

ACADEMIC PROGRAM REVIEW REPORT AY2023-24

Program(s) in the review: BS/MS Mechanical Engineering

Specialized Accrediting Agency (if applicable): Engineering Accreditation Commission of ABET

Campuses where the program is delivered: Anchorage KOD KPC MSC PWSC

Year of last review: AY20 (BS), AY23 (MS)

Final decision from last review: Continuation

PROGRAM SECTION (Due on March 1)

The program review committee chair and committee members are assigned by the dean. All program faculty should be included in the review process, including faculty on the community campuses. After completing the Program Section below, the program review committee chair will enter their name and date, and email this form to the dean, copying all committee members. If the program is fully delivered on a community campus, copy the appropriate community campus director(s). The program review committee chair's name and date lines are at the end of the Program Section.

Program Review Committee:

Raghu Srinivasan, Associate Professor of Mechanical Engineering and Department Chair, UAA

Jennifer Brock, Associate Dean for Academics and Professor of Mechanical Engineering, UAA

1. Demonstrate that the program has responded to previous recommendations.

BS Recommendation 1 (2020): *Reduce the number of upper-division electives offered each semester to increase the number of students per course.*

How do you know the recommendation has been successfully achieved? (2500 characters or less)

We consistently offered 3 upper division electives every semester with a few exceptions.

Actions taken to date (2500 characters or less)

As noted above, minimum of three upper division electives are offered every semester. But there are exceptions when new faculties were encouraged to offer new electives in their area of expertise and this diversifies our elective selections (one of our advisory board recommendations). ME students are required to take 12 credits of electives out of which 9 credits has to be ME prefix. It is hard to find that balance when you reduce the number of electives offered.

Evidence of success to date (2500 characters or less)

Since Spring 2021, upper division electives enrollment is around 50 students per semester. Two courses in each semester (like Vibrations, Aerodynamics, Manufacturing, Advanced Fluid Dynamics) consistently had enrollments more than 20.

BS/MS Recommendation 1 (2020): *Work toward the stated goals and initiatives that will help increase enrollment, maintain and enhance the program, increase student success, operate in a cost-effective manner, and generate additional revenue.*

How do you know the recommendation has been successfully achieved? (2500 characters or less)

The Mechanical Engineering department has revised the curriculum for the BSME program, and the new curriculum has been improved with new design-track courses and students would need to take fewer courses. The total number of required credits for the new curriculum is 124, 7 credits less than the old curriculum (131).

Actions taken to date (2500 characters or less)

The revised curriculum went into effect from AY 2022-2023. Students were also advised to switch catalogues if that ends up in lower number of credits to graduate and plans were put in to accept few courses from old catalogues as part of this transition.

Evidence of success to date (2500 characters or less)

More students submitted academic petitions as part of this transition and students distinct counts are as follows: 2020-304, 2021-259, 2022-248, 2023-222. We are averaging ~250 as our student distinct count.

MS Recommendation 1 (2023): *In conjunction with the Dean's Office, develop and implement new strategies to recruit students to the program.*

How do you know the recommendation has been successfully achieved? (2500 characters or less)

ME department recently revamped advisory board. We are working with the Dean's office and advisory board to develop strategies to recruit more students to the program.

Actions taken to date (2500 characters or less)

The Program review for MSME is very recent (Spring 2023) and we are working on forming a committee headed by our graduate chair to address all the recommendations.

Evidence of success to date (2500 characters or less)

N/A

MS Recommendation 2 (2023): *Evaluate the curriculum for opportunities to develop new graduate courses that will attract the program's own undergraduate students and more UAA graduates into the program.*

How do you know the recommendation has been successfully achieved? (2500 characters or less)

Most of our MSME students are recruited through the UAA's accelerated BSME/MSME program.

Actions taken to date (2500 characters or less)

The Program review for MSME is very recent (Spring 2023) and we are working on forming a committee headed by our graduate chair to address all the recommendations.

Evidence of success to date (2500 characters or less)

MS Recommendation 3 (2023): *Consider working with Enrollment Services to develop a BS/MS recruitment plan, which might include working with the Middle College School, and continue to focus on the non-thesis option for MS recruitment.*

How do you know the recommendation has been successfully achieved? (2500 characters or less)

N/A

Actions taken to date (2500 characters or less)

The Program review for MSME is very recent (Spring 2023) and we are working on forming a committee headed by our graduate chair to address all the recommendations. One of the tasks of this committee would be to work closely with the Enrollment Services and Dean's office and develop a recruitment plan (for both BS and MS programs).

Evidence of success to date (2500 characters or less)

N/A

MS Recommendation 4 (2023): *Develop ideas to make the MS program more attractive for non-thesis working professionals and improve their writing abilities.*

How do you know the recommendation has been successfully achieved? (2500 characters or less)

Actions taken to date (2500 characters or less)

The Program review for MSME is very recent (Spring 2023) and we are working on forming a committee headed by our graduate chair to address all the recommendations. One of the tasks of this committee would be to work closely with the newly revamped advisory board and explore how to bring in working professionals into our MSME program as they would be the most benefited group for non-thesis options.

Evidence of success to date (2500 characters or less)

N/A

MS Recommendation 5 (2023): *Collect and present more formal evidence, even if qualitative rather than quantitative, for program quality and potential areas for improvement toward student learning outcomes.*

How do you know the recommendation has been successfully achieved? (2500 characters or less)

We assess all outcomes by sending out a questionnaire to thesis and project committees when a student defends a thesis or project.

Actions taken to date (2500 characters or less)

Evidence of success to date (2500 characters or less)

Our MSME students met or exceeded faculty expectations in all areas.

- 2. Demonstrate the centrality of the program to the mission, needs, and purposes of the university and the college/community campus. Include how the program is integrating (or planning to integrate) intentionally designed opportunities for students to develop the four core competencies (Effective Communication; Creative and Critical Thinking; Intercultural Fluency; and Personal, Professional, & Community Responsibility). (3000 characters or less)**

Our capstone design course continues to teach these skills. Students may also optionally participate in internships, summer jobs, and part-time engineering employment while in school, and this would be an opportunity to develop these skills as well. Most of the upper-div lab courses involve written communication in the form of lab reports (ES A341L, ME A334L, ME A414L). ME A441L features a library research assignment. ME A438 Design of Mechanical Engineering Systems (capstone design) requires students to turn in a final design report and make an oral presentation, and have frequent meetings through out the semester with clients, who are frequently community members and non-engineers. ME A441L library research assignment - students must write a 2-page lit review discussing human interactions with technology. Within these bounds, they may pick the topic of their choice. There are scaffolding assignments throughout the semester to keep them on track.

For MSME program, project or thesis followed by a defense is one of the options vast majority of students choose and is an excellent place to hone these skills. Both require a high-quality written report and a public oral defense. The MSME continues to produce high-quality projects and theses. Thesis are most often supported by research funding (both internally and externally).

- 3. Demonstrate program quality and improvement through assessment and other indicators.**

- a. Program Student Learning Outcomes Assessment and Improvement Process and Actions**

- i. BS Mechanical Engineering**

- *1) Identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics; 2) Apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors; 3) Communicate effectively*

with a range of audiences; 4) Recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts; 5) Function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives; 6) Develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgement to draw conclusions; and 7) Acquire and apply new knowledge as needed, using appropriate learning strategies.

Describe your key findings for these outcomes. (3500 characters or less)

Student work was assessed directly in the required courses. Results were aggregated over the summer by the assessment coordinator. Other data collected included senior exit survey data each semester, and constituent surveys (to current students, alumni, employers, and faculty) to determine how well our Program Educational Objectives are meeting our constituent needs. Constituent surveys are deployed every three years. Faculty are scheduled to discuss the results by the end of Spring 2024.

Describe actions taken to improve student learning for these outcomes. (3500 characters or less)

This will be discussed at the end of Spring 2024 faculty meeting.

Describe evidence that these actions are working. (3500 characters or less)

The BSME degree program at the University of Alaska Anchorage has been recently accredited by the Engineering Accreditation Commission of ABET, the global accreditor of college and university programs in applied and natural science, computing, engineering, and engineering technology.

ii. MS Mechanical Engineering

- *1) Use in-depth methods of analysis; 2) Demonstrate graduate-level mechanical engineering theory; 3) Conduct advanced mechanical engineering research and applications; 4) Apply graduate-level engineering theory to the design of mechanical engineering systems; 5) Work effectively within the professional framework of organizations responsible for the practice of engineering.*

Describe your key findings for these outcomes. Programs may enter "See above" if there is a significant overlap of outcomes. (3500 characters or less)

In the MSME program, we have struggled with the statistics of small numbers with respect to our assessment data. We continue to work with students on a case-by-case basis to promote their graduate study and support their work.

Describe actions taken to improve student learning for these outcomes. Programs may enter "See above" if there is a significant overlap of outcomes. (3500 characters or less)

We are working on forming a committee headed by our graduate chair to address all the recommendations and improve our MSME enrollment.

Describe evidence that these actions are working. Programs may enter "See above" if there is a significant overlap of outcomes. (3500 characters or less)

N/A

- b. Demonstrate program quality and improvement through other means, for example, maintaining specialized accreditation, using guidance from advisory boards/councils, responding to community partners and local needs, maintaining currency of the curriculum, implementing innovative program design, intentionally integrating high-impact teaching and learning practices into the program, and meeting indications of quality in distance education, such as the C-RAC Standards. (3500 characters or less)**

N/A

4. Demonstrate student success and the closing of equity gaps.

- a. Analyze and respond to the disaggregated data in the data sheet for your program. Provide clarifications or explanations for any positive or negative trends indicated by the data, and discuss what you are doing to close any equity gaps. The Student Success program review metrics are Junior Graduation Rate, Associate Graduation Rate, Semesters to Degree – Graduate Programs, and Course Pass Rates by Course Level. (3500 characters or less)**

Junior graduation rate from 2020 fluctuates but on the other hand, full time students pass rates are consistently around 70% for lower division courses. That improves to high 80% for full time upper division courses.

- b. Numerous US universities, and a number of programs across UAA, have holistically evaluated their programs and courses to look for unintended barriers to student success. For example, the Purdue IMPACT (Instruction Matters: Purdue Academic Course Transformation) effort between 2011 and 2018 resulted in 325 courses being redesigned to incorporate research-based strategies known to increase student outcomes, while maintaining academic quality and rigor. Other efforts have involved course sequencing and scheduling, resulting in improved success even for [graduate students](#). Please consider your program's graduation rate, course pass rates, and similar data sources to reflect on any barriers to students moving through the curriculum, and describe what steps you have taken (or are planning to take) for possible redesign of gateway courses, course sequence changes, course scheduling, or similar efforts. (3500 characters or less)**

See above for curriculum revision for BSME program.

- c. **Provide evidence of the overall success of students in the program. For example, you might talk about the percent of students in post-graduation employment in the field or a related field, the percent of students who go on to graduate school or other post-graduation training, and/or the percent of students who pass licensure examinations. You might also give examples of students who have been selected for major scholarships or other competitive opportunities. [Please do not use personally identifiable information.] (3500 characters or less)**

Our students are employed in the state of Alaska and in lower 48. Some of our BSME students go on to continue graduate education (both here at UAA or at Universities in the lower 48). Our student successes include jobs at federal agencies, major national and international employers in aerospace, and local industries.

5. Demonstrate demand for the program.

- a. **Analyze and respond to the data in the data sheet for your program. Provide clarifications or explanations for any positive or negative trends indicated by the data, and discuss what you are doing to improve. The Demand program review metrics are Ratio of Out-of-Discipline Credit Hours to Total Credit Hours, Number of Program Graduates Who Continue Education, and Number of Program Graduates Who Return to UAA to Pursue an Additional Program. (3500 characters or less)**

The BSME and MSME programs meet UAA's mission to support workforce development in the high demand job field of mechanical engineering. Most of the program's graduates work in Alaska, helping to fulfill the higher education needs of the state. The program collaborates with other Engineering departments on curriculum. The program also has many partnerships with local industry, government, and non-profit organizations. Our students also continue to pursue additional education (both at UAA or somewhere else). The 5 year trend for the percentage of total credit hours taken in the discipline by students outside of the discipline is consistently around 70% and this shows the demand for our courses across the university.

6. Demonstrate program productivity and efficiency.

- Analyze and respond to the data in the data sheet for your program. Provide clarifications or explanations for any positive or negative trends indicated by the data, and discuss what you are doing to improve. The Productivity and Efficiency program review metrics are Five Year Degree and/or Certificate Awards Trend, Student Credit Hours per Full-Time Equivalent Faculty, and Full-Time Equivalent Student per Full-Time Equivalent Faculty. (3500 characters or less)**

The SCH/FTEF figures for BSME is consistent with slight drop in 2022 and 2023. The FTES/FTEF also follows the same trend as SCH/FTEF. These ratios could improve in the following semesters as one of our faculty resigned in Spring 2024. BSME program is the second most enrolled baccalaureate program in CoEng and this SCH/FTEF and FTES/FTEF figures support that. The small enrollment and degree award figures make it very difficult to comment on trends for MSME program.

Optional: Discuss the extent to which, if any, extramural funding supports students, equipment, and faculty in the program. (3000 characters or less)

ME tenure-track/tenured professors employ MSME students in their research programs funded by the Department of Transportation (DoT), NASA, and other internal and external funding sources. Our professors also recruit undergraduate students to work in funded research programs.

- 7. Assess program distinctiveness, as well as any duplication resulting from the existence of a similar program or programs elsewhere in the University of Alaska System. Is duplication justified, and, if so, why? How are you coordinating with UAA's community campuses and the other universities in the system? (2500 characters or less)**

UAF has the only other BSME and MSME program in the state. The faculty at UAA and UAF have technical expertise in different areas, and upper-level elective and graduate courses in particular, emphasize different areas, which makes the relationship between the programs complementary rather than competitive. The programs collaborate on shared curriculum, capstone projects, joint research, and intercampus club activities. Both programs primarily serve their own regions of the state and there is more demand for graduates in the State than is currently produced by UAA and UAF combined.

- 8. Assess the strengths of your program and propose one or two action steps to address areas that need improvement. (4000 characters or less)**

The BSME program was reaccredited by ABET in 2023 and our graduates are serving the engineering needs of our state and beyond. Based on what was learned from the process, we continue to evaluate our Program Educational Objectives (PEOs) by considering all our constituencies.

Make the non-thesis option for the MSME programs more attractive for working professionals who don't have the time to do a research thesis. MSME students writing their thesis should improve their writing ability by taking ENG/WRTG courses. Our Advisory Board members brought up the concerns with technical writing of our graduates during our last meeting. We could work closely with the board and explore the possibility of offering our own upper division technical writing course and also add a graduate level writing course as part of the MSME Graduate Study Plan (GSP). Teaching Assistant (TA) scholarship support from the College of Engineering for MSME students will also improve the program tremendously.

After completing the Program Section above, the program review committee chair should enter their name, date, and email this form to the dean, copying the committee members. If the program is fully delivered on a community campus, copy the appropriate community campus director(s).

Committee chair first name last name: Raghu Srinivasan

Date: 3/20/2024

END OF PROGRAM SECTION

DEAN SECTION (Due on April 1)

If the program is fully delivered on one or more community campus, the dean should consult with the director(s) of the campus. After completing the Dean Section below and entering their name, the dean should email this form to the committee. If the program is delivered on a community campus, copy the appropriate community campus director(s). The program has one week to provide an optional response to the Dean Section using the Program Optional Response Section of this form.

1. Evaluation of Progress on Previous Recommendations

For each recommendation from the last program review, indicate if the recommendation has been met or has not been met and provide commendations and guidance as appropriate. (2500 characters or less for each recommendation)

BS Recommendation 1 (2020): Reduce the number of upper-division electives offered each semester to increase the number of students per course. Recommendation has been met.

The Department has essentially met this recommendation. As stated, the average enrollment in its upper-division elective classes has been consistent and strong. The Department still has some elective courses that are consistently under-enrolled, and should consider offering those less frequently (such as every other year), or developing new courses that would be of more interest to students.

BS/MS Recommendation 1 (2020): Work toward the stated goals and initiatives that will help increase enrollment, maintain and enhance the program, increase student success, operate in a cost-effective manner, and generate additional revenue. Recommendation has been met.

The Department has made progress toward this recommendation. The Department is commended for reducing the number of credits in the BSME degree from 131 to 124 in its recent curriculum overhaul. This puts the program more in line with other engineering programs nationally in terms of number of credits, and is expected to benefit students. Enrollments across the college decreased during the pandemic, so increasing enrollments is a priority for all programs in the near term.

MS Recommendation 1 (2023): In conjunction with the Dean's Office, develop and implement new strategies to recruit students to the program. Recommendation has not been met.

Enrollment to the MSME has not increased. Contributing factors include the pandemic, which led to decreased enrollments across the board, and the fact that the Department has had very little time to comply with this recommendation. The Department's plans of forming a faculty committee and consulting its Advisory Board are appropriate steps toward this goal.

MS Recommendation 2 (2023): Evaluate the curriculum for opportunities to develop new graduate courses that will attract the program's own undergraduate students and more UAA graduates into the program. Recommendation has not been met.

The Department has had very little time to comply with this recommendation. The Department's plans of forming a faculty committee and consulting its Advisory Board are appropriate steps toward this goal.

MS Recommendation 3 (2023): Consider working with Enrollment Services to develop a BS/MS recruitment plan, which might include working with the Middle College School, and continue to focus on the non-thesis option for MS recruitment. Recommendation has not been met.

The Department has had very little time to comply with this recommendation. The Department's plan of charging the intended faculty committee to work with Enrollment Services is an appropriate step toward this goal.

MS Recommendation 4 (2023): Develop ideas to make the MS program more attractive for non-thesis working professionals and improve their writing abilities. Recommendation has not been met.

The Department has had very little time to comply with this recommendation. The Department's plan of charging the intended faculty committee to work with the Advisory Board to explore ideas is an appropriate step toward this goal.

MS Recommendation 5 (2023): Collect and present more formal evidence, even if qualitative rather than quantitative, for program quality and potential areas for improvement toward student learning outcomes. Recommendation has been met.

The MSME program has been collecting and assessing data on its SLOs consistent with its Programmatic Assessment Plan. Some of this data should be cited as to why the MSME students met or exceeded expectations in all areas.

Provide your analysis of #2-8 below, based on the data provided and the program's responses above.

2. Centrality of the Program. (2000 characters or less)

We concur that the program is demonstrating centrality and opportunities for students to develop the UAA Core Competencies, particularly in the culminating experiences that occur in the senior year. Related to the Personal, Professional, and Community Responsibility Core Competency, we note that the BSME is the only CoEng baccalaureate degree that does not currently require PHIL A305 Professional Ethics as one of its Humanities GER classes. The Department is therefore encouraged to consider this addition.

3. Program Quality and Improvement (2000 characters or less)

The BSME program has appropriate, documented processes for assessing and evaluating the extent to which the student outcomes are being attained, per criteria required by ABET for its accreditation. The program was recently re-accredited by ABET.

4. Student Success and the Closing of Equity Gaps (2000 characters or less)

We concur with the Department's observation that, while the junior graduation rate has fluctuated considerably in recent years, both the upper-div and lower-div course pass rates have remained very consistent.

5. Demand (2000 characters or less)

We concur with the Department's observation that the program meets a definite need within the state of Alaska. The Department is commended for recently revitalizing its Advisory Board in the spirit of continuing the close ties with industry that are essential to our college.

6. Productivity and Efficiency (2000 characters or less)

The BSME program is the second most highly-enrolled program in CoEng, and the SCH/FTEF and FTES/FTF do indeed reflect this. Several Department faculty carry a large degree of external funding, which has created research and other opportunities for undergraduate and graduate students.

7. Duplication and Distinctiveness (2000 characters or less)

We affirm that the Department does collaborate with the ME Department at UAF College of Engineering and Mines. Both programs primarily serve students within the catchment area of each university, and each program has its own areas of distinction thanks to specialization among the faculty.

8. Strengths and Ideas for Moving Forward (2000 characters or less)

The Department's plan to work with its Advisory Board to explore ways to address students' writing skills is an appropriate step. The College hopes to continue to provide funding for graduate TAs, but in the current budget environment, we expect that these will remain limited in the near future.

Dean's Final Evaluation

I commend the program for: (number and list the specific commendations in the narrative box, 2000-character limit)

The program is commended for reducing the number of credits in the BSME, revamping its Advisory Board, and successfully navigating reaccreditation of the BSME by ABET.

I recommend that the program: (number and list the specific recommendations in the narrative box, 2000-character limit)

Most of the recommendations for the MSME have not yet been met, although the Department has had very little time to address them. For the overall recommendation below, I am recommending a follow-up program review for MSME in AY2027 to gauge progress on the recommended actions for the MSME program. However, the BSME remains strong and I propose regular program review in AY2031. I realize this means that the programs would be split apart again. Upon successful review of the MSME program, they might be merged again in AY2031.

Dean's overall recommendation to the provost: Continued Review -- Program is required to address specific issues and to undergo a follow-up review.

If an Interim Progress Report is proposed, recommended year: N/A

If a Follow-up Program Review is proposed, recommended year: AY2027

Proposed next regular Program Review: AY2031

After completing the Dean Section above, the dean should enter their name, date, and email this form to

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the committee. If the program is fully delivered on a community campus, copy the appropriate community campus director(s). The program has one week to provide an optional response to the Dean Section using the Program Optional Response Section below.

Dean first name last name: Kenrick Mock

Date: 4/1/2024

END OF DEAN SECTION

PROGRAM OPTIONAL RESPONSE SECTION (Due within one week of receiving dean's review)

Programs have the option to submit to the provost a response to the dean's evaluation within one week of receiving the dean's review, using the narrative box below. Please indicate whether or not you will submit an optional response below.

Are you submitting an optional response? If yes, add your response below, enter your name and date, and follow the guidance below for submission. If no, enter your name and date, and follow the guidance below for submission. **No**

Optional Response: (10,000 characters or less)

After completing this section, the form should be submitted to uaa.oaa@alaska.edu, with a copy to the dean. If the program is fully delivered on a community campus, copy the appropriate community campus director(s) as well.

Committee chair first name last name: Raghu Srinivasan

Date: 4/5/2024

END OF PROGRAM OPTIONAL RESPONSE SECTION

PROVOST SECTION (Due on August 1)

After completing, signing, and dating the Provost Section of this form, email the completed form to the program review committee and dean, with a copy to uaa.oaa@alaska.edu for posting. If the program is delivered on a community campus, copy the appropriate community campus director(s) as well.

Provost's commendations, additional or adjusted recommendations, if any, and other general comments (3500 characters or less):

I agree with the dean's commendations and would like to recognize, in particular, the curriculum update reducing total credits to the bachelor's degree, and the re-constitution of the program's advisory board. I also agree with the dean's recommendations, and, in particular, wish to note the need to grow graduate enrollments. One strategy is to lean into what is already working for the program by writing

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graduate students into more external grants. As part of its undergraduate recruitment strategy, the program will want to explore alignment and engagement with the Anchorage School District academies.

While the dean proposed a follow-up review for the master's program, and none for the bachelor's program, I am scheduling both degrees for a follow-up review. This is because the programs should be mutually reinforcing, and solutions to graduate recruitment might very well be related to actions and activities related to the undergraduate program.

Finally, I am asking programs to ensure that all students have access to high-quality, highly-engaged learning opportunities, such as internships, practicums, clinicals, study away, and undergraduate research, regardless of modality or location. Programs will be asked to report on progress toward this goal in their next Program Review. These efforts naturally complement and extend our commitment to UAA's core competencies: Effective Communication; Creative and Critical Thinking; Intercultural Fluency; and Personal, Professional, and Community Responsibility.

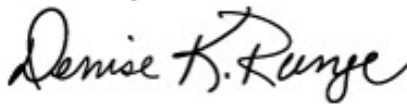
Provost's decision: Continued Review -- Program is required to address specific issues and to undergo a follow-up review.

Interim Progress Report: N/A

Follow-up Program Review: AY2027

Next regular Program Review: N/A

Provost's signature:



Date: 7/31/2024