Assessment Plan

M.S. in Industrial and Systems Engineering Program
Industrial and Systems Engineering Department
School of Engineering and Computer Science
Oakland University

Approved by the ISE Dept. faculty: November 29, 2007
Overview of ISE Dept. Assessment Process.

The ISE Dept. faculty are committed to continuously improve the quality of both the undergraduate and graduate educational programs. The faculty has developed and implemented a formal plan to measure, assess, evaluate and improve the ISE programs in a systematic way. The development of this plan began with identifying the constituent groups the ISE Dept. serves, that is, students, employers and faculty; setting outcomes for each educational program that describe the skills necessary for successful modern engineering practice; and identifying outcomes for each educational program that insure the skills necessary to achieve the program learning outcomes.

The program assessment/improvement process involves both indirect and direct measures of the success of each course within each program as well as overall measures of the educational programs and of the assessment process itself. The overall success of a program is measured by whether the students of that program can demonstrate achievement of all outcomes as they graduate.

The ISE Dept. faculty have chosen an embedded approach to program assessment. Key courses have been identified in the ISE M.S. program where students have the opportunity to demonstrate the achievement of the program outcomes; the set of key courses is chosen to insure that all of the program outcomes are demonstrated. Student materials are collected from the key courses that provide evidence that the outcomes have been achieved. External evaluators, including faculty not directly involved with the course and departmental advisory board members, review these materials to establish whether the students in that class have achieved some or all of the program outcomes. Every semester, the ISE Dept. faculty review the results of these external evaluations and generate appropriate plans to improve the achievement of the program outcomes.

Each ISE course has a set of course outcomes, developed by the instructing faculty and ISE Graduate Committee, which insure the logical sequence of topics necessary to the eventual achievement of the program outcomes. At the end of each semester, the students and faculty in each course rate how well that particular course section achieved its objectives. The faculty identify the specific program outcome(s) achieved in the course and provide evidence in support of their contention. In addition, students and faculty are encouraged to comment on how well the course fits into the overall scheme of the program and to suggest improvements to the course, the course outcomes and the overall program of study. The ISE Dept. holds a faculty meeting at the beginning of each semester to review all external evaluations and end-of-course evaluations from the prior semester and develop any needed plan for improvement.
The ISE M.S. program’s assessment process is outlined as follows.

**Oakland University’s Role and Mission Statement.**

The following sections from Oakland University’s Role, Mission Statement and goals have relevance for the M.S. in Industrial and Systems Engineering (ISE) program:

1) “Each program provides a variety of courses and curricula experiences to ensure an enriched life along with superior career preparation or enhancement.”

2) “The university offers master’s programs that meet demonstrable needs of Michigan residents ...”

**ISE M.S. Program Goals.**

The ISE M.S. program goals listed below flow from the goals identified by Oakland University. In order to facilitate the understanding of linkages, the numerical references that identify the linkages are consistent throughout this plan. For example, any ISE program goal labeled “1” below flows from the O.U. goal labeled “1” above.
1a) The program will enable students to design and analyze systems composed of diverse components that must interact in prescribed fashions to meet specified objectives.

1b) The program will enable students to apply mathematical and computer skills to engineering design and analysis.

1c) The program will enable students to adapt to new technologies and methods and use these in engineering design and analysis.

2) The program will enable students to function successfully in the automotive and other global industries.

**Student Learning Outcomes.**

Relevant student learning outcomes were developed based on the program goals. Each of these learning outcomes are related to a program goal. The numerical references are again consistent with the programs goals as well as the university’s role and mission statement. Before graduating, students in the M.S. in ISE program will demonstrate their skills in the following areas.

1a) Students will demonstrate an ability to design and analyze a product or process to satisfy a client’s needs subject to constraints.

1b) Students will demonstrate an ability to apply the skills and knowledge necessary for mathematical, scientific, and engineering practices.

1b) Students will demonstrate an ability to interpret graphical, numerical, and textual data.

1c) Students will demonstrate an ability to use modern engineering tools.

2) Students will demonstrate an ability to recognize when information is needed and to have the ability to locate, evaluate, and use effectively the needed information.

**Measures.**

The overall success of the M.S. in ISE program is measured by whether the students can demonstrate achievement of all learning outcomes as they graduate. In order to assess the students’ achievement, the ISE Dept. faculty have selected one direct measure and one indirect measure.

**Direct Measure.** A key courses are identified in the ISE M.S. program where students have the opportunity to demonstrate the achievement of the program learning outcomes. Note that any engineering M.S. program basically consists of fifth-year elective courses. Every engineering major contains of several areas (e.g., in ISE: quality control, production systems, etc). On the undergraduate level, the program requirements are general in nature requiring the students to take courses in all areas. On the graduate level, students have freedom to select from elective-
type courses with a concentration in a few areas or spread out over several areas. Thus, no single course is required for all students enrolled in the ISE M.S. program.

The ISE M.S. key courses are chosen to insure that all of the learning outcomes are demonstrated. The current key courses are ISE 583 Production Systems and Workflow Analysis, ISE 585 Statistical Quality Analysis, ISE 587 Foundations of Systems Engineering and ISE 684 Computer-Integrated Manufacturing Systems. Currently, all ISE M.S. students are required to take at least three of these four courses. Each year, two of these key courses are selected for external review (ISE 583 and ISE 587 on even years and the others on odd years).

When a key course is under review, student materials are collected that provide evidence that the outcomes have been achieved, such as homework assignments, laboratory assignments, project assignment and exams. External evaluators (faculty not directly involved with the course, engineers from industry and ISE Dept. Advisory Board members) review these materials to establish whether the students in that class have achieved some or all of the program outcomes.

The rubric used by the external evaluators is presented in Appendix A. Note that every assignment is not expected to demonstrated competency in all four learning outcomes. Hence, a customized rubric containing only the appropriate learning outcomes is generated for each assignment. The rubrics are generated by any ISE Dept. faculty member from the SECS assessment website. The ISE Dept. faculty meet to review the results of these external evaluations and generate appropriate plans to improve the achievement of the program outcomes.

Indirect Measure. Each ISE M.S. course has a set of course outcomes, developed by the instructing faculty and the ISE Dept. Graduate Committee, which insure the logical sequence of topics necessary to the eventual achievement of the program outcomes. At the end of each semester, the students in each course rate how well that particular course section achieved its outcomes (Appendix B contains an example rubric for ISE 581 Lean Principles and Application). The ISE faculty review all of these course evaluations each semester at a department faculty meeting and generate appropriate plans to improve the achievement of the program outcomes.

**Documentation of Assessment Process.**

All actions taken at each step of the assessment process are documented in an online assessment database. The ISE Dept. Chair, ISE Dept. Graduate Committee Chair and ISE Dept. Assessment Coordinator update this database every time action is taken in the assessment process (see example in Appendix C), and are solicited for improvements to the assessment process (see example in Appendix D). In this way, a written record is kept of both the assessment activities and of the process itself. This record is used by the ISE faculty to evaluate and improve the assessment process.

**ISE Dept. Faculty Involved in the Assessment Process.**

All ISE Dept. faculty members are involved in the assessment process.
Appendix A - Example External Evaluation Rubric (Direct Measure)

SECS External Evaluation of Program Outcomes - Graduate
Example Assignment
Fall 2007
Evaluator: __________________________ Date: ________________

Identification of student(s) or group:

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Please rate how well the student work presented demonstrates the following program outcomes, using a scale from 0-100. Ratings of 70 or higher are considered acceptable levels of accomplishment. Include any comments to justify or explain your ratings.

<table>
<thead>
<tr>
<th>An ability to design and analyze a product or process to satisfy a client's needs subject to constraints.</th>
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<td>Comments:</td>
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<tr>
<td>An ability to apply the skills and knowledge necessary for mathematical, scientific, and engineering practices.</td>
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<tr>
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<tr>
<td>Comments:</td>
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Evaluators:

Thank you for volunteering to assess the graduate engineering programs of the SECS. This service helps us continuously improve our programs of study in order to better serve our students.

You will be examining student work which has been selected by the instructor because [s]he believes that it demonstrates one or more of the outcomes of the program of study. Your task is to rate how well the student work that you are examining demonstrates the program outcomes. In order to focus your evaluation, the instructor may have provided examples of what [s]he thinks may be relevant material or topics to consider or look for. As a guide to assigning ratings, 70% or above is considered to be an acceptable level of accomplishment. Include comments to explain or justify your ratings.

It is important to understand that you are not grading the student work. The students will receive, or have already received, their grades from their instructor.

Department Graduate Curriculum Committee Chairs:

Please compute the averages of all of the rating sheets for all evaluators, and enter them in the online External Evaluation of Program Outcomes database. You must keep the original evaluation sheets, and the student work that has been evaluated, for a period of three years.

<table>
<thead>
<tr>
<th>Score</th>
<th>Rating</th>
<th>Description</th>
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<tbody>
<tr>
<td>90-100</td>
<td>Excellent</td>
<td>All assumptions, justifications and arguments are based on thorough and exhaustive mathematical analysis, experiments, computer simulations and/or research; research appears thorough and complete and is thoroughly documented; presentations are very well organized, easy to follow and exhibit thorough command of English.</td>
</tr>
<tr>
<td>80-89</td>
<td>Very Good</td>
<td>Most assumptions, justifications and arguments are based on thorough mathematical analysis, experiments, computer simulations and/or research; research appears complete and is well documented; presentations are well organized and exhibit good use of English.</td>
</tr>
<tr>
<td>70-79</td>
<td>Good</td>
<td>Some assumptions, justifications and arguments are based on thorough mathematical analysis, experiments, computer simulations and/or research; research appears complete and is documented; presentations are organized and exhibit standard use of English.</td>
</tr>
<tr>
<td>60-69</td>
<td>Below Average</td>
<td>Most assumptions, justifications and arguments do not appear based on mathematical analysis, experiments, computer simulations and/or research; research is missing, and/or undocumented; presentations are not organized well and exhibit sub-standard use of English.</td>
</tr>
<tr>
<td>50-56</td>
<td>Poor</td>
<td>Assumptions, justifications and arguments are not based on mathematical analysis, experiments, computer simulations and/or research; research is missing and/or undocumented; presentations are poorly organized and exhibit poor use of English.</td>
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Appendix B - Example Student Evaluation Rubric (Indirect Measure)

Course Objectives

Course: ISE 581  Section: 47798  Semester: Fall 2007  Instructor:

This section for evaluating the course. Please rate how well you think that YOU have met the objectives of the course. Please do not attempt to click "Finish" unless you have answered all of the following questions.

<table>
<thead>
<tr>
<th>KEY</th>
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<tbody>
<tr>
<td>E=EXCELLENT</td>
</tr>
<tr>
<td>G=GOOD</td>
</tr>
</tbody>
</table>

Please rate the following aspects of the course:

1. Define terminology associated with lean and lean manufacturing.
2. Discuss the theoretical and historical framework that leads up to lean concepts and principles.
3. Observe and analyze work as activities, connections and flows.
4. Identify the symptoms of waste in a work environment and in a simulated activity.
5. Differentiate between processes and activities that are value added and non-value added.
6. Participate on a team conducting continual improvement efforts.
7. Apply the appropriate rules/principles, concepts, tools and supporting systems of lean in simulated activities.
8. Define and discuss the necessary interrelationships by which people, processes, tools and systems operate at peak effectiveness within a lean environment.
9. THE FOLLOWING ARE SECTION OUTCOMES.  NA : 
10. This course was enriched by the multiple faculty presentations.
11. Value of the recitation component of this course.
12. Value of the project component of this course.
13. Overall rating of this course as a learning experience.
Appendix B - Example Student Evaluation Rubric (Indirect Measure)

![Image of the evaluated rubric](image-url)

**Course:** ISE 581  
**Section:** 47798  
**Semester:** Fall 2007  
**Instructor:** [Instructor Name]

### GENERAL QUESTIONS

Please select the response that most clearly describes your AGREEMENT with the following statements concerning the course and the instructor.

1. Making the objectives of the course clear to me.
2. Developing and presenting the course material in a clear and organized manner.
3. Stimulating and deepening my interest in the subject.
4. Motivating me to do my best work.
5. Explaining and clarifying difficult material and problem solutions.
6. Willingness to provide individual assistance to students outside of classroom hours.
7. Ability to handle questions from the class.
8. Utilization of class time.
9. Utilization of instructional aids such as blackboard, slides or viewgraph.
10. Uniformity and impartiality in grading.
11. Promptness in returning homework, laboratory reports and examinations.
12. Overall rating as a teacher.
13. Value of the textbook contribution to the course.
14. Value of the recitation component of the course.
15. Value of the laboratory component of the course.
16. Adequacy of the computing and/or laboratory facilities.
17. Overall rating of this course as a learning experience.

<table>
<thead>
<tr>
<th>KEY</th>
<th>E=EXCELLENT</th>
<th>A=AVERAGE</th>
<th>U=UNSATISFACTORY</th>
<th>NA=DOES NOT APPLY</th>
</tr>
</thead>
<tbody>
<tr>
<td>G=GOOD</td>
<td>P=POOR</td>
<td></td>
<td></td>
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</tbody>
</table>

Use a metric to indicate your level of agreement: 
- 5 = Strongly Agree  
- 4 = Agree  
- 3 = Somewhat Agree  
- 2 = Somewhat Disagree  
- 1 = Disagree  
- 0 = Strongly Disagree

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Appendix B - Example Student Evaluation Rubric (Indirect Measure)

Please feel free to leave comments on each of the following:

18. INSTRUCTOR 

19. COURSE 

20. GRADING AND EVALUATION 

21. OTHER 

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Student Profile

Course: ISE 581  Section: 47798  Semester: Fall 2007  Instructor:  

1. Hours spent per week outside the classroom for this course. 
2. Your assessment of the amount of material covered in this course. 
3. What grade do you expect to receive in this course? 
4. What is your approximate cumulative grade point average? 

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Appendix B - Example Student Evaluation Rubric (Indirect Measure)

1. Did your instructor have you work in teams of two or more in this class?

2. Overall, how satisfied were you with your experience with teams in this class?

3. What type of guidance did you receive from your instructor in this class to help you with your team activities?

4. Did your instructor/TA (not students) select the team members for at least one of your teams?

5. If a student on your team did little or no work on an assignment, were you provided the option of not including that student's name on the finished report?

6. Did you have the option of firing a person from your team? (Just the option, you didn't have to have fired anyone.)

7. Did you have one or more people on your team who you thought did not pull their weight?

8. Please feel free to comment on your experience with teams in this class:
Appendix C - Assessment Documentation Online Form

Assessment Documentation

This database has been established to record the assessment and program improvement activities for the School of Engineering and Computer Science. It is for the use of the SECS deans, the SECS department chairs and the curriculum committee chairs of the undergraduate and graduate programs.

To record an assessment activity, please fill out the form in its entirety and submit the entry. Your entry will not be recorded unless all fields are completed. To edit an existing entry of yours, select it from the pull down list, edit it and submit the edited entry.

Select entry:  - Add new entry -  Select  Delete

Date of activity:  10/8/2007

Submitted by:  Robert Van Til

Submitted as:  Assessment Coordinator

Entry applies to:  IE - Industrial Engineering

Activity:  

Submit Entry  Reset Form  Back to Main Secure Menu
Appendix D - Program and Course Improvements Online Form

Program and course improvements

This database has been established to record the program and course improvements for the School of Engineering and Computer Science. It is for the use of the SECS deans, the SECS department chairs and the curriculum committee chairs of the undergraduate and graduate programs.

To record a program or course improvement, please fill out the form in its entirety and submit the entry. Your entry will not be recorded unless all fields are completed. To edit an existing entry of yours, select it from the pull down list, edit it and submit the edited entry.

Select entry: - Add new entry -  Select  Delete

Date: 10/8/2007
Submitted by: Robert Van Til
Submitted as: Assessment Coordinator
Entry applies to: IE - Industrial Engineering

Template: The Assessment Group has considered the data gathered with the Assessment Tool(s) during the Assessment Period and has recommended Action(s) to be implemented in Semester, Year, and anticipates Result(s).

Assessment Group:
Assessment Tool(s):
Assessment Period:
Action(s):

To be implemented in: Fall  2007
Result(s):

Submit Entry  Reset Form
Back to Main Secure Menu