Colorado State University Pueblo

Assessment Plan

Master of Science in Industrial & Systems Engineering (MSISE)

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The MSISE program is housed within the Engineering Department at the CEEPS. The primary contact for assessment is H. Sarper.

Mission: The MSISE program prepares students from diverse educational backgrounds to function as engineers in advanced projects in industrial engineering and operations research and to continue their studies and obtain other advanced degrees especially at doctoral level.

The Colorado State University – Pueblo's mission statement states that "*The University shall offer a broad array of baccalaureate programs with a strong professional focus and a firm grounding in the liberal arts and sciences. The University shall also offer selected masters level graduate programs. (Colorado Statutes 23-55-101).*" The MSISE program builds on our Bachelor of Science in Industrial Engineering (BSIEN) program that has "a strong professional focus and a firm grounding in …sciences." Like the BSIEN program, the MSISE program also has a strong professional focus and will provide graduates with advanced scientific/engineering knowledge and skills to the region. The MSISE program closely follows the mission of the Department of Engineering which is to provide the highest quality engineering education in preparation of graduates for professional positions and/or doctoral studies. The Department is focused on broad engineering degrees not offered elsewhere in Colorado.

Objectives and activities used in measuring objective achievements are shown below.

OBJECTIVE	ACTIVITY/ PROCESS	MEASURES	FREQUENCY	HOW MEASURED
Graduates obtain jobs in their field of expertise and perform well and/or	Questionnaire	Self-report of graduates	Every 3 years	Survey analysis
Graduates start Ph.D. programs	Contact with graduates	Admission and graduation rates	Varies	Completed doctoral degree count; doctoral degree in process count

Expected Student Learning Outcomes

Each MISE graduate will be able to:

- Apply industrial engineering knowledge in facility design, operations planning, operations research, and simulation,
- Apply engineering principles in the design and analysis of a system or process to meet specified needs,
- Communicate effectively in writing and orally.

The above SLOs are directly related to the program's mission which is to provide the highest quality engineering education in engineering disciplines unique to Colorado. The department faculty is actively engaged in creating the SLOs for each program. It is their responsibility to communicate them to the students. Also, the faculty communicate and further refine the SLOs based on the inputs from the program's industrial advisory board.

Assessment Activities

The MSISE program is assessed by periodically reviewing the results of various metrics such as final course exams, homework assignments, projects, project report evaluations, presentations, paper evaluations, student surveys, and exit interviews with MSISE graduates. The results are used to improve the program. A curriculum map is presented below for the MSISE program.

Curriculum Map for MSISE

Courses and Learning Outcomes	Apply industrial engineering knowledge in facility design, operations planning, operations research, and simulation		Apply engineering principles in the design and analysis of a system or process to meet specified needs		Communicate effectively in writing and orally	
	opportunity	measure	opportunity	measure	opportunity	measure
EN 520	X	P	A/spring	PR, SS	A/spring	PP and/or PR
EN 571	X	P	X	F, HW		
EN 575	X	P	A/fall	PR		
EN 577	A/spring	P	X	F		
EN 593					A/fall	PP, PE

The curriculum maps above show the courses in which the outcomes are taught.

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* F = Final course exam *(direct)*
HW = Homework assignment *(direct)*
I = Exit interview *(indirect)*
P = Project *(direct)*
PR = Project report evaluation *(direct)*
PP = Presentation *(direct)*
PE = Paper evaluation *(direct)*
SS = Student survey *(indirect)*
A = Assessed for program outcomes
X = Opportunity, but not assessed for program outcomes

Note: All SLOs will be assessed every academic year.

Assessment Methods

Method type	Apply industrial engineering knowledge in facility design, operations planning, operations research, and simulation	Apply engineering principles in the design and analysis of a system or process to meet specified needs	Communicate effectively in writing and orally.
Direct			PE (EN 593)
	PR (EN 577)	PR (EN 575)	Presentation Evaluation (EN 520 and EN 593)
Indirect	Exit interviews	Exit interviews	Student Survey

The faculty member in charge of each course (as listed in the curriculum maps) is responsible for the implementation of the assessment methods, for reporting the results and for the implementation of changes that resulted from the decisions made by the engineering department faculty (at their faculty meetings). The faculty reports and discussions take place at the end of the school year. The changes to a course are implemented the next time the course is offered, unless the changes have to be approved by the CAPB.

The MSISE Program Director conducts exit interviews and reports the results to the faculty at the departmental meetings at the end of each school year. Also, the MSISE Program Director (who usually teaches EN 593) conducts student surveys in class and is responsible for the appropriate assessment method, analysis and reporting of the results.

While students are not actively involved in the design of assessment methods, they are an integral part of the learning loop showing the success of SLOs and the program objectives. We do not plan to seek an additional accreditation through ABET since there are only minimal advantages to such an accreditation.

Assessment Rubrics

Apply industrial engineering knowledge in facility design, operations planning, operations research, and simulation

	Exceeds expectations 5%	Meets expectations 75%	Does not meet expectations 20%
Design Strategy	Develops a design strategy, including a plan; decomposes work into subtasks, and develops a timetable.	Uses a design strategy with guidance.	No design strategy is attempted.
Solutions	Develops several potential designs and based on the analysis of those designs finds an optimal design solution using the system view approach.	Can develop and compare multiple solutions to a problem, but does not usually arrive at the best result; conducts optimization but neglects one or two key aspects. Does not use the system view approach.	Cannot design a system or individual component without significant amount of help. Only focuses on one solution to a problem; no optimization attempted.
Tools	Uses computer tools (e.g., LINDO, ARENA, MATLAB, @RISK, PLANTOP) effectively.	There is evidence of mostly correct use of computer tools and engineering resources	There is no evidence of use of computer tools and engineering resources.

Apply engineering principles in the design and analysis of a system or process to meet specified needs

	Exceeds expectations 5%	Meets expectations 75%	Does not meet expectations 20%
Design Strategy	Develops a design strategy, including a plan; decomposes work into subtasks, and develops a timetable.	Uses a design strategy with guidance.	No design strategy is attempted.
Constraints & Variables	Develops a solution that includes realistic constraints and stochastic variables when necessary	Develops a deterministic solution only that fails to include one or more minor realistic constraints and potential randomness in data.	There is no consideration of realistic constraints.

Communicate effectively in written form

	Exceeds expectations 5%	Meets expectations 75%	Does not meet expectations 20%
Articulation	Articulates ideas clearly and concisely using visual aids where appropriate.	Articulates ideas, but the idea flow is somewhat disjointed. Does not always use visual aids appropriately (e.g. a table and a graph representing the same information are used; a figure is not addressed in the narrative).	Does not develop/articulate Ideas well. Makes points that are hard to understand. Does not use visual aids.
Organization	Organizes the material in a logical sequence (paragraphs, subheading, etc.).	In general, organizes the material well, however, occasionally paragraphs combine multiple thoughts; sections and sub-sections are not identified clearly.	Imposes little or no structure or organization; does not use subheadings or proper paragraph structure.
Neatness	Presents material neatly and professionally	Occasionally, does not present material neatly.	Does not present material neatly.
Grammar and Spelling	Uses grammar and spelling correctly.	Makes one or two spelling/grammar errors per page.	Makes spelling/grammar errors throughout more than 1/3 of the paper.
Writing Style	Uses professional writing style.	Sometimes uses jargon, improper voice, improper tense, inappropriate style, etc.	Uses inappropriate writing style for the audience and for the assignment.
Document Formatting	Conforms to the prescribed format.	Conforms to the prescribed format in many portions of the assignment.	Does not follow the prescribed format.

Communicate effectively in oral form

	Exceeds expectations 5%	Meets expectations 75%	Does not meet expectations 20%
Delivery	Plans and delivers an oral presentation effectively; applies the principle of "tell them."	Presents key elements of an oral presentation adequately, but does not apply "tell them" clearly.	Organizes the presentation poorly (e.g. no clear introduction or summary is delivered).
Length and Detail	Presents technical content appropriate for the time allowed and the audience level.	Presents excessive or insufficient detail for time allowed and/or the audience level.	Presents for an inappropriately short or long time period; omits key results during presentation.
Mechanics	Makes eye contact; can be easily heard; speaks comfortably with minimal prompts; does not block the screen; doesn't show any distracting habits.	Exhibits minor difficulties (e.g. makes sporadic eye contact; occasionally is difficult to hear or understand; overuses prompts or does not use prompts enough; occasionally stumbles or loses place; occasionally blocks screen; occasionally exhibits some distracting habits (um, ah, clicking pointer, etc.)).	Exhibits major difficulties with the presentation (e.g. makes no eye contact; is difficult to hear or understand; reads from prepared script; blocks the screen; exhibits distracting habits (um, ah, clicking pointer, etc.)).
Dialect	Uses proper American English.	Occasionally uses an inappropriate style of English-too conversational; uses understandable English.	Uses poor English and/or poor pronunciation.
Visual Aides	Uses visual aides effectively.	Presents visual aides that have minor errors or are not always clearly visible.	Presents multiple slides that are unclear or incomprehensible.
Appearance	Exhibits professional appearance.	Appears too casual for a professional presentation.	Appears inappropriately dressed for the occasion (e.g. wears shorts, sandals, etc.)
Listening and Response to Questions	Listens carefully and responds to questions appropriately; is able to explain and interpret results for various audiences and purposes.	Sometimes misunderstands questions; does not respond appropriately to the audience, or has some trouble answering questions.	Does not listen carefully to questions; does not provide appropriate answers, or is unable to answer questions about the presentation material.

Assessment Results

The artifacts of student learning will be evaluated by multiple faculty using the attached rubrics. Based on the developed rubrics, each professor for his/her course evaluates the assessment results. Then at the end-of-the-year faculty department meeting all the results are discussed:

- Course SLO assessment results from each professor according to the rubrics above
- Student survey results
- Exit interview results
- Input(s) from the appropriate industrial advisory board and
- All program outcomes.

After the discussion and evaluation, the faculty members decide on the changes (if any) to the curriculum to improve the achievement of program outcomes. In the future, the assessment results may be used for budgeting and strategic planning. Also, the MSE Program Director is responsible for result dissemination to graduate students in the program (an e-mail announcement), faculty (faculty department meeting), the industrial advisory board (the yearly meeting), and the administration (the yearly assessment program report). In addition, the MSISE Program Director or student's advisor duty is to discuss with each student the progress in meeting the SLOs during advising session(s).

Continuous Process

The assessment plan is reviewed by the engineering faculty at their faculty meeting at the end of the school year, and after the discussion and evaluation of assessment results for that year. The department chair includes in the agenda the evaluation and the assessment plan reviews for each program. While reporting of the changes in the program is a part of the responsibilities of the MSISE Program Director, the program improvement process is the responsibility of all engineering faculty.

At the end of each assessment cycle, the MSISE Program Director reports to the administration the assessment results and the changes implemented or initiated. Also, based on the assessment results of that year, the MSISE Program Director suggests action items to the faculty for the following year.