

Annual/Biennial Program Assessment Report

Academic Year Assessed: 2022-2023

Report started: June 9, 2023

College: College of Agriculture and College of Engineering

Department: Agricultural Economics & Economics and Mechanical & Industrial Engineering

Submitted by: Dr. Greg Gilpin and Dr. Dilpreet Bajwa, Co-Chairs of Fin. Eng. Steering Comm.

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.

PLO B was assessed last year (B. Analyze data, interpret results, and draw appropriate conclusions). The data collected was EFIN 301 final projects from a random sample of students. All projects showed strength in analysis and presenting analytical findings. All work provided appropriate conclusions. Some weaknesses in student competencies included ability to expand conclusions to generalizable implications and backing up conclusions with data analysis and interpretation. The assessment worked well and we did not make substantial changes to this year’ cycle’s assessment approach.

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

Can students communicate effectively within a range of audiences? Also, can students function effectively on inter-professional teams?

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	Data Source*
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		
PROGRAM LEARNING OUTCOME	Threshold Value	Data Source
C. Communicate effectively with a range of audiences	The threshold value for this outcome is for 80% of assessed students to score above 12 on a 0–15-point scale.	All EFIN 499 final group projects from Spring 2023.
D. Function effectively on inter-professional teams	Comparing personal scores with the average of their group members' scoring, 75% of students' personal rating will be within 25% of their group's average score for them.	All EFIN 499 final group projects from Spring 2023.

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.**

PLO C. Communicate effectively with a range of audiences

Method of collection: Instructor of EFIN 499 provided all final projects for Spring 2023 (no randomized sample, using population). Names of students were redacted. Dilpreet Bajwa, Greg Gilpin, Faraz Dadgostari, Joe Atwood, and Yang Yu individually evaluated each students' work using the below rubric and also provided comments. Initial analysis completed by DAEE Business Operations Manager.

Sample size: All students in EFIN 499.

Student group	1	2	3
Total score out of 15	13.5	14.7	15
Score (in percent)	90%	98%	100%

- All groups are assessed 'competent'. The EFIN steering committee evaluates this as 'exceeding expectations' as all have average scores above 90%.

D. Function effectively on inter-professional teams

Method of collection: Instructor of EFIN 499 provided team evaluations of all 12 enrolled students. Each student was responsible for grading their teammates' contribution along with their own. Each student's personal contribution score was compared to the average of their three other teammates' contribution score. We are seeking to understand whether students have an awareness of their contributions to a team that closely matches with the rest of the team's opinion. Initial analysis completed by DAEE Business Operations Manager.

Sample size: All students in EFIN 499 during Spring 2023.

Proportion of Students, by category of awareness

Category of Awareness:	Large gaps in awareness	Above-average gaps in awareness	Below-average gaps in awareness	Low gaps in awareness
		25%	42%	33%

- All groups are assessed 'competent' with respect to their ability to function effectively on inter-professional teams (evaluated less than or equal to 25% variance).
- 75% of students 'exceeded expectations', i.e., being evaluated less than 25% variance.

The EFSC also reviewed data from alumni surveys (administered every five years), job placement data (administered every five years), and senior exit interview data. Below are trends and analysis.

Alumni Survey

Alumni gave positive feedback on the training in technical skills they received in the program (quantitative and data analysis). Some indicated more training may be provided to improve communication skills to a wide range of audiences, especially to those without engineering background. It was suggested by some respondents that more background knowledge of the financial industry should be added to the courses. In particular, the financial industry in the global and societal perspectives, as well as up-to-date modeling and analysis skills. More direction/advising in the capstone course was also suggested.

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Job Placement

Out of 65 students who graduated from spring 2016 to 2022, we have information about the employment status of 49 (75%) students. Out of 49 graduates, 95% are employed, and 75% are within the correct occupation for the degree. The current "current occupation percentage" of 75% is acceptable. Only 11% of employed graduates occupy totally irrelevant jobs. 14% of employed graduates are employed in software engineering roles, 13% of employed graduates are employed in other engineering roles, and about 22% are employed in consulting jobs. Even

though these roles are not considered financial engineering, risk, and data analytics roles, a significant portion of the skills learned in the program are used in these jobs.

We should collect data about the tools, knowledge, and skills our graduates find missing in their job interviews and the first year of employment. Given the data, we should focus more on how financial engineering, risk, and data analytics tools and knowledge related to the skillsets required in consulting, software engineering, and even classic engineering roles. I suggest we add/focus more on business analytics material in our program.

Senior Exit Interviews

Separate capstone project advisors for EFIN and IMSE would be helpful. The nature of some project was vague, the R&D was not linear. Project were more of management style, some projects required predicting outcome without many details.

If possible, share the capstone projects before the semester begins, let students pick their teams. Introduce a EFIN 101 course that explains the program and courses, and job placement opportunities. Too many economic classes, adjust STAT 408 and EFIN 301 sequence. Introduce EFIN 201 before students move into 300 and 400 level courses.

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

Indicators	Beginning: 1	Developing: 2	Competent: 3
C. Communicate effectively with a range of audiences	Project does not make sense out of the context of the class and is hard to make sense of.	Problem introductions, methodology and solutions are somewhat understandable by a range of audiences; one or two concepts provided without nuance or real-life application.	Problem introductions, methodology and solutions are all easily understandable by a range of audiences; project works well as a stand-alone poster.
D. Function effectively on inter-professional teams	Group assessments and individual assessments show a large gap of awareness (<u>over 25%</u> variance)	Group assessments and individual assessments are consistent within <u>10-25%</u> variance.	Group assessments and individual assessments are consistent within <u>10%</u> variance.

The FESC also reviewed three courses (ECNS 460, ECNS 309, and ECNS 301). Prior to completing the assessment, the FESC decided to remove ECNS 309 from the curriculum to reduce the number of SCH from 126 to 80. It was found to be not to be within the scope of the curriculum during previous assessments. Below are the assessments of ECNS 460 and ECNS 301.

ECNS 460

An evaluation of ECNS 460 (the syllabus and the syllabus listed technological requirements, reading materials, and stated learning outcomes) was conducted to determine if ECNS360 meets the Financial Engineering program's desired student outcomes of applying the knowledge of mathematics, economics, engineering and computing to identify, formulate, design and assess solutions to complex problems (MAJOR EMPHASIS).

Based on an evaluation of ECNS 460, we conclude that the course effectively meets the desired learning outcomes. We did not identify any areas that would hinder the course's alignment with the EFIN program's objectives. Given ECNS 460's rigorous data analytics content and the importance of data analytics in financial engineering, we recommend that ECNS 460 continue to be included as a required component of the Financial Engineering program. ECNS 460 fulfills the major emphasis outcome of applying knowledge from mathematics, economics, engineering, and the ability to identify, formulate, design, and assess solutions to complex problems.

The data analytics skills developed in ECNS 460 are beneficial in preparing the students for later classes and eventual job placement in an increasingly data driven economy that may involve using data and employing statistical, modelling, and machine procedures to assist decision makers in making informed judgments. ECNS 460 is a valuable contribution to the Financial Engineering program and should be maintained.

ECNS 301

We conducted an evaluation of ECNS 301 (syllabi, final exam, and learning outcomes) to determine whether the course met the Fin. Eng. program's student outcomes of 1) apply knowledge of mathematics, economics, engineering and computing to identify, formulate, design and assess solutions to complex problems (MAJOR EMPHASIS), and (2) recognize professional and ethical responsibilities in the conduct of their work and make informed judgments that consider cultural, societal, and environmental impacts (MINOR EMPHASIS).

Based on an evaluation of ECNS 301, we conclude that the course effectively meets the above learning outcomes. The evaluation did not identify any deficiencies that would hinder the course's alignment with the program's objectives. Therefore, we recommend that ECNS 301 continues to be regarded as a vital component of the Financial Engineering program. It successfully fulfills the major emphasis outcome of applying knowledge from mathematics, economics, engineering, and computing to identify, formulate, design, and assess solutions to complex problems. Additionally, while the evaluation did not explicitly assess the minor emphasis outcome of recognizing professional and ethical responsibilities and considering cultural, societal, and environmental impacts, it is important to continue monitoring and integrating these aspects into the course to ensure ongoing compliance. Overall, ECNS 301 is a valuable contribution to the Financial Engineering program and should be maintained as such.

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 the EFIN 499 capstone project to assessment PLO C and D because it acts as the cumulative assessment of EFIN students' demonstration of effectively communicating with a wide range of audiences and function on interprofessional teams – these students work in groups with clients to produce a solution to a complex financial problem. They require to collaborate with themselves, communicate with the clients' representatives, present their research to their class, and also at a COE poster session with students, faculty, and employers.

This assessment provides evidence that the EFIN program provides the necessary instruction and experiences for them to communicate effectively and function as a team.

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

The EFIN 499 is an integral component of the program and provides substantial value-added to prepare students for real-world scenarios – working on a team to solve tasks and communicate effectively to a wide range of individuals.

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

One team was on the border of being 'competent' functioning effectively on inter-professional teams. While we have a student in-take form to compose student groups, we will re-evaluate this process to improve student matching. We will continue to monitor groups of students during capstone that struggle with their communication and provide additional support.

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 provided to the Fin. Eng. faculty for review and an open dialogue was initiated. As demonstrated in our assessment plan, our assessment goes well beyond PLOs. As shown in the table below in section 6c, our assessment is quite comprehensive and mirrors ABET certification (albeit pared down).

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

There was a substantial overhaul of the major and minor. The major had 126 credits required and this was reduced to 80 (the SCH limit of an extended major). The minor was reduced from 60 credits to 30. This will make our programs more accessible to students and also reduce redundant coursework.

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

N/A

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

Faculty will need to be trained on the new curriculum and those teaching in the program will need to work with industry contacts – we also have a department list of such contacts, and they will be provided.

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?**

We have revised our assessment schedule to make it more feasible. As shown in 6c, our assessment covers all aspects of the program.

- 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, the curriculum continues to be updated with regards to the sequencing of courses. This is driven by data collected during senior exit interviews, the alumni survey, and by Fin. Eng. Steering Committee discussions. These adjustments are monitored and will be discussed and assessed in subsequent years to come.