed the Comprehensive Examination, and have a thesis topic approved by their Thesis Advisory Committee and the Associate Chair for Graduate Studies via the Dissertation Research Proposal process. Students must also have completed all Georgia Tech Responsible Conduct of Research (RCR) training requirements.

The minor need not be completed prior to candidacy.

### Final Doctoral Examination

The Final Doctoral Examination, often referred to as the “dissertation defense,” will be an oral examination on the student’s research and the results obtained. A final draft version of the dissertation should be presented to the Final Doctoral Examination Committee membership at least two weeks prior to the defense date, though some advisors and/or committee members may require a longer lead time (typically not more than one month). It is expected that the final draft will be a complete document conforming to the requirements for submission to the Georgia Tech Graduate Thesis Office.

A student will pass the examination if not more than one dissenting vote is cast by the committee. A vote may be favorable subject to minor revisions to the dissertation; these would be coordinated through the advisor. Upon successful completion of the examination and any conditions, the Final Doctoral Examination Committee signs the [Certificate of Thesis Approval](#) form. The student is responsible for delivering this completed form to the Academic Office.

Once the Associate Chair for Graduate Studies signs a *Certificate of Thesis Approval* and the Ph.D. candidate files the dissertation with Georgia Tech, the Ph.D. degree is conferred.

### Ph.D. Program Requirements

Each Ph.D. degree program and specialization has specific course requirements. Students are expected to complete the course programs described below prior to candidacy, and many of the

courses are recommended to be completed prior to the comprehensive examination. Students seeking to waive a program course requirement must receive permission from the Associate Chair for Graduate Studies. It is not our intent to have students repeat coursework that they may have already mastered during prior graduate degree programs, so please ask for appropriate waivers.

#### **Ph.D. in Industrial Engineering**

All degree requirements, specializations, and information about Comprehensive Exams are found in the Georgia Tech Catalog: <https://catalog.gatech.edu/programs/industrial-engineering-phd/>.

#### **Ph.D. in Operations Research**

All degree requirements, specializations, and information about Comprehensive Exams are found in the Georgia Tech Catalog: <https://catalog.gatech.edu/programs/operations-research-phd/>.

#### **Ph.D. in Machine Learning**

The machine learning (ML) Ph.D. program is a collaborative venture between Georgia Tech's colleges of Computing, Engineering, and Sciences. Faculty from [ML@GT](#) research center will manage all operations and curricular requirements for the new Ph.D. Program, which include five core and five elective courses, a qualifying exam, and a doctoral dissertation defense. The curriculum for the PhD in Machine Learning is truly multidisciplinary, containing courses taught in eight schools across three colleges at Georgia Tech: the Schools of Computational Science and Engineering, Computer Science, and Interactive Computing in the College of Computing; the Schools of Aerospace Engineering, Biomedical Engineering, Electrical and Computer Engineering, and Industrial and Systems Engineering in the College of Engineering; and the School of Mathematics in the College of Sciences. Details can be found at: <http://ml.gatech.edu/phd>.

#### **Ph.D. in Algorithms, Combinatorics, and Optimization**

The ACO Program is a multidisciplinary venture sponsored by ISyE, the School of Mathematics, and the College of Computing. ACO Program faculty members are drawn from these three academic units. Qualified students are admitted to the ACO Program by an admissions committee consisting of ACO faculty with representatives from the three participating units. Each student in the ACO Program has a home academic unit chosen from among the three sponsoring units. Details can be found at: <http://www.aco.gatech.edu/descript.html>

#### **Ph.D. in Computational Science and Engineering**

The CSE Ph.D. degree is a joint program between the Colleges of Computing, Sciences, and Engineering. The Ph.D. degree in CSE requires a minimum of 31 semester hours of coursework. The program of study is designed to give the student breadth of knowledge in computational science and engineering, depth in specific computational methods and techniques, and knowledge to apply these techniques to problems within the context of a specific application domain. Details regarding this interdisciplinary program can be found at: <http://www.cseprograms.gatech.edu/csephd>

#### **Ph.D. in Bioinformatics**

Bioinformatics is a multidisciplinary field in which physical sciences, life sciences, computer science, and engineering are merged to solve both fundamental and applied problems in biology and medicine. The Bioinformatics Ph.D. degree is a joint program among School of Biology, School of Chemistry and Biochemistry, School of Mathematics, College of Computing, School of Industrial and Systems Engineering, School of Biomedical Engineering. Details regarding this interdisciplinary program can be found at: <http://www.biology.gatech.edu/graduate-programs/bioinformatics/>