

NORTHWESTERN TECHNOLOGICAL INSTITUTE



**Industrial Engineering &
Management Sciences**

**Graduate Student
Handbook**

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1. INTRODUCTION

This handbook is designed to provide you with a guide for planning your graduate program in Industrial Engineering & Management Sciences at Northwestern University. As such, it is hoped that this handbook will prove to be a valuable resource regarding the requirements, procedures, and opportunities of the IEMS program. It should be noted that, for the most part, the handbook deals with Program and Departmental procedures. On matters concerning Graduate School or University policy, the most recent Graduate School Catalog or the Northwestern Student Handbook should be consulted.

While the handbook provides the basic information necessary for successfully negotiating the requirements of the Program, it is not meant to serve as a substitute for our advisory system. You are encouraged to schedule frequent meetings with your advisor to discuss your goals and plans, as well as your progress in the Program. The Program offers many opportunities and options and your advisor's guidance is important to help you maximize your educational experience at Northwestern.

GRADUATE SCHOOL STATUS: Students are admitted to The Graduate School of Northwestern University in order to study Industrial Engineering within the IEMS Department. That is, students must follow all the procedures and guidelines established by The Graduate School for such matters as registration, receiving payment of stipends, ensuring full-time status in terms of graduate study, meeting graduation deadlines, etc. Staff within The Graduate School (847) 491-5279 (633 Clark Street, Evanston Campus) are willing to help students as long as students follow Graduate School procedures. Do not ignore notices, requests or memos issued by The Graduate School (e.g., TGS E-News) and be sure that you are in compliance with Graduate School procedures.

IT IS YOUR RESPONSIBILITY TO CONSULT THIS HANDBOOK AND SEEK OUT ADDITIONAL INFORMATION so that you adhere to required Division, Departmental or Graduate School procedures. If you have questions or are confused consult the Coordinator of Graduate Student Life, Adam Cebulski, Finally, the Student Life Handbook provides helpful information on matters of relevance to your life as a graduate student.

2. GOALS OF THE Ph.D. PROGRAM

An attractive feature of our program is the flexibility and freedom presented to students to pursue careers in different areas of Industrial Engineering. Our faculty feel that as a result of training with us, you will be well-prepared for careers in research or academia.

The graduate program is designed to produce competent, creative professionals who are capable of functioning in both industry and academic settings. The overall goal of the program is to produce PhD's in Industrial Engineering who:

1. Have a *broad* knowledge of the Industrial Engineering field;
2. Have *specialized* knowledge of analytical tools and strategies for concerns as diverse as scheduling, planning, distribution, design, location, and control
3. Have knowledge and experience related to the development of theoretical and practical tools that can be used to solve problems in industry and government.
4. Can effectively communicate their knowledge of industrial engineering across several contexts;
5. Have knowledge of and adhere to the ethical standards of the profession and who have the ability to demonstrate appropriate professional conduct and professional interpersonal relationships.

3. GENERAL PROGRAM REQUIREMENTS AND PROCEDURES

3.1. Degree Requirements

To receive the Ph.D. in Industrial Engineering, students must **successfully** complete the following:

1. 17 courses of graduate course work beyond the bachelor's degree and entering prerequisites (Required course work is outlined in Section 4);
2. Departmental Masters Qualifying & Candidacy Exam (see below);
3. Ph.D. Dissertation (including Oral Defense of proposal and completed Dissertation);

3.2. Masters Degree Requirements

Although the Program is oriented toward the Ph.D., students receive the M.S. as they progress toward the Ph.D. For students who are progressing to the Ph.D., the Master's Degree is generally awarded upon completion of the following:

1. 12 courses of graduate course work beyond the bachelor's degree or entering prerequisites (including required clinical core);
2. Departmental Masters Qualifying & Candidacy Exam (see below);

More specific information about Degree Requirements and the procedures for applying for graduation can be found in The Graduate School Catalog.

3.3. Time Requirements

Students in the graduate program are expected to devote full-time to graduate study and complete the requirements for the Ph.D. within 4-5 years (or less if one enters with advanced standing). The sample program of studies given in Table 1 illustrates a possible timetable for completion of degree requirements. While circumstances may require some adjustment of this timetable, students are encouraged to adhere to this schedule as closely as possible regarding coursework completion. You should have only 1-2 courses of the required 17 left to take in your third year.

You will note from The Graduate School Catalog that The Graduate School deadlines for completion of degree requirements extend beyond those of the IEMS Program. According to Graduate School rules, students entering the University with a bachelor's degree must complete all requirements for the M.S. within 5 years and for the Ph.D. within 9 years. Students entering with advanced standing must complete all Ph.D. requirements within 6 years. It should be noted, however, that these deadlines are outlined with part-time and full-time students in mind. Because the IEMS Program accepts only full-time students, **we expect students to complete the M.S. and the Ph.D. within the guidelines outlined by our Program (as stated above).**

Students are expected to complete the requirements for the M.S. and Ph.D. in an orderly, progressive sequence. **Perhaps the greatest challenge in doing this is budgeting one's time and balancing the varied requirements of the Program;** i.e., coursework, exams and independent research. A suggested calendar or timetable for doing this is presented in section 12. It is also important to work closely with your advisor in planning and setting goals for each year.

3.3.1. Table 1: Sample Course of Studies

Schedules will vary depending on the availability of courses. A typical program of study for a student entering with a Bachelor's degree is:

FIRST YEAR (Candidacy & Qualifying Exam at the end of this year)

IEMS 401 Intermediate Statistics*	1
IEMS 450-1 Mathematical Programming I*	1
IEMS 460-1 Stochastic Models I*	1
IEMS 480-1 Production and Logistics I*	1
IEMS 480-2 Production and Logistics II*	1
IEMS 488 Economics and Decision Analysis*	1
IEMS 435 Introduction to Stochastic Simulation	1
Electives (Towards major and minor)	5
Total	12**

* Required courses for the first year

** 12 courses are required for successful completion of a masters

SECOND YEAR

IEMS 450-2 Mathematical Programming II	1
IEMS 460-2 Stochastic Models I	1
Elective (Towards Major and Minor)	1 or more
Research (590)	
Total	3
Running Total	15

THIRD YEAR (Propose during or at the end of this year)

Elective (Towards Major and Minor)	2 or more
Research (590)	NA
Internship***	NA
***Internships are encourage at any point during study except for first year	
Total	2
Running Total	17

FOURTH and FIFTH YEARS

Dissertation Research (TGS 598 & 599)

3.4. Transfer/Waiver of Credits

According to Graduate School regulations, all requirements for the M.S. must be earned at Northwestern University Chicago. **Should any credits be transferred, a M.S. degree from Northwestern is no longer possible.**

3.4.1 Transferring Credits

Students who enter with a M.S. in Industrial Engineering or related field from an accredited institution and who wish to begin Ph.D. work at an advanced level may petition for transfer of credit to the Graduate Committee of the IEMS Department. To do this, students

should submit a Transfer/Waiver Request Form (available for download on the IEMS website) with a list of courses for which credit is being requested, plus transcripts, course descriptions, syllabi, reading lists, or any other available material to the Director of Graduate Studies immediately after entering the program. The Director of Graduate Studies and the committee will review the request, supporting material, and meet with the student. The amount of credit accepted for transfer is contingent upon the evaluation made by the committee and the Dean at The Graduate School. The Graduate School limits transfer credit to 3 quarters or the amount required for the M.S. at Northwestern.

3.4.2 Waiving Courses

Students who enter with course credits from an accredited institution and who wish to waive particular required courses because they have taken similar ones previously (at a graduate level) may petition to do so. To do this, students should submit a Transfer/Waiver Request Form (available for download on the IEMS website) with a list of courses for which credit is being requested, plus transcripts, course descriptions, syllabi, reading lists, or any other available material to the Director of Graduate Studies immediately after entering the program. The Director of Graduate Studies and a committee of faculty who specialize in the particular fields of the courses will review the request, supporting material, and meet with the student. Should a request be granted, it does not lower the amount of courses the student will take for the degree. **For any course that is waived, a student must supplement an additional elective.**

3.5. Student Development/Advising Program

Objectives: The overall objective of the Advising Program is to maximize the professional growth and development of students in the Ph.D. Program in Industrial Engineering by:

1. providing structured advising and assistance in the planning of educational experiences at the beginning and end of each academic year;
2. maintaining contact with internship sites, monitoring the activities of students and their progress in skill development;
3. providing consistent and detailed feedback to students in a personal format.

Both the student and advisor play key roles in the entire planning, monitoring, and feedback process. In essence, this plan provides a general structure for the advisor/student relationship and establishes the advisor as a key person in helping the student to integrate the multiple and diverse aspects of education in IEMS. Upon entrance to the program, students are assigned a temporary first year Advisor. These should be utilized during the first year for general advising. After the first year of study, the faculty assign students based on interest to a permanent adviser. Advisors help students move through the Program in a timely manner by charting their progress on the different program requirements via Advisor-student meetings at least two times per year. Students are free to request changes in one's advisors (although most of our students do not make such requests as there are few faculty members in any given research area).

Advising and Feedback Plan: Students are responsible for scheduling regular meetings with their advisors to consult about the program and their professional development. At a minimum, these meetings should be held as outlined below.

1. **At the Beginning of the Academic Year** - meet to discuss tasks to be completed for the year, priorities for learning, and a plan for accomplishing goals for the year.
2. **At the End of the Academic Year (Prior to the Annual Review)** - meet to review progress toward goals, assess status, make plans for summer. Assess strengths and

weaknesses.

3. **After Annual Review** - meet to discuss feedback from Annual Review.

3.6. Graduation

When a student thinks he/she will be ready to graduate at the end of a particular quarter, he/she should file an application for graduation with The Graduate School online via CAESAR. Although degrees are conferred two times per year, a graduation ceremony is only held in June of each year. Thus, if your degree is conferred in Summer, Fall or Winter, you would participate in a ceremony the following June. The deadline for application is usually about two months prior to graduation (consult graduate calendar for exact dates; <http://www.tgs.northwestern.edu>).

3.7. Maintenance of Student Status

Students who are on full-time internships and are not taking classes should register for the Crown Internship Program with Melissa Grady (L-254) the quarter they are on internship. This is a non-credit course which allows students on internship to maintain their student status within the university. This may be taken three times during an academic year but not consecutively.

Students who have completed the 17 required courses for the Ph.D., but have not completed the Dissertation and are not on internship, must also maintain continuous registration in The Graduate School. While working on the Dissertation Proposal, students should register for TGS 599: Post Candidacy Research and after three quarters of that for TGS 503: Resident Research Continuation. Three quarters of TGS 599 are required before graduation – and the summer quarter counts if dissertation defense occurs during this quarter. For most summer registrations you will use TGS: 598: Residential Doctoral Study – especially if a student is an international student on a visa.

Should a student wish to maintain their status in the program but not register for any courses or research, they will register for TGS 512: Continuous Registration with a cost of \$100 charged to the student each quarter. After they have reached their 9 year mark, registration would be changed to TGS 513: Advanced Continuous Registration and a fee of \$1000 would be charged per quarter.

4. CURRICULUM

Except for unusual circumstances, each class you take is worth 1 credit hour. Basically, the required courses are those identified by the Department.

4.1 Basic Core Curriculum

PhD students spend about half of their first year of study taking a common core of six IE/MS courses that provide fundamental knowledge:

- IEMS 401 Intermediate Statistics
- IEMS 450-1 Mathematical Programming I
- IEMS 460-1 Stochastic Models I
- IEMS 480-1 Production and Logistics I
- IEMS 480-2 Production and Logistics II
- IEMS 488 Economics and Decision Analysis

Additional first-year courses may be chosen from relevant graduate-level offerings throughout the University in such areas as mathematics, economics, engineering, management, and the social sciences.

4.2 Advanced Study

Students whose performance in first-year courses and the core exam demonstrates a strong potential for success in research are invited to continue to study for the PhD degree. The program has three additional required courses, which can be taken in either the first or second year:

- IEMS 435 Introduction to Stochastic Simulation
- IEMS 450-2 Mathematical Programming II
- IEMS 460-2 Stochastic Models I

4.3 Majors & Minors

In their initial three years, PhD students also complete a 4-course major and two 2-course minors consisting of graduate level courses from IEMS and other selected engineering departments. Majors and minors may be chosen from the following areas:

- Stochastic Modeling and Analysis
- Optimization
- Financial Engineering
- Production and Logistics
- Decision and Risk Analysis
- Applied Statistics and Quality Engineering
- Organization Theory and Systems Analysis

4.3.1. Designing Major/Minor Areas

Representative courses in these areas are listed in the Ph.D. Major and Minor Areas Document. Students also may petition to substitute a major or minor area of their design with approval from their advisor and the Graduate Committee.

FORMS REQUIRED:	Designed Area Form
OBTAIN FROM:	Handbook, or On-Line, or Coordinator of Student Life
SIGNATURES:	Advisor, Director of Graduate Studies, Coordinator of Student Life
TIME LINE:	Before final exam

After consulting with their advisers, students may enroll in additional advanced courses, from a variety of departments, appropriate to their backgrounds, objectives, and research interests. Students typically complete advanced lecture courses during their third year, while filling out their schedule with one or more units of 499 Projects arranged with their advisers.

4.4 Candidacy Exam (Core Exam)

This is an exam students take at end of the first year. If a student passes the exam, (s)he become officially a Ph.D. candidate and can start working on his/her research interests. Otherwise, if they have taken 12 courses, have a minimum B average, and have had a satisfactory performance in the exam, they can graduate with an MS degree. "Passing the exam" means passing an evaluation by IEMS faculty, who look at the exam itself as well as course performance.

4.5 Dissertation

The dissertation is normally done upon completing the fourth or fifth year for each student. Special accommodations can be made if a student has taken time off or other reasons. All exceptions must be approved by the student's Adviser and the Director of Graduate Studies.

4.6. Electives

Within the structure of the graduate program, students have considerable freedom to pursue individualized interests through elective courses. Electives constitute half of the total program of studies. These electives are selected by the student, in consultation with his/her advisor, and should be chosen to provide greater depth in the student's specialized interest areas as well as a richer contextual framework for his/her clinical interests.

A fairly up-to-date listing and description of both required and elective courses can be found in the most recent Graduate School Catalog. In addition to those courses listed, the Program offers a Special Topics Seminar in Industrial Engineering (IEMS 490). The course is used to give seminars on advanced research topics of special relevance or interest to students.

Since these courses tend to be more specialized, their scheduling also depends on the availability of a qualified instructor. It is wise to think about your electives well in advance and to consult with your advisor or the Director of Graduate Studies concerning the scheduling of these courses.

4.7. Other Educational Opportunities

In addition to formal coursework and training experiences offered by the Department, there are numerous informal opportunities available to graduate students. These experiences can play an important role in one's overall professional development and students are encouraged to participate in as many as possible. Some opportunities generally available are:

4.7.1. Research Groups.

Most faculty members lead informal research groups in their special areas of interests. These groups generally meet to discuss and plan research in the area of concern and are open to interested students. Since these groups may change from year to year, you should be alert to announcements of research groups during the first semester of each year.

4.7.2. Brown Bags and Speakers.

The department hosts talks, discussions and presentations during the year related to various professional issues, research, and developments within sub-disciplines of industrial engineering. Look for notices about the time and place of such meetings.

ALL GRADUATE STUDENTS IN THEIR FIRST YEAR ARE EXPECTED TO ATTEND BROWNBAG SEMINARS SPONSORED BY THE INFORMS CHAPTER.

4.7.3. Conferences and Workshops.

The IEMS Department sponsors each student one time to attend a professional

conference (such as INFORMS). We suggest this is done as late as possible in the student's graduate career as it is very beneficial for networking and job hunting. Please make sure to check with the Financial Assistant or Business Administrator regarding what and for how much conferences are covered for reimbursements. There may also be funding available from advisors for conference attendance.

4.7.3.1 TGS Travel Grant

Objective of the Grant: The Conference Travel Grant provides funds to assist PhD and MFA students traveling to conferences and/or seminars to make presentations on behalf of the University. The award is not intended to support attending courses at other schools, research or general educational travel. **The maximum Conference Travel Grant is \$500 for students in McCormick.**

For more information on the TGS Travel Grant visit Website at: <http://www.tgs.northwestern.edu/financialaid/fellowshipsandscholarships/fellowshipsandgrants/conferencetravelgrant/>

5. INTERNSHIPS

5.1. General Information

Internships can begin after the second year with approval from the Department and the student's Adviser. Students can arrange their own internships with companies directly, work with faculty in the department, or visit the Co-Op & Internship Office in McCormick. Typically, students do internships during the summer quarter.

5.2. Crown Registration

Students who are on full-time internships and are not taking classes should register for the Crown Internship Program with the McCormick Graduate Office (L-254) the quarter they are on internship. This is a non-credit course which allows students on internship to maintain their student status within the university. This may not be taken for two quarters consecutively.

6. CANDIDACY EXAM & M.S. DEGREE

All MS and PhD students who wish to continue beyond the first year for the PhD must take a candidacy exam that tests their ability to understand, apply, and integrate material from their first year of study. The candidacy exam is offered in June of each year. A student must take the exam no later than his/her first opportunity after completing the six required first-year PhD core courses. (For most students, this would mean June of their first year. However, transfer or part-time students have the option of delaying the exam until they complete these six core courses.)

6.1. Format of Exams

The candidacy exam is a one-hour oral exam administered to individual students by committees of at least three IEMS faculty members. The exam is based on the student's review and presentation of one of a selection of papers provided by IEMS faculty. A student is also required to submit to his/her committee a short written report on the paper prior to the oral examination. Guidelines for the oral presentation and written report are communicated in advance. In the above, the phrase "IEMS faculty member" means any faculty member with at least a 20% appointment in

IEMS.

6.2. Dates & Times

The Candidacy Exams take place following final exam week during the week of Commencement. The times and dates are subject to change but dates will be announced at least one month before they are scheduled to occur.

6.3. Evaluation of Candidacy Exams

Following the student's exam, committee members each confidentially submit a grade evaluation to the IEMS Graduate Committee. This grade evaluation is incorporated into the Graduate Committee's evaluation of all first-year students for the purpose of deciding continuation towards the PhD and the awarding of the MS degree. This evaluation is based on exam performance, overall course performance, faculty evaluation of research ability, and other criteria.

There are three decisions that can be made during this evaluation:

1. **No pass, no M.S.** In this case the student did not successfully pass the exam and will not be eligible to receive the M.S. degree.
2. **M.S. conferral, No continuation.** In this case the student passed the exam and will receive their M.S. (upon successful completion of 12 courses), but they will not be asked to continue on the Ph.D. track.
3. **M.S. conferral, Invitation to Continue.** In this case the student passed the exam and will receive their M.S. (upon successful completion of 12 courses), and they are asked to continue in the program.
 - a. **Please note:** M.S. conferral, Invitation to Continue may have stipulations attached. Some stipulations include (but are not limited to):
 - Must retake 1 (or more) of the exams
 - Must find an advisor by a specific date
 - Must raise their GPA to a specified number by a specific date

6.4. M.S. Degree Conferral

Should the student pass the Candidacy Exam and is told they can be awarded the M.S. Degree they must log into CAESAR and fill out the Application for Degree Form stating they will finish in the Fall of the following year (because Core Exams are so late to commencement, all students will receive their degree at the next conferral time – Winter if immediately following Candidacy Exams). This can be done any time after the first year.

FORMS REQUIRED:	Application for Degree Form
OBTAIN FROM:	CAESAR
SIGNATURES:	Approval by the Coordinator of Student Life
TIME LINE:	After the 1 st year

7. PROSPECTUS & DISSERTATION PROCEDURES

Typically, students present a prospectus once they have finished an initial part of the Ph.D. research and have a clear idea about the next steps. Usually this happens during the third year; it must happen by the beginning of the fifth year. Prospectus requires a written report, an oral presentation and approval by a committee chosen by student and advisor.

The dissertation is normally completed 3 quarters after the prospectus (must not be less than 3 quarters). The committee is allowed to change should students need to expand or replace members.

7.1. Prospectus/Dissertation Committee

A student's dissertation committee is chaired or co-chaired by the student's advisor. Two or more additional committee members are chosen by the advisor in consultation with the student. At least two committee members, including the chair or a co-chair, must be full or joint IEMS faculty. The committee must include at least one member who has primary affiliation outside the department.

7.2. Developing The Prospectus/Dissertation Proposal

After choosing your committee, meet with your Adviser regularly to develop your proposal. The proposal typically consists of a substantial literature review and detailed methods section.

You (not your advisor or Thesis/Dissertation Director) are responsible for meeting Department and Graduate School deadlines

Once you or your Chair agree that your proposal is ready, you may schedule a proposal defense meeting with your reader(s).

7.3. Prospectus

Prior to the meeting, you must log onto CAESAR and fill out the Prospectus form in the Student Section. Print it out with all your committee members. At the proposal meeting, the committee may require changes. Upon approval by the committee, all member must sign the Prospectus form and return it to the Coordinator of Graduate Student Life, Adam Cebulski. The student must also submit the Course Verification form to ensure they are fulfilling the major/minor requirements.

FORMS REQUIRED:	Prospectus Form
OBTAIN FROM:	CAESAR
SIGNATURES:	Each committee member signs the sheet
TIME LINE:	During 3-4 th year in program

FORMS REQUIRED:	Course Verification Form
OBTAIN FROM:	IEMS Website
SIGNATURES:	Student, Advisor, Coordinate of Graduate Student Life
TIME LINE:	At the time of proposal

7.4. The Dissertation Defense Meeting

Both the Department and Graduate School require an Oral Defense of the Ph.D. Dissertation. In the Oral Defense, the student has a final, formal meeting with his or her committee members to present and answer questions about the research. Different committees handle this meeting in different ways. It is a good idea to talk to all the members of your committee about their approach and expectations of the Oral Defense, in order to be well prepared for the meeting. Many committees encourage students to present and answer questions about their research as they would do for a professional conference presentation. Students may also be asked to explain how their research relates to existing literature; alternative methods for overcoming limitations or non-significant results; ideas or plans for follow-up studies; and so forth.

The Oral Defense must be scheduled by the Coordinator of Graduate Student Life at a time agreed upon by the student and the committee. Once the defense is scheduled, it is the student's

responsibility to prepare a formal announcement of the defense and post these announcements in the department. Arrangements can be made for conference calls and various other methods of electronic participation.

Prior to defending, students must log onto CAESAR to fill out the Final Exam form (dissertation defense form). All committee members must be filled out and this form should be printed and taken to the defense. Upon completion and approval of the defense (including all necessary edits) the form must be signed by all members of the committee and returned to the Coordinator of Graduate Student Life.

FORM REQUIRED:	Final Exam
OBTAIN FROM:	CAESAR
SIGNATURES:	Each committee member signs the sheet
TIME LINE:	At conclusion of defense (4 th or 5 th year)
SUBMIT TO:	Coordinator of Graduate Student Life

7.5. Electronic Participation & Approval

Should a committee member not be physically able to attend the oral defense, they are allowed to participate electronically. These methods include but are not limited to: conference call, webcam conferencing, video conferencing. The department can supply a phone used for conference calls. All other methods of electronic participation are the student's responsibility to provide and set up. Whoever participated electronically, must send an e-mail directly to the Coordinator of Graduate Student Life stating they have accepted the dissertation with no changes.

7.6. Final Copy of the Dissertation

Once the committee approves the Text (including any necessary edits and changes) and the Oral Defense, the Final Copy of the Thesis/Dissertation is submitted on-line via the ProQuest system. Once your dissertation has been approved by your committee and all edits and revisions are complete, the student must submit an electronic version of the paper online via UMI/ProQuest. Visit <http://www.tgs.northwestern.edu/studentsvcs/doctoral/degreetcompletion/> regarding formatting guidelines and copyright laws and regulations or

FORM REQUIRED:	Final copy of Thesis/Dissertation
SUBMITTED:	On-line via ProQuest
TIME LINE:	At least 1-month prior to expected date of graduation (see web site above for the exact dates each quarter).

8. ANNUAL REVIEW

8.1. General Information

The overall progress and performance of every student in the Graduate Program is reviewed at least once a year. This annual evaluation is designed to enhance the professional, scientific, and personal growth of the students through constructive feedback and to help the student internalize a realistic assessment of his/her skills, competencies, strengths, and weaknesses. In addition to assisting the individual student's development, these evaluations provide important information about the effectiveness of the program in achieving its goals and objectives and meeting its responsibilities to its students, the profession, and society.

8.2. Criteria for Evaluation

The following areas of functioning are examined in the evaluation process:

Academic Work: Students are expected to maintain above a **B** average in all coursework. **C's** in required Clinical or Departmental core courses are not acceptable.

Research: Students are expected to demonstrate initiative and competency in pursuing their research requirements and independent research interests and to attend division and departmental research presentations.

Interpersonal/Professional Development: Interpersonal and personal qualities are considered primarily as they impact on the student's academic and professional activities. In this regard, students are expected to maintain appropriate interpersonal relationships and an openness to feedback and new learning experiences. In terms of professional development, students are expected to demonstrate research standards, to adhere to the policies and expectations of all research and industrial engineering settings in which they work, and to carry out responsibilities in a professional manner. The department will make every effort to provide professional development opportunities.

Progress in Meeting Program Requirements: Students are expected to maintain consistent progress toward their degree and to meet the deadlines for completion of requirements as set by the Program.

8.3. Procedures and Review Feedback

Prior to the scheduled review, the student may meet with his/her advisor to discuss his/her progress. The general results of each student's review are presented by the advisor to the faculty in attendance at the Annual Review Meeting. All students are discussed. After the faculty meeting, the department provides feedback in writing to the student.

8.4. Procedures for Handling Problem Situations

In most cases, students are making satisfactory progress and the review serves primarily to highlight strengths and weaknesses and to aid in educational planning. It is also hoped that periodic thorough reviews will enable problem areas to be identified and remediated before they become major concerns. It is possible, however, that the Graduate Committee may note problems that raise serious concerns about a student's suitability for the profession of industrial engineering and/or a student's motivation to complete the Program.

For instance, the most common problem situation that arises is a student's failure to make expected progress on his/her research. For example, our Program expects students to finish the candidacy exam by the end of the first year.

Our Program policy is that students who fail to complete the Candidacy Exam by the end of the Spring semester of the 1st year or who are asked to retake specific exams are placed on probation.

In other cases, when the Graduate Committee has serious concerns about a student's status in the Program, the student will be given the opportunity to present additional materials for consideration and/or appear before the Committee who is responsible for considering all available information and making a judgment regarding the student's status. If serious problems or deficiencies exist, probationary status or dismissal from the program may be recommended. In either case, the reason for such action must be communicated to the student in writing and in a meeting with the advisor and the Director of Graduate Studies. Placement on probationary status also requires that the

student be given a time-limit for the probation and a recommended plan for remediation of the problem area(s). It should be stressed that dismissal from the Program is considered an extreme action and one that is not often taken. Since students are a highly select group, the Committee operates under the assumption that all students will successfully complete the Program. All efforts are thus directed toward that end.

8.5. Appeal Procedures

The faculty make every effort to ensure that each student's progress is carefully reviewed and the resulting feedback is accurate and constructive. There may be, however, instances in which a student feels that a review decision is unjust or is based on incomplete or inaccurate information. If this occurs, there are appeal channels available to the student.

First, the student should discuss his/her concerns with their Advisor in order to resolve any misconception or misperception. If the Adviser and the student are not able to resolve the concern, an appeal may be directed to the Director of Graduate Studies and the IEMS Chairperson. The University policy for academic-related grievances is provided in The Graduate School Catalog. For non-academic matters, such policies are provided in the Northwestern Student Handbook.

9. FINANCIAL ASSISTANCE

The Program in Industrial Engineering is an intensive, full-time endeavor that requires one's full efforts and energies. Because of this, the Program attempts to provide financial support for Ph.D. students in good standing who are taking a full course load. Our goal is to provide some form of University support for a student's first four years in the Program. For the fifth year and beyond, the department does not guarantee funding and each student will be considered based on the available funds. While on internship, students are supported by the internship setting.

There are additional funding opportunities besides those mentioned below. For example, there are usually university assistantships obtainable through units such as the Transportation Center, Murphy TA Fellows, or Final Year Cabells.

The Department will fund all first year students on fellowships which do not require outside time commitments such as research or teaching. After the first year, the student will align themselves with an advisor and be supported by the advisor's grants. If advisors do not have grant money to support students, the department may choose to step in and provide funding. The department makes its decisions regarding student funding based upon the availability of funding and progress in the program.

Regardless of the funding source, students should not be concerned during their first four years about being funded. All funding is guaranteed unless the student is on probation or has stipulations to their matriculation or continuation in the program.

9.1. Graduate Assistantships

Assistantships for second year and older students provide a stipend plus full-tuition remission and require that a student work 20 hours per week as a research assistant (RA) for a faculty member(s) in the IEMS Department or as a teaching assistant (TA) for a faculty member who is teaching large undergraduate classes.

For students interested in going into academia, the department can arrange for Instructor positions. These require that students teach their own undergraduate class(es). Assistantships are

awarded on an as needed basis, with top priority given to students in their first four years of the Program. Other factors taken into consideration in awarding assistantships include performance in previous assistantships and overall progress in the program

9.2. Outside Employment

University funding is provided to enable students to devote full-time to graduate study. As such, students who are given University assistance agree not to hold outside employment. In instances where the University is unable to provide financial assistance (e.g. advanced students completing the dissertation), it is recognized that students may need to secure part-time employment. Completion of degree requirements, however, should remain the top priority and a full-time pursuit. International students are not allowed to pursue any employment outside of Northwestern due to visa restrictions.

10. STUDENT REPRESENTATION AND COMMITTEES

Students are strongly encouraged to participate in the professional life of the IEMS Department by participation on committees or in INFORMS.

10.1. Graduate Liaison Committee (GLC)

The Program and the Department values students' input and reactions. Generally each class of graduate students (1st, 2nd, 3rd, and 4th+) selects a student representative to attend the Graduate Liaison Committee meetings held monthly each academic quarter. Student representatives are expected to share student concerns, raise and discuss issues, and help gather information from other students and convey information back to the faculty. The committee also helps to plan recruiting weekend.

10.2. INFORMS

INFORMS is the graduate student chapter of the nationally recognized INFORMS organization. The membership body and executive board is composed of IEMS graduate students beyond their first year. They help to organize the annual INFORMS conference and the department brown bags.

10.2.1 Brown Bag Seminars

Brown bag is a lunch seminar series designed exclusively for first-year students of the MS and PhD programs at IEMS Department. It provides an opportunity for the 1st years to hear invited speakers on a wide range of subjects that will definitely interest them. The motivation behind the series is two-fold: to help orient the 1st years for their new roles as graduate students, and to help settle them into the IEMS Department, into Northwestern University and into the field of industrial engineering and management sciences at large. 1st year students are encouraged to go to each of the BB sessions. The potential subjects for this one-year series include the following:

- IEMS faculty members introducing their research interests and opening projects (they will be held mainly in the latter half of the year);
- Creating IEMS student web page;

- Job and internship finding help;
- Improving presentation skills;
- Advice from senior students;
- Other topics that students are interested in.

10.3. Northwestern Organizations

We also invite our students to take advantage of the resources available within the University and local community.

11. DEPARTMENT/UNIVERSITY INFORMATION & FACILITIES

The following services are available through the IEMS department:

11.1 Graduate Offices

Each PhD student is guaranteed an office space during their first four years in the department. While generally there is room for all students, MS and 5+ year students are not guaranteed this space. Computers are provided by the student's advisor (unless they are not needed). First year students have computers available at their space in the first year office through the department.

11.1.1 Graduate Office Rules & Regulations

- Students are responsible for the cleanliness of their office – each student's area must be kept free of food debris
- Students need to clean the white boards at least once a week to keep them in good condition. Writing left too long becomes permanent.
- Offices are not to be used as a meal room (except for occasional snacks). Food, especially with strong aromas, should be eaten in the Tech Express cafeteria.
- Students must have a unanimous decision between office mates to change anything in the office (e.g., printer server placement, mini fridge, etc) and no changes should involve any movement of the main furniture or be an inconvenience to students.
 - Each year, any office with changed items must allow students in the office to reconsider their initial choice. This should be done after office assignments during the summer (or when everyone returns in the fall)
- There will be no parking of bicycles in the offices
- English should be spoken at all times when in any departmental area, including graduate student offices. Students should get into the habit of speaking English regardless of country of origin.
- Offices are for official use only – they are not for social gatherings or other activities that may disrupt other student's work/research.
- TA's should host their office hours in the room provided for this purpose, C236. TA hours are not to be held in graduate student office space for any reason. There are no exceptions.

11.2 Mailboxes:

Each student has a departmental mailbox located in C220 (the Student Life hallway). Mail will be distributed to mailboxes each day. Packages will be left in the Copy Room to insure safety. Faculty and Staff mailboxes are located in C210. There are bins for campus mail and stamped

mail in the copy room.

11.3 Copy Equipment:

The copy machine is located in room C210 and will be available for use free of charge during regular office hours. (M-F 8:00 a.m. to 5:00 p.m.) Each student will be provided with a user name and password to the copier as well as have a finger vein scan done. A maximum of 500 pages may be copied or printed each quarter on a student account. Students can request to have their limit extended should they have extenuating circumstances (e.g., they are proposing or defending, etc). The copier privileges are offered to make your educational experience smoother by making it easier for you to copy lecture notes, research papers, etc.

If you are a TA, you may copy your class handouts, exams and other materials. The copier privileges will be canceled if it is found that they are misused, e.g., if you violate copyright laws by copying parts of a book or if you copy materials for persons not belonging to the department or if you consistently exceed your page limit. Paper is located on the metal shelving unit next to the copy machine. The copier also has scanning capabilities to email. Please see the Program Assistant for training or if the copier becomes jammed so that we may resolve the problem in a timely manner.

11.4 Fax Machine:

The department fax machine is available for your use at no charge. Long distance faxes, any calls outside the 312, 847, 630, 708, or 773 area codes, require the use of a long distance code. Please see the Program Assistant for assistance when sending long distance faxes. Only school-related business is authorized. Faxes may be received at this fax machine as well (free of charge). The number is (847) 491-8005.

11.5 Keys:

You will receive three door keys: one to the graduate mailbox room/TA office, one to the outer door of the Tech Building, and one to your graduate office. You will also receive desk keys to your station. You will be charged a replacement fee to replace lost keys (\$25.00 per building/room key and \$10.00 for a desk/overhead bin key). You are responsible for bringing your keys with you each day.

11.6 Office Supplies:

Please see the Program Assistant in room C210 for supplies. A limited number of supplies are available for your use.

11.7 Paychecks:

For those students receiving funding, paychecks are direct deposit only. We do not receive paper checks or stubs unless you are being reimbursed. They will be available on the last working day of the month, beginning in September. For consistency in financial matters, including payroll, the twelve-month calendar is divided into four quarters:

Fall: September – November
Winter: December – February
Spring: March – May
Summer: June – August

Even though the beginning and end of classes may not be within these months, you are paid according to this schedule.

It is highly advisable that you sign up for direct deposit for those of you receiving stipend checks. This ensures that the paycheck is in your account in a timely fashion.

11.8 TA Room (Tech, C236):

You are required to reserve time in this room with the Coordinator of Graduate Student Life at the start of each quarter. Booking is on a first come first served basis. Each week the schedule will be posted outside of the room. This room is for TAs only and is not to be used for social activities. Exceptions can be made for research groups or study sessions but TA hours have first priority.

11.7.1 Rules and Regulations for TA Office

- TA's should host their office hours in the room provided for this purpose, C236. TA hours are not to be held in graduate student office space for any reason. There are no exceptions.
 - Please do not leave signs on the door asking students to meet you in your office. You are to be in the office when you have assigned hours.
- You may not check out C211 for TA hours unless you can demonstrate a need for the space (e.g., early TA hours have more than 5 students attending at a time). Even when C211 is reserved, departmental functions have priority. The room can be rebooked for another purpose on short notice.
- TAs are required to wipe down the whiteboards after every session.

11.9 Conference Room:

The department has one conference room, C211, and one seminar room, M228. Time must be reserved for both of these rooms with Terri Pedersen. You must be trained to use and check out the A/V equipment in M228. The First Year Brown Bags will be located in C211.

11.10 Kitchen:

The department kitchen is located next to our conference room M228 in the hallway right outside the department. You may use any of the kitchen facilities (microwave, refrigerator, stove, sink). With such a large number of people sharing these facilities, **it is essential that everyone cleans up after themselves. Wash your dishes, wipe off the counter, do not leave old food in the refrigerator, etc.!** Graduate students use the refrigerator in this kitchen. It is, therefore, the responsibility of the graduate students to clean out and defrost the refrigerator on a monthly basis. Coffee, tea, spring water, and hot cocoa are available in room C210. Please help yourself.

11.11 WildCARD:

Your University Identification card is called the "WildCARD." This card provides the following services:

- Library privileges
- Admittance to the Sports Pavilion and Aquatic Center (SPAC)
- Value can be stored on the card to use in vending machines, washers, dryers and photocopiers
- Turn your WildCARD into a bank card by linking it to a LaSalle Bank checking account
- Admittance to sporting and other University events

The WildCARD Office is located on the Underground Level of Norris Center. For further information, visit their website at: <http://www.univsvcs.northwestern.edu/WildCard/index.html>.

11.12 NetID:

The Northwestern University Network Identifier (NetID) and password identify you to the NU network and allow you to access a variety of resources and services such as NU calendar, NU email, library resources, IT lab printing, Blackboard and CAESAR. Further information about your NetID can be found at <https://snap.it.northwestern.edu/>.

12. THE GRADUATE SCHOOL (TGS)

If you are receiving financial aid, Northwestern University requires that you maintain full time registration throughout the academic year. Full-time registration, according to Northwestern University regulations, means three or four courses per quarter or registration in a 598, 599, 503, or 512 course.

12.1 Advisors & Student Services Staff:

Larry Henschen, Associate Dean Student Services
henschen@ece.northwestern.edu 847.491.8485

Lesley Perry, Director Student Services
l-perry2@northwestern.edu 847.491.7332

Antoaneta Condurat, Counselor Student Services (Student last names beginning with A-J)
a-condurat@northwestern.edu 847.491.8469

Kate Veraldi, Coordinator Student Services (Student last names beginning with K-Q)
k-veraldi@northwestern.edu 847.467.4108

Stephen Scott, Assistant Director Student Services (Student last names beginning with R-Z)
sms@northwestern.edu 847.491.3226

12.2 Academic Standing:

You are required to remain in good academic standing. You must maintain at least a 3.0 average. If your performance falls below acceptable standards, you will be notified by The Graduate School and the appropriate action will be taken. For further information on academic standards, please visit the Graduate School's website at: <http://www.tgs.northwestern.edu/>. You can also check with the Graduate Program Coordinator or the advisors at The Graduate School if you have any questions about Graduate School policies.

12.3 Health Insurance:

The State of Illinois requires all full-time students to maintain health insurance that meets the state's standards. In order to meet these standards, coverage must meet the following criteria:

- * Minimum of \$250,000 in coverage per year
- * Annual deductible must not exceed \$1000

- * Provide coverage for inpatient and outpatient services anywhere in the U.S.
- * Provide coverage for inpatient and outpatient mental health services
- * Includes coverage for pre-existing conditions

The University has contracted with the Aetna Student Health Plan for the academic year to provide health insurance that meets or exceeds these standards. The cost of the health plan for graduate students is \$2,360.00 with a \$250 annual deductible.

A complete brochure, regarding the health insurance program, may be found at <http://www.aetnastudenthealth.com>. Go to "Students". This will direct you to the "Student Connection" page. Click "Find Your School". Enter "Northwestern University" or type "812845" as the policy number. Click on "Search". Northwestern University should appear. Click on "Benefits Details" on the menu at the left side of the page. Click on "2008-2009 brochure".

All students must enroll in this plan or indicate they have equivalent health insurance through another source.

All **new entering full-time graduate students** must complete the online "Coverage Selection Form" (CSF) through CAESAR. The form is located at www.northwestern.edu/caesar and must be completed no later than October 1, 2008. Students who miss the deadline will automatically be enrolled in the university's health insurance plan. Billing for the university's health insurance plan will take place upon completion of registration.

For **returning full-time students**, who enrolled in one of the NU Plan for the previous academic year, your health insurance coverage will automatically roll over into the new plan for the current academic year. Returning students are not required to complete any forms. But students should take time to thoroughly review the new health insurance plan. Returning students who wish to opt out of the NU insurance plan must complete the online CFS Form through CAESAR at www.northwestern.edu/caesar. If a student wishes to no longer participate in the plan and discovers that their student account was billed for the NU plan, they should contact the Insurance Office at (847) 491-4134 or (847) 491-2114 to request removal of charges.

For **more information** about the Health Insurance plans contact Wendy Weaver, Health Service Administrator from the Office of Risk Management, is available to meet with any student or student group seeking further information about health insurance. You may contact Wendy at 847/491-2113 or w-weaver@northwestern.edu.

Aetna's Customer Service department is also available Monday through Friday from 8:30 to 5:30 ET at 877/480-4161. Detailed Plan information is provided online through Aetna's Student Connection at www.aetnastudenthealth.com.

12.4 Activity Fee:

The Graduate School implemented a new, mandatory activity fee of \$60 per quarter (\$240 for 4 quarters) that began winter quarter 2007 to support new services for full-time students of The Graduate School. The services that became available January 3, 2007 include:

- * U-Pass (a special fare card to be used on all Chicago Transit Authority (CTA) transportation (the El system and Pace buses) for all full-time "resident" students in The Graduate School)
- * Legal services from an attorney to assist with issues such as landlord issues, credit and debt problems, traffic violations
- * Community building activities and professional development opportunities that will include events such as the "TGS Night Out"

To be clear, \$56 of the \$60 activity fee funds the U-Pass. The U-Pass can be picked up at the very beginning of each quarter in the Lobby of the Technical Institute. It can also be picked up at any point during the quarter from the main office of The Graduate School located in the Rebecca Crown Center at 633 Clark Street at the South End of Campus.

12.4.1 Billing

The \$60 activity fee will be posted to the student's tuition and fee account quarterly based on their enrollment status for that academic quarter. **Students are responsible for paying the fee**

themselves on Caesar. Note: this fee is not an allowable expense on sponsored projects.

Students enrolled in 512 (continuous registration), 513, 514, 510 (Co-op internship) 506, 507, 508 and those with other less-than-full-time registration will not be charged the activity fee and are NOT eligible for the activities described in this announcement.

Please direct all questions regarding the mandatory fee and any of the services provided by it to Penny Warren, Assistant Dean of Student Life and Multicultural Affairs at The Graduate School, telephone, 847-491-8507 or by e-mail at p-warren@northwestern.edu.

13. GRADUATE PROGRAM CALENDAR

This calendar will give you a general idea about each year's plan. You should check The Graduate School calendar each quarter for the precise dates. Some of these dates are **required**; those are indicated in **bold type**.

<u>COURSE REGISTRATION</u>	<u>APPROXIMATE DATE</u>
Register for Fall Classes	Early September (or during Spring Quarter)
Begin Fall Classes	Mid September
Register for Winter Classes	December
Begin Winter Semester	January
Register for Spring Classes	March
Begin Spring Semester	April
<u>FIRST YEAR TASKS</u>	<u>APPROXIMATE DATE</u>
Talk to potential advisors about research interests	End of Winter Quarter/Beginning of Spring
Become involved with a research team	Summer following first year
Candidacy Exam	Mid June
Apply for M.S. Degree Graduation	by Fall, Second Year for December Conferral
<u>SECOND YEAR TASKS</u>	<u>APPROXIMATE DATE</u>
Meet regularly with Advisor	Year-round
Develop schedule for progress	Beginning of Fall quarter
<u>THIRD YEAR TASKS</u>	<u>APPROXIMATE DATE</u>
Meet regularly with Advisor	Year-round
Masters Thesis Proposal Defense Meeting	By end of Spring Semester, third year (4th at the latest)
<u>FOURTH AND FIFTH YEAR TASKS</u>	<u>APPROXIMATE DATE</u>
Ph.D. Data Collection and Analysis	Fall-Spring, Fourth Year
Apply for Ph.D. Graduation	End of April/Beginning of May, year of Graduation
Defend Ph.D. Dissertation	May – middle of June, Fourth (anytime fifth)
Submit dissertation on-online	Middle of quarter (Dec. Conferral), May/June (Spring Conferral)

Appendix A – Curriculum Planner

Ph.D. Curriculum Planner for students entering during or after 1998-99

Student Name:		Starting Date:	
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Category	Course	Title	Quarter Taken	Professor	Grade
Core	IE 401	<i>Intermediate Statistics</i>			
	IE 450-1	<i>Mathematical Programming I</i>			
	IE 460-1	<i>Stochastic Models I</i>			
	IE 480-1	<i>Production/Logistics I</i>			
	IE 480-2	<i>Production/Logistics II</i>			
	IE 488	<i>Economics/Decision Sciences</i>			
Required	IE 435	<i>Simulation</i>			
	IE 450-2	<i>Mathematical Programming II</i>			
	IE 460-2	<i>Stochastic Models II</i>			
Major:		Area:			
Course 1					
Course 2					
Course 3					
Course 4					
Minor 1:		Area:			
Course 1					
Course 2					
Minor 2:		Area:			
Course 1					
Course 2					
Other Courses:					
TA Experience:					

Exam	Date Taken	Committee Members	Result
Candidacy Exam			
Prospectus (Proposal)		Chair:	
Dissertation Defense		Chair:	

Appendix B – Major and Minor Worksheet

Red text indicates recent changes.

Courses

	<i>Stochastic Modeling and Analysis</i>	<i>Optimization</i>	<i>Financial Engineering</i>	<i>Production and Logistics</i>	<i>Decision and Risk Analysis</i>	<i>Applied Statistics and Quality Engineering</i>	<i>Organization Theory and Systems Analysis</i>
IEMS 461 Advanced Stochastic Models	X		X				
IEMS 464 Advanced Queueing Theory	X						
IEMS 465 Simulation Experiment Design and Analysis	X					X	
IEMS 466 Computational Methods in Applied Probability	X						
IEMS 468 Stochastic Control	X						
MATH 450-1,2 Probability	X						
MATH 462-1,2,3 Stochastic Processes	X						
ECE 486 Queueing Models for Computer Communication	X						
MECS 463 Stochastic Calculus and Control with Applications (Baris Ata Spring 2006)	X						
IEMS 452 Combinatorial Optimization		X					
IEMS 454 Large-Scale Optimization		X					
IEMS 459 Design and Analysis of Heuristics		X					
IEMS 457 Integer Programming		X					
IEMS 458 Advanced Mathematical Programming		X					
IEMS 490 (Daskin) Heuristic Methods in Optimizat - Winter 2004		X					
ECE 457 (Hai Zhou) Advanced Algorithms - Spring 2006		X					
IE 490 (Klabjan) Dynamic Programming (Fall 2008)	X	X					
IE 490 (Fourer) Optimization Srv&Cyberinfrastr (Spring 2007)		X					
IE 490 (Homem-de-Mello) Stochastic Optimization (Spring 2007)	X	X					
IEMS 373 Introduction to Financial Engineering (Winter 2004 or earlier only)			X				
IEMS 473-1,2 Financial Engineering I,II			X				
FINC 485 Introduction to Finance			X				
FINC 487 Dynamic Asset Pricing Theory			X				
FINC 488 Econometrics of Financial Markets			X				
IEMS 490 (Birge) Stochastic Optimization and Financial Engineering			X				
IEMS 490 (Staum) Simulation for Financial Engrn - Fall 2004			X				
OPNS 470 Operations Economics				X			
IEMS 482 Routing and Scheduling				X			

IEMS 483 Reliability and Maintenance in Production Systems				X			
IEMS 484 Inventory and Distribution Systems				X			
IEMS 485 Stochastic Models of Manufacturing Systems				X			
IEMS 486 Logistics Management				X			
IEMS 487 Investment Decisions and Engineering Analysis				X	X		
IEMS 489 Transportation Network Design and Operation				X			
IEMS 490 (Smilowitz) Terminal Operations & Design				X			
IEMS 490 (Daskin) Adv Location Modling & Algorith - Fall 2004, Spring 2005, Fall 2007				X			
CE 471-1,2 Transportation Systems Analysis				X			
CE 479 Transportation Systems Planning and Management				X			
CE 480-1,2 Travel Demand Analysis and Forecasting I, II (1) (1)				X	X		
CE 482 Evaluation and Decision Making for Infrastructure Systems				X	X		X
Bus 40901 (Univ of Chicago - Eisenstein) Self-Organizing Logistics Systems				X			
IEMS 445 Decision and Risk Analysis					X		
IEMS 448 Probabilistic Reasoning in Expert Systems					X		
MECS 460-1 Foundations of Managerial Economics I: Static Decision Models					X		
MECS 460-1 (Rakesh Vohra) beginning Fall 2004		X			X		
MECS 460-2 Foundations of Managerial Economics II: Dynamic Decision Models (1)					X		
MECS 460-3 Foundations of Managerial Economics III: Game Theory (1)					X		
MECS 462 Decision Theory					X		
Stat 325 Survey Sampling						X	
Stat 350 Regression Analysis					X	X	
Stat 351 Design and Analysis of Experiments					X	X	
Stat 352 Nonparametric Statistical Methods						X	
Stat 355 Analysis of Qualitative Data						X	
Stat 420-1,2,3 Advanced Statistics					X	X	
Stat 448 Multivariate Statistical Methods					X	X	
Stat 453 Survival Analysis					X	X	
Stat 454 Time-Series Analysis					X	X	
Stat 455 Advanced Analysis of Qualitative Data						X	
Econ 480-1,2,3 Introduction to Econometrics						X	
Econ 481-1,2,3 Econometrics						X	
Econ 482 Applied Econometrics: Time-Series Methods						X	
Econ 483 Applied Econometrics: Cross-Section Methods						X	
IEMS 490 (Apley) Data Mining Methods in Engg - Fall 2005						X	
IE 490 (Ankenman) Advanced Experimental Design (Spring 2007)						X	
IEMS 410 Introduction to Technology Management							X
IEMS 411 Field Research in Organizations							X
IEMS 413 Information Systems and Telecommunications Management							X

IEMS 419 Technical Entrepreneurship Inside and Outside the Company								X
IEMS 430 Systems Analysis								X
IEMS 432 Systems Engineering								X
IEMS 433 Theory and Practice of Evaluation								X
IEMS 434 Systems Methodology								X
IEMS 436 Engineering Project Management								X
IEMS 441-0 - Social Network Analysis								X
MORS 424-1 The Individual and the Organization								X
MORS 424-2 Social Processes In Organizations								X
MORS 425-1 Behavior In Organizational Systems								X
MORS 425-2 Organizations In Their Environments								X
MORS 426 Empirical Research In Organization Behavior-Methods and Practice								X
MORS 427 Laboratory Experimentation With Organizations								X
MORS 451 Designing Organizational Systems								X

The following courses do not count towards any PhD major area

MEM Courses

IEMS 402 Engineering Management
 IEMS 403 Accounting Issues for Engineers
 IEMS 404 Financial Issues for Engineers
 IEMS 405 Marketing Issues for Engineers
 IEMS 407 Quantitative Methods for Decision Making
 IEMS 413 Information Systems and Telecommunications Management
 IEMS 414 Information Systems Design and Installation
 IEMS 415 Computer Simulation for Risk and Operations Analysis
 IEMS 416 Business Process Change Management
 IEMS 417 Product Development for Engineering Managers
 IEMS 419 Technical Entrepreneurship
 IEMS 423 Accounting Issues for Engineers
 IEMS 424 Leadership and Organizational Behavior
 IEMS 425 Financial Issues for Engineers
 IEMS 426-1 Project Management I
 IEMS 426-2 Project Management II
 IEMS 427 Operations Analysis
 IEMS 428 Design for Six Sigma
 IEMS 429 Negotiations for Engineers
 IEMS 431 Marketing Issues for Engineers
 IEMS 437 Strategic Management for Engineers
 IEMS 439 Business Laboratory
 IEMS 471 Factory Physics
 IEMS 486 Logistics and Service Operations Management
 IEMS 487 Legal and Political Dimensions of Telecommunications
 IEMS 490 (Gellman) Strategic Management of Tech & Innov
 IEMS 490 (Frey) Product Management - Spring 2005, Spring 2004
 IEMS 490 (Werwath) Business Process Change Management - Spring 2005
 IEMS 490 (Klein) Leadership and Organ. Behavior - Winter 2004
 IEMS 490 (Chow) Technology for E Business - Spring 2004

Cross-listed with MGMT 464

IEMS 490 (Hopp) New Product Innovation - Spring 2005

- LOC 440 Strategic Change: Methods for Practice
- LOC 441 Strategic Change II: Methods for Practice

Strategic Change: Methods for Practice

LOC 430 Knowledge Management

- LOC 431 Knowledge Management II

Knowledge Management II

MPM 336 Project Scheduling

MPM 338 Public Infrastructure Management

DSGN 395 Fundamentals of Lean Six Sigma

Related Course in the Department of Chemical Engineering

CHEM ENG 459 Topics in Process Simulation and Monitoring (1)

Related Courses in the Department of Civil Engineering

CIV ENG 477 Computers in Engineering Design, Management, and Decision Making (1)

Related Course in the Department of Computer Science

COMP SCI 336 Design and Analysis of Algorithms (1)

Related Courses in the Department of Economics

ECON 410-1,2,3 Microeconomics (1) (1) (1)

ECON 412-1,2 Economic Theory and Methods (1) (1)

ECON 414-1,2 Economics of Information (1) (1)

Related Courses in the Department of Electrical and Computer Engineering

ECE 313 Telecommunication Networks for Multimedia (1)

ECE 333 Introduction to Communication Networks (1)

Has been taught jointly with IE 450-2 in Winter 2002, 2003, 2004, 2005

ECE 479 Nonlinear Optimization (1)

ECE 490 Advanced Robotic Systems (1)

Related Course in the Department of Engineering Science and Applied Mathematics

ES APPM 442-1,2,3 Stochastic Differential Equations (1) (1) (1)

Related Course in the Department of Management and Organizations

MORS 459 International Technology Management: Competitive Intelligence, Strategies, and Structures (1)

Related Courses in the Program in Managerial Economics and Strategy

DECS 444 Stochastic Models for Management and Economics (1)

OPNS 452 Operations Scheduling (1)

OPNS 453 Inventory Management (1)

OPNS 455 Logistics: Location, Transportation, and Allocation Aspects

MGMT 467 Transportation Policy

Related Courses in the Department of Mathematics

MATH 310-1,2,3 Introduction to Real Analysis (1) (1) (1) (old numbering)

MATH 320-1,2,3 Introduction to Real Analysis (1) (1) (1)

MATH 321-1,2,3 MENU: Real Analysis (1) (1) (1)

Related Course in the Department of Mechanical Engineering

MECH ENG 442 Metal Forming (1)

Related Course in the Department of Sociology

Course Completion Verification Form

This must be completed and signed at the time of your prospectus exam to verify you are successfully progressing towards degree completion.

Please return this form to the Coordinator of Graduate Student Life at the time of your prospectus exam.

Student Name:		Starting Date:	
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Category	Course	Title	Quarter Taken	Professor	Grade
Core		<i>Intermediate Statistics</i>			
		<i>Mathematical Programming I</i>			
		<i>Stochastic Models I</i>			
		<i>Production/Logistics I</i>			
		<i>Production/Logistics II</i>			
		<i>Economics/Decision Sciences</i>			
Required		<i>Simulation</i>			
		<i>Mathematical Programming II</i>			
		<i>Stochastic Models II</i>			
Major:	Area:				
Course 1					
Course 2					
Course 3					
Course 4					
Minor 1:	Area:				
Course 1					
Course 2					
Minor 2:	Area:				
Course 1					
Course 2					

Exam	Date Taken	Committee Members	Result
Candidacy Exam			PASS
Prospectus (Proposal)			

Student Signature: _____ Date: _____

Advisor Signature: _____ Date: _____

Department Signature: _____ Date: _____

DESIGNED MAJOR & MINOR REQUEST FORM

NAME: _____ ID: _____

ENTRANCE IN PROGRAM : Fall 20____ DATE OF REQUEST: ____ / ____ / ____
Requests cannot be made any earlier than after the completion of one year of study.

In their initial three years, PhD students also complete a 4-course major and two 2-course minors consisting of graduate level courses from IEMS and other selected engineering departments. Majors and minors may be chosen from the following areas:

- Stochastic Modeling and Analysis
- Optimization
- Financial Engineering
- Production and Logistics
- Decision and Risk Analysis
- Applied Statistics and Quality Engineering
- Organization Theory and Systems Analysis

Representative courses in these areas are listed in the Ph.D. Major and Minor Areas Document. Students also may petition to substitute a major or minor area of their design with approval from their advisor and the Graduate Committee. Please list the courses below and the name of the designed major or minor. **A different form must be submitted for each designed area.**

TITLE: _____ CIRCLE: MAJOR MINOR

COURSE 1: _____ Year Taken: _____
Full Course Title and Instructor

COURSE 2: _____ Year Taken: _____
Full Course Title and Instructor

COURSE 3: _____ Year Taken: _____
Full Course Title and Instructor

COURSE 4: _____ Year Taken: _____
Full Course Title and Instructor

Student Signature: _____ Date: _____

Advisor Signature: _____ Date: _____

Do not mark below this line – DGS use only

Date Presented to Graduate Committee: _____

___ I approve the designed area as listed ___ I approve the designed area with the following modifications (See below)

Modifications:

Graduate Director Signature: _____ Date: _____

Do not mark below this line – Office use only

Date Processed: _____ Graduate Coordinator Signature _____

Registration and Residency

For these instructions courses are defined as one credit classes you register for that meet regularly with faculty instruction. You will receive a grade of A – F for these courses.

If you are being supported by the department in the form of a fellowship, teaching assistantship or research assistantship, you must be registered full-time, or 3-4 units. If you need to be registered full-time and will not be registering for courses, you should register for one of the graduate school general registrations. This is typically used during summers or once you've completed your course requirements. These registrations do not count toward your residency requirement of 8 quarters of full time graduate coursework, including 590 Research. They simply allow you to maintain full-time status and use university facilities at a reduced tuition level.

Students registering for TGS 500, TGS 512, or TGS 513 should use CAESAR, the online registration system. Current students unable to register online may do so by e-mailing his or her TGS Student Services representative (See TGS Staff to find your assigned representative). Please cc: Adam Cebulski on all requests regarding registration issues. Students may register for TGS 500 and non-required courses. However if you are in TGS 500 status and will be doing more than two courses, please do not register for TGS 500 and just register for the 3+ classes. Information about deadlines and procedures for registration is available at The Graduate School office or on the IEMS calendar.

Residency

A student pursuing a doctoral degree must complete eight quarters of residency consecutively over two years, including summers (see the PhD Timeline for Completion). Any alterations in the residency timeline can be managed through Leave of Absence requests. Per the continuous registration policy, all doctoral students must be registered at Northwestern University in each of the fall, winter and spring terms until all degree requirements have been completed, including dissertation submission to The Graduate School.

Residency and Transfer Credit

No residency credit will be awarded by The Graduate School for work completed in a graduate program outside of The Graduate School. Individual programs may waive course requirements based on work completed at another institution (either prior to or after enrollment at Northwestern), but all students must complete nine graded courses in The Graduate School and maintain a B average (3.0 GPA). Students may register for 590 Research within their programs to maintain full-time registration during quarters in which they are not enrolled full time in graded coursework.

IEMS 590 Research

Department courses identified as 590 Research, which apply toward residency, may be taken for one, two, three, or four course units per quarter. Generally, this registration is not available to students until a core of basic courses has been completed. (This is not a TGS class)

Continuous Registration (TGS 512)

All active students in The Graduate School must be registered at Northwestern University in each of the fall, winter and spring terms until all degree requirements have been completed, including dissertation submission to The Graduate School. Students in the following categories are in compliance with this requirement for continuous registration:

- Students who are registered for at least one Graduate School course, including courses for zero credit and courses numbered 590.
- Students who are registered for TGS 500.
- Students who are registered as CIC Traveling Scholars.

Any student not satisfying one of these conditions during a fall, winter or spring quarter must register for TGS 512 if the student has not reached his/her degree deadline. Any student beyond his/her degree deadline must register for TGS 513. This policy applies to all students who are continuing in their degree programs, including students away from campus or on leave for any reason (medical, family, research, etc.) and students who are unfunded (without any stipend or tuition scholarship). Students in terminal master's degree programs and PhD students who have not yet reached candidacy must meet with their advisor or DGS before registering for TGS 512.

Registration in TGS 512 confers the following benefits:

Continuation of the student's Net ID and email account,

- access to university facilities such as libraries, labs, and sports facilities,
- maintenance of one's visa status,
- the ability to defer student loans,
- the right to take additional cost-of-living loans (federal and alternative) as determined by their financial state, and
- the right to buy into the Northwestern health insurance policy (but not to qualify for the subsidy).

All doctoral students receiving any form of financial aid from or through the University must register full time for eight quarters of registration within their programs. Once the eight-quarter residency requirement has been met, students must register for TGS 500 while receiving aid. Students in TGS 512 will not be allowed to register for any additional courses.

Students who miss one or more quarters of registration (excluding summer) will be withdrawn from the University. Students who fall into this category and who wish to return to the university must submit the Application for Readmission form to TGS, and will be retroactively registered for TGS 512 in each quarter (excluding summer) that the student was not registered. Any missed tuition for a given quarter and retroactive registration fees must be paid to the University in order to gain readmission and restore good academic standing. Students will be notified via E-News of the above policy requirements and thus be reminded of the need to maintain this continuing student status. The tuition cost for 512 will rise in alignment with university-wide tuition increases.

TGS 513 Advanced Continuous Registration - Effective Fall 2008

PhD students are expected to complete the degree before the end of the ninth year from the date of matriculation (and must be continuously registered from the time of matriculation to the time of completion). Master's students are expected to complete the degree before the end of the fifth year from the date of matriculation. Students who have not finished by these times may continue to work towards completion but effective Fall 2008 will be required to register in each of Fall, Winter, and Spring Quarter for TGS 513 and pay the corresponding tuition (\$1000 per quarter).

Areas of Interest Around Campus

1. *International Office*: 491-5613, 630 Dartmouth Street. All international students are encouraged to check in with the international office when they get to campus. This office provides special instructions and help with international students' forms and regulations, and may be able to direct students to groups or activities at Northwestern geared toward their culture or interests. <http://www.nwu.edu/international/index.html>
2. *Technical Institute*: 2145 Sheridan Road.
3. *Sports and Aquatic Center (SPAC)*: 491-4300, 2379 N. Campus Drive. This facility houses an Olympic size swimming pool and indoor track, various Nautilus and Cybex weight machines, treadmills and Stairmasters, and basketball, tennis, squash and racquetball courts. It's nicer than most \$50 per month fitness centers and is conveniently located close to the Tech building. If you live on the south side of campus, try Blomquist Memorial Gym (617 Foster, 491-7250) which has a few courts, a weight lifting area, and an aerobics/spinning area. <http://www.nwu.edu/fitness-recreation/>
4. *Seeley G. Mudd Library*: 491-3362, 2233 N. Campus Drive. This is the Tech library, where most of the science and engineering books and journals are located. It's generally much quieter than the main library and has a great view of the lake.
5. *Norris University Center*: 491-2300, 1999 S. Campus Drive. This is Northwestern's student center, and it contains the school bookstore, a cafeteria (cafeteria hours: Mon-Thurs 8:00 am to 11:00 pm, Friday 8:00 am to 7:00 pm, Saturday 9:00 am to 3:00 pm, and Sunday 10:00 am to 8:00 pm) a convenience store, postal services, a reading library, as well as many other services. The cafeteria food includes Mexican, pizza, salad bar, Chinese, short order and Deli. A coffee bar and ice cream stand are located separately. The information desk on the first floor is a great source for answers to many and varied questions about Northwestern, and available services. <http://www.stuaff.nwu.edu/norris/>
6. *University Library*: 491-7658, 1935 Sheridan Road. Three towers and associated buildings contain the majority of Northwestern's collection of works in the humanities, social sciences, and history. Also, the business collection is located here.
7. *Kresge Centennial Hall*: 467-5560, 1859 Sheridan Road. This is where you go to obtain your Net ID.
8. *Campus Police*: Emergency: 456, 491-3254, 1819 Hinman. This is also where you get your parking permit. <http://nuinfo.nwu.edu/up/>
9. *Rebecca Crown Center*: 633 Clark Street. The Graduate School and Registrar are located in this complex.
10. *Human Resources*: 491-7362, 720 University Place.
11. *Searle Hall*: 491-8100, 633 Emerson. The Student Health Center is located in this building.
12. *Ryan Field and McGaw Hall*: Ticket Office: 491-2287. The stadium is the site of football games, while McGaw Hall contains Welsh-Ryan arena, home of the basketball team. Students get into the football games for \$8 each, or may purchase a season pass for \$36. Basketball tickets may be purchased for \$5 each or \$50 for a season pass. Tickets for individual games are sold on a first-come, first-serve basis, so you'll want to plan ahead.