Master of Engineering Programs

in

Systems Engineering and

Engineering Management

Student Handbook
2014-2015

8/8/2014

Welcome to the Master of Engineering Programs in Systems Engineering and Engineering Management at Iowa State University! This student handbook will provide you with general guidelines regarding policies and procedures related to the programs. Please note that the Graduate College Handbook provides more detailed information on the graduate program policies. We advise you to review the Graduate College Handbook at http://www.grad-college.iastate.edu/common/handbook/.

The Master of Engineering degree programs in Systems Engineering and Engineering Management are managed through the Department of Industrial and Manufacturing Systems (IMSE) at Iowa State University (ISU). Information on the department and degree programs is located at:

http://www.imse.iastate.edu

Please review this handbook periodically for any updates. We look forward to working with you and wish you the best of success in your studies.

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Student Handbook

for

Master of Engineering in Systems Engineering

and Engineering Management Programs

1. Introduction

1.1. What is Systems Engineering and Engineering Management?

The systems we are designing today are more complex than ever. Engineers with specialized skills in systems engineering and engineering management are called on to help deal with the challenges of managing these complex systems.

The International Council of Systems Engineering (INCOSE) defines systems engineering as follows:

> "Systems Engineering (SE) is a design and management discipline that is very useful in the designing and building of large or complex systems. It is a discipline that was conceived of and introduced by the U.S. Government and was developed to counteract the difficulties encountered in the engineering of increasingly large, complex, and inter-disciplinary technological systems. However, this discipline has also evolved to aid in the design of many other types of systems (Social Systems Design), not the subject of this program."

The American Society for Engineering Management (ASEM) defines engineering management as follows:

> "Engineering Management (EM) bridges the gap between engineering and management. EM is the art and science of planning, organizing, allocating resources, and directing and controlling activities that have a technological component."

1.2. Some of the Principles of Complex System Design

Successful design and management of complex systems is based on a few simple but powerful principles. The first principle is iterative top-down (or hierarchical) design. This means a complex system is designed by breaking it down into its component subsystems and then repeating the process on each subsystem until off-the-shelf or easily designable components are all that remain.

A second principle is bottom-up integration. This principle simply means that large systems are built by taking the lowest level components and putting them together one level at a time. Between each level's integration, the result of the previous level is tested to make sure it works. This way, even very large systems can be easily built and bugs can be discovered and fixed before they are buried too deeply. In reality, bottom-up integration is the same as top-down design in reverse.

A third principle is that of the system life cycle. A life cycle is simply an understanding of the progression of a system from inception, to design, construction, implementation, operation, maintenance, and eventually to its shutdown, disassembly, and disposal. The system being designed has a life cycle, as does the systems engineering design and manufacturing process. Each stage in each of these life cycles has a life cycle, and on and on iteratively. This principle aids in the understanding of what needs to be done when and where and how each small piece fits into the big picture. It also aids in breaking large conceptual procedures or processes into smaller, more easily manageable chunks.

Successful design is based on a "user perspective." Engineers build systems that take into account the user's wants, needs, preferences, and capabilities. Every type of user of a potential system (operator, maintenance, management, etc.) MUST be involved in the design of that system. This is a simple factor of optimization – who knows better than the user what they want, what they need, and what their capabilities are?

The management of a system development process calls for a unique set of skills. These include an understanding of advanced engineering design methods, skill in managing and leading distributed cross-disciplinary design teams, and an entrepreneurial approach to using resources to meet customer needs.

2. Systems Engineering and Engineering Management Programs at Iowa State University

The Master of Engineering in Systems Engineering and Engineering Management programs are designed to enable engineers, regardless of undergraduate discipline, to develop the analytical abilities needed to design and manage complex systems. The intent of these programs is to extend the ability of engineers to work across disciplinary boundaries and to develop their management and leadership capabilities for today's work environment.

Iowa State University offers several options in bringing these degree programs to you, so that you can fulfill your professional obligations and enhance your educational credentials. Delivery options include both on-line and on-campus courses.

3. Administration of Systems Engineering Program

The following individuals at ISU are available to assist you with any problems or questions you may have.

Director of Graduate Education for Systems Engineering

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4. Admission Requirements

Unrestricted admission requires (1) a 3.0 grade point average from an ABET accredited undergraduate engineering program, (2) two years of engineering experience or current full-time employment as an engineer, (3) calculus, engineering statistics, and engineering economy. A GRE is not required for this program.

Applicants for admission to the Systems Engineering Program apply through the Graduate College at Iowa State University http://www.admissions.iastate.edu/apply/ . Each applicant must submit:

- Application and application fee
- Official academic transcripts
- Three letters of recommendation
- Resume

Applications should be submitted as early as possible before the beginning of the semester for which admission is sought. Individuals may also take up to 9 credits at Iowa State as a non-degree seeking student and then transfer them to the program when they are admitted.

The Master of Engineering in Systems Engineering Program at Iowa State University is focused on supporting working professionals so teaching or research assistantships typically are not available.

5. Degree Requirements

Coursework-Only Option

The complete requirements for the Systems Engineering program coursework-only option include the following:

1. **Systems Engineering Core Courses**
   Twelve graduate credits in engineering. All students must take the following:
   IE 564: Decision Analysis in System Design
   AerE/EE/IE 565: System Engineering and Analysis (3 credits)
   IE 570 Systems Engineering and Project Management
   IE 585 Requirements Engineering

2. **Elective Courses**
   Eighteen graduate credits in advanced engineering, business, or a related field. These courses are determined by the student and academic advisor to fit the needs of the individual student's program.

The student's major professor will be the Director of Graduate Education for Systems Engineering, who will also have responsibility for monitoring progress and providing guidance on coursework. The major professor approves each student's program of study (POS).

The complete requirements for the Engineering Management program coursework-only option are:

1. **Engineering Management Core Courses**
   Twelve graduate credits in engineering and business. All students must take:
   IE 563 Engineering Management Theory (3 credits)
   IE 570 Systems Engineering and Project Management (3 credits)
   MGMT 583 Strategic Management of Innovation (3 credits)
   SCM 524 Strategic Process Analysis and Improvement (3 credits)

2. **Elective Courses**
   Eighteen graduate credits in advanced engineering, business, or a related field. These courses are determined by the student and academic advisor to fit the needs of the individual student's program.

The student's major professor will be the Director of Graduate Education for Engineering Management, who will also have responsibility for monitoring progress and providing guidance on coursework. The major professor approves each student's program of study (POS).

Creative Component Option

A second option to obtain a Masters of Engineering in Systems Engineering or Engineering Management includes a creative component and the requirement to pass a final oral exam.

6. Chronological List of Items that Must Be Completed to Obtain the Degree

All forms noted below can be found on the Graduate College website at http://www.grad-college.iastate.edu/common/forms/student_forms.php

Items	*Completion Date*	*Form*
Application for Graduate College	Before the completion of nine credit hours of coursework at ISU	http://www.admissions.iastate.edu/apply/graduate.php
Request to Establish a Home Department	First semester after admission to SE Program	"Home Department for Students Admitted to Interdepartmental Majors" form
Satisfy Graduate English Requirement *(for non-native speakers only, see details below)*	Beginning of first semester of enrollment	
Program of Study Approval	Before completing 12 credits of graduate work	"Program of Study" form
Application for Graduation (Diploma Slip) Filed	Before the semester of graduation begins	"Application for Graduation (Diploma Slip)" form
Request for Graduation Check/Approval	Before the semester of graduation begins	"Request for Graduation Check/Approval" form

Fill out a draft copy of each form and email to the Program Assistant. We will review and return to student for signature.

7. Description of the Chronological List of Items that Must Be Completed to Obtain the Degree

7.1. Complete Application for Graduate School

You must be admitted to the Graduate College before you complete more than nine hours of coursework at ISU. That is, if you are taking courses as a non-degree (undeclared) student, do not take more than nine credits at ISU before you formally apply to the Systems Engineering program. **Only nine credits taken before admission may be applied to the total number of credits required for graduation**.

You may apply online at http://www.admissions.iastate.edu/apply/

7.2. Satisfy Graduate English Requirement, if Applicable

Non-native speakers or international students who do not have undergraduate degrees from U.S. universities must take the English placement test at the beginning of their first semester of enrollment. Students who do not pass the exam will be assigned to take one or more English courses. Please refer to the following link for additional details: http://www.grad-college.iastate.edu/common/handbook/.

For more information on dates and locations of the exams, please contact the following:

TESL/Applied Linguistics
226 Ross Hall
Ames, IA 50011
Phone: 515-294-6398
Email: ept@iastate.edu

7.3. Request to Establish a Home Department

The student is required to complete a "Home Department for Students Admitted to Interdepartmental Majors" form. The student will then reside in the department of their major professor. When completing the form, be sure to enter "IMSE Department."

7.4. Approval of Program of Study (POS)

- Accomplish before completing 12 credits of graduate work. If necessary, changes may be made in the POS at a later date by completing the "Modifications to the POS" form.
- List all courses applicable to the program.
- The Director of Graduate Education for Systems Engineering will assist you with development of your POS.

7.5. Diploma Slip

Completed and submitted before the semester of graduation begins.

7.6. Request for Graduation Check/Approval List

Completed before the semester of graduation begins.

7.7. Graduate College Handbook

For detailed information regarding the items described above, please consult the "**Graduate Handbook.**" The handbook describes Graduate College guidelines and procedures. It is a valuable reference for ISU students. You can also access the latest version of the handbook on the WEB at **http://www.grad-college.iastate.edu/common/handbook/.**

8. COURSES

8.1. SCHEDULE OF COURSES

A schedule of courses provided for each semester can be found on the Engineering-LAS Online Learning webpage at http://www.elo.iastate.edu/.

Tentative course rotations can be found online at http://www.elo.iastate.edu/tentative-course-rotations/.

8.2. REGISTERING FOR COURSES

There are several options to register for courses. The student can register online through the following website https://accessplus.iastate.edu/NonAuth/R404/R4048.jsp .

8.3. TRANSFER COURSES

You may not transfer more than eight hours of coursework to be applied to your program of study. In other words, at least twenty-two credits must be taken at ISU. You must receive a "B" or better on any transfer course. It is advisable to get the course approved with your major professor before you take the course. Provide a description of the course numbering system (in order for ISU to confirm that the course is a graduate level course) or some other type of evidence that the institution at which you took the course considers it to be a graduate course. Also provide a copy of the course syllabus, a catalog description of the course, the name of textbook(s) used for the course, and the name and telephone number of the course instructor.

8.4. TEXTBOOKS

Textbook information is available from

University Book Store
Phone: 1-800-478-0048
On-line: http://www.isubookstore.com/.

8.5. TUITION AND FEES

Tuition and fees are subject to change. The latest updated information can be found on the Engineering-LAS Online Learning Web page at http://www.elo.iastate.edu/how-elo-works/tuition-and-fees/.

9. IMPORTANT TELEPHONE NUMBERS AND LINKS

What	*Telephone*	*Website*
Bookstore		
University Bookstore	1-800-433-3451, or 515-294-5684	http://www.isubookstore.com/
College of Engineering		http://www.eng.iastate.edu/
Engineering-LAS Online Learning	1-800-854-1675 or 515-294-7470	http://www.elo.iastate.edu/
Graduate Admissions	515-294-0818	
Graduate College	515-294-4531	http://www.grad-college.iastate.edu/