MEMORANDUM

To Board of Regents

From: Board Office

Subject: Post-Audit Report on Master of Engineering in Systems Engineering, Iowa State University

Date: November 5, 2001

Recommended Action: Approve the post-audit report on the Master of Engineering in Systems Engineering at Iowa State University.

Executive Summary: Iowa State University has submitted a post-audit report, as required by Board of Regents *Procedural Guide §607,* on the Master of Engineering in Systems Engineering.

It appears the program meets or exceeds the Board's criteria for Post-Audit Reports. The program is not duplicative of other programs in Iowa, actual enrollment in the program has been larger than projected at the time that the program was proposed, and the employment rate of graduates is very good. Costs have been increased over those proposed initially; however, the costs are attributed to increased student enrollment in the program.

The responses to the Regent questions for post-audit review are attached, pages 3-6.

Strategic Plan: Post-audits are consistent with the Board's Strategic Planning KRA 1.1.0.0 to improve the quality of existing and newly created educational programs.

Background: Iowa State University's masters program in systems engineering is serving a need of industry to develop systems engineers who can successfully oversee the development of new products and systems. This includes industries within the State of Iowa, such as Rockwell Collins and John Deere, as well as others, and industries across the nation.

Analysis:

Review Question Responses

Pages 3-6 contain ISU's responses to the post-audit review questions.

Enrollment

The program has grown from 12 students enrolled during the first year of the program to almost 70 in Fall 2000.

	95-96	96-97	97-98	98-99	99-00	00-01	01-02	02-03
Total majors	12	20	37	47	61	68	105*	110*
Non-major enrollment in program courses (fall and spring)	0	1	50	37	24	24	25	25

*Fall of years 2001-02 and 2002-03 include 31 students from ISU's new Executive Engineer Dual Masters Degree program.

Graduation and Placement

Twenty-two students have graduated (as of Fall 2000).

1995-96	1	1999-2000	7
1996-97	7	2000-01	9
1997-98	4	2001-02	11
1998-99	9	2002-03	44*

*Includes graduation of first Executive Engineer Dual Masters Degree class.

The majority of students, already full-time employees, continue with their existing positions once their degrees are completed. Those students who participated in the program as full-time students in residence at ISU have had good success in obtaining employment in related fields in systems engineering.

Collaborative program

The systems engineering program at ISU is now cooperating in a joint effort with the University of Iowa's Tippie School of Management to provide an Executive Engineer Dual Masters Degree Program especially created for mid- to upper-level engineering managers and executives. Students in this program will meet for 26 months and earn a master of engineering from Iowa State University and a master of business administration from the University of Iowa. ISU had 31 students enrolled in this program, as of Fall 2000.

Expenditures

As explained on page 6, the added costs have related to the growth in enrollment.

Charles R. Kniker

Approved: Robert J. Barak

h/aa/docket/2001/novgd4b

Regents Post-Audit Review
Master of Engineering in Systems Engineering
Administered by the College of Engineering at Iowa State University

Introduction

In view of the ever increasing complexity of today's products and systems, engineers are needed who possess knowledge of the combination of the methods and tools required to improve the effectiveness, including availability, reliability, maintainability, quality, and trustworthiness and at the same time reduce the costs of new and existing systems. This is the role of the systems engineer. Iowa State's masters program in systems engineering is serving a need of industry to develop systems engineers who can successfully oversee the development of new products and systems. This includes industry within the state of Iowa, such as Rockwell Collins and John Deere, as well as others, and industry across the nation. Although the bulk of our students are located in Iowa, through this program we have served the needs of students and industry from all across the nation, with students enrolled in the program from as far away as Florida and Arizona.

The systems engineering program at ISU is now cooperating in a joint effort with the Tippie School of Management at the University of Iowa to provide an Executive Engineer Dual Master's Degree Program especially created for mid- to upper-level engineering managers and executives. Students participating in this program will meet for 26 months and earn a master of engineering in systems engineering from Iowa State and a master of business administration from Iowa.

Although systems engineering has its roots during WWII, it has seen significant growth in the past two decades. Evidence is the development in 1990 of the International Council of Systems Engineering (INCOSE), the professional society for systems engineers. INCOSE now holds annual conferences, with an attendance of around 700 engineers at the last conference. The membership in INCOSE has grown to about 3500 in its first ten years, and the membership continues to grow. This provides us with a strong indication that the need for systems engineers will be growing over the next few decades, and our program will fill a need to educate the sytems engineers that will be required by industry.

1. **Program Availability**
   There are no similar programs at other Regent universities or in other colleges and universities in Iowa.

2. **Enrollment**
   a. Enrollment - The following table provides Fall semester enrollment in the program for the last four years and the current year, and an estimate on the enrollment for the next three years.

	1995-96	1996-97	1997-98	1998-99	1999-00	2000-01	2001-02	2001-03
Total majors in program	12	20	37	47	61	68	105*	110*
Non-major enrollment in program courses (fall & spring)	0	1	50	37	24	24	25	25

* Fall of years 7 and 8 include 31 students from our new Executive Engineer Dual Masters Degree program.

Approximately 60% of the students enrolled in the program are Iowa residents. Approximately 15% of the students enrolled in the program are international students.

The actual enrollment figures for the last four years are significantly larger than those projected in the original program proposal. There is a greater demand from industry for systems engineers than we realized. In addition, we have done a good job of advertising the program which has resulted in a greater demand for the degree than originally projected. We also recognized the demand for this type of degree from military personnel and have successfully sought out this market.

b. Dropouts - The table below provides the number of dropouts in the program over the last five years.

1995-96	1996-97	1997-98	1998-99	1999-00
0	0	0	1	3

The students who have dropped out of the program are all full-time employed. The degree program created a greater burden on their time than they could comfortably handle.

3. **Graduation and Placement Information**
The table below indicates the number of graduates of the program each of the previous fours years and estimates of the number that will complete the program this year and each of the next three years.

1995-96	1	1999-00	7
1996-97	7	2000-01	9
1997-98	4	2001-02	11
1998-99	9	2002-03	44*

*Includes graduation of first Executive Engineer Dual Masters Degree class

The following table provides estimates of job placement for program graduates over the past five years.

	1995-96	1996-97	1997-98	1998-99	1999-00
Further study in graduate or professional school		1			
Employed in field or related field	1	5	4	8	7
Employed in non-related field		1		1	
Unemployed					
Unknown					

The majority of our students are already full time employed (distance education students) and thus continue with their existing position once they complete their degree. Successful completion of the degree increases their opportunity for promotion. Those students who participated in the program as full time students in residence at ISU have had good success in obtaining employment in related fields to systems engineering.

4. Accreditation Status

Accreditation is available for systems engineering programs. However, in engineering education, accreditation of undergraduate programs is considered essential but very few graduate programs are accredited. Accreditation at the graduate level has not attained the same level of importance as it has for baccalaureate programs. Therefore, there is no plan to submit this program for accreditation.

5. Staffing

The table below provides previous, current and estimates of future FTE staffing of the program.

	1995-96	1996-97	1997-98	1998-99	1999-00	2000-01	2001-02	2002-03
Faculty	0.38	0.38	0.82	0.79	0.13	0.13	0.13	0.13
Graduate Assistants	0	0	0	0.25	0.38	0.25	0.25	0.25
Other Staff	0	0	0	0	0	0	0	0

6. **Expenditures**
The following table outlines the increases in expenditures resulting from the adoption of this program, as well as estimated increases over the next two years.

	1995-96	1996-97	1997-98	1998-99	1999-00	2000-01	2001-02
Faculty	22,500	22,500	27,800	30,400	6,400	6,400	6,400
Graduate Assistants				4,100	7,100	5,400	5,400
Other Staff							
General Expense				3,300	29,970	20,000	20,000
Equipment							
Library Resources							
Space Needs							
Computer Use							
Other Resources							
TOTAL	22,500	22,500	27,800	37,800	43,470	31,800	31,800

All entries in this table represent increments above a zero base for the first year, and are not cumulative.

7. **Differences between proposed and actual staffing and expenditures**
During the first few years of the program there was a greater need for faculty staffing than anticipated. Adjunct faculty were hired to teach the basic systems engineering core courses. Existing faculty in the College of Engineering are now teaching these courses and the need for adjunct faculty has been reduced. In addition, the class sizes have been larger than expected, which has created the need to supply the faculty with graduate teaching assistants.

General expense has been much greater than expected. We have done extensive development of marketing tools and advertisements for the program which have resulted in higher expenses. However, these efforts have resulted in a significant growth in enrollment.

8. **Supporting Materials**
Attached to this document are the following items:
1. A copy of the final version of the proposal for the program.
2. Letters of support for the program from current students and graduates of the program.
3. Letters of support for the program from employers of program graduates.
4. Letter of support for the program from the Dean's Office of the College of Engineering at ISU.