

MASTER OF SCIENCE PROGRAM REQUIREMENTS AND GUIDELINES

THE UNIVERSITY *of* TENNESSEE

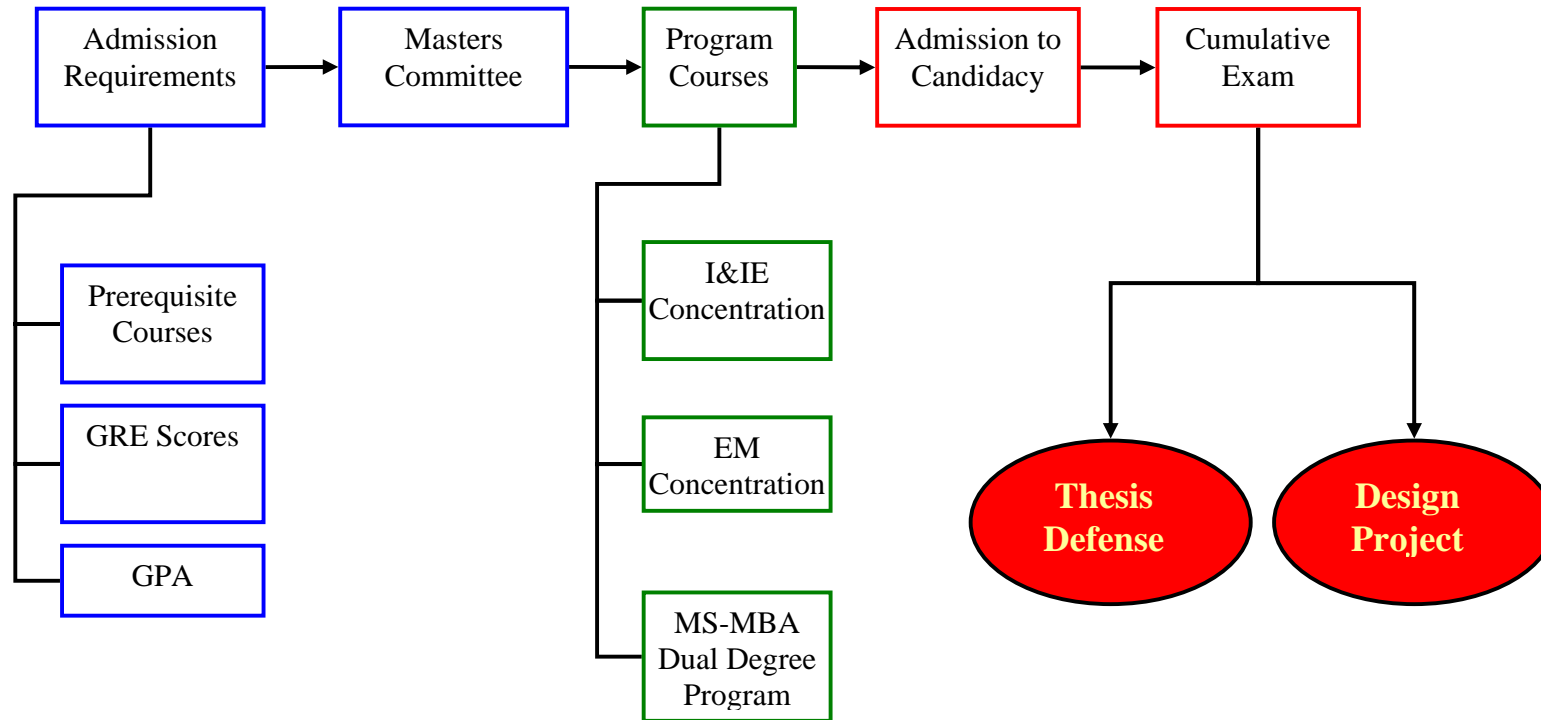
DEPARTMENT of INDUSTRIAL and INFORMATION ENGINEERING

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Masters Program

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I. Masters Degree Program Flowchart



II. ADMISSION REQUIREMENTS

In order to pursue any graduate program at The University of Tennessee, a formal application for admission must be made to The Graduate School. The graduate catalog includes instructions for the application procedure and a *Graduate Application for Admission* form. To request admissions information from the Graduate School, complete and submit the on-line application at <http://gsapp.dii.utk.edu/>. From this site you can download a copy of the entire application form, after you complete the on-line application and are ready to submit it, you will need to be able to print the signature form on a printer. The online graduate catalog can be found at <http://web.utk.edu/~gsinfo/toc.htm>

Admission to The Graduate School does not ensure acceptance into a specific degree program, nor admission to candidacy for the degree desired. The Department of Industrial and Information Engineering must approve all students for admission to potential degree status and non-degree status in Industrial & Information Engineering, and recommend appropriate action to The Graduate School. Admission by the Department of Industrial and Information Engineering is determined on a competitive basis. In addition to the minimal requirements of the Graduate School, the Department of Industrial and Information Engineering also requires the following:

Department Admission Requirements of the MSIE Program

- *The Graduate Committee will evaluate each applicant's background and may require additional or leveling coursework prior to admission.*
- Undergraduate degree from a qualified Engineering, Science or related program. U.S. Engineering programs must be ABET accredited.
- GRE Scores (General Test); requires a minimum score of 600 for quantitative and 40 on the analytical writing exam, any exceptions must obtain consent of the department Graduate Committee.
- Minimum GPA of 3.0 in a 4.0 scale during the senior year.
- English certification (e.g. TOEFL) as specified by the graduate school is required for all international students unless they have completed an undergraduate or other masters degree program at an English based institution.
- Essay (2 double-spaced pages) *Current Topic:* How will my experiences in the MSIE Program at the University of Tennessee enhance my career?
- Admission Recommendation Forms or letters of reference from 3 suitable references.

Admission Status may be one of the following, as defined by the IE department:

- **Regular Admission** – *students eligible to receive tuition waiver and/or financial support (fellowship, GTA, RA, etc.)*
- **Probationary Admission** – *students not eligible to receive tuition waiver or graduate assistantships*

International students with undergraduate degrees from foreign institutions, however, may not be admitted on probation. Applicants with work experience who are entering graduate school after at least 5 years away from an educational institution will be given consideration with greater flexibility relative to GPA. The graduate committee in the department sets any prerequisite courses or other measures that apply to the particular situation of the applicant. The department and the Office of Graduate Admissions and Records must be notified of any change in the entering date after admission has been granted.

- Changing from Probationary to Regular Admission
 - i. Complete a minimum of 9 hours of graduate course work toward the MSIE degree, with a minimum 3.0 GPA, and
 - ii. Written recommendation of faculty advisor.

Potential Degree Students

These students have met all requirements (with any specified prerequisite courses) for admission to the Master of Science program with a major in industrial and information engineering. A student must maintain a cumulative 3.0 grade-point average to continue enrollment in the Master of Science program.

Admission on Probation

Students (U.S. citizens only) may be admitted into the department on probation (upon recommendation by the department to The Graduate School) when the grade-point average is between 2.7 and 3.0. The basic question is whether the student can compete successfully in the Master of Science program and maintain an average GPA of at least 3.0. If admitted, The Graduate School requires that these students take 9 or more course hours for graduate credit and maintain at least a B average. If a student completes 9 or more hours for graduate credit and maintains at least a B average or better, the probation status will be removed by The Graduate School (upon recommendation by the department). The department, however, reserves the right to review the academic performance and program progress of the student and determine continuing acceptability for the master's program in the Department of Industrial and Information Engineering. Failure to maintain a B average while in this status results in dismissal by The Graduate School. *An international student cannot be admitted on probation.*

Non-Degree Students

The non-degree student can be a student of The Graduate School who may be taking coursework in industrial and information engineering but has not been admitted by the department to pursue a degree program. The student may elect non-degree status because a graduate degree is not desired, or because the student has not decided upon a specific program of study. Also, the department may admit a student as non-degree because there is some uncertainty about the

graduate program that the student wants to follow in industrial and information engineering. The student should be aware that there is a limit to the number of hours that can be taken while in non-degree status and applied toward a graduate degree. The graduate catalog states that the limit is 15 semester hours. An international student on a non-immigrant visa may not enroll in the non-degree status (for additional details see “Non-degree Admission” in the graduate catalog).

Financial support

Limited financial support, in the form of tuition waivers or fellowships, is available from the department for positions as Graduate Assistants, Graduate Teaching Assistants, or Graduate Research Assistants. The available positions are filled on a competitive basis, and students with a proven record in the Department of Industrial and Information Engineering are normally selected. A description of general policies that apply to all graduate assistantships is provided in the graduate catalog in the section titled, *Policy for the Administration of Graduate Assistantships*. This discussion covers topics such as the rights, responsibilities, evaluation, supervision, training, and work assignments of graduate assistants. The number of assistantships available varies from year to year as the research and other needs of the department and the operating budget changes. Students should make known their financial need and desire to compete for financial support to their major professor or to the Department Head. The major professor may or may not have support available for his or her students. The final decision on the award of an assistantship to any student is made by the Department Head.

Regularly Admitted students in the MSIE program are eligible for financial support; *Probationary* students are ineligible. Individual project Principal Investigators may select from *Regularly Admitted* students for RA appointments. Laboratory GTA appointments of *Regularly Admitted* students will be recommended by faculty responsible for each laboratory. All students receiving financial support from the IE department are required to select and complete the *Thesis Option* if that option is available in their degree program.

III. MASTER’S COMMITTEE

A committee composed of the major professor (chairperson) and at least two other faculty members (at least one of the two must be from industrial and information engineering), all at the rank of assistant professor or above, should be formed early in a student’s program. The committee assists the student with his or her thesis or project work and conducts the final examination. If the minor in statistics is part of the student’s program, one member of the committee must be from the Statistics Department. The major professor and the student are responsible for forming the committee and advising the graduate secretary. This is required for the completion of the Application for Admission to Candidacy form.

IV. PROGRAM PLAN

INDUSTRIAL AND INFORMATION ENGINEERING CONCENTRATION

The prerequisites and graduate course hour requirements (thesis and non-thesis) for each of the four areas of specialization available in the industrial and information engineering concentration in the Master of Science program are described in this section.

The following three prerequisite courses are required in this concentration for all specialties if not included in a previous undergraduate degree program in an *engineering discipline*. The engineering student may be exempted if an equivalent course was taken in his or her undergraduate program within the last six years, or if documented work experience has allowed the student to maintain currency in a subject area. Any other student from a technical curriculum that is admitted by the department may be required to take additional prerequisite courses. Additional prerequisite course requirements for a specialization, if any, are discussed later within that section. Competency with the personal computer is assumed.

Prerequisites*

Stat 251	Probability and Statistics for Engineers and Scientists
IE 301	Operations Research in Industrial and information engineering I
IE 405	Engineering Economic Analysis

- * Students off-campus (distance education) in the general industrial and information engineering (GIE) specialization who did not have an introduction to operations research course in their undergraduate program will take EM 537 (Analytical Methods for Engineering Managers) instead of IE 301. Statistics 251 and IE 405 are available off-campus utilizing electronic media at least one semester each academic year.

The course hour requirements for the thesis and non-thesis options in the industrial and information engineering concentration, as well as any additional prerequisites and the course requirements for each of the four specialization areas are discussed in the following sections.

General Course Hour Requirements

The semester graduate course hour requirements for the thesis and non-thesis options under the industrial and information engineering concentration are summarized below.

Coursework (credit hours):

	<u>Thesis Option</u>	<u>Non-thesis Option</u>
Industrial and Information Engineering Core	12	12
Industrial and Information Electives	9	9
Technical Electives	6	9

Thesis	6	0
IE Design (Capstone) Project	0	3
Total:	<u>33</u>	<u>33</u>

IE Core Courses:

- IE 516 Statistical Methods in Industrial and information engineering (3)
- IE 518 Advanced Engineering Economic Analysis (3)
- IE 522 Optimization Methods in Industrial and information engineering (3)
- IE 526 Advanced Systems Modeling (3)

The graduate courses selected as general electives by the student and the major professor should be based on the student’s background and future goals. The general elective courses are to be technical or management based, or a combination of the two. For example, the courses selected might further the depth of knowledge in the area of specialization; increase knowledge in other areas of industrial and information engineering; be from another engineering discipline, statistics, or mathematics; broaden the students knowledge in general management; or enhance the student’s capability in technical management.

Coursework:

IE Core: IE 516, IE 518, IE 522, and IE 526

GIE Elective Courses:

- IE 504 Product Development Process
- IE 506 Product Selection and Evaluation
- IE 508 Int. Manufacturing Systems
- IE 509 Multidisciplinary Project
- IE 513 Facilities Planning and Design
- IE 514 Advanced Information Systems Analysis and Design
- IE 515 Advanced Production and Inventory Systems
- IE 519 Human Factors Engineering and Ergonomics
- IE 521 Human Factors Engineering Methods
- IE 527 Lean Production Systems
- IE 552 Advanced Linear Programming
- IE 556 Data Mining in Engineering & Manufacturing
- IE 561 Multivariate Statistics
- Other IE Graduate Courses selected with major professor

ENGINEERING MANAGEMENT CONCENTRATION

Major Professors: Dr. Gregory Sedrick (Note: Other Department of Industrial and Information Engineering faculty may be used; however, coordination with Dr. Sedrick is required.)

The engineering management (EM) concentration in the Master of Science program is designed to meet the needs of the engineer who is currently functioning in an engineering or other

technical management position in industry, or is currently employed in an engineering or technical position and desires to achieve a management position. The engineering management area of study integrates industrial and information engineering graduate coursework with additional graduate courses specifically developed to provide the engineer with those skills necessary for success in engineering and technical management. It is expected that this concentration will be of great interest to the practicing engineer in U.S. industry.

In addition to the basic admission requirements for the Master of Science program with a major in industrial and information engineering, the engineering management concentration has an additional admission requirement of two years of industrial experience as a practicing engineer or scientist in a company in the United States, or current full-time employment in an appropriate engineering or applied science position. The program is non-thesis and requires 33 hours of coursework plus a 3-hour design (capstone) project. This concentration is fully supported off-campus utilizing electronic media for video taping and interactive distance teaching methods and is made available through the cooperative efforts of the Department of Industrial and Information Engineering at The University of Tennessee main campus in Knoxville and The University of Tennessee Space Institute in Tullahoma, Tennessee (Contact: Dr. M.L. Hailey, telephone: 931-393-7264).

The following two prerequisite courses are required in this concentration if not included in a previous undergraduate degree program in an engineering discipline. The engineering student will be exempted if an equivalent course was taken in his or her undergraduate program within the last six years. Any other student from a technical curriculum that is admitted by the department may be required to take additional prerequisite courses. Competency with contemporary information technologies (including personal computer, productivity software tools, and web usage) is assumed.

Prerequisite Courses:

- Stat. 251 Probability and Statistics for Engineers and Scientists
- IE 405 Engineering Economic Analysis

Coursework:

Summary of EM concentration graduate coursework (credit hours):

Engineering Management (EM) Core*	9 hours
EM Concentration Courses	12 hours
Technical Electives	6 hours
Management Electives	6 hours
EM Capstone Project	<u>3 hours</u>
Total:	36 hours

EM Core: IE 516, IE 518 and EM 537 (Analytical Methods for Engineering Managers)*

* For students with an undergraduate degree in industrial and information engineering, IE 522 is required instead of EM 537.

EM Concentration Courses (required):

- EM 531 Motivation and Culture in Engineering Management

EM 533	Theory and Practice of Engineering Management
EM 536	Project Management
EM 539	Strategic Management in Technical Organizations

EM Technical Electives: Select 6 hours with major professor. *

IE 423	Industrial Safety
IE 513	Facilities Planning and Design
IE 514	Advanced Information Systems
IE 515	Advanced Production and Inventory Systems
IE 519	Human Factors Engineering and Ergonomics
IE 521	Advanced Human Factors Engineering Methodology
IE 522	Optimization Methods in Industrial and information engineering
IE 526	Systems Modeling and Simulation
IE 527	Lean Production Systems
EM 542	Design of Experiments for Engineering Managers

* Students with an undergraduate degree in industrial and information engineering may substitute 3 hours of graduate coursework in another engineering discipline, if approved by the major professor, for part of this requirement.

EM Management Electives: Select 6 hours with major professor

EM 532	Productivity and Quality Engineering
EM 534	Financial Management for Engineering Managers
EM 535	Management of Technology
EM 538	New Venture Formation
EM 540	Labor Relations
EM 541	Managing Change and Improvement in Technical Organizations

EM Capstone Project: EM 501 (3 hours).

MS-MBA DUAL DEGREE PROGRAM

The dual degree candidate must satisfy the curriculum and graduation requirements of the Department of Industrial and Information Engineering and the College of Business Administration. Dual degree students withdrawing from the dual program before completion of both degrees will not receive credit toward graduation in either degree program for courses in the other degree program, except as such courses qualify for credit without regard to the dual degree program. The MS and the MBA degrees will be awarded upon successful completion of the requirements of the dual program.

Coursework:

All engineering majors enrolled in the product development and manufacturing program must complete common coursework designed to provide them with an integrated, multidisciplinary teamwork experience. The MBA curriculum in product development and manufacturing consists of 33 hours of coursework in the College of Business Administration and 15 hours of coursework in the College of Engineering. Engineering coursework includes a culminating 3-hour integrated project report course, and a final examination, as required by the Dual Program Committee, taken during the first session of summer following the second year.

Curriculum for Dual Degree Program in Product Development and Manufacturing

BA 511	Summer – First Year MBA Core	3
BA 512	Fall – First Year MBA Core Program	15
ME/IE 504	Product Development Process	1
BA 513	Spring MBA Core Program	9
ME/IE 506	Product Selection & Evaluation	2
IE/ME 508	Integrated Process Design	3
BA 514	Summer Internship	3
IE/ME 509	MBA “Distance Course” Project Management	1
	Fall - Second Year	
IE 503*	Survey of Manufacturing Systems Engineering—DROPPED	3
IE 511**	Business Planning and Commercialization—DROPPED	3
IE/ME 509	Project Management	1
IE 510	Advanced Topics in Manufacturing Systems—DROPPED	3
IE 524	Advanced Integrated Manufacturing Systems—DROPPED	3
IE Elective	(IE 514, IE519, or IE 526)	3
---	Spring MBA “hub” course elective	3
IE/ME 509	Project Management	1
IE 512**	Process Development and Market Feasibility—DROPPED	3
IE 522	Optimization Methods in IE	3
IE Elective	(IE 514, IE519, or IE 526)	3
ME/IE 594	Summer (first session) Culminating Integrated Project Report—NOT ON SCHEDULE	3
	TOTAL	69

* The IE 503 course is required for all students enrolling in the MSIE option with undergraduate degrees in disciplines other than IE. ***DROPPED***

** The students enrolling in the MSE concentration may substitute other IE courses.

V. ADMISSION TO CANDIDACY

Admission to candidacy indicates agreement that the student has demonstrated ability to do acceptable graduate work and that satisfactory progress has been made toward a degree. Admission to candidacy is applied for as soon as possible after the student has completed any prerequisite courses and 9 hours of graduate coursework with a 3.0 average or higher in all graduate work. The form must include all coursework being used for the degree, including transfer coursework, must be signed by the student's committee, and must be submitted to the Office of the University Registrar no later than the last day of classes of the semester preceding the one in which he/she plans to graduate.

VI. CUMULATIVE EXAMINATION

A student presenting a thesis or project must pass a comprehensive oral examination. In the case of a project, this is supplemented by a written exam, which is determined by the student's graduate committee. The examination, which is concerned with coursework and the thesis or project work, is to determine the ability of the candidate to integrate material in the major and related fields. The final draft of the thesis or project document, approved by the major professor, must be distributed to all committee members at least one complete week prior to the date of the final examination. Students in the M.S.-MBA dual degree program will take a comprehensive written examination near the end of the summer semester in which the 3 semester-hours "integrated culminating experience" is taken.

Except with prior approval from The Graduate School, the examination must be given in university-approved facilities. It must be scheduled through the Office of Graduate Admissions and Records (use the Recommended Arrangements for Final Examination form) in accordance with deadlines specified in the Graduate School News, and will be conducted by the student's master's committee. In case of failure, the candidate may not apply for reexamination until the following semester. The result of the second examination is final. Students in the engineering management concentration, however, may schedule their exam through the Engineering Management Office in Tullahoma. This office will then contact the Office of Graduate Admissions and Records to complete the scheduling process.

Approved Dual Credit

For those students not working towards the MS-MBA dual degree, a maximum of 6 credit hours of approved graduate-level courses completed in the College of Business Administration may be counted toward the MS degree program with a major in Industrial and Information Engineering. A maximum of 15 credit hours of approved graduate-level courses completed in the Department of Industrial and Information Engineering may be counted toward the MBA degree program.

The approval of courses is the responsibility of the Dual Program Committee and the student's assigned advisor.

Time Limits

Candidates have six calendar years from the time of enrollment in The Graduate School to complete the degree. Students who change degree programs during this six-year period may be granted an extension after review and approval by The Graduate School. In any event, courses used toward a master's degree must have been taken within six calendar years of graduation.

APPENDIX: Design and Capstone Project Guidelines

DESIGN OR CAPSTONE PROJECT REQUIREMENTS AND GUIDELINES

The purpose of the design (capstone) project is to provide a culminating experience in the student's master's program that requires the integration and application of knowledge attained in the coursework. The analysis of a problem in industry or another application area is the normal type of project pursued. The required project work, in general, is modeled after the thesis but is reduced in scope and has a different focus; that is, the project is three graduate credit hours of work instead of six and does not have the same research emphasis as a thesis.

The selected project area must require the integration of a reasonable scope of IE knowledge, including emphasis on the application of one or more methodologies. The project will be done individually by the student with the support of the major professor and other members of his or her master's committee. The project must be an original work by the student. For example, the description of a previous or current project in industry or another application area in which the student was or is involved as part of the effort is not acceptable. Some important attributes of a well-selected project area, and the subsequent effort by the student, are as follows:

1. The scope and focus of the problem or application area can be well defined; that is, the total effort is feasible within three credit hours of work, includes the integration of IE knowledge with emphasis on one or more methodologies, and addresses an area of interest in industrial and information engineering.
2. The goals of the project can be defined and are achievable.
3. Normally, the development, analysis, and comparison of alternative courses of action are required (included).
4. A literature search, related to the project area and methodologies used is included, and the results of the search are accounted for in the project work.
5. A professional final project report, using the outline given in this appendix, is prepared.

The preparation (writing) of a professional final report is an important part of the student's project effort. The report is the primary academic product and also serves as the basis of the required oral presentation by the student to his or her master's committee (and to meet other communication needs related to the project). The final report logically discusses the problem or application area, related information and data, the analysis process and results, and the conclusions and recommendations. The basic contents of the project report are as follows:

1. Initial (front) material:
 - a. Title page
 - b. Table of contents
 - c. List of Tables
 - d. List of figures
 - e. Executive summary (not to exceed 1 ½ pages)

2. Body of the report:
 - a. Introduction
 - b. Description of the problem or application area
 - c. Planned goals and objectives
 - d. Literature search (and interpretation of results)
 - e. Development (and description) of the alternative courses of action or methodology
 - f. The analysis process and results
 - g. Conclusions
 - h. Recommendations

3. Supporting (back) material:
 - a. List of references from the literature search
 - b. Appendices
 - c. Student's resume

The student's oral presentation to his or her master's committee will be primarily based on Section 2 (body of the report). After the presentation, the committee will complete the oral part of the final examination on the project and other selected coursework subjects.

An academic type project may be used as an alternative to an industry or other application based problem. An academic project usually addresses a methodology question (which may be in the context of a hypothetical situation) or a set of technical topics, and requires a more in-depth literature search and emphasis on the technical considerations being addressed.

The contents of the final report for an academic project will be basically the same as discussed above with modifications to the body of the report as necessary. However, the major professor may approve in place of the report the preparation of a technical article ready for submission to a refereed journal for publication. The contents and format of the article will be determined by the requirements of the selected journal and accepted professional practice. The oral presentation by the student to the committee and the completion of the oral part of the final examination by the committee are the same as for the problem type project.