

## **Standard 11: Outcome Measures Used to Improve Program**

Evidence shall show how direct and indirect outcome measures and the Industrial Advisory Committee's input and approval of the program/option are used to improve the overall program/option based on data collected and analyzed (complete Table B for each program/option).

Outcome measures shall include but need not be limited to:

- a. graduate satisfaction with program/option,
- b. employment of graduates,
- c. employer satisfaction with the graduates' preparation for employment,
- d. course-based direct measures, and
- e. criteria established by the Institution's regional accreditation activities.

Other possible measures could include but need not be limited to:

- f. job advancement of graduates,
- g. graduate success in advanced program/options, and/or
- h. student success in passing certification exams.

### **Summary Response**

Since the last ATMAE site visit in March 2019, changes in programs across the Department of Applied Engineering have been significant, ranging from minor adjustments to major revisions. The Applied Engineering Curriculum Committee, comprised of all Applied Engineering full-time faculty members, is the driver for these changes, and considers data gathered from graduating senior surveys, feedback from employers, and input from the Applied Engineering Industry Advisory Council.

### **Improvements Applying to All Programs**

**Career Events** - As part of a continuous improvement effort across all programs in the Department of Applied Engineering, the faculty and department staff recognized a need for students to better connect with regional employers to obtain internships for the senior internship requirement (AE 494 – Applied Engineering Senior Internship) as well as full-time employment opportunities.

Beginning in Spring 2020, the Department of Applied Engineering began independently planning and hosting career fair events each fall and spring for students from all majors represented in the department. The most recent events in Fall 2023 and Spring 2024 saw attendance of 29 employers and 22 employers, respectively.

Graduating seniors indicate an overwhelmingly positive outcome from attending Applied Engineering career events, with 70% of 2023 graduates receiving some offer of employment from attending a department career event (Figure 42). The addition of these events has also resulted in strengthened relationships between department faculty and employers, opening channels of feedback, opportunities for facility visits, and development opportunities and partnerships with these stakeholders.

Graduation Year (n = respondents)	Did you attend an Applied Engineering Career Fair event during any semester?	Did you obtain any interviews by attending an Applied Engineering Career Fair event?	Did you obtain any job offers (internships, co-ops, or full-time) by attending an Applied Engineering Career Fair event?
2023 (n=33)	97% Yes (32/33)	76% Yes (25/33)	70% Yes (23/33)
2022 (n=45)	89% Yes (40/45)	67% Yes (30/45)	56% Yes (25/45)
2021 (n=21)	90% Yes (20/21)	Question not included on survey	29% Yes (6/21)

Figure 42. Graduating Senior Feedback Re. Department Career Events

**Establishment of Co-op Education Program** – Recognizing the importance of work-based learning, and in response to requests from employers, the Department of Applied Engineering established a co-op education program for applied engineering students – the first of its kind on the JSU campus.

Collaborating with representatives from JSU Student Success, Financial Aid, the Registrar’s Office, and the Dean of the College of Business and Industry, Dr. Ingalsbe established co-op programs for both part-time and full-time schedules. The part-time program, “Parallel Co-op” allows students working within commutable distance from JSU to work 20-25 hours per week while taking a reduced course load (minimum of six hours). The full-time program, called “Alternating Co-op” allows students to alternate semesters of full-time employment and full-time enrollment at JSU. Both programs allow the student to be recognized by the Office of Financial Aid as full-time students, so their financial aid status is not affected. Details of both the parallel and alternating co-op programs are in Appendix N.

One of the 2024-2029 goals of the Department of Applied Engineering is to grow participation in the co-op education program (please refer to Standard 1).

**Facilities Improvements** – The 2018 EF-3 tornado that devastated the Jacksonville State University campus resulted in several renovation and building projects in the months and years that followed. One of the new buildings is Hugh Merrill Hall, home of the College of Business

and Industry. In August 2021, the Department of Applied Engineering moved its faculty and department offices to the new facility from Ayers Hall.

The 105,000-square-foot Merrill Hall features a 300-seat auditorium, three-story atrium, 12 academic classrooms, a finance lab, the Dr. Louise J. Clark Student Advising Center, interview rooms, collaborative “Team Rooms” for students, faculty and staff offices, and conference rooms. A coffee shop operates on the first floor. The Applied Engineering department office is in a third-floor suite with faculty offices. Nearby is the department’s primary teaching classroom: 300 Merrill Hall. 300 Merrill Hall seats 70 students, which is almost double the size of our previously largest classroom in Ayers Hall.



Figure 43. Hugh Merrill Hall (JSU 2022)

The spaces in Ayers Hall previously occupied by the department in Ayers Hall are in the process of being renovated into new learning spaces, as discussed in Standard 1 – Program Goals. Since 2019, the following renovations to spaces in Ayers Hall have occurred:

- **Room 120 – Industrial Hygiene Studio:** This former computer lab was renovated in Summer and Fall of 2023 with new paint, furniture, and audio-visual systems. It is dedicated to Industrial Hygiene instruction. Industrial hygiene equipment has been purchased and continues to be purchased so this space is fully equipped for teaching Industrial Hygiene I (AE 388) and Industrial Hygiene II (AE 490).
- **Room 149 – Instructional Classroom:** This is the primary teaching classroom for the department at Ayers Hall. In 2022 the audio/visual system was upgraded. In December 2023 the room received new paint and lighting.
- **Room 157 – General Safety Studio:** This former classroom and robotics lab received new paint and lights in Spring 2023. When funding becomes available, it will be a general use lab for students to engage in hands-on instruction in personal protective

equipment (PPE), fall protection equipment, ergonomic assessments, and other safety practices.

- **Room 161 – Design Lab:** This classroom is dedicated to instruction in 2D and 3D design. It was renovated in Summer 2019 with new furniture, computers, paint, lighting, and audio-visual systems.



Figure 44. Applied Engineering Design Lab - 161 Ayers Hall (JSU 2020)

Another significant facility addition that directly benefits Applied Engineering students is the JSU Center for Manufacturing Support<sup>29</sup> (CMS) Automation Hub, a space that opened in Fall 2022. The CMS falls under the administrative umbrella of the Department of Applied Engineering and is fully funded by the State of Alabama to promote advanced manufacturing practices and provide students with learning experiences within its facilities.

The CMS Automation Hub houses all automation-related equipment used in Applied Engineering coursework. The 6000 square-foot facility houses a variety of industrial robots from FANUC, Universal Robots, and Dobot, as well as Programmable Logic Controller (PLC) trainers.

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<sup>29</sup> JSU Center for Manufacturing Support (n.d.). <https://www.jsu.edu/applied-engineering/cms/index.html>



Figure 45. CMS Automation Hub (2023)

**Quality of Online Instruction** – When prompted to answer the question, “Online classes closely replicated the face-to-face classroom in terms of quality and personal interaction,” responses to the graduating senior survey indicated an opportunity for improvement related to the quality of online instruction provided. In 2021, 34% of students disagreed or strongly disagreed with this statement. While the prompt does not address Applied Engineering courses specifically, it is reasonable to assume that respondents had previously enrolled in one or more online courses offered in their major programs.

To address this feedback, all full-time faculty in the Department of Applied Engineering enrolled in the Online@JSU Certified Online Instructor course. All full-time faculty and some part-time faculty members finished the course in 2021-2022. Faculty courses were reviewed and critiqued as part of the process.

The course learning objectives for the Certified Online Instructor course are:

- Refresh one’s knowledge and skills in basic Canvas tools and navigation.
- Review and apply best practices in teaching an online course.
- Design, create, and build an outline of an online course.
- Create Canvas pages, modules, announcements, assignments, quizzes, and discussions.
- Practice and implement the backward design process when creating learning units.
- Focus on course alignment between objectives, activities, and assignments.
- Choose strategies and tools to help you create the type of course culture desired for the online course.
- Practice using the Canvas Accessibility Check and check all content for accessibility.



- Create/build an entire and complete online course.

As shown in the following table, responses from students regarding the quality of online course instruction have improved. More than 50% of 2023 graduates either agreed or strongly agreed that online course quality and interaction is comparable to in-person instruction. This is an improvement of more than 20% compared to 2021 responses.

Graduation Year (n = respondents)	“Online classes closely replicated the face-to-face classroom in terms of quality and personal interaction”		
	Strongly Agree or Agree	Neutral	Disagree or Strongly Disagree
2023 (n=33)	58% (19/33)	27% (9/33)	15% (5/33)
2022 (n=45)	51% (23/45)	31% (14/45)	18% (8/45)
2021 (n=38)	34% (13/38)	32% (12/38)	34% (13/38)

Figure 46. Graduating Senior Feedback Re. Quality of Online Instruction

**Compliance with Regional Accreditor** - The Southern Association of Colleges and Schools Commission on Colleges (SACSCOC), JSU's institutional accrediting body, requires that the institution identify expected outcomes, assess the extent to which it achieves these outcomes, and provide evidence of seeking improvement based on analysis of the results for student learning outcomes in each of its educational programs.

To maintain compliance with these requirements, the Department of Applied Engineering submits Program Learning Outcome reports to the Office of Institutional Research and Effectiveness on an annual basis, each October. These reports are in Appendix O. The faculty members within the department discuss student learning outcomes measured directly through academic assessments to determine if curricular, instructional, and/or programmatic revisions are necessary.

## Program-Specific Improvements

Program-specific improvements are summarized using Table B for each academic program.

<b>B.S. Applied Manufacturing Engineering – Automation and Robotics</b> <b>Table B - Outcome Measures Used to Improve Program</b>	
<b>Program Learning Outcome</b>	6.ii. Students will possess an ability to apply concepts of industrial automation and control systems.
<b>Means of Assessment</b>	Indirect: Graduating Senior Survey – Student comments regarding the need for more hands-on learning opportunities.
<b>Criterion for Success</b>	Provide students with engaging, hands-on experiences to learn concepts of industrial automation and control systems.
<b>Actions Taken for Program Improvement</b>	The Center for Manufacturing Support (CMS) designed and built of 10 new programmable logic controller (PLC) trainers for hands-on, industry-realistic instruction.
<b>Results of Actions Taken</b>	Students now have more hands-on engagement and industry-realistic learning opportunities to learn programmable logic controllers.
<b>Analysis of Results</b>	There will be an ongoing analysis of feedback (formal and informal) from students using these pieces of equipment.
<b>Actions Planned</b>	The trainers will have new components added to them (such as conveyers and vision systems) to provide additional technologies for students to learn.

Figure 47. Table B for B.S. Applied Manufacturing Engineering - Automation and Robotics

<b>B.S. Occupational Safety and Health Management Table B - Outcome Measures Used to Improve Program</b>	
<b>Program Learning Outcome</b>	9.i. Design a system or program to meet desired safety needs.
<b>Means of Assessment</b>	Indirect: Input from OSHM Program Advisory Committee (PAC)
<b>Criterion for Success</b>	The OSHM PAC provided feedback in 2022 concerning the need for additional industrial hygiene instruction for students.
<b>Actions Taken for Program Improvement</b>	A second course in industrial hygiene, AE 490 – Industrial Hygiene II, was added to the 2023-2024 academic catalog. The course is now a requirement for all students in the 2023-2024 catalog and later. A lab was renovated in 2023 for dedicated industrial hygiene instruction.
<b>Results of Actions Taken</b>	Students will now receive additional instruction in industrial hygiene in a newly renovated instructional space, preparing them to design and execute an industrial hygiene program in the field.
<b>Analysis of Results</b>	There will be an ongoing analysis of feedback (formal and informal) from faculty and students concerning the new course and instructional space.
<b>Actions Planned</b>	Additional equipment will be added to the teaching space as funds become available. Department budget now includes a line item of \$9K/year for lab equipment.

Figure 48. Table B for B.S. Occupational Safety and Health Management



<b>All Undergraduate Programs</b> <b>Table B - Outcome Measures Used to Improve Program</b>	
<b>Program Learning Outcome</b>	<b>Student Employability</b> – Encompasses all program learning outcomes
<b>Means of Assessment</b>	Indirect: It was observed by faculty over many years that the lowest performing students across all programs had great difficulty finding employment (both senior internship and full-time employment). In general, students with cumulative GPAs of less than 2.75 experienced these challenges.  Note: To maintain Good Standing at the university, a student will maintain a minimum 2.00 institutional grade point average (GPA). <sup>30</sup> Prior to Fall 2022, this was the minimum GPA required for graduation from Applied Engineering undergraduate programs.
<b>Criteria for Success</b>	A student will find an appropriate internship in time to register for AE 494 – Applied Engineering Senior Internship. A student will find full-time employment in his/her field of study within 4 months of graduation.
<b>Actions Taken for Program Improvement</b>	The following requirement was added to the 2022/2023 undergraduate catalog, “The student must have earned an overall grade point average of 2.75 based upon a 4.00 scale to include all AE courses and MS (math) courses with a “C” or better.” <sup>31</sup>
<b>Results of Actions Taken</b>	Students who do not meet the minimum cumulative GPA requirement by the time of graduation will not meet graduation requirements. Students with deficient GPAs are counseled during academic advising to seek additional support or to consider alternate majors.  Looking ahead, students meeting the new GPA requirement are expected to find internships and full-time employment in their fields of study.
<b>Analysis of Results</b>	Students in the 2022/2023 catalog are not yet eligible for AE 494 – Applied Engineering Senior Internship. The results of this change will be apparent starting in the 2025/2026 academic year when these students are seniors.
<b>Actions Planned</b>	The faculty will continue to monitor student placement information as it relates to this action.

Figure 49. Table B for Improvement - Addition of Minimum GPA to Undergraduate Curriculum

<sup>30</sup> Jacksonville State University Undergraduate Catalog > Academic Regulations > Good Academic Standing (2023). <https://catalog.jsu.edu/undergraduate/academic-regulations/#text>

<sup>31</sup> Jacksonville State University Undergraduate Catalog > College of Business and Industry > Department of Applied Engineering > Overview. (2023). <https://catalog.jsu.edu/undergraduate/business-industry/applied-engineering/>

**B.S. Applied Manufacturing Engineering – Automation and Robotics  
 B.S. Applied Manufacturing Engineering – Manufacturing Management  
 B.S. Occupational Safety and Health Management**

**Table B - Outcome Measures Used to Improve Programs**

<b>Program Learning Outcome</b>	General PLO #4. An ability to understand ethical and professional responsibilities and the impact of technical and/or scientific solutions in global, economic, environmental, and societal contexts.
<b>Means of Assessment</b>	Indirect: Faculty Observations/Input
<b>Criterion for Success</b>	Students are adequately prepared for professional success in internships and full-time employment.
<b>Actions Taken for Program Improvement</b>	The Applied Engineering Undergraduate Curriculum Committee (all full-time faculty) recognized that the curriculum taught in AE 493 – Applied Engineering Senior Seminar, was helpful to students but this information was needed earlier in the plan of study.  Action: Addition of AE 393 – Applied Engineering Junior Seminar to the undergraduate curriculum for AME-AR, AME-MM, and OSHM majors starting in Fall 2022. This course replaces AE 493 – Applied Engineering Senior Seminar.
<b>Results of Actions Taken</b>	Students now receive instruction in professional matters such as: resume creation, mock interviews, effective professional communication, evaluation of employment offers, professional ethics, personal values, and personal finance.
<b>Analysis of Results</b>	Since the course was first offered in Fall 2022, an increased number of students have received offers of employment at Applied Engineering career events (70% in 2023 compared to 56% in 2022).
<b>Actions Planned</b>	The faculty will continue to monitor opportunities to further prepare students for professional success.

*Figure 50. Table B for Improvement – Addition of AE 393 to the Undergraduate Curriculum*

<b>B.S. Manufacturing Systems Technology Table B - Outcome Measures Used to Improve Program</b>	
<b>Program Learning Outcome</b>	MFG 4: The student explains and applies the principles, basic concepts, and methodology of engineering economy.
<b>Means of Assessment</b>	Student Learning Outcome (SLO): Students will propose improvements (based on course knowledge) to a current manufacturing system being utilized by a manufacturer.  Assessment: MFG 505 – Manufacturing Operational Systems I, Presentation: Tools of Toyota
<b>Criterion for Success</b>	Goal: 80% of students will earn a grade of B or better on the assignment.
<b>Actions Taken for Program Improvement</b>	Continuous improvements in this course include the adding a LinkedIn group for current students and alumni to allow greater networking and engagement in the program. In Fall 2023 a private LinkedIn group was created: “Manufacturing Systems Alumni Network.” The group is comprised of both current students and program alumni, strengthening connections locally and across the country.
<b>Results of Actions Taken</b>	Students and alumni are invited to on-campus events and provided the opportunity to share resources, experiences, and knowledge. Several current students and program alumni attended a recent Applied Engineering on-campus open house in Fall 2023.
<b>Analysis of Results</b>	The faculty will continue to discuss methods for better engaging students so that performance continues to meet success criteria.
<b>Actions Planned</b>	.Annual reviews of assessment results will take place.

Figure 51. Table B for Improvement – PLO 4 for MFG Program