THE H. MILTON STEWART

SCHOOL OF INDUSTRIAL AND SYSTEMS ENGINEERING

GRADUATE HANDBOOK

THE GEORGIA INSTITUTE OF TECHNOLOGY

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INTRODUCTION

This handbook has been prepared to help you plan and execute 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). It is important for you to note that this document does not replace the Institute's *General Catalog* but it should act as a useful guide in addressing a host of questions and concerns regarding graduate study in ISyE. Of course, your faculty advisor, the Associate Chair for Graduate Studies, and the academic office staff are also available to help you with questions pertaining to your program.

Now, you will quickly observe that there is substantial unevenness in this document regarding "criticality levels" of the various guidelines, rules, and regulations. Clearly, some items can be examined in a cursory fashion, if at all, while others will need to be carefully reviewed and faithfully followed. Above all, it is *your* responsibility to be clear on all items. Please understand that as you progress through your program of study, appeals to waive or have excused the enforcement of any of these guidelines and especially where the latter are clearly specified, will not be routinely approved or tolerated.

STUDENT FILE 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, the School adopts the viewpoint that the student is responsible for seeing that his/her records are complete. It is also the student's responsibility to meet any deadlines specified in this document, the *General Catalog*, or any other School or Institute policy.

RULES AND REGULATIONS-GRADING POLICY AND GENERAL PROCEDURES

The *General Catalog* describes high-level requirements for graduate programs as well as procedures and grading. Accordingly, the appropriate sections should be carefully studied by all graduate students. Please be informed that the incomplete (*I*) course grade must be removed during the first term of enrollment after the term in which it was given. If this is not done, the *I* grade becomes an *F* grade. If you wish to withdraw from a class, please be advised that at Georgia Tech the dropped class does not disappear from your transcript but rather appears as a "*W*" grade. The drop period at Georgia Tech is usually during the first five to six weeks of the regular term (check the Institute calendar for specific dates, especially for summers). Courses can be dropped on-line using the **WEB Student Access System**. 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 within the dates stipulated by the Office of Business and Finance.

STARTING AND STOPPING

In order to register you will need to refer to the schedule of classes bulletin for **O**n-line **S**tudent **C**omputer **A**ssisted **R**egistration (OSCAR). The bulletin is prepared by the Office of the Registrar and contains all of the information necessary for registration, as well as final exam schedules, *etc.*.

At the end of your graduate program, you must have certain academic and administrative paperwork completed and filed. Degree petitions must be submitted in the term prior to graduation. Be sure to check with the ISyE Academic Office Staff during your final semester of enrollment to ensure that you are cleared for graduation.

THE STEWART SCHOOL BUILDING COMPLEX

The Stewart School 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 most ISyE classes; the second is the

Groseclose Building where the majority of faculty have their offices but where some conference and seminar rooms are located as well; and the third facility, called the Main Building, houses the School Chair's Office, some administrative and support staff and the majority of offices for Ph.D. students. The Office of Academic Programs is located in the Groseclose Building.

There are two student lounges in the Main Building, one in Groseclose. Graduate student mailboxes are located in a secure area on the first floor of the Main Building. The Academic Office will use these mailboxes to send you information, and they can be useful for exchanging materials with classmates. This mailbox does not replace the P.O. Box assigned to you at the Student Center Post Office. You will receive information as to the location of the latter as well as how to have mail addressed to this mailbox. This is the address you should use for all outside correspondence.

There are two general computer labs within the Stewart School complex. The graduate lab, in Room 113 of Groseclose, is an unattended facility which you may access 24 hours a day, seven days a week using your magnetic student ID. The undergraduate lab, in Room 118, also in Groseclose, is a staffed lab that has a schedule posted on the door. This lab, while primarily for undergraduate students, is also available to ISyE graduate students as space permits.

Within a couple of weeks of your first term registration your student ID will be activated to allow you access to the ISyE buildings and computer labs through the magnetic card reader system. Please be sure to immediately report a lost or stolen card to the Academic Office in order to prevent a security problem (as soon as Student Services has issued a replacement card, ISyE should also be notified so that you can regain access).

Above all, you will certainly want e-mail access. OIT (http://www.oit.gatech.edu) provides every student and every employee with a GT account. Your GT account username and password identify you to the GT campus network and enable you to use a variety of resources and services outside of ISyE. Your official campus e-mail address is based on your GT account username. This e-mail address appears in the campus directory and gives you access to a number of GT resources. In addition to your GT account, graduate students can also apply for an ISyE UNIX account. An ISyE UNIX account provides for a UNIX account w/home directory and access to the appropriate UNIX resources within ISyE as well as an ISyE e-mail account*. For instructions regarding how to go about getting this set up, visit http://www.isye.gatech.edu/unixaccount.

*It is highly recommended that all mail from your GT account be forwarded to your ISyE account so that you will receive graduate mailings.

HONOR CODE

Georgia Tech has an honor code. The Stewart School subscribes to all tenets of the Honor Code and fully intends to vigorously enforce them. You are advised to familiarize yourself with the Honor Code which be found at: http://www.deanofstudents.gatech.edu/integrity/

MASTERS DEGREE PROGRAMS

The Stewart School offers eight degree options at the master's level. Seven of these options lead to *designated* degrees, all of which are coursework-only, while the eighth is an undesignated Master of Science. The specific options are:

Master of Science in Industrial Engineering (MSIE)
Master of Science in Operations Research (MSOR)
Master of Science in Statistics (MSStat)*
Master of Science in Quantitative and Computational Finance (MSQCF)*
Master of Science in Health Systems (MSHS)
Master of Science in International Logistics (MSIL)
Master of Science in Computational Science and Engineering (MSCSE)*
Master of Science (MS)

Degree options marked with an asterisk (*) are interdisciplinary, *i.e.,* sponsored by ISyE and other academic units at the Institute.

ADMISSION

A student seeking admission to a master's program should complete the application process described in the Institute application materials. The General portion of the Graduate Record Examination (GRE) is required of all applicants. Substitutions for the GRE (*e.g.,* GMAT, prior graduate work, *etc.*) are not allowed unless a specific degree option and/or applicant's background warrants such consideration.

STUDENT ADVISING

An advisor is assigned to each master's student prior to matriculation. The original assignment is arbitrary but is intended to be reflective of student interest and advisor availability. A change of advisor may be made routinely. It is desirable for a student to prepare a preliminary Masters' program of study and to confer with his/her advisor before registering for courses. Subsequent changes in this program should be made in consultation with the advisor and if needed, the Associate Chair for Graduate Studies. The student is encouraged to maintain contact with his/her advisor throughout their period of study.

GENERAL REQUIREMENTS

Most Master's degrees in the School require 30 semester hours of credit; the lone exception is the **MSQCF** which requires 36 credit hours. All options consist of coursework requirements only; however, students pursuing certain of these options may, under exceptional circumstances, be allowed to take a thesis, subject to the approval of a consenting thesis advisor and the Associate Chair for Graduate Studies. In such a case, the thesis would count for six hours of credit which would replace (only) free or unrestricted electives in the respective degree requirements. It is expected, however, that students pursuing any of the designated master's options will typically *not* seek to be engaged in a master's thesis activity.

PRELIMINARY PREPARATION

A student seeking a Master's degree must have a Bachelor's degree and typically one earned in an engineering discipline, science, mathematics, or some other field that provides an adequate background for the successful completion of one of the School's programs. Students having backgrounds that are less than good matches as well as ones from unaccredited degree programs, can expect to be asked to progress through (possibly substantial) preliminary coursework in order to elevate their preparation to the level required. The prerequisite coursework for the various Master's degrees is described subsequently. This makeup work can be taken at Georgia Tech or from other institutions providing similarly rigorous offerings.

POLICIES ON UNDERGRADUATE COURSES AND COURSES WITH PASS/FAIL GRADING

Credit earned for undergraduate courses taken as remedial work in order 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 of the master's programs described below, cannot be used to satisfy degree requirements. In exceptional cases, a student may take a 4000-level course for degree credit, subject to approval by the Associate Chair for Graduate Studies. Do not register for such courses until approval has been granted. A written petition justifying this request is required. Courses at the 3000-level and below are not permitted and as a rule-of-thumb, students should not expect to have approved any 4000-level course that is a requirement for the BSIE.

PETITION FOR A DEGREE

A student is responsible for seeing that his/her graduate files in the School are kept up-to-date and that all requirements and deadlines are met. A petition for a degree must be submitted by the end of the term prior to the term in which graduation is anticipated. A student pursuing a Master's degree who wishes to continue studying for the Ph.D. must apply to the School for admission accordingly. 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 masters program.

GRADES REQUIRED

Only courses with letter grades of *A*, *B*, or *C* may be used to satisfy degree requirements and the institutional final GPA requirement of 2.7 must also be satisfied. For most degree options, courses graded *Pass/Fail* may not be applied towards the Master's degree.

PROGRESS TOWARD A DEGREE

Twelve semester hours constitute full-time enrollment status. As a full-time student, you are encouraged to schedule coursework that provides clear evidence that you are making progress toward your degree requirements. Retarding this progress by scheduling superfluous hours with the apparent intent of delaying your graduation is unacceptable. Equally unacceptable is the needless adoption of the Pass/Fail basis as well as a delay of core courses exhibiting this same intent of artificially prolonging your program. An audit of transcripts will be conducted at the completion of each term and students who appear to be violating the spirit of these guidelines will have a hold placed on their registration; particularly serious cases will be forwarded to the Office of the Dean of Students.

In the Academic Programs Office, you can pick up two sample program schedules, one for satisfaction of the **MSIE** requirements and another relative to the **MSOR** (these two degree options have been selected as illustrations since, in combination, they comprise a large portion of the master's population). The aim of both illustrations is to provide some guidance regarding how you can schedule your coursework in order to complete your degree in an expeditious manner. This is an important planning exercise because you will not want to be "caught" with a requirement (or two) left to satisfy only to discover that in your last, planned term of residence, courses that suffice are not offered. This is especially critical if you plan to enroll in a summer term where very few graduate courses tend to be available.

MASTERS DEGREE REQUIREMENTS

Candidates pursuing any of the Stewart School's Master's degrees should have or be willing to attain, at least, a mathematics background essentially equivalent to the first two years of an accredited engineering degree, including exposure to a course in linear algebra. In addition, solid undergraduate-level courses in calculus-based probability and statistics will be expected before enrolling in any of the respective graduate courses called for in the stated degree programs below. Note that due to the somewhat unique intent and target audience of the **MSIL** program, applicants accordingly may be subject to more flexible interpretations of the aforementioned prerequisite requirements. In general, students are expected to abide by the listed prerequisites for all graduate courses. Requirements for all designated MS degrees follow.

MASTER OF SCIENCE IN INDUSTRIAL ENGINEERING (MSIE)

REQUIRED CORE **(6 courses)**

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

Select three (3) courses from the following list (degree credit is not allowed for both ISyE 6225 *and* 6227):

ISyE 6669	**Deterministic Optimization**
ISyE 6650	**Probabilistic Models and Their Applications**
ISyE 6644	**Simulation**
ISyE 6414	**Statistical Modeling and Regression Analysis**
ISyE 6225	**Engineering Economy** *or*
ISyE 6227	**Introduction to Financial Engineering**

TECHNICAL ELECTIVES **(2 courses)**

These courses should be at the 6000-level and need not be confined to ISyE, but may include courses from other fields such as mathematics and computer science as well as other engineering disciplines. Above all, the intent is that these courses have demonstrable technical content. An approved list of electives can be found in the Academic Programs Office. Selections of courses not on the approved list are subject to the approval of the Associate Chair for Graduate Studies, possibly in consultation with the School Graduate Committee. Do not take a class not on the approved list assuming that getting it approved, after the fact, will be routine.

FREE ELECTIVES **(2 courses)**

Use of the qualifier "free" is not to be interpreted literally, *i.e.*, a drama course or one in pottery-making will not be allowed. However, these two course selections are certainly less restricted than the technical electives specified above; allowed in the free elective category are courses in say, economics, management, psychology, public policy, international affairs, *etc.*

TOTAL REQUIRED HOURS **30**

Note: Of the four courses selected as either technical or free electives, at least two must carry ISyE course numbers. With some exceptions, cross-listed courses such as ISyE 67xx will not count as satisfying this 2-course minimum. Also, no more than 3 hours of special problems (ISyE 8900/8901) can be used unless the student is enrolled in the Joint ISyE-NUS option. Also, when ISyE 8900/8901 is used, the hours must be

used as free electives. Exceptions to any of these credit hour stipulations must be approved by the Associate Chair for Graduate Studies.

MASTER OF SCIENCE IN OPERATIONS RESEARCH (MSOR)

REQUIRED CORE **(5 courses)**

ISyE 6669	**Deterministic Optimization**
ISyE 6650	**Probabilistic Models and Their Applications**
ISyE 6644	**Simulation**
Math 4261	**Mathematical Statistics I**
CS/ISyE 6xxx	**Computing* (see below)**

TECHNICAL ELECTIVES **(5 courses)**

Students will typically satisfy this requirement with 6000-level (or above) coursework that is traditionally identified with and clearly supports the stated degree concentration of "Operations Research." In addition to relevant courses from ISyE, courses may be taken in other fields such as mathematics and computing. A list of approved **MSOR** electives is provided in the Academic Programs Office. Selected 4000-level courses *may* be used, typically from mathematics, but ones not on the approved list, have to be approved by the Associate Chair for Graduate Studies.

TOTAL REQUIRED HOURS **30**

*The computing requirement calls for a course from graduate-level offerings in the College of Computing *or* from ISyE courses where in either case substantial emphasis is placed on either computation or computational theory, *e.g.*, CS 6520, CS 6550, ISyE 6679, CSE 6140, *etc.* Exceptions to courses such as these must be approved by the Associate Chair for Graduate Studies.

Note: If Math 4261 is not available, ISyE 6412 (Theoretical Statistics) will substitute.

MASTER OF SCIENCE IN STATISTICS (MS Stat)

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**

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 Manufacturing Design and Improvement
ISyE 6412	Theoretical Statistics
ISyE 6416	Computational Statistics
ISyE 6420	Bayesian Statistics
ISyE/BME 6421	Biostatistics
ISyE 6805	Reliability Engineering
Math/ISyE 6761	Stochastic Processes I
Math/ISyE 6762	Stochastic Processes II
Math/ISyE 6781	Reliability Theory
Math/ISyE 6783	Financial Data Analysis
ISyE 7400	Advanced Design of Experiments *or*
ISyE 7401	Advanced Statistical Modeling
ISyE 7405	Multivariate Data Analysis
ISyE 7406	Data Mining
ISyE 7441	Theory of Linear Models

FREE ELECTIVE **(1 course)**

TOTAL HOURS REQUIRED **30**

MASTER OF SCIENCE IN HEALTH SYSTEMS (MSHS)

METHODOLOGY CORE **(select 3 courses)**

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

HEALTH SYSTEMS CORE **(2 courses)**

HS 6000	Introduction to Healthcare Delivery
HS 6400	Healthcare Systems Practice *or*
	ISyE 8800 Health and Humanitarian Project

ELECTIVE HEALTH SYSTEMS COURSES **(select 2 courses)**

To be selected from an approved list of courses, in health-related areas/subjects, maintained in the School Graduate Office.

FINANCE/MANAGEMENT COURSES **(select 2 courses)**

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

FREE ELECTIVE **(select 1 course)**

To be selected from an approved list of courses in ISyE, CoC, HS, or Management

TOTAL REQUIRED HOURS **30**

MASTER OF SCIENCE IN QUANTITATIVE AND COMPUTATIONAL FINANCE (MSQCF)

REQUIRED CORE **(6 courses)**

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

FOUNDATIONAL AND TECHNICAL ELECTIVES **(3 courses)**

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

FREE ELECTIVES **(3 courses)**

Students must select nine hours at the 6000-level or higher.

TOTAL REQUIRED HOURS **36**

MASTER OF SCIENCE IN INTERNATIONAL LOGISTICS (MSIL)

Students in this executive program complete 30 semester hours distributed over five intensive two-week sessions. Each of these sessions is focused upon a particular theme in the context of international logistics. Referred to as Residences, the five sessions along with corresponding coursework are described at the following site:

http://www.emil.gatech.edu/program-information/program_format.php.

Please note that courses in this special masters program are not available to non-MSIL students.

MASTER OF SCIENCE IN COMPUTATIONAL SCIENCE AND ENGINEERING (MSCSE)

Details regarding this interdisciplinary masters degree option can be found at:

http://www.cc.gatech.edu/education/grad/cse-degreq/view.

PH.D. PROGRAMS

The degree Doctor of Philosophy (Ph.D.) through the Stewart School recognizes demonstrated proficiency and high achievement in research within the disciplines and sub-disciplines represented in the School. After adequate preparation, the successful candidate must complete a searching and authoritative investigation of a special area in their chosen field, culminating in a written dissertation describing the results of that investigation.

MATRICULATION REQUIREMENTS

Applicants are required to submit a written statement describing their motivation for pursuing the Ph.D. in the Stewart School. Transcripts of prior academic work are required as are scores on the general portion of the Graduate Record Examination (ACO applicants are encouraged to submit scores from the Mathematics Subject Test). In addition, applicants must request that credible letters of reference be submitted on their behalf and which attest to their ability to perform rigorous Ph.D. level work. In order 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 one of the School's master's programs and who seek to be approved to continue for the Ph.D. may do so by completing a request form which can be obtained in the Academic Programs Office. By and large, these students' cases for admission will be considered as if they were new. That said, it is certainly the case that such applicants' performance during their Master's degree work will be taken into account. Master's students seeking this evaluation should not expect to have their cases considered (for a decision) until the final term of their master's program of study.

PROGRAM STRUCTURE

Currently, the Stewart School supports five distinct Ph.D.s:

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

The **ACO, CSE,** and **Bioinformatics** Ph.D.s are interdisciplinary.

FIRST-YEAR REVIEW

Unless their doctoral program/specialization requires a comprehensive examination at the end of the first year, each Ph.D. student will have his/her performance reviewed after the first two terms of study. This assessment will be based on the advisor's report (if relevant), course performance, and if appropriate, research performance. The review will be conducted by the Stewart School Graduate Committee. The outcome of this review will be communicated in writing to the student. 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 lacking and there is no strong mitigating evidence supporting a decision otherwise, the student will be informed that they have not passed and they will not be permitted to continue in the program. If the Graduate Committee believes that more information regarding a student's performance is needed, the review may be deferred. ACO students pass through a separate review that is performed by the ACO Coordinating Committee.

COMPREHENSIVE EXAMINATION

The comprehensive examination is an Institute requirement and may assess both general as well as specialized knowledge in the student's major area of concentration. Prior to the beginning of each academic year, faculty examining committees representing the Ph.D.s in Industrial Engineering and Operations Research will be announced through the Office of the Associate Chair for Graduate Studies (since **ACO**, **CSE** and **BIOINFORMATICS** are interdisciplinary, they are treated separately). Each committee is responsible for the scheduling and administration of its examination. In addition, each committee will report to the Associate Chair an assessment of the student's performance along with a recommendation that the student has: (i) passed, (ii) passed with some stated condition(s), (iii) failed but with an opportunity to re-take the examination at a later time, or (iv) failed with no opportunity to retake the examination.

In the case of the Ph.D. in Industrial Engineering, students are required to sit for the comprehensive examination in one of the four specializations listed earlier. Students pursuing the Ph.D. in Operations Research have no such flexibility since their comprehensive is defined by a common core of courses, *c.f.,* OR Program requirements given on page 17. Further, OR Ph.D. students must sit for the comprehensive examination at the beginning of their second year. In exceptional cases, a doctoral student may seek to be tested in some other concentration and/or by an *ad hoc* examining committee. This will be allowable, subject to the School Graduate Committee approving a petition in this regard submitted by the student and his/her advisor. It is to be understood, however, that creation of a special examination committee is viewed as a rare event and requests for its formation will be scrutinized carefully. If a case is approved for the formation of an *ad hoc* committee for a student, the student's advisor will not normally be named to the committee.

Comprehensive examinations are normally offered in the Fall and Spring semesters (not in Summer). Each Committee is free to exercise some latitude regarding their examination's administration, *i.e.*, schedule, composition, duration, *etc.*. A Ph.D. student, once matriculated into the Ph.D. program, must pass the comprehensive examination by the end of their 6th semester in residence (not counting Summer terms). The student will pass the examination if not more than one dissenting vote is cast by the Examination Committee. A student failing the examination twice may not continue in the program.

MINORS

The Institute requires that each Ph.D. student have 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. While the School will be flexible in approving minors, it is important that the student be clear that this breadth intent is not to be abused. For example, if a student's major concentration is, say, statistics then a minor in "mathematics" but consisting of mathematical statistics courses would not likely pass this test. Typical minors for ISyE Ph.D. students are computer science, mathematics, economics, and finance.

DISSERTATIONS

Doctoral students are expected to conduct a searching and authoritative investigation of a topic in their chosen field culminating in a written dissertation. The dissertation must either extend the boundaries of fundamental knowledge in a field or provide a new and better understanding/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.

INSTITUTE POLICY ON 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 persons, one of whom is the Thesis Advisor. The Thesis Advisor and the majority of the Thesis Advisory Committee shall be members of the Academic Faculty. This 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 Thesis Advisory Committee considers the dissertation to be satisfactory, a recommendation is made to the Vice-Provost for Graduate Studies and Research 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 others, 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 the Academic Faculty and distinct from the unit in which the student is enrolled. Occasionally, a request is made to have a non-Georgia Tech individual included as a member of the Final Doctoral Examination Committee. This request is not approved routinely; the credentials of such an individual must be submitted to the Associate Chair for Graduate Studies and will be scrutinized with the aim of verifying that the individual has a background that approximates that of a member of the Academic Faculty (*i.e.,*. holds a Ph.D., is research-active, *etc.*).

It is common for the School to simply appoint a Thesis Advisory Committee which also serves as the Final Doctoral Examination Committee.

FACULTY ADVISOR AND THESIS ADVISORY COMMITTEE

Ph.D. students are encouraged to select a research advisor as soon as this is appropriate. Indeed, many students may spend the first year settling on their area of concentration and during this time they may confer with several faculty members, all of whom may be likely candidates for such advisement. It remains, however, that a student will not gain candidacy until they have settled on their dissertation topic and advisor as well as the Thesis Advisory Committee which will approve his/her dissertation topic.

PROGRESSION OF DISSERTATION RESEARCH AND RESEARCH PROPOSAL

The focus of the Ph.D. program is on research. Accordingly, doctoral students are expected to prepare a cogent, self-contained written research proposal that should describe the research problem to be addressed, demonstrate an understanding of existing work, describe the intended approach to the problem's solution, and show an understanding of the nature and significance of anticipated results. The student is expected to present this proposal, accompanied by an oral presentation, to his/her Thesis Advisory Committee. Students are urged to present their proposal no later than 24 months after the student has passed the comprehensive examination. If judged to be satisfactory, the Thesis Advisory Committee signs the appropriate section of the Thesis Topic Approval form which can be found in the Academic Programs Office. This document is then submitted to the Associate Chair for Graduate Studies. When the student completes a thesis that is generally acceptable to the Thesis Advisory Committee and conforms to the format rules of the Graduate Division of the Institute, the advisor will ask the Associate Chair to schedule the student's Final Doctoral Examination. Normally, it is expected that the proposal be presented at least one semester prior to the Final Doctoral Examination. That said, some advisors and/or their Thesis Advisory Committee members may well impose a longer period such as two semesters.

A student who fails to obtain approval of his/her thesis proposal must rectify the situation by modifying their existing proposal and, if relevant, its oral defense to conform to the requirements set forth by their existing Thesis Advisory Committee. If this second attempt is not successful, then the student will have the equivalent of one full term to seek another research topic including, if appropriate, an alternative thesis advisor. This action must be reported to the Associate Chair for Graduate Studies, by the relevant faculty advisor, within the stated grace period. Failing this, the student will be dismissed from the Ph.D. program in the Stewart School.

CANDIDACY

To qualify for candidacy students must have completed any formal 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.

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 such as one month. The final draft version will also be made available for public viewing in the School. It is expected that the final draft will essentially be a complete document in that absent any required modifications arising from the defense, the document would be admissible for submission to the Georgia Tech Graduate Thesis Office. A student will pass the examination if not more than one dissenting vote is cast. A vote may be favorable subject to minor revisions to the dissertation; these would be coordinated through the Advisor.

COMPLETING REQUIREMENTS FOR MASTERS' DEGREES (as part of a Ph.D. program)

It is common for Ph.D. students to pick up 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 often applied to satisfy relevant degree requirements for various of the School's Master's degree options. Obviously, any course taken as part of a Ph.D. program of study that relates to but dominates a corresponding master's version can be used as a substitute accordingly. Note, however, that if more than one master's degree is sought, "double-counting" of courses is not permitted; that is, if a course is required by two master's degrees, the course can be applied to one but a suitable substitution must be sought for the second degree. Such substitutions must be approved by the Associate Chair for Graduate Studies.

As a final note, Ph.D. students are not encouraged to take multiple master's degrees. As a Stewart School doctoral student you are fully expected to commit yourself to the pursuit of the Ph.D. and ultimately, this will mean complete devotion to your research. Advisors are not enthusiastic about their students diverting attention from their research efforts in order to pursue multiple Master's degrees. Such diversion may well be deemed contrary to the "good progress" expectation the School places on its Ph.D. students and failure to comply accordingly may affect students' cases for GRA and GTA funding.

DOCTORAL PROGRAM REQUIREMENTS

Following are course requirements for each Ph.D. supported by the Stewart School. Students should consult with their advisor (or the Associate Chair for Graduate Studies) regarding the suitability of their background as it relates to preparation for various courses comprising the student's specific option.

PH.D. IN INDUSTRIAL ENGINEERING

A. SPECIALIZATION: SUPPLY CHAIN ENGINEERING

DOMAIN CORE

ISyE 62xx	**Supply Chain Engineering (ISyE 6202 substitutes in AY 2010-11)**
ISyE 7201	**Production Systems Engineering**
ISyE 7203	**Logistics Systems Engineering**

METHODS CORE

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 CORE (select one from the list below)

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 a minimum of two additional courses related to their major area chosen in consultation with their advisor.

It is recommended that students complete the domain courses 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.

B. SPECIALIZATION: STATISTICS

CORE

ISyE 6412	**Theoretical Statistics**
ISyE 6413	**Design and Analysis of Experiments**
ISyE 6416	**Computational Statistics**
ISyE 6650	**Probabilistic Models and Their Applications** *or* **Math 6241: Probability I**
ISyE 7401	**Advanced Statistical Modeling**

THEORY (select two or more):

ISyE 6420	**Bayesian Statistics**
ISyE 6761	**Stochastic Process I**
ISyE 6762	**Stochastic Process II**
ISyE 6781	**Reliability Theory**
ISyE 7405	**Multivariate Data Analysis**
Math 6242	**Probability II**
Math 6262	**Statistical Estimation**
Math 6263	**Testing Statistical Hypotheses**

METHODS (select three or more):

ISyE 6402	**Time Series**
ISyE 6404	**Nonparametric Statistics**
ISyE 6405	**Statistical Methods for Manufacturing Design and Improvement**
ISyE 6414	**Statistical Modeling and Regression Analysis**
ISyE 6805	**Reliability Engineering**
ISyE 7400	**Advanced Design of Experiments**
ISyE 7406	**Data Mining and Statistical Learning**

ELECTIVES (select one or more):

BIOL 7023	**Bioinformatics**
CS 7645	**Numerical Machine Learning**
ECE 6254	**Statistical Digital Signal Processing**
ISyE 6201	**Manufacturing Systems**
ISyE 6202	**Warehousing Systems**

ISyE 6203 **Transportation and Supply Chain Systems**
ISyE 6230 **Economic Decision Analysis**
ISyE 6644 **Simulation**
ISyE 6664 **Stochastic Optimization**
ISyE 6669 **Deterministic Optimization *or* ISyE 6661: Linear Optimization**
ISyE 6783 **Statistical Techniques of Financial Data Analysis**
ISyE 6832 **Simulation Theory and Methods**

All 11 courses satisfying the above requirements in the Program of Study must be completed in order to obtain doctoral candidacy.

C. SPECIALIZATION: ECONOMIC DECISION ANALYSIS

CORE

ISyE 6225 Engineering Economy
ISyE 6230 Economic Decision Analysis
ECON 6106 Microeconomic Analysis

ADDITIONAL COURSE REQUIREMENTS (7 courses as indicated)

All of the following:
Math 4317 Real Analysis
ISyE 6661 Optimization I
ISyE 6663 Optimization III *or* ISyE 6664 Stochastic Optimization
ISyE 6671 Stochastic Processes I

One of the following:
ISyE 6413 Design and Analysis of Experiments
ISyE 6414 Statistical Modeling and Regression Analysis

One of the following:
ISyE 6201 Manufacturing Systems
ISyE 6203 Transportation and Supply Chain Systems

One of the following:
Approved finance area elective (*e.g.*, ISyE 6759 Stochastic Processes of Finance I, ISyE 6227 Introduction to Financial Engineering, ISyE 6673 Financial Optimization, ISyE 6783 Statistical Techniques of Financial Data, ISyE 6785 The Practice of Quantitative Finance, or ISyE 6793 Advanced Topics in Quantitative Finance)

Approved economics area elective (*e.g.*, ECON 6160 Econometric Analysis, ISyE 6223 Understanding and Supporting Human Decision Making, ISyE 8803 Game Theory, or ISyE 8803 Sustainable Systems)

It is recommended that the first seven courses listed above be taken before sitting for the comprehensive examination.

All ten courses in the Program of Study must be completed in order to obtain doctoral candidacy.

D. SPECIALIZATION: SYSTEM INFORMATICS AND CONTROL

DOMAIN CORE
ISyE 6810 **System Monitoring and Prognostics**

ISyE 7201	**Production Systems Engineering**
ISyE 7204	**Informatics in Production and Service Systems**

METHODS CORE (Select three courses)

ISyE 6661	**Linear Optimization**
ISyE 6761	**Stochastics I**
ISyE 7406	**Data Mining**
ECE 6550	**Linear Systems and Control**

METHODS BREADTH (Select at least three courses from at least two areas below)

Stochastics and Simulation

ISyE 6644	**Simulation**
ISyE 6832	**Simulation Theory and Methods**
ISyE 6656	**Queueing Theory**
ISyE 6762	**Stochastics II**

Statistics

ISyE 6402	**Time Series**
ISyE 6405	**Statistical Methods for Manf 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 6559	**Advanced Linear Systems**
ECE 6552	**Nonlinear Systems**
ECE 6553	**Optimal Control**
ECE 6554	**Adaptive Control**
ECE 6551	**Digital Control**
ECE 6556	**Intelligent Control**
ECE 6120	**Automata Theory**
ME 6401	**Linear Systems Control**
ME 6402	**Nonlinear Control Systems**
ME 6443	**Variational Methods**
ME 6403	**Digital Control Systems**
ME 6404	**Advanced Control Systems Design and Implementation**

Optimization

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

Other possible methodology courses (consent of advisor required)

SEMINAR (required)

ISyE 8014	**Contemporary Topics in System Informatics and Control**

APPLICATIONS (select at least one course)

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**

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 pursuing the Ph.D. in Operations Research must satisfy the requirements stated below:

CORE (all students):

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 (required but not part of the comprehensive exam)

DEPTH

Students must select at least three courses from one of the focus areas listed below:

Optimization:

ISyE 6664 Stochastic Optimization
ISyE 6679 Computational Methods in OR
ISyE 7872 Convexity
ISyE 7873 Advanced Nonlinear Programming
ISyE 7876 Advanced Combinatorial Optimization
ISyE 7877 Advanced Integer 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/Math 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:

Students must select at least two courses from the list below that matches their respective depth selection choice:

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
ISyE 7xxx Stochastic Process Limits
ISyE 7xxx Stochastic Networks
ISyE 7xxx Rare Event Systems
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 6650 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/Math 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 7872 Convexity
ISyE 7873 Advanced Nonlinear Programming
ISyE 7876 Advanced Combinatorial Optimization
ISyE 7877 Advanced Integer Programming
CS 6650 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 Program CORE except for ISyE 6832 as indicated above.

PH.D. IN ALGORITHMS, COMBINATORICS, AND OPTIMIZATION (ACO)

The ACO Program is a multidisciplinary venture sponsored by the Stewart School, 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.

CORE

CS 6550	**Design and Analysis of Algorithms**
ISyE 7661	**Theory of Linear Inequalities**
ISyE 7686	**Advanced Combinatorial Optimization**
Math 6014	**Graph Theory**
Math 6121	**Algebra I**
Math 6221	**Advanced Classical Probability Theory**

ADDITIONAL COURSE REQUIREMENTS

Each ACO student must complete at least 18 hours of additional coursework at the 6000-level or higher. The student's home unit may specify some of the courses used to fulfill this requirement. For ACO students with the Stewart School as their home unit, this stipulation includes the courses listed below (as part of the 18 hours):

ISyE/Math 6761	**Stochastic Processes I**
ISyE 6663	**Nonlinear Optimization**
Math 6021	**Topology of Euclidean Spaces**
CS 6520	**Complexity**

MINOR

Each ACO student must satisfy the Institute requirement of a minor program of study consisting of at least 9 hours of course work chosen to the satisfaction of the Coordinating Committee and the student's home unit. Courses in the **ACO** CORE may not be used as part of the minor.

COMPREHENSIVE EXAMINATION

ACO students are strongly encouraged to pass the written Comprehensive Examination by the end of their third semester in residence (not counting the Summer term), and must take it before the end of their fourth academic semester. The examination will be based primarily on the content of the courses in the Program CORE and one additional course selected from CS 7520, CS 7530, CS 6520, or CS 7510. Upon passing the examination, students will be advised that they will be admitted to candidacy for the Ph.D. upon satisfactory completion of all requirements and filing a statement naming the dissertation advisor and research topic.

RESEARCH PROPOSAL

By the end of their third calendar year in residence, each ACO student must defend a research proposal. The purpose of this exercise is to demonstrate that the student has adequate knowledge of a research area that would allow a thesis of the quality expected of ACO students, that the student is aware of an adequate supply of research problems, that he/she has a plan to pursue those problems, and that he/she is capable of carrying out this plan. Detailed guidelines are provided on the ACO website.

DISSERTATION AND FINAL DOCTORAL EXAMINATION

An ACO student's dissertation research may be carried out under the direction of *any* member of the ACO Program faculty. Accordingly, research topics may be chosen from a wide range of subjects in combinatorics, complexity and the analysis of algorithms, and combinatorial optimization.

Each ACO dissertation must be available for public viewing at least one month prior to the scheduled defense. For each dissertation a recognized expert in the field (other than the advisor or co-advisors, if any) must be designated as a "reader". The reader may or may not be from Georgia Tech, and may or may not be a member of the thesis committee. A report from the reader must be available to the thesis committee and the Director of the ACO Program prior to the defense. The reader's report should comment on the main research contributions, readability, and publishability of the results.

PH.D. IN COMPUTATIONAL SCIENCE AND ENGINEERING

Detail regarding this interdisciplinary program can be found at:

http://www.cc.gatech.edu/education/grad/cse-degreq/view

PH.D. IN BIOINFORMATICS

Detail regarding this interdisciplinary program can be found at:

http://www.biology.gatech.edu/graduate-programs/bioinformatics/

ACADEMIC CALENDAR

Note that dates listed below are current as of the printing date of this Handbook. Occasionally, there are adjustments and in that regard, you are advised to consult the Registrar's website for any official changes (http://www.registrar.gatech.edu).

FALL 2010

Registration	August 16-27
Classes begin	August 23
Final Exams	December 13-17
Commencement	December 17-18

SPRING 2011

Registration	TBD
Classes begin	January 10
Final Exams	May 2-6
Commencement	May 7

SUMMER 2011

Registration	May 12-20
Classes begin	May 16
Final Exams	August 1-5
Commencement	August 6

FALL 2011

Registration	August 17-26
Classes begin	August 22
Final Exams	December 12-16
Commencement	December 17

You are advised to be vigilant regarding other important dates that may play a role in your progression through the Program. Among these are each term's drop date, the date for late payment of fees, and deadlines for degree petitions and thesis/dissertation submissions. Information should be easily found on various Institution Office web sites (*i.e.*, Registrar, Office of Graduate Studies, *etc.*).

TENTATIVE GRADUATE COURSE PROJECTION

The following represents a projected schedule for graduate courses this year. Please note that as the title proclaims, this projection is only tentative. For a course listed with no projection, the message to you is that the stated course is not likely to be taught at all or at least not taught by ISyE faculty. Note also that listings indicated in summer are least reliable; indeed, it is conceivable that the School will offer no courses in summer should budgetary resources and/or lack of faculty availability so dictate. That said, courses that are marked below represent a family of offerings from which various subsets have traditionally been selected for scheduling in the summer session.

COURSE	F	Sp	Su
ISyE 6101 Organizational Behavior for Engineers			
ISyE 6201 Manufacturing Systems	x	x	
ISyE 6202 Warehousing Systems	x	x	
ISyE 6203 Transportation and Supply Chain Systems	x	x	
ISyE 6205 Cognitive Engineering			
ISyE 6215 Models of Human-Machine Systems		x	
ISyE 6223 Understanding/Supporting Human Decision Making		x	
ISyE 6224 Topics in Human-Integrated Systems	x		
ISyE 6225 Engineering Economy	x		x
ISyE 6227 Introduction to Financial Engineering			
ISyE 6229 Productivity Measurement and Analysis	x		
ISyE 6230 Economic Decision Analysis		x	
ISyE 6231 Design of Human-Integrated Systems	x		
ISyE 6232 Safety-Critical Real-Time Systems			
ISyE 6234 Measurement of Human-Integrated Systems			
ISyE 6307 Scheduling Theory		x	
ISyE 6402 Time-Series Analysis		x	
ISyE 6404 Nonparametric Statistics	x		
ISyE 6405 Statistical Methods for Manufacturing Design/Improvement	x		
ISyE 6412 Theoretical Statistics	x		
ISyE 6413 Design and Analysis of Experiments	x		x
ISyE 6414 Statistical Modeling and Regression Analysis	x		x
ISyE 6416 Computational Statistics		x	
ISyE 6420 Bayesian Statistics	x		
ISyE 6421 Biostatistics		x	
ISyE 6644 Simulation	x		x
ISyE 6650 Probabilistic Models and Their Applications	x	x	x
ISyE 6656 Queueing Theory			
ISyE 6661 Linear Optimization	x	x	
ISyE 6662 Discrete Optimization		x	
ISyE 6663 Nonlinear Optimization		x	
ISyE 6664 Stochastic Optimization	x		
ISyE 6669 Deterministic Optimization	x		x
ISyE 6673 Financial Optimization	x		
ISyE 6679 Computational Methods in Operations Research	x	x	
ISyE 6701 Energy Technology and Policy		x	
ISyE 6739 Basic Statistical Methods		x	x
ISyE 6759 Stochastic Processes in Finance I	x		
ISyE 6761 Stochastic Processes I	x		
ISyE 6762 Stochastic Processes II		x	
ISyE 6767 Design/Implementation of Sys. To Support Comp. Finance		x	
ISyE 6769 Fixed Income Securities		x	
ISyE 6772 Managing Resources of the Technological Firm			
ISyE 6773 Strategic Management of Technology-Based Ventures			

ISyE 6774 Management of Technology Project			
ISyE 6775 Management of Technology Seminar			
ISyE 6777 Analysis of Emerging Technologies			
ISyE 6779 Dynamic System Simulation & Modeling			
ISyE 6781 Reliability Theory	x		
ISyE 6783 Statistical Techniques of Financial Data Analysis		x	
ISyE 6785 The Practice of QCF	x		
ISyE 6795 Introduction to Cognitive Science			
ISyE 6805 Reliability Engineering			
ISyE 6810 System Monitoring and Prognostics		x	
ISyE 6832 Simulation Theory and Methods		x	
ISyE 7000 Master's Thesis	x	x	x
ISyE 7201 Production and Service Systems Engineering	x		
ISyE 7203 Logistics Systems Engineering	x		
ISyE 7204 Informatics in Production and Service Systems		x	
ISyE 7210 Real-Time Interactive Simulation	x		
ISyE 7400 Advanced Design of Experiments			
ISyE 7401 Advanced Statistical Modeling		x	
ISyE 7405 Multivariate Data Analysis	x		
ISyE 7406 Data Mining and Statistical Learning		x	
ISyE 7441 Theory of Linear Models			
ISyE 7653 Case Studies in Logistics and Manufacturing			
ISyE 7661 Theory of Linear Inequalities	x		
ISyE 7682 Convexity	x		
ISyE 7683 Advanced Nonlinear Programming	x		
ISyE 7686 Advanced Combinatorial Optimization		x	
ISyE 7687 Advanced Integer Programming	x		
ISyE 7790 Cognitive Modeling			
ISyE 8011-2-3 Graduate Seminar			
ISyE 8795 Colloquium in Cognitive Sciences			
ISyE 8803 Topics in Industrial Engineering	y	y	y
ISyE 8014 Contemporary Topics in SIAC		x	
ISyE 8813 Topics in Operations Research	y	y	y
ISyE 8843 Advanced Topics in Statistics			
ISyE 8851 Topics in Manufacturing			
ISyE 8852 Topics in Logistics			
ISyE 8861 Advanced Topics in Stochastics	x	x	
ISyE 8862 Advanced Topics in Simulation			
ISyE 8871 Advanced Topics in Linear and Discrete Optimization	x	x	
ISyE 8872 Advanced Topics in Nonlinear Optimization	x	x	
ISyE 8893 Special Topics in Cognitive Science			
ISyE 8900 Special Problems in Industrial Engineering	x	x	
ISyE 8901 Special Problems in Operations Research	x	x	
ISyE 9000 Doctoral Thesis	x	x	x
HS 6000 Introduction to Healthcare Delivery			
HS 6100 Healthcare Delivery System Models			
HS 6200 Healthcare Financial Management			
HS 6300 Healthcare Information Systems			
HS 6400 Healthcare Systems Practice			
HS 8800-13 Special Topics	y	y	y
HS 8900-1 Special Problems	x	x	x

y: Topic number; used for *ad hoc* offerings involving material not likely to become a permanent course.