College of Engineering and Engineering Technology

Department of Industrial and Systems Engineering

Industrial and Systems Engineering

Master of Science

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Submitted to the University Assessment Panel by:

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1. Introduction

The Bachelor of Science program in Industrial and Systems Engineering (ISYE) is accredited by the Accreditation Board of Engineering and Technology (ABET). ABET accreditation is essential for the BS degree program. It is rare that Master of Science programs in engineering seek ABET accreditation. All engineering programs at NIU do not seek ABET accreditation for the MS degree programs.

The Department of Industrial and Systems Engineering chose to model the assessment plan for the MS degree program akin to ABET guidelines and expectations. This helps all our stakeholders to understand the assessment process well while maintaining rigor in our efforts to continuously improve and strengthen our program. The student learning outcomes for the MS program has changed since our last UAP review in 2012. Previously, our MS student learning outcomes were similar to the BS student learning outcomes. Based on the feedback from UAP and annual assessment feedback, the faculty developed the new set of student learning outcomes (as discussed in section 2). The student learning outcomes were also shared with our industry advisory board, students, and alumni to seek their input for any modifications.

The MS assessment plan mirrors our assessment plan for the BS program. The assessment plan for BS is prescribed by ABET and followed by all engineering programs across the nation. The assessment plan includes both direct and indirect assessment methods. Details on the learning outcomes and assessment is described in the following sections.

2. Student Learning Outcomes (SLOs)

The Department of Industrial and Systems Engineering (ISYE) has developed its learning objectives (or program outcomes) in consultation with faculty, industrial advisory board members, students and alumni.

The learning objectives are:

A. An ability to define and formulate Industrial and Systems Engineering problems.
B. An ability to apply math and scientific tools to define, design, predict, improve, and optimize the systems performance.
C. An ability to independently learn advanced topics in Industrial and Systems Engineering.
D. An ability to conduct research or project professionally and ethically.
E. An ability to effectively communicate ideas/concepts and research findings through technical reports and professional presentations.

Each outcome is more acutely defined with a set of operational definitions. These definitions provide a more detailed description of the objectives of each outcome. The operational definitions of each program outcome is shown in Table 1.

Table 1. Program Outcome and Operational Definitions

Program Outcome	Operational Definition
A. An ability to define and formulate Industrial and Systems Engineering problems.	A1. Defines the problem and the scope of the study clearly.
	A2. Defines the objectives concisely and clearly.
	A3. Formulates the problem appropriately.
B. An ability to apply math and scientific tools to define, design, predict, improve, and optimize the systems performance.	B1. Applies appropriate tools to analyze the data/problem.
	B2. Applies appropriate quantitative and qualitative tools while exploring solutions.
	B3. Develops alternative solutions, compares and proposes the best feasible solution.
	B4. Documents, recommends, and explains the best feasible solution clearly.
C. An ability to independently learn advanced topics in Industrial and Systems Engineering.	C1. Demonstrates the ability to use information seeking tools to search for state-of-the-art material.
	C2. Explains concepts/techniques learned independently in a simple and easy to understand manner.
	C3. Demonstrates the ability to apply the self-learned concepts to solve the chosen problem.
D. An ability to conduct research or project professionally and ethically.	D1. Uses project management skills to develop a plan and execute the plan to complete the research or project in a timely manner.
	D2. Follows code of ethics for engineers while conducting the research or project.
E. An ability to effectively communicate ideas/concepts and research findings through technical reports and professional presentations.	E1. Explains notations used clearly.
	E2. Communicates ideas, concepts, and research findings effectively in writing.
	E3. Explains experimental setup, experiments, analysis, and research findings clearly.
	E4. Uses appropriate graphics effectively in written and oral presentations.
	E5. Follows appropriate citation style and citations.
	E6. Uses presentation slides and materials that are well-designed (appropriate fonts, colors, contrast, etc.) and are readable.
	E7. Uses appropriate presentation techniques (maintains eye contact, modulates voice, avoids distracting gestures, etc.)

3. Program-by-Baccalaureate Student Learning Outcomes Matrix

This third section of the assessment plan is an alignment of your degree program student learning outcomes with the university baccalaureate student learning outcomes. **This applies only to undergraduate degree programs.**

4. Curriculum Map

The graduate program provides courses in wide range of topics which allows students to take courses that fit their interests and career goals. All students are required to take ISYE 695 Graduate Seminar, and the remaining courses must be approved by an advisor. There are three options for graduation: Thesis, Project and Paper.

Course	Program Student Learning Outcomes				
	A. Define and formulate ISYE problems	B. Apply math and scientific tools	C. Learn advanced topics independently	D. Ethics in research/project	E. Effective written and oral communication
ISYE 695: Graduate Seminar	B		B	B	B
ISYE 699A: Master's Thesis	P	P	P	P	P
ISYE 699B: Graduate Project	P	P	P	P	P
Note. Course supports the outcome at the B=beginning, D=developing, or P=proficient level.					

5. Assessment Methods

The department has four assessment methods that used to collect data on student performance. Course-embedded assessments, project/thesis evaluation by advisor and committee members, student exit survey and employer survey are used to assess the SLOs. Course activities such as assignments, quizzes, presentations and report writing are used for direct assessment of student performance in the required course by the instructor. The advisor and the thesis/project committee members assess the student's performance on the thesis/project through report writing, formal presentations and interim meetings. Each student during the graduating semester is requested to fill an exit survey to self-reflect on their attainment of student learning outcomes. The faculty in the department is very active in obtaining research funding from local industry (who typically employ our students). Each project includes one or more graduate students on these projects. The employers/sponsors of these projects have an opportunity to closely interact with our students over one or more semesters. Consequently, the department bestows importance to their input on student learning outcomes. The feedback from these employers helps us to improve course offerings, content change in courses, development of new courses/certificates, etc. The exit survey and employer survey are indirect assessment tools employed in the assessment plan.

Assessment Method	Explanation					
	Description	Student-Level Achievement [a]	Program-Level Target [b]	When Data Will be Collected	Person Responsible	SLOs Covered
ISYE 695	Evaluation of student's performance on specific activities (e.g. assignments, quizzes, papers, projects, and exams).	A student will achieve a score of 3 or better (out of 4) on the activities in the course.	50% of all students will meet the student-level target.	Fall and Spring	Course Instructor	A, C, D, E
Master's Thesis Evaluation	Evaluation of the master's thesis on how well the student achieved the student learning outcomes.	A student will achieve a score of 3 or better.	50% of all students will meet the student-level target.	Fall, Spring, Summer	Advisor	A, B, C, D, E
Graduate Project Evaluation	Evaluation of the master's project on how well the student achieved the student learning outcomes.	A student will achieve a score of 3 or better.	50% of all students will meet the student-level target.	Fall, Spring, Summer	Advisor	A, B, C, D, E
Exit Survey	Graduating student's feedback on how well they achieved the student learning outcomes.	A student will achieve a score of 3 or better.	50% of all students will meet the student-level target.	Fall and Spring	Department Chair	A, B, C, D, E

Assessment Method	Explanation					
	Description	Student-Level Achievement [a]	Program-Level Target [b]	When Data Will be Collected	Person Responsible	SLOs Covered
Employer Survey	Evaluation of project, internship, or co-op by employers on how well the student achieved the student learning outcomes.	A student will achieve a score of 3 or better.	50% of all students will meet the student-level target.	Spring	Department Chair	A, B, C, D, E
Note. [a] Student-level target is the score or performance an individual student must demonstrate to say the student met the student learning outcome. [b] Program-level target is the percent of all students that must demonstrate they meet the student learning outcome.						

ASSESSMENT METHODS-BY-OUTCOMES MATRIX

The instructor of ISYE 695 is responsible for collecting and assessing the data. The students typically are required to take this course during their first semester. We offer this course every semester. The thesis/project advisor and the committee is responsible assessing each student. The department chair is responsible for administering the exit survey (each semester) and the employer survey (annually). The assessment data and feedback is discussed at the faculty meeting (once a semester) and at our annual faculty retreat.

Assessment Method	Program Student Learning Outcome				
	A. Define and formulate ISYE problems	B. Apply math and scientific tools	C. Learn advanced topics independently	D. Ethics in research/project	E. Effective written and oral communication
ISYE 695	F, D		F, D	F, D	F, D
Master's Thesis Evaluation	S, D	S, D	S, D	S, D	S, D
Graduate Project Evaluation	S, D	S, D	S, D	S, D	S, D
Exit Survey	S, I	S, I	S, I	S, I	S, I
Employer Survey	S, I	S, I	S, I	S, I	S, I
Note. F=formative assessment, S=summative assessment, D=direct assessment, and I=indirect assessment. See the paragraph above for an explanation of each type of assessment.					