

**Program
Requirements**

IOWA STATE UNIVERSITY



College of Engineering

Student Handbook

for

**Master of Engineering in
Systems Engineering**

Table of Contents

<u>Introduction: Definition and Principles of Systems Engineering</u>	1
<u>Systems Engineering Program at ISU</u>	2
<u>Administration of Systems Engineering Program</u>	2
<u>Admission Requirements</u>	3
<u>Degree Requirements</u>	4
<u>Chronological list of items that must be completed to obtain the degree</u>	5
<u>Courses</u>	7
<u>Important Phone Numbers and Links</u>	9

Student Handbook for Master of Engineering in Systems Engineering

1. Introduction

1.1 What is Systems Engineering?

Welcome to Systems Engineering at Iowa State University. 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 interdisciplinary 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.

1.2 Some of the Principles of Systems Engineering Based Design

Systems Engineering has as its basis a few simple but powerful principles. The first principle is iterative top-down (or hierarchical) design. This simply means that a complex system is designed by breaking a system down into its component subsystems and then repeating the process on each subsystem until off-the-shelf or easily designable components are all that remains.

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, to construction, implementation, operation, maintenance, and eventually to its shutdown, disassembly and disposal. The system being designed has a life cycle; the systems engineering design and manufacturing process has a life cycle; 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, how each small piece fits in the big picture, and aids in breaking large conceptual procedures or processes into smaller, more easily manageable chunks. This, alone, was found to be responsible for the elimination of a large amount of the errors that occur in the design of very large, complex systems.

The last principle is that of "user perspective." Systems Engineering attempts to 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?

2. Systems Engineering Program at ISU

This program in systems engineering will lead you to a master's degree in engineering. It is designed to enable engineers, regardless of undergraduate discipline, to develop the analytical abilities needed to design, evaluate, and build complex systems involving many components and demanding specifications. The intent of the program is to extend the ability of engineers to work across disciplinary boundaries as needed. It also develops the management capabilities needed in today's work environment.

Iowa State offers several options in bringing this degree program closer to you, so you can fulfill your professional obligations and enhance your qualifications without extensive travel to the Iowa State campus in Ames. Delivery options include: Live and archived media over the web, Videotape or cd-rom delivered to your workplace or home, or On-campus.

3. Administration of Systems Engineering Program

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

Systems Engineering Supervisory Committee

Douglas D. Gemmill (Chair)

Department of Industrial and Manufacturing Systems Engineering

3004 Black Engineering

Iowa State University

Ames, Iowa 50011

Tel: 515-294-8731

Fax: 515-294-3524

Email: n2ddg@iastate.edu

Doug Jacobson

Electrical and Computer Engineering

2419 Coover

Tel: 515-294-8307

Fax: 515-294-8432

Email: dougj@iastate.edu

J. Adin Mann, III
Department of Mechanical Engineering
2032 Black Engineering
Tel: 515-294-2877
Email: jamann@iastate.edu

Program Assistant

Shawna Saad
Engineering Distance Education Office
2273 Howe Hall, Suite 1364
Iowa State University
Ames, Iowa 50011
Tele: 800-854-1675 or 515-294-7470
Fax: 515-294-6184
Email: ssaad@iastate.edu

4. Admission Requirements

Individuals with undergraduate degrees in any area of Engineering, and graduated in top half of their class may apply. Applicants with non-Engineering degrees and/or not in top half of their class will be considered on an individual basis.

Applicants for admission to the Systems Engineering Program apply through the Graduate School at Iowa State University. Each applicant must submit a completed application form, three letters of recommendation, an official transcript of undergraduate and graduate records to date, and a \$30 nonrefundable fee for US applicants and a \$70 fee for international applicants. The three letters of recommendation can be submitted on-line by each reference or can be mailed directly to the [Chair of the Systems Engineering Supervisory Committee](#). Application should be submitted as early as possible before the beginning of the term for which admission is sought.

Applicants may obtain an application or apply on-line on the Graduate College website at: <http://www.admissions.iastate.edu/apply/index.php>

5. Degree Requirements

The student must complete a minimum of 30 semester credit hours of graduate level courses.

5.1 Course work only option

The course requirement is expressed in terms of four components.

1. System Engineering Core Courses

Six graduate credits in the general area of systems engineering. All students must take:

- AerE/EE/IE 565: System Engineering and Analysis (3 credits)
- IE 566: Applied Systems Engineering (3 credits)

2. Elective Engineering Courses

Fifteen graduate credits in advanced engineering. These courses are determined by the student and the Systems Engineering Director of Graduate Education (DOGE) to fit the needs of the individual student's program.

3. Elective Non-Engineering Courses

Six credits outside of the engineering fields that meet individual educational objectives. These might come from business, economics, computer science, mathematics or statistics, among other areas.

4. Elective course

One additional 3-credit course. This course could be chosen from either category 2 or 3 above based on the needs of the individual student's program with guidance from the Systems Engineering DOGE. A 3-credit independent study can also be used to satisfy this requirement.

Note: Students typically are allowed to transfer up to 6 credit hours of non-ISU graduate credit into their degree program.

Students will be mentored by the Systems Engineering DOGE who will also have responsibility to monitor their progress and provide guidance on course work. In addition, the DOGE will serve on each student's POS committee. Programs of study will be approved by the POS Committee.

Note: There is no final oral exam.

5.2 Creative Component Option

A second option to obtain a Masters of Engineering in Systems Engineering includes a creative component and the requirement to pass a final oral exam. For more information on this option please contact the DOGE ([Doug Gemmill](#)).

6. Chronological list of items that must be completed to obtain the degree

Items	Completion Date	Link to Graduate College Forms
Application for Graduate College	Before the completion of nine credit hours of coursework at ISU	http://www.admissions.iastate.edu/apply/index.php?type=us_grad
Establish a Home Department	Before completing 12 credits of graduate work	Home Department for Students Admitted to Interdepartmental Majors
Satisfy Graduate English Requirement <i>(for non-native speakers only, see details below)</i>	Before completing 12 credits of graduate work	
Approval of Committee Appointment	Before completing 12 credits of graduate work	Committee Appointment Form
Approval of Program Of Study	Before completing 12 credits of graduate work	Program of Study (POS) Form
Diploma Slip Filed	Before the semester of graduation, or the first week of the semester of graduation	Application for Graduation (Diploma Slip)
Graduation checklist	At least 5 weeks before end of term of graduation (Please note once the Diploma Slip is filed, EDE will complete and turn in this form)	Graduation Check for Approved Programs without a Final Oral Examination

Description of the chronological list of items that must be completed to obtain the degree

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 obtain an application for admission to the Graduate College by contacting the Engineering Distance Education office, or you can download the required form from the WEB at: <http://www.grad-college.iastate.edu/forms/forms.html>

Other forms are also available at the above web site, such as program of study forms. In addition, there are instructions for filling out the forms at this website.

When completing the application, be sure to enter “**Systems Engineering**” as the major desired.

The three letters of reference should be submitted online by the references or mailed directly to the Chair of the Systems Engineering Supervisory Committee.

You can also apply On-Line at:

http://www.admissions.iastate.edu/apply/index.php?type=us_grad

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.

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

Kristi Correia
Intensive English & Orientation Program
102 Landscape Architecture Building
phone: 515-294-3568
email: kanderso@iastate.edu

Request to Establish a Home Department

The student is required to complete a “Request to Establish a Home Department for Students Admitted to Interdepartmental Majors” form. The student will then reside in the department of his/her major professor. Once you have completed a draft of this form email it to the DOGE for systems engineering (Dr. Doug Gemmill at n2ddg@iastate.edu) so it can be checked for correctness. The systems engineering program assistant will route the form for signatures.

Approval of Committee Appointment

The student is required to complete the “Recommendation for Committee Appointment” form. Once you have completed a draft of this form email it to the DOGE for systems engineering (Dr. Doug Gemmill at n2ddg@iastate.edu) so it can be checked for correctness. The systems engineering program assistant will route the form for signatures.

Approval of Program of Study (POS)

The “Program of Study” form is included as an appendix to this document.

- Accomplish before completing 12 hours of coursework. (If necessary, changes may be made in the POS at a later date.)
- List all courses applicable to the program.
- Fill out a draft copy,
- The DOGE for systems engineering (Dr. Doug Gemmill) will assist you with development of your POS.

Once you have completed a draft of this form email it to the DOGE for systems engineering (Dr. Doug Gemmill at n2ddg@iastate.edu) so it can be checked for correctness. The systems engineering program assistant will route the form for signatures.

Diploma Slip filed

The student is required to complete the “Application for Graduation” (Diploma Slip). This is completed at beginning of semester of graduation, by the end of the first week of class. For summer session graduation the form must be submitted by the end of the spring semester.

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. Copies may be obtained by contacting the Graduate College Office, Pearson Hall, Room 1137, 515-294-4531. You can also access the latest version of the handbook on the WEB at:

<http://www.grad-college.iastate.edu/publications/homepage.html>

7. Courses

7.1 Schedule of Courses

A schedule of courses provided for each semester can be found on the Engineering Distance Education webpage at www.ede.iastate.edu

Additional information regarding course information and course descriptions can be found in the Online Class Catalog at <http://www.iastate.edu/~catalog/>

7.2 Registering for courses

Once you have chosen the course you wish to take, students have two choices to register:

1. The Engineering Distance Education registration form found at

<http://www.ede.iastate.edu/Registration-Form/Registration-Announcement/Online-Registration.html>.

- **NEW** and **ON-CAMPUS STUDENTS on CO-OP or INTERNSHIPS** are required to register using this link.

2. [Online Through AccessPlus](#)

- Available to **OFF-CAMPUS STUDENTS** only.
- This method gives instant confirmation of registration.
- Log into one system to register, view grades, or make a change in your schedule.

PLEASE NOTE: Starting summer 2008, on-campus students **will NOT** be allowed to register for off-campus courses. The only exceptions will be the following:

1. Students who are on co-op or internship and/or
2. Students who are taking off-campus courses **ONLY**

Please contact the EDE office at ede@iastate.edu if you have any questions.

7.3 Transfer Courses

You may not transfer more than six hours of coursework to be applied to your program of study (without waiver). 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 the DOGE of Systems Engineering before you take the course. Provide a description of course numbering system (in order for ISU to confirm 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

7.4 Textbooks

Textbook information is available from:

University Book Store

Phone: 1-800-478-0048

On-line: <http://www.isubookstore.com/>

7.5 Tuition and fees

Tuition and fees are subject to change. The latest updated information can be found on the Engineering Distance Education Web page at

<http://www.ede.iastate.edu/Tuition-and-Fees/Tuition/Tuition-and-Fees.html>

8. Important telephone numbers and Links

What	Telephone	Link
Bookstore University Bookstore	1-800-433-3451, or 515-294-5684	http://www.isubookstore.com/
College of Engineering		http://www.eng.iastate.edu/
Engineering Distance Education	800-854-1675	https://www.ede.iastate.edu/
Graduate Admissions	515-294-0818	
Graduate College	515-294-4531	http://www.grad-college.iastate.edu/
Systems Engineering SE Committees Doug Gemmill (DOGE) Doug Jacobson J. Adin Mann SE Program Assistant Shawna Saad	 515-294-8731 515-294-8307 515-294-2877 515-294-7470	 http://www.ede.iastate.edu/Graduate-Programs/Grad-Pro/sys.html Email: n2ddg@iastate.edu Email: dougj@iastate.edu Email: jamann@iastate.edu Email: ssaad@iastate.edu