

Graduate Handbook

2019 — 2020

Welcome!

TO:	New Graduate Students
FROM:	Alan Erera Professor and Associate Chair for Graduate Studies

On behalf of the faculty and staff, let me welcome you to the H. Milton Stewart School of Industrial and Systems Engineering (ISyE). We are glad that you have decided to pursue graduate studies here, and we wish you success. We encourage you to take full advantage of the many resources offered by our top-ranked programs!

This Graduate Handbook is the definitive guide to all of our Master's and Ph.D. degree programs, and you must refer to it as you plan your studies here in our School. As you probably know, we offer a large number of graduate degree programs, each with its own unique set of requirements and rules. Additionally, we have a number of policies and procedures that apply to all graduate students in the School. Please study the requirements of your program carefully, and understand that while we will advise you along the way as needed, the ultimate responsibility to ensure that you meet requirements and adhere to policies is yours alone.

If you have questions about the contents of the Graduate Handbook, please come to the Academic Office and someone here will try to clarify matters and/or address your concerns. Our Graduate Programs Manager is Amanda Ford (Groseclose 212). Dr. Dawn Strickland is our Director of Student Services (Groseclose 209), and she directs the Academic Office. Our Director of Master's Programs is Dr. Dave Goldsman (Groseclose 433). The common goal shared by everyone on our team is help you throughout your time as a student in our graduate program.

Again, welcome to Georgia Tech and good luck!

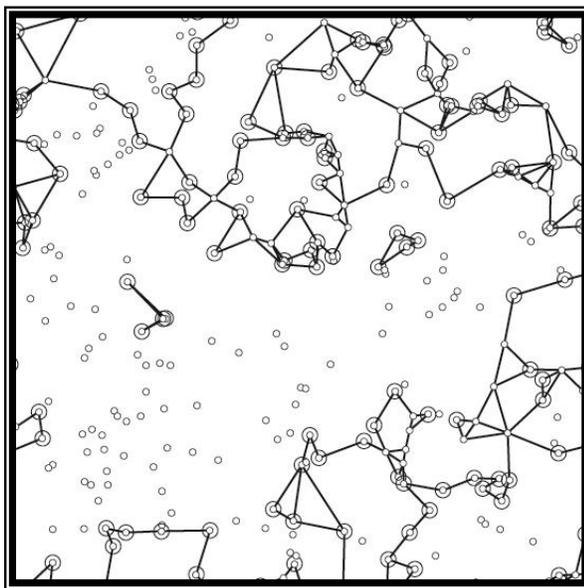


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Introduction

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 [Grad Guide](#), published by 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 study and refer to the Catalog sections that cover relevant topics, including specific degree requirements. It is important for you to note that this Handbook does not replace the Catalog. However, this Handbook does describe 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 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 located 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 located 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 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.

There is one general-use computer lab within the ISyE complex, which is unattended but may be accessed 24 hours a day, seven days a week using your BuzzCard. The lab facility is located in ISyE Main 115. To print or make photocopies in these facilities requires charges to your BuzzCard account.

ISyE also 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 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. In short, ISyE adopts the viewpoint that the student is responsible for seeing that his/her 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.

Records for students in the Ph.D. degree program are 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 through Gradtracker. 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 on the [Registrar's Office website](#).

Before applying for graduation, Master's students should ensure that program course requirements are satisfied. Please use the ISyE Master's [Program of Study Worksheet](#) to check your requirements, and discuss your course plan with your faculty advisor. 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. Audit basis courses are not counted toward full-time enrollment. 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. Students with graduate research or teaching assistantships, traineeships, or who are receiving a fellowship payment 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 each semester. Ph.D. students request GRA or GTA positions prior to the semester by deadlines announced by the Academic Office using the Gradtracker system. ISyE Master's students who are offered a graduate student employment position should also submit a Position Request Form in Gradtracker. 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, and Amanda Ford manages the process and will ensure that your hiring will be completed if you applied for and received approval for a position request in Gradtracker by the announced deadlines. As a graduate student, you are only hired on a semester-by-semester basis, and a rehire is 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 first day of the semester, 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 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. 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

Final course grades are issued at the end of each semester following the Final Examination week. No interim grades appear on a transcript. Letter graded courses at Georgia Tech result in *A*, *B*, *C*, *D*, or *F* grades. Pass/fail graded courses result in *S* (satisfactory) or *U* (unsatisfactory) grades.

In some cases, you may receive a course grade of Incomplete (*I*) when course requirements are not completed by the grading deadline in a semester. Please be informed that a student who receives an incomplete (*I*) course grade must work actively with the course instructor to complete course requirements and submit a grade change form by the end of the first semester of enrollment following the semester in which it was given. If the student does not resolve the grade in time, the incomplete grade is automatically converted to an *F* grade.

If you wish to withdraw from a class after the registration period ends, please be advised that the dropped class does not disappear from your transcript but rather appears with a *W* grade. The last date for dropping a course occurs sometime after the midway point in the semester (check the [Registrar's calendar](#) for the specific dates for each semester, including the Summer semester). Courses can be dropped on-line using the student online registration system accessible via Buzzport. It is always a good idea to keep a record of your drop action until the *W* appears on your transcript. If you are eligible for a refund, you must complete a separate request for this and submit it in accordance to the dates stipulated by the Office of the Bursar.

Student Grievances

If a student has an academic complaint about an instructor in an ISyE course, the first step is for the student to discuss the concern directly with the instructor to seek a resolution. If the student is not satisfied with the instructor response, the student should then file the complaint in writing with ISyE's Director of Student Services. If the student is not satisfied with the proposed plan of action jointly determined between the Director and the instructor, the student may file the complaint with the ISyE School Chair who will consider the case and then advise the student on next steps.

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

ISyE offers four degree options at the Master's level:

- 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 four 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)**

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

BS/MS Program in Supply Chain Engineering

Admission

A student seeking admission to a Master's program should complete the application process described at 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 take the Test of English as a Foreign Language (TOEFL), 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). Effective Spring 2020, the institute now accepts the IELTS in lieu of the TOEFL.

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 will be instructed to 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 requirements with the ISyE Director of Master's Programs or the Associate Chair for Graduate Studies. Since admission requirements vary by program, and programs have different student capacities, such requests may not be granted.

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 Director of Master's Programs and the Associate Chair for Graduate Studies. Master's 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's 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's of Science degree in addition to the Ph.D. Such students should again apply to the ISyE Graduate Programs Manager using the same process as above, except that a reference letter must be provided by the dissertation research advisor recommending the admission.

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

Follow-on MBA Study

Students pursuing Master's of Science 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's 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 apply for admission. Students who do not wish to use the online application system to apply for Ph.D. study can submit a simplified application directly to the Graduate Programs Manager consisting of an updated CV, a statement of purpose, and at least two new letters of recommendation from Georgia Tech faculty. It is best if one of these letters is written by the student's

prospective thesis research advisor and expresses very strong support. Such requests will be evaluated in the same fashion as for new Ph.D. applicants and typically will not be considered until the final term of the applicant's Master's program. To receive full consideration, applications must be received by the usual Ph.D. application deadline, which is December 15 each year for the following fall semester. Students who apply after April 1 are generally ineligible for assistantship funding.

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 to help you create a program of study that conforms to our requirements while satisfying your interests. It is a good idea to obtain a copy of the [*Instructions and Worksheet for Master's Program of Study*](#) form from the ISyE website, and to use it to prepare a preliminary program of study for discussion with your advisor. Subsequent changes in this program should be made in consultation with your advisor and, if needed, the Associate Chair for Graduate Studies.

Advising is also provided by the Director of Master's Programs, the Director of Student Services, and the Graduate Programs Manager. Administrative questions can often be answered most quickly by the Graduate Programs Manager.

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 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 Director of Master's Programs or 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. A Ph.D. course substitution table is provided in this handbook.

Elective Courses

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

Technical or Track 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 a technical elective prior to approval.

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 your degree interest. 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.

If a degree program allows four or more courses as either technical or free electives, at least two must carry ISyE course numbers. Cross-listed courses such as ISyE 67xx (see below) will not count as satisfying this 2-course minimum, unless the specific course is listed as an allowable technical elective for the program.

Cross-Listed Classes

Classes in the 67xx series are cross-listed with one or more schools in the College of Engineering or other colleges at Georgia Tech. Frequently they will be taught by faculty who are not from ISyE, but when signing up for the class on OSCAR, you should always have the option of taking the course as ISYE 67xx.

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 or Ph.D. program.
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 *A*, *B*, or *C* 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.

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.

Please be advised also that most courses in ISyE are taught at most once per year, and very few offerings are available during the summer semester. During orientation, we will discuss ISyE's plan to offer specific courses for the following three semesters (Fall, Spring, Summer). Please study this information carefully. Degree requirement exceptions will not be granted due to poor planning by a student.

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 completing courses in a timely fashion. 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 Requirements By Program

Master of Science in Industrial Engineering (MSIE)

Faculty Advisor: Dr. Dave Goldsman

Required Core - (6 courses)

ISyE 6201	Manufacturing Systems
ISyE 6202	Warehousing Systems
ISyE 6203	Transportation and Supply Chain Systems

and select (3) courses from the following list:

ISyE 6225	Engineering Economy
ISyE 6414	Statistical Modeling and Regression Analysis
ISyE 6644	Simulation
ISyE 6650	Probabilistic Models and Their Applications
ISyE 6669	Deterministic Optimization

MSIE Technical Electives - (2 courses)

Approved technical electives are provided in a subsequent list in this handbook and on the [ISyE website](#).

Free Electives - (2 courses)

Free electives may be chosen from the approved MSIE technical electives or from the complete list of ISyE graduate courses, with the exception of ISyE 6739 which is not allowed for degree credit. Complementary graduate courses from other departments may also qualify as free electives but are subject to approval by the faculty advisor.

Total Required Coursework - 30 credit-hours

Master of Science in Operations Research (MSOR)

Faculty Advisor: Dr. Dave Goldsman

Required Core - (4 courses)

ISyE 6669	Deterministic Optimization
ISyE 6650	Probabilistic Models and Their Applications
ISyE 6644	Simulation
Math 4261	Mathematical Statistics I

Computing Elective - (1 course)

CS 6520	Computational Complexity Theory
CS 6550	Design and Analysis of Algorithms
ISyE 6679	Computational Methods in Operations Research
CSE 6140	Computational Science and Engineering Algorithms

MSOR Technical Electives - (5 courses)

Approved technical electives are provided in a subsequent list in this handbook, and on the [ISyE website](#).

Total Required Coursework - 30 credit-hours

Master of Science in Supply Chain Engineering (MSSCE)

Faculty Director: Dr. Alan Erera

Required Core - (10 courses)

ISyE 6333	Operations Research for Supply Chain Engineering 1
ISyE 6334	Operations Research for Supply Chain Engineering 2
ISyE 6335	Supply Chain Engineering 1
ISyE 6336	Supply Chain Engineering 2
ISyE 6337	Supply Chain Engineering 3
ISyE 6338	Supply Chain Strategy
ISyE 6339	Supply Chain Information Systems
ISyE 6340	Supply Chain Engineering Seminar
ISyE 6341	Capstone Project for Supply Chain Engineering 1
ISyE 6342	Capstone Project for Supply Chain Engineering 2

Total Required Coursework - 30 credit-hours

ISyE 6333-42 courses are restricted to enrollment only by MSSCE students. MS Analytics students with appropriate preparation may request permits to enroll in 6333-37 if space permits.

Master of Science in Health Systems (MSHS)

Faculty Advisor: Dr. Pinar Keskinocak

The MSHS degree can be earned by completing one of two track options, the General Track or the Predictive Health Track:

MSHS General Track

Required Core - (6 courses)

HS 6000	Introduction to Healthcare Delivery
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and select (1) course from the following list:

HS 6400	Healthcare Systems Practice
ISyE 6320	Public Impact Applications of OR

and select (3) courses from the following list:

ISyE 6669	Deterministic Optimization
ISyE 6650	Probabilistic Models and Their Applications
ISyE 6644	Simulation
ISyE 6414	Statistical Modeling and Regression Analysis

and select (1) course from the following list:

MGT 6000	Financial and Managerial Accounting
MGT 6060	Financial Management I
ISyE 6225	Engineering Economy
ISyE 6227	Introduction to Financial Engineering
HS 6200	Healthcare Financial Management

MSHS Technical Electives - (3 courses)

Approved technical electives are provided in a subsequent list in this handbook, and on the [ISyE website](#).

Free Electives - (1 course)

Total Required Coursework - 30 credit-hours

MSHS Predictive Health Track

Required Core - (8 courses)

HS 6000	Introduction to Healthcare Delivery
ISyE 6669	Deterministic Optimization
ISyE 6650	Probabilistic Models and Their Applications
ISyE 6644	Simulation
ISyE 6414	Statistical Modeling and Regression Analysis
ISyE 7406	Data Mining and Statistical Learning

and select (1) course from the following list:

HS 6400 Healthcare Systems Practice
ISyE 6320: Public Impact Applications of OR

and select (1) course from the following list:

MGT 6000	Financial and Managerial Accounting
MGT 6060	Financial Management I
ISyE 6225	Engineering Economy
ISyE 6227	Introduction to Financial Engineering
HS 6200	Healthcare Financial Management

MSHS Technical Electives - (1 course)

Approved technical electives are provided in a subsequent list in this handbook, and on the [ISyE website](#).

Free Electives - (1 course)

Total Required Coursework - 30 credit-hours

Master of Science in Analytics (MSANLT)

Faculty Director: Dr. Joel Sokol

The MS Analytics degree can be earned by completing one of three track options: Analytical Tools, Business Analytics, or Computational Data Analytics. Please note that MS Analytics students select one of these tracks as a major, and that switching tracks requires approval of the Director of the MS in Analytics program. With approval of the Director, courses marked below with asterisk* may be replaced with MS Analytics Electives by students with appropriate backgrounds. The two practicum courses marked

* Courses that may be replaced with MS Analytics Electives by students with appropriate backgrounds

with two asterisks** can be replaced with an approved internship and MS Analytics Electives with approval from the Director.

MSANLT Analytical Tools Track

Introductory Core - (3 courses)

CSE 6040 Computing for Data Analytics*
ISyE 8803 Introduction to Analytical Methods**Error! Bookmark not defined.**
MGT 8803 Introduction to Business for Analytics**Error! Bookmark not defined.**

Required Core - (7 courses)

CSE 6242 Data and Visual Analytics
MGT 8803 Big Data Analytics in Business
ISyE 8803 Applied Analytics Practicum I**
ISyE 8803 Applied Analytics Practicum II**
(2) approved Statistics courses and (1) approved Operations Research course, as listed on the [MS Analytics website](#).

Track Electives - (2 courses)

(1) approved Operations Research course, and (1) approved course in either Statistics or Operations Research, as listed on the [MS Analytics website](#).

Total Required Coursework - 36 credit-hours

MSANLT Business Analytics Track

Introductory Core - (3 courses)

CSE 6040 Computing for Data Analytics*
ISyE 8803 Introduction to Analytical Methods*
MGT 8803 Introduction to Business for Analytics*

Required Core - (7 courses)

CSE 6242 Data and Visual Analytics
MGT 8803 Big Data Analytics in Business
MGT 8803 Applied Analytics Practicum I**
MGT 8803 Applied Analytics Practicum II**
(2) approved Statistics courses and (1) approved Operations Research course, as listed on the [MS Analytics website](#).

Track Electives - (2 courses)

Two approved Business electives, as listed on the [MS Analytics website](#).

Total Required Coursework - 36 credit-hours

MSANLT Computational Data Analytics Track

** Courses that may be replaced with an approved internship and MS Analytics Electives with approval from the Director

Introductory Core - (3 courses)

CSE 6040	Computing for Data Analytics*
ISyE 8803	Introduction to Analytical Methods*
MGT 8803	Introduction to Business for Analytics*

Required Core - (7 courses)

CSE 6242	Data and Visual Analytics
CSE 6740	Computational Data Analysis
MGT 8803	Big Data Analytics in Business
ISyE 8803	Applied Analytics Practicum I**
ISyE 8803	Applied Analytics Practicum II**

(1) approved Statistics course and (1) approved Operations Research course, as listed on the [MS Analytics website](#).

Track Electives - (2 courses)

Two approved Computing electives, as listed on the [MS Analytics website](#).

Total Required Coursework - 36 credit-hours

Master of Science in Statistics (MS Stat)

Faculty Advisor: Dr. Yajun Mei

Required Core - (4 courses)

Math 4261	Mathematical Statistics I
Math 4262	Mathematical Statistics II
ISyE 6413	Design and Analysis of Experiments
ISyE 6414	Statistical Modeling and Regression Analysis

Technical Electives - (5 courses)

Math 4317	Real Analysis
Math 6262	Statistical Estimation
Math 6263	Testing Statistical Hypotheses
Math 6266	Linear Statistical Models
Math 6267	Multivariate Statistical Analysis
ISyE 6402	Time-Series Analysis
ISyE 6404	Nonparametric Data Analysis
ISyE 6405	Statistical Methods for Manuf. Design & Improvement
ISyE 6412	Theoretical Statistics
ISyE 6416	Computational Statistics
ISyE 6420	Bayesian Statistics
ISyE 6421	Biostatistics
ISyE 6761	Stochastic Processes I
ISyE 6762	Stochastic Processes II
ISyE 6781	Reliability Theory
ISyE 6783	Financial Data Analysis
ISyE 7400	Advanced Design of Experiments
ISyE 7401	Advanced Statistical Modeling
ISyE 7405	Multivariate Data Analysis
ISyE 7406	Data Mining

Free Elective - (1 course)

Total Required Coursework - 30 credit-hours

Master of Science in Quantitative and Computational Finance (MSQCF)

More information about the MSQCF program can be found on the [Scheller College of Business website](#).

Required Core - (6 courses)

MGT 6078	Finance and Investments
MGT 6081	Derivative Securities
Math 6635	Numerical Methods in Finance
ISyE 6759	Stochastic Processes in Finance I
ISyE 6767	Design and Implementation of Systems to Support Computational Finance
ISyE 6769	Fixed Income Securities

Technical Electives - (3 courses)

ISyE 6673	Financial Optimization
Math 6235	Stochastic Processes in Finance II
MGT 6090	Management of Financial Institutions
ISyE 6783	Statistical Techniques of Financial Data
ISyE 6785	The Practice of Quantitative and Computational Finance
MGT 7061	Empirical Finance

Free Electives - (3 courses)

Total Required Coursework - 36 credit-hours

Master of Science in Computational Science and Engineering (MSCSE)

ISyE Unit Coordinator and Faculty Advisor: Dr. Christos Alexopoulos

Details regarding this interdisciplinary Master's degree option can be found on the [Computational Science and Engineering website](#).

Core Courses - (4 courses)

CSE 6643	Numerical Linear Algebra
CSE 6140	Computational Science and Engineering Algorithms
CSE 6730	Modeling and Simulation
ISyE 6740	Computational Data Analysis
CSE 6220	High Performance Computing

Computational and Technical Specialization - (4 courses)

The 12 credit-hours of coursework here must be relevant to CSE, include one application area, and include 6 credit-hours of coursework in non-CS/CSE courses. The specialization must be approved by your ISyE advisor.

Technical Electives - (2 courses)

Technical electives must be approved by your ISyE unit coordinator, and are typically chosen from the MSIE, MSOR, or MS Statistics technical elective lists in this handbook, and on the [ISyE website](#).

Master's Degree Technical Electives and Substitutions

Technical Electives for MS in Industrial Engineering

- ISyE 6225 Engineering Economy
- ISyE 6230 Economic Decision Analysis
- ISyE 6307 Scheduling Theory
- ISyE 6402 Time-Series Analysis
- ISyE 6404 Nonparametric Data Analysis
- ISyE 6405 Statistical Methods for Manufacturing Design/Improvement
- ISyE 6413 Design and Analysis of Experiments
- ISyE 6414 Statistical Modeling and Regression Analysis
- ISyE 6416 Computational Statistics
- ISyE 6420 Bayesian Statistics
- ISyE 6421 Biostatistics
- ISyE 6644 Simulation
- ISyE 6650 Probabilistic Models and Their Applications
- ISyE 6662 Optimization II
- ISyE 6663 Optimization III
- ISyE 6664 Stochastic Optimization
- ISyE 6669 Deterministic Optimization
- ISyE 6679 Computational Methods
- ISyE 6701 Energy Policy and Technology
- ISyE 6740 Computational Data Analysis
- ISyE 6781 Reliability Theory
- ISyE 6805 Reliability Engineering
- ISyE 6810 Systems Monitoring & Prognostics
- ISyE 7204 Informatics in Production and Service Systems
- ISyE 7406 Data Mining and Statistical Learning

Other courses may be acceptable, including advanced versions of courses listed above, but must be approved by the Associate Chair for Graduate Studies. Submit all approval requests using the online approval system managed by the Academic Office.

Technical Electives for MS in Operations Research

- ISyE 6202 Warehousing Systems **or**
ISyE 6203 Transportation and Supply Chain Systems
- ISyE 6225 Engineering Economy
- ISyE 6230 Economic Decision Analysis
- ISyE 6307 Scheduling Theory
- ISyE 6402 Time-Series Analysis
- ISyE 6404 Nonparametric Data Analysis
- ISyE 6413 Design and Analysis of Experiments
- ISyE 6414 Statistical Modeling and Regression Analysis
- ISyE 6416 Computational Statistics
- ISyE 6420 Bayesian Statistics
- ISyE 6421 Biostatistics
- ISyE 6679 Computational Methods
- ISyE 6701 Energy Policy and Technology

- ISyE 6781 Reliability Theory
- ISyE 7201 Production and Service Systems Engineering
- ISyE 7203 Logistics Systems Engineering
- ISyE 7400 Advanced Design of Experiments
- ISyE 7401 Advanced Statistical Modeling
- ISyE 7405 Multivariate Data Analysis
- ISyE 7406 Data Mining and Statistical Learning
- Math 4022 Introduction to Graph Theory
- Math 4032 Combinatorial Analysis
- Math 4305 Topics in Linear Algebra
- Math 4317 Analysis I **or**
Math 4318 Analysis II
- Math 4640 Numerical Analysis I **or**
Math 4641 Numerical Analysis II
- CS 4510 Automata and Complexity
- CS 6236 Parallel and Distributed Simulation
- CS 6505 Computability and Algorithms
- CS 6520 Computational Complexity
- CS 6550 Design and Analysis of Algorithms

Various 6000-level math courses that are graduate versions of courses above may be suitable, but should be approved in advance by the Associate Chair for Graduate Studies. Certain advanced topics courses (ISyE 88xx) may also be allowed, subject to approval. Submit all approval requests via email to your advisor.

Technical Electives for MS in Health Systems

- ARCH 6243 Evidence-Based Design
- ARCH 6271 Healthcare Des Of Future
- BIOL 6150 Genomics and Applied Bioinformatics
- BIOL 7023 Bioinformatics
- BMED 6507 Fundamentals of Medical Device Regulatory Process
- ISyE 6421 Biostatistics **or**
BMED 6700 Biostatistics
- BMED 6789 Technology Ventures
- BMED 7411 Mathematical Models in Biology and Medicine
- CS 6150 Computing For Good
- CS 6440 Intro Health Informatics
- ECON 6510 Health Economics
- HP 6601 Industrial Hygiene
- HTS 6122 History of Medicine
- HTS 6123 Social & Cultural BIOMED
- MGT 6357 Service Operations Management
- MGT 8803 Management of the Healthcare Enterprise

Ph.D. Course Substitutes

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 or Math 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

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.

Students who are presently enrolled in an ISyE Master's programs can apply for admission into the Ph.D. program without reapplying to Georgia Tech. Applicants can submit a simplified application directly to the Associate Chair for Graduate Studies consisting of an updated CV, a statement of purpose, and at least two new letters of recommendation from Georgia Tech faculty. Please see the earlier section of this document for more information about *Follow-on Ph.D. Study*.

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. 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. For office hours or other discussion meetings, please use ISyE Main 342/344/347/348/349 or similar rooms in our building 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. Sleeping or living full-time in your office will result in your dismissal from our Ph.D. program.

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

Doctor of Philosophy in Operations Research

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

Doctor of Philosophy in Machine Learning*

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

Doctor of Philosophy in Bioinformatics*

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.

* 4 Interdisciplinary degrees

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 3rd 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 is satisfactory, the student will be informed that they have passed. 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 [t-square site](#) titled *Comprehensive Exams* 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: January

Industrial Engineering, System Informatics and Control: August

Industrial Engineering, Economic Decision Analysis: January

A student who has not passed a comprehensive examination by the end of the 6th 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.

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 9 hours (3 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.

Georgia Tech 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.

In some cases, a student may seek a faculty research advisor from another school at Georgia Tech. If such a student has a co-advisor on the ISyE faculty, they may remain eligible for GTA funding. If not, the student will generally be ineligible for future GTA or GSI funding from the School.

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 the School.

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. 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.

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 research active. 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. Although the requirement is to present to the Thesis Advisory Committee, we highly encourage each student to present the proposal to a fully-assembled Final Doctoral Examination Committee (which by definition includes the smaller advisory committee).

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 his/her committee. The content expected in the written research proposal should be discussed with the research advisor and committee members.

If judged to be satisfactory, the Thesis Advisory Committee members must sign the appropriate section of the [*Request for Admission to Ph.D. Candidacy form*](#) approving the thesis topic. Each member of the 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 Programs Office.

A student must present the thesis proposal at least one semester prior to the Final Doctoral Examination. Advisors may expect a longer period between proposal and Final Doctoral Examination. A student who fails to obtain approval of his/her 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 all core course work requirements as stated in their Program concentration, achieve a satisfactory scholastic record, pass 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 Programs 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 By Program

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: Specialization in Supply Chain Engineering

Domain Core - (3 courses)

ISyE 6202	Warehousing Systems
ISyE 7201	Production Systems Engineering
ISyE 7203	Logistics Systems Engineering
ISyE 8813	Inventory Systems

Methods Core - (5 courses)

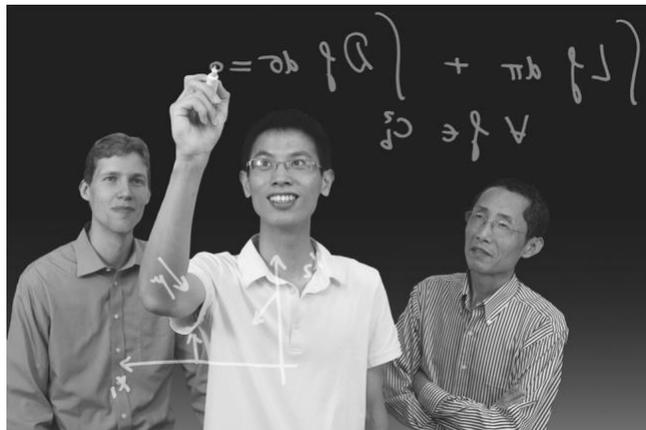
ISyE 6661	Linear Optimization
ISyE 6662	Discrete Optimization
ISyE 6761	Stochastic Processes I
ISyE 6230	Economic Decision Analysis
ISyE 6414	Statistical Modeling and Regression Analysis

Computational Elective - (1 course)

CSE 6140	Computational Science and Engineering Algorithms
CS 6550	Design and Analysis of Algorithms
ISyE 6679	Computational Methods in Operations Research

By completion of the Ph.D., students must have taken at least two additional courses related to their major area chosen in consultation with their advisor and a minimum of 13 total courses including the minor.

Students must complete three of the domain core courses as well as ISyE 6661, 6662 and 6761 before they sit for the comprehensive examination.



Ph.D. in Industrial Engineering: Specialization in Statistics

Domain Core - (4 courses)

ISyE 6412	Theoretical Statistics
ISyE 6413	Design and Analysis of Experiments
ISyE 6416	Computational Statistics
ISyE 7401	Advanced Statistical Modeling

Statistics Electives - (4 courses)

ISyE 6402	Time Series Analysis
ISyE 6404	Nonparametric Statistics
ISyE 6420	Bayesian Statistics
ISyE 6421	Biostatistics
ISyE 6740	Computational Data Analytics
ISyE 6781	Reliability Theory
ISyE 6783	Financial Data Analysis
ISyE 6805	Reliability Engineering
ISyE 7400	Advanced Design of Experiments
ISyE 7405	Multivariate Data Analysis
ISyE 7406	Data Mining and Statistical Learning

Technical Electives - (2 courses)

ISyE 6661	Linear Optimization
ISyE 6662	Discrete Optimization
ISyE 6663	Nonlinear Optimization
ISyE 6664	Stochastic Optimization
ISyE 6761	Stochastic Processes I
ISyE 6762	Stochastic Processes II
ISyE 6832	Advanced Simulation
ISyE 6810	System Monitoring and Prognostics
ISyE 7204	Informatics in Production and Service Systems
Math 6014	Graph Theory
Math 6241	Probability I
Math 6242	Probability II
Math 6643	Numerical Linear Algebra
CS 6550	Design of Algorithms
CS 7520	Approximation Algorithms
CS 7530	Randomized Algorithms
CS 7545	Machine Learning Theory
ECE 6254	Statistical Machine Learning

Other Ph.D.-level Math, Computer Science, or Machine Learning courses by permission of the Associate Chair for Graduate Studies.

All 10 courses satisfying the above requirements in the Program of Study must be completed to obtain doctoral candidacy. Two of the Technical Electives courses may double-count to the Minor if they are part of a cogent Minor approved by the Associate Chair for Graduate Studies.

Ph.D. in Industrial Engineering: Specialization in Economic Decision Analysis

EDA Core - (5 courses)

ISyE 6225	Engineering Economy
ISyE 6230	Economic Decision Analysis
ISyE 8813	Game Theory
ECON 7012	Microeconomic Theory I
ECON 7013	Microeconomic Theory II

Operations Research Core - 3 courses)

ISyE 6661	Optimization I
ISyE 6663	Optimization III
ISyE 6761	Stochastic Processes I

Statistics Elective - (1 course)

Select one course from ISyE 6402 to ISyE 6421

Breadth Elective - (1 course)

ISyE 6227	Introduction to Financial Engineering
ISyE 6673	Financial Optimization
ISyE 6785	The Practice of Quantitative & Computational Finance
ISyE 7201	Production Systems Engineering
ISyE 7203	Logistics Systems Engineering
HS 6000	Introduction to Health Care Delivery
CS 8803	Algorithmic Game Theory

For new students who have not taken Real Analysis, it is recommended you take Math 4317 in your first year. The following courses compose the comprehensive examination: ISyE 6230, ISyE 8813 Game Theory, Econ 7012, ISyE 6661. All ten courses in the Program of Study must be completed to obtain doctoral candidacy.



Ph.D. in Industrial Engineering: Specialization in System Informatics and Control

Domain Core - (3 courses)

ISyE 6810	System Monitoring and Prognostics
ISyE 7201	Production Systems Engineering
ISyE 7204	Informatics in Production and Service Systems

Methods Core - (3 courses)

ISyE 6661	Linear Optimization
ISyE 6761	Stochastics I
ISyE 7406	Data Mining

Methods Breadth - (4 or more courses)

Select courses from two or more of the six focus areas:

Stochastics and Simulation

ISyE 6644	Simulation
ISyE 6832	Simulation Theory and Methods
ISyE 6656	Queuing Theory
ISyE 6762	Stochastics II

Statistics

ISyE 6402	Time Series
ISyE 6405	Statistical Meth. for Manuf. Systems Design/Improvement
ISyE 6412	Theoretical Statistics
ISyE 6413	Design and Analysis of Experiments
ISyE 6420	Bayesian Statistics
ISyE 7401	Advanced Statistical Modeling
ISyE 7405	Multivariate Data Analysis
ECE 6555	Optimal Estimation

Computing and Algorithms

ISyE 6679	Computational Methods in Operations Research
ISyE 6416	Computational Statistics
CS 6550	Design and Analysis of Algorithms

Dynamics and Control

ECE 6120	Automata Theory
ECE 6550	Linear Systems and Control
ECE 6551	Digital Control
ECE 6552	Nonlinear Systems
ECE 6553	Optimal Control
ECE 6554	Adaptive Control
ECE 6556	Intelligent Control
ECE 6559	Advanced Linear Systems
ME 6401	Linear Systems Control
ME 6402	Nonlinear Control Systems
ME 6403	Digital Control Systems
ME 6404	Advanced Control Systems Design and Implementation
ME 6443	Variational Methods

Optimization

ISyE 6664	Stochastic Optimization
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ISyE 6662	Discrete Optimization
ISyE 6663	Nonlinear Optimization

Applications

ISyE 6201	Manufacturing Systems
ISyE 6202	Warehousing Systems
ISyE 6203	Transportation and Supply Chain Systems
ECE 6557	Manufacturing Systems Design
ME 6222	Manufacturing Processes and Systems
ME 6223	Automated Manufacturing Process Planning
ME 6225	Metrology and Measurement Systems
ME 6754	Engineering Database Management Systems

Along with the regular course requirements, students are required to sign up one time for the seminar class ISyE 8014 (Contemporary Topics in System Informatics and Control).

It is recommended that students complete the domain and methods course requirements before they sit for the comprehensive examination. A student is not admitted to candidacy until all of the stated course requirements in the Program of Study have been completed.

Ph.D. in Operations Research

Students in the Ph.D. in Operations Research program choose a single track from Optimization, Stochastics, or Applications that guides the program of study below:

Domain Core - (6 courses)

ISyE 6661	Linear Optimization
ISyE 6662	Discrete Optimization
ISyE 6663	Nonlinear Optimization
ISyE 6761	Stochastics I
ISyE 6762	Stochastics II
ISyE 6832	Simulation Theory and Methods

Depth Electives - (3 or more courses)

Students choose courses below only in their chosen track:

Optimization:

ISyE 6664	Stochastic Optimization
ISyE 6679	Computational Methods in OR
ISyE 7510	Graph Algorithms
ISyE 7661	Theory of Linear Inequalities
ISyE 7682	Convexity
ISyE 7683	Advanced Nonlinear Programming
ISyE 7686	Advanced Combinatorial Optimization
ISyE 7687	Advanced Integer Programming
ISyE 7688	Computational Mathematical Programming

Stochastics:

ISyE 6664	Stochastic Optimization
ISyE 7xxx	Stochastic Process Limits
ISyE 7xxx	Stochastic Networks
ISyE 7xxx	Rare Event Systems
Math 6241	Probability I

Math 6242	Probability II
Math 7244	Stochastic Processes and Stochastic Calculus

Applications:

ISyE 6229	Productivity Measurement and Analysis
ISyE 6230	Economic Decision Analysis
ISyE 6664	Stochastic Optimization
ISyE 6759	Stochastic Processes in Finance I
ISyE 7201	Production and Service Systems Engineering
ISyE 7203	Logistics Systems Engineering
Math 7244	Stochastic Processes and Stochastic Calculus

Breadth Electives - (2 or more courses)

Students choose courses below only in their chosen track (same as above):

Optimization:

ISyE 6230	Economic Decision Analysis
ISyE 6412	Theoretical Statistics
ISyE 6656	Queueing Theory
ISyE 7201	Production and Service Systems Engineering
ISyE 7203	Logistics Systems Engineering
ISyE 7400	Advanced Design of Experiments
ISyE 7401	Advanced Statistical Modeling
ISyE 7405	Multivariate Data Analysis
Math 6014	Graph Theory
Math 6241	Probability I
Math 6242	Probability II
Math 6643	Numerical Linear Algebra
Math 6644	Iterative Methods for Systems of Equations
CS 6550	Design of Algorithms
CS 7520	Approximation Algorithms
CS 7530	Randomized Algorithms

Stochastics:

BIOL 7023	Bioinformatics
ISyE 6412	Theoretical Statistics
ISyE 6645	Monte Carlo Methods
ISyE 6679	Computational Methods in OR
ISyE 6759	Stochastic Processes in Finance I
ISyE 7201	Production and Service Systems Engineering
ISyE 7203	Logistics Systems Engineering
ISyE 7400	Advanced Design of Experiments
ISyE 7401	Advanced Statistical Modeling
ISyE 7405	Multivariate Data Analysis

Applications:

ISyE 6402	Time-Series Analysis
ISyE 6412	Theoretical Statistics
ISyE 6673	Financial Optimization
ISyE 6679	Computational Methods in OR
Math 6014	Graph Theory
Math 6241	Probability I
Math 6242	Probability II
ISyE 6656	Queueing Theory
ISyE 7xxx	Stochastic Process Limits
ISyE 7xxx	Stochastic Networks

ISyE 7xxx	Rare Event Systems
ISyE 7400	Advanced Design of Experiments
ISyE 7401	Advanced Statistical Modeling
ISyE 7405	Multivariate Data Analysis
ISyE 7682	Convexity
ISyE 7683	Advanced Nonlinear Programming
ISyE 7686	Advanced Combinatorial Optimization
ISyE 7687	Advanced Integer Programming
CS 6550	Design of Algorithms
CS 7520	Approximation Algorithms
CS 7530	Randomized Algorithms

The comprehensive examination for the Ph.D. in Operations Research is based on content of the courses in the Domain Core. Students must complete exams in ISYE 6661 and 6761, and one other Domain Core course. Courses selected from the breadth requirements can be used to count toward the Minor.

Ph.D. in Machine Learning (ML)

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 Science. Details regarding this interdisciplinary program can be found on the [Machine Learning PhD Program website](#).

Ph.D. in Algorithms, Combinatorics, and Optimization (ACO)

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 regarding this interdisciplinary program can be found on the [Machine Learning PhD Program website](#).

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 on the [Computational Science and Engineering website](#).

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 on the [5-year BS/MS program\(BSBIOL/MSBIO\) website](#).

Tentative Graduate Course Projection

To determine which ISyE graduate courses will be offered during which semester, please refer to the [registration and curriculum area of the ISyE website](#). Courses that are taught regularly in a semester are marked, and those that are taught sporadically may be marked with a specific year or not at all.