

Annual/Biennial Program Assessment Report

Academic Year Assessed: 2023-2024

Report started: June 1, 2024

College: College of Agriculture and College of Engineering

Department: Agricultural Economics & Economics and Mechanical & Industrial Engineering

Submitted by: Dr. Greg Gilpin

Program(s) Assessed

List all majors (including each option), minors, and certificates that are included in this assessment:

Financial Engineering, BS and Minor

- Have you reviewed the most recent Annual Program Assessment Report submitted and Assessment and Outcomes Committee feedback? (please contact Assistant Provost Deborah Blanchard if you need a copy of either one).**

The Assessment Report should contain the following elements, which are outlined in this template and includes additional instructions and information. Additional instructions and information should be deleted from final reports.

1. Past Assessment Summary.
2. Action Research Question.
3. Assessment Plan, Schedule, and Data Source(s).
4. What Was Done.
5. What Was Learned.
6. How We Responded.
7. Closing the Loop.

Sample reports and guidance can be found at:

https://www.montana.edu/provost/assessment/program_assessment.html

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1. Past Assessment Summary. Briefly summarize the findings from the last assessment report conducted related to the PLOs being assessed this year. Include any findings that influenced this cycle’s assessment approach. Alternatively, reflect on the program assessment conducted last year, and explain how that impacted or informed any changes made to this cycle’s assessment plan.

Last year, PLOs C (Communicate effectively with a range of audiences) and D (Function effectively on inter-professional teams) were assessed using data from all EFIN 499 capstone projects (no randomized sampling). The projects demonstrated strengths in areas such as problem definition, data analysis, modeling frameworks, and presenting conclusions. However, some students struggled with making their methodologies clear to broader audiences and aligning results with project goals. This feedback informed this year’s cycle, but no significant changes were made to the assessment approach due to the overall strong outcomes.

2. Action Research Question. What question are you seeking to answer in this cycle’s assessment?

This cycle’s assessment focuses on whether students can recognize ethical and professional responsibilities in engineering contexts and make informed judgments that consider cultural, societal, and environmental impacts.

3. Assessment Plan, Schedule, and Data Source(s).

a) Please provide a multi-year assessment schedule that will show when all program learning outcomes will be assessed, and by what criteria (data).

ASSESSMENT PLANNING CHART: Financial Engineering						
PROGRAM LEARNING OUTCOME (Student Outcomes)	2022-2023	2023-2024	2024-2025	2025-2026	2026-2027	<i>Data Source*</i>
A. Apply knowledge of mathematics, economics, engineering, and computing to identify, formulate, design and assess solutions			X			EFIN 401 Exam
B. Analyze data, interpret results, and draw appropriate conclusions				X		EFIN 301 Final Project
C. Communicate effectively with a range of audiences	X				X	EFIN 499 Final Project
D. Function effectively on inter-professional teams	X				X	EFIN 499 Final Project
E. Recognize professional and ethical responsibilities in the conduct of their work and make informed judgements that consider cultural, societal, and environmental impacts		X				EIND 300 Assignment

- b) **What are the threshold values for which your program demonstrates student achievement?**

Threshold Values		
	Threshold Value	Data Source
Mini Paper 2	The threshold value for this outcome is a 3.0 average rating	A random sample of 10 on assignment in EFIN 300 from Spring 2022.
Fundamentals of Engineering Exam	MSU Average meets ABET Comparator / Ratio = 1.00	All students taking exam in EIND 300 during AY23-24

4. What Was Done.

- a) **Was the completed assessment consistent with the program's assessment plan? If not, please explain the adjustments that were made.**

Yes

No

- b) **How were data collected and analyzed and by whom? Please include method of collection and sample size.**

For PLO E, which assesses the ability to recognize ethical and professional responsibilities, the data were collected from Mini Paper 2 assignments in EIND 300 (Spring 2022). Kevin Cook evaluated a random sample of 10 student projects using a rubric. Additionally, Fundamentals of Engineering Exam scores from Fall 2023 and Spring 2024 were collected and compared against the ABET benchmark.

Data Collected	Mini Paper 2	Fundamentals of Engineering Exam
Course and Semester	EIND 300, Fall 2022	Jan-Jun 2024, Jul-Dec, 2023
Assessment Method	Faculty Evaluation using rubric	Exam scores
Sample	Random Sample of 10 Projects	All students taking exam (n=13,4)
Threshold	Average rating = 3.0	MSU Average meets ABET Comparator / Ratio = 1.00
Results	Average rating = 3.35	Jan-Jun 2023 ratio = .87 Jul-Dec 2022 ratio = .98 Avg = .93
Comparison to Benchmark	Exceeds	MSU Average slightly below ABET Comparator / Ratio = 1.00

- Mini Paper 2: The random sample had an average score of 3.35, exceeding the benchmark of 3.0.
- Fundamentals of Engineering Exam: MSU's average score (0.93) was slightly below the ABET comparator of 1.00.

The FESC also reviewed data from job placement data and senior exit interview data. Below are trends and analysis.

Job Placement

From 2016 to 2024, 88% of graduates whose job placement information is available (58 out of 87 students) are employed. Of these, 87% are working in roles directly related to their degree, meaning that 77% of all graduates are in relevant positions.

- 2023: 100% of the 10 graduates with known job placement status are employed, with 80% in relevant roles.
- 2024: 71% of the 7 graduates with known job placement status are employed, with 100% in relevant roles.

This data indicates that 77% of our graduates are working in relevant fields, exceeding our 75% threshold and suggesting the program effectively prepares students for the job market. Notably, 2023 graduates saw a trend toward consulting, software engineering, and data analytics, reflecting the demand for transferable skills. In 2024, while all employed graduates were in relevant fields, the overall employment rate dropped to 71%, signaling potential challenges in job placement rather than misalignment with career goals.

As mentioned previously, we should gather more data on the tools and skills graduates find lacking during interviews or in their first year of employment. Additionally, placing more emphasis on financial engineering, risk, and data analytics could help align the curriculum with consulting and engineering roles. Incorporating more business analytics into the program would also benefit graduates.

Furthermore, feedback from the FE capstone class suggests we can leverage the capstone course as a job placement opportunity. Partnering with companies for capstone projects could provide not only real-world experience but also networking opportunities that lead to internships or job offers. This approach would strengthen students' practical skills while enhancing their job prospects.

Senior Exit Interviews

EFIN graduates valued the capstone course for its real-world application of their education, particularly the opportunity to work with clients and present at the design fair. Most students felt that their projects were a good fit for their educational background, and they appreciated the collaboration between departments (EFIN + IMSE). However, some areas for improvement were identified, including securing NDAs before project start, clarifying the final report and deliverables from the outset, and avoiding repetitive projects each year. Some students also felt that the capstone course favored IMSE students, leaving EFIN students with less support.

c) Please provide a rubric that demonstrates how your data were evaluated.

Competency	Levels of Attainment				Rating
	4 Exceeds Expectations	3 Meets Expectations	2 Below Expectations	1 Unsatisfactory	
<i>e-1. Understands ethics appropriate to the discipline.</i>	<ul style="list-style-type: none"> Demonstrates high-level understanding of the codes, canons, and laws that form the basis for ethical evaluation and professional conduct. 	<ul style="list-style-type: none"> Demonstrates understanding of most codes, canons, and laws that form the basis for ethical evaluation and professional conduct. 	<ul style="list-style-type: none"> Demonstrates little understanding of codes, canons, and laws that form the basis for ethical evaluation and professional conduct. 	<ul style="list-style-type: none"> Does not demonstrate understanding of the codes, canons, and laws that form the basis for ethical evaluation and professional conduct. 	
<i>e-2. Recognize and weigh ethical implications of engineering solutions and design decisions and use that understanding to make informed judgements.</i>	<ul style="list-style-type: none"> Engineering solutions and design decisions reflect a recognition, consideration and proper weighting of all ethical implications and consequences. 	<ul style="list-style-type: none"> Engineering solutions and design decisions reflect a recognition, consideration and proper weighting of most ethical implications and consequences. 	<ul style="list-style-type: none"> Engineering solutions and design decisions reflect a recognition, consideration and proper weighting of some ethical implications and consequences. 	<ul style="list-style-type: none"> Engineering solutions and design decisions do not reflect a recognition, consideration and proper weighting of ethical implications and consequences. 	

Definition of Levels of Attainment:

- 4) Exceeds Expectations = Student demonstrates greater knowledge, skill or ability than is expected of a graduating senior engineering student.
- 3) Meets Expectations = Student demonstrates sufficient knowledge, skill or ability expected of a graduating senior engineering student.
- 2) Below Expectations = Student demonstrates less knowledge, skill or ability than is expected of a graduating senior engineering student.
- 1) Unsatisfactory = Student does not demonstrate adequate knowledge, skill or ability for a graduating senior engineering student.

The FESC also reviewed three courses (EIND 300, EIND 364, and EIND 457).

EIND 300 - Engineering Management and Ethics

The review of EIND 300 demonstrates that the course is well-aligned with its intended learning outcomes, particularly in enhancing students' communication skills and their ability to recognize professional and ethical responsibilities. Assignments like mini-papers and presentations encourage clear articulation of ideas, while the course also emphasizes ethical frameworks and the societal and environmental impacts of management decisions. Overall, the course fits well within the broader curriculum but could benefit from clarifying engagement expectations, documenting past changes, and incorporating more diversity content.

EIND 364 - Principles of Operations Research I

EIND 364 was reviewed through its syllabus, topics list, problem sets, and exams provided by students. The course aligns well with its learning outcomes, particularly in fostering students' problem definition and solving skills. The rigorous coverage of matrix and optimization theory, alongside applied problem-solving using continuous and mixed-integer programming, equips students with practical, high-value skills. The course also prepares students well for more advanced coursework or capstone projects, seamlessly fitting into the broader curriculum.

EIND 457 - Regression and Multivariate Analysis

The review of EIND 457 shows that it effectively meets the program's learning outcomes by integrating mathematics, economics, engineering, and computing to inform managerial decision-making. Students gain hands-on experience with data analysis through Minitab, enabling them to analyze relationships and make data-driven conclusions. The course provides a strong foundation in regression analysis and prepares students for more complex analytical tools within the financial engineering program. Its focus on real data and statistical theory ensures that students are well-equipped for advanced problem-solving.

5. What Was Learned.

- a) **Based on the analysis of the data, and compared to the threshold values established, what was learned from the assessment?**

The FESC chose EFIN 300 to assess PLO E, as it directly aligns with this learning outcome. Students generally perform well in the course, demonstrating a solid understanding of ethical behavior and industry professional standards. While MSU's performance was slightly below ABET standards, the difference was within a statistical margin of error, making it inconclusive. We will continue to monitor performance and adjust the curriculum as needed.

- b) **What areas of strength in the program were identified from this assessment process?**

The assessment of EFIN 300 shows that the course effectively instills ethical awareness and professional responsibility in students. Through assignments such as mini-papers and discussions on industry standards, students are able to grasp the importance of ethical behavior in engineering contexts. This reinforces their ability to make informed judgments that consider societal, environmental, and cultural impacts, which is a key outcome of PLO E.

- c) **What areas were identified that either need improvement or could be improved in a different way from this assessment process?**

Two areas for improvement related to the **EFIN 499** capstone project were identified during senior exit interviews, which serve as a follow-up to the assessment conducted in the previous cycle:

1. Capstone projects should include sufficient economics, finance, and coding components to better align with FE student needs.
2. Clearer guidance and expectations regarding project deliverables should be provided from the start of the project.

6. How We Responded.

- a) Describe how “What Was Learned” was communicated to the department, or program faculty. How did faculty discussions re-imagine new ways program assessment might contribute to program growth/improvement/innovation beyond the bare minimum of achieving program learning objectives through assessment activities conducted at the course level?**

The assessment and report were presented to the Financial Engineering faculty, initiating an open dialogue. In addition to reviewing student outcomes, discussions focused on how program assessments can foster innovation beyond PLOs. Faculty explored ways to integrate real-world applications into the curriculum, aiming to move beyond minimum requirements and encourage deeper industry engagement and skill development.

- b) How are the results of this assessment informing changes to enhance student learning in the program?**

The assessment identified that we were not awarding credit for summer internships aligned with Financial Engineering, as specified in our BOR program application. In response, we introduced EFIN 498 to allow students to earn professional elective credit. Two students obtained credit last year, though most have opted out. We plan to review why students are choosing not to earn credit and consider adjustments to improve uptake.

Additionally, efforts were made to improve the match rate for capstone projects with industry contacts. All capstone projects last year were finance-related, and this year a tenure-track faculty member with expertise in Financial Engineering was placed on the capstone project to further strengthen industry connections.

- c) If information outside of this assessment is informing programmatic change, please describe that.**

N/A

Evaluation schedule, AY2022-23 – AY2028-29

		Academic Year						
Data		2022-23	2023-24	2024-25	2025-26	2026-27	2027-28	2028-29
1	Job Placement	X	X	X	X	X	X	X
2	EAB Review	X	X	X	X	X	X	X
3	Internship Interviews	X	X	X	X	X	X	X
4	Alumni Survey	X					X	
5	Curriculum Review	X		X		X		X
6	Senior Exit Interviews	X	X	X	X	X	X	X
7	Course Reviews ¹	ECNS 460 ECNS 309 ECNS 301	EIND 364 EIND 300 EIND 457	EFIN 101 EFIN 401 EFIN 405	EIND 468 EFIN 301 EFIN 305	ECNS 461 ECNS 313 EFIN 499	EIND 354 EIND 464	EIND 373 EGEN 325 ECNS 345
8	Embedded Outcomes Assessment (EOA)	c, d	e	a	b	c, d	e	a
	EOA Data Source	EFIN 499	EIND 300	EFIN 401	EFIN 301	EFIN 499	EIND 300	EFIN 401
9	Assessment and Outcomes Committee Feedback	X	X	X	X	X	X	X

d) What support and resources (e.g. workshops, training, etc.) might you need to make these adjustments?

We are leveraging external industry leaders to assist in identifying capstone project companies. However, additional support is needed on industry partnership cultivation and networking. We will also explore university resources, such as career services to better support these industry connections.

¹ Course reviews evaluate the syllabi, final exam, and course learning outcomes to identify whether they fulfil the student outcomes as per Table 3 below.

7. Closing the Loop(s). Reflect on the program learning outcomes, how they were assessed in the previous cycle (refer to #1 of the report), and what was learned in this cycle. What action will be taken to improve student learning objectives going forward?

- a) **In reviewing the last report that assessed the PLO(s) in this assessment cycle, what changes proposed were implemented and will be measured in future assessment reports?**

None at this time. We revised our assessment schedule during 2022-23 to ensure it aligns with program feasibility while still covering all aspects of the curriculum. As highlighted in section 6c, this new schedule better reflects the time and resources available for comprehensive assessment across all PLOs, ensuring continuous evaluation of student outcomes.

- b) **Have you seen a change in student learning based on other program adjustments made in the past? Please describe the adjustments made and subsequent changes in student learning.**

Yes, curriculum adjustments, particularly in course sequencing, have led to improved alignment with industry expectations. These changes, driven by senior exit interviews, alumni surveys, and discussions within the Financial Engineering Steering Committee, have resulted in better-prepared students, particularly in the integration of technical and professional skills. These improvements will continue to be assessed and refined in future cycles.