ABET SELF-STUDY QUESTIONNAIRE: Manufacturing Systems Engineering SELF-STUDY REPORT

2024-2025 Review Cycle

ENGINEERING ACCREDITATION COMMISSION

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Introduction

The Self-Study Report for the Manufacturing Systems Engineering (MSE) degree is a quantitative and qualitative assessment of the strengths and limitations of the program being submitted for review.

The Self-Study Report provides information critical to a thorough on-site review of the program. The Report addresses the extent to which the program meets applicable ABET Criteria and policies.

Supplemental Materials

The following materials are supplied in addition to the Self-Study Report:

- The general institution catalog covering course details and other institutional information applicable at the time of the review.
- Promotional brochures or literature describing program offerings of the institution.
- Official academic transcripts of recent graduates. The **official academic transcript** contains a listing of all the courses taken by a graduate, year/semester courses were taken, the grades earned, and degree(s) earned. The Team Chair will request a specific sampling size of transcripts for each program and will provide a timeframe in which they should be provided to program evaluators. Each academic transcript is to be accompanied by the program requirements for the graduate and by worksheets that the program uses to show how the graduate has fulfilled program requirements. It is not required to remove names and other personal identifying information from transcripts and associated student records before providing them to the Evaluation Team. However, if desired, personal identifying information may be replaced with a simple alphanumeric code by which the documents may be referred to during the evaluation.
- Evidence (e.g., reports) to show compliance with Criterion 5 (d) related to the culminating major engineering design experience. Evidence to show compliance with Criterion 5 regarding the culminating design experience is provided electronically on a storage platform titled ‘Box’ upon request.

ABET
Self-Study Report

for the

Manufacturing Systems Engineering
Bachelor of Science Degree

at

Weber State University

Engineering Technology Building 1447
Edvalson St. Dept 1802
Ogden, UT 84408-1802

July 1, 2024

CONFIDENTIAL

Program Self-Study Report
for
EAC of ABET
Accreditation or Reaccreditation

BACKGROUND INFORMATION

A. Contact Information

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B. Program History

Include the year implemented and the date of the last general review. Summarize major program changes with an emphasis on changes occurring since the last general review.

The MSE program was started in the fall of 2018 and had its first graduate in 2020. The program applied for initial accreditation review in July of 2022 and was granted accreditation in October of 2023. Since the last program review there have been several minor changes to the program.

B.1 FACULTY

Weber State University's Manufacturing Systems Engineering (MSE) program has undergone significant enhancements to foster a more inclusive and diversified learning environment. A key initiative involves expanding the diversity within the faculty to provide students with a broader range of perspectives and expertise as well as two new faculty requisitions to support the program.

The program has strategically customized course assignments to align with the unique strengths and specialties of faculty members at Weber State. This tailored approach ensures that students benefit from a well-rounded education that reflects the diverse facets of manufacturing systems engineering.

A notable improvement is the restructuring of key courses, namely MSE 3700, MSE 4010, MSE 4615, MSE 3040, MSE 4600, MSE 4620, and MSE 4700. Previously taught by a single instructor, these courses now boast a team of five different instructors. This deliberate shift allows students to access a variety of viewpoints, experiences, and teaching styles within these crucial components of the MSE curriculum. The diverse faculty team brings a wealth of knowledge and practical insights, enriching the learning experience for students and preparing them to navigate the complexities of the manufacturing industry with a more comprehensive skill set.

To address ABET concerns about faculty support, the MSE program has taken a proactive approach by restructuring pivotal courses. Notably, for the Spring semester of 2024, the program has re-allocated an additional 12 credit hours (MSE 3040, MSE 4600, MSE 4700 and MSE 4620) strategically distributed among a diverse group of faculty, most of whom are either tenured or on the tenure track. Previously, these courses were taught by the same instructor. This deliberate enhancement ensures that students benefit from a more comprehensive and varied educational experience, directly addressing the ABET review concerns and reinforcing the program's commitment to academic excellence.

By embracing these program improvements, Weber State University's MSE degree not only aligns better with industry demands but also promotes a more inclusive and dynamic educational environment, fostering a new generation of manufacturing systems engineers equipped to excel in the evolving landscape of the field.

B.2 COURSE IMPROVEMENTS

MSE 3700

The continuous improvement efforts for MSE 3700 at Weber State University are centered on enhancing students' ability to demonstrate specific learning outcomes outlined by ABET. Addressing ABET Learning Outcomes 2 and 4, which emphasize engineering design, public health, safety, welfare, ethical responsibilities, and societal impacts, the course has undergone a substantial redesign.

The innovative approach involves a shift towards interactive project-based learning. By incorporating real-world projects, students are now provided with opportunities to apply engineering design principles to generate solutions that meet specified needs. Moreover, the redesign emphasizes considerations for public health, safety, and welfare, as well as the broader impacts on global, cultural, social, environmental, and economic factors. This dynamic learning environment fosters a more comprehensive understanding of how engineering solutions intersect with diverse contexts.

Additionally, an improved assessment tool has been implemented to ensure a more nuanced evaluation of student learning outcomes. Recognizing the limitations of a previously employed timed quiz, the new assessment tool captures a higher level of detail and precision in gauging students' abilities to recognize ethical and professional responsibilities in engineering situations. This strategic shift in assessment methods allows for a more accurate reflection of students' application of engineering principles within the complexities of global, economic, environmental, and societal contexts.

Another improvement in the MSE 3700 course involves the selection of a new textbook that aligns more closely with the specific content and objectives of the course. The updated textbook is tailored to better suit the nuances of manufacturing systems engineering, replacing the previous one that was primarily centered around systems engineering. This strategic choice aims to enhance the relevance and applicability of course materials, ensuring that students receive targeted and comprehensive insights into the principles and practices specifically relevant to MSE 3700. By aligning the textbook with the course's focus, students now have a more tailored and effective resource to support their learning in manufacturing systems engineering.
In addition to the textbook update, MSE 3700 has introduced a crucial enhancement by incorporating the SolidWorks Certified SolidWorks Associate (CSWA) exam into the course. Recognizing the paramount importance of proficiency in solid modeling and Computer-Aided Design (CAD) for graduates entering the field of manufacturing systems engineering, faculty members are actively considering the inclusion of this certification exam in the continuous improvement plan.

The CSWA exam serves as a benchmark for evaluating students' competency in SolidWorks, a widely used CAD software in the industry. By integrating this certification into course assessment, MSE 3700 aims to ensure that students not only grasp theoretical concepts but also develop hands-on skills essential for successful careers in manufacturing. This strategic addition aligns with industry demands and reinforces the course's commitment to producing graduates well-versed in the practical applications of solid modeling and CAD within the context of manufacturing systems engineering.

These concerted efforts in course redesign and assessment tools not only align with ABET standards but also ensure that students in MSE 3700 are better equipped to demonstrate and apply crucial engineering skills and ethical considerations in a practical, real-world setting.

MSE 4615

MSE 4615, the Senior Project I course, has undergone significant enhancements to offer students a more comprehensive and hands-on experience in the field of manufacturing systems engineering. The course structure has transitioned from a solo virtual format to an in-person, team-oriented approach. Students are now immersed in the entire manufacturing process, gaining practical insights into design, prototyping, production phases, testing, evaluation, concept generation, and specification.

The revamped curriculum ensures that students acquire proficiency in generating essential documentation, including engineering drawings, inspection reports, solid models, and Finite Element Analysis (FEA) of designs and systems. Notably, the incorporation of a peer review component and a more stringent grading rubric elevates the course's evaluation process, providing students with constructive feedback and enhancing the overall quality of their work. This transformation of MSE 4615 aligns with industry demands, offering students a hands-on understanding of the complexities involved in manufacturing processes while emphasizing collaboration, documentation, and rigorous evaluation through peer reviews. The course now serves as a pivotal platform for students to apply their knowledge and skills in a real-world context, preparing them for successful careers in manufacturing systems engineering.

MSE 3040

An error was discovered in the catalog description. This course was updated with the following catalog description: This course covers an overview of Cost Estimating and Engineering Economic Analysis including evaluating investment alternatives, considering time value of money, inflation, and depreciation. Students develop skills to make informed decisions, incorporating economic, ethical, and environmental factors. Students gain proficiency in creating robust cost estimates and contributing to strategic decision-making in engineering projects.
A curriculum change was initiated on 11-27-23 to update the catalog description.

MSE 3850

We also made several enhancements to our course, "SPC and Reliability," aimed at enriching the learning experience and facilitating greater student success. These improvements have been carefully crafted to address specific areas of learning gaps and to provide students with valuable opportunities for skill development and application.

New Process Capability Lab:
In response to the evolving needs of our students, we have introduced a cutting-edge Process Capability Lab to our curriculum. This new lab is designed to immerse students in the practical application of statistical process control (SPC) principles, offering hands-on experience in analyzing process performance and assessing its capability to meet specifications. Through interactive exercises and real-world case studies, students will deepen their understanding of process variation and gain valuable insights into optimizing process performance for enhanced reliability and quality assurance.

Updated Facilitation of GRES Problem Solving Method:
To further support student learning and mastery of critical problem-solving techniques, we have revamped the facilitation of the GRES problem-solving method (Goal clarification, Root cause analysis, Explore alternatives, Select a solution). By integrating updated instructional strategies and resources, we aim to empower students to effectively identify, analyze, and resolve complex issues related to statistical process control and reliability engineering. Through guided practice and feedback, students will develop proficiency in applying the GRES method to real-world challenges, equipping them with invaluable problem-solving skills essential for success in quality management roles.

These enhancements reflect our ongoing commitment to delivering a dynamic and engaging learning experience that prepares students for the demands of modern industry. We are dedicated to fostering a supportive and collaborative learning environment where students can thrive and develop the expertise necessary to excel in SPC and reliability engineering. Join us as we embark on this exciting journey of discovery and growth in quality management excellence.

MSE 4010

MSE 4010: Facility Design and Material Handling Design, also underwent significant changes. This course was completely redesigned based upon the foundational text "Manufacturing Facilities Design and Material Handling" by Mathew Stephens, 6th edition (2018), this course offers a structured exploration of key concepts and principles essential for success in facility design and material handling.

Structured Curriculum:
The course structure is centered around the text, with each chapter meticulously covered through session modules and hands-on labs known as deliverables. Students will engage with the material in a systematic manner, delving into topics such as facility layout planning, material flow analysis, and optimization techniques. Through a combination of lectures, practical exercises, and real-world case studies, students will gain a deep understanding of the fundamental principles and best practices in facility design and material handling.

Integration of Reverse Logistics:
In response to evolving industry trends and demands, we have introduced a dedicated session on Reverse Logistics in factories. This new addition to the curriculum explores the intricacies of managing product returns and reverse supply chains within manufacturing facilities. Students will examine strategies for efficiently handling returned products, minimizing waste, and maximizing value recovery, thereby enhancing their understanding of sustainable manufacturing practices.

Expertise and Experience:
Led by an instructor with extensive experience in designing and delivering similar courses at prestigious institutions such as the University of Pittsburgh and the Rochester Institute of Technology, MSE 4010 combines academic rigor with practical insights drawn from real-world applications. The instructor's expertise ensures that students receive high-quality instruction and guidance throughout their learning journey.

Tailored Labs for Utah and WSU:
While the course already offers a robust set of hands-on labs, efforts are underway to develop additional Utah and WSU specific labs to further enrich the learning experience. These tailored labs will provide students with opportunities to apply course concepts in the context of local industry practices and challenges, enhancing their readiness for future professional endeavors.

Interactive Learning Environment:
Unlike its previous iteration, this revamped course is designed to be highly interactive, leveraging the Canvas platform to deliver engaging lectures, files, deliverables, handouts, and support materials. Through interactive discussions, collaborative assignments, and multimedia

resources, students will actively participate in their learning journey, fostering deeper understanding and retention of course material.

MSE 4700

For the Spring semester 2024, this course was reassigned to two faculty members (Comber and Knighton) to increase hands-on curriculum in automation. Previously this course was taught from a theoretical perspective and faculty wanted students to be able to complete the course with tangible and measurable skills in automation. The faculty members implemented a new automation book by Groover. Comber and Knighton switched the labs to use some of the modules in the Amatrol PLC trainers and Mechatronics trainers which includes PLC programming using ladder logic, memory bits and memory bit stacking, sequencing, interlocks and latching, and timers/counters. Students completed a Universal Robot Training online certification for robotics which includes pick and place and simple integration. Faculty also required the students to take the SME certification exam in this course (changing to MSE 4620 in spring 2025).

MSE 4600

For Spring 2024, we hired an industry expert from FlexSim, Anthony Johnson, to co-teach MSE 4600 Production Systems Modeling and Analysis. Mr. Anthony recently completed his master's degree at Columbia University in Industrial Engineering. Over the past 20 years, he has been the lead developer of the discrete-event simulation software FlexSim. He taught the course very professionally and helped the students gain an in-depth knowledge of the software while exposing them to the real-world applications and benefits of discrete event simulation and analytics. The students completed several assignments building basic models and then each completed an individual project over the final 4 weeks of the semester and then presented their simulation models and analysis to the class.

MSE 3460

For the Fall Semester 2024, the instructor for the course updated the syllabus to include online tutorials from my.solidworks.com to allow students to review some basic and advanced modeling concepts at the beginning of the semester who have not had SolidWorks instruction or experience recently and need a refresher course. This allows the instructor to proceed with the planned assignments without spending class or lab time with the entire class when there may be a single student who needs the review. The instructor also improved the Calculus design assignment to integrate Excel for a graphical representation of a break-even analysis to help students better visualize the alternate design/production options.

B.3 REVISE INDUSTRY ADVISORY COUNCIL

The Industry Advisory Council that was originally developed was not representative of the broader manufacturing engineering industry and was heavily weighted toward one particular company and council members that represent Systems Engineering. This council, as a result, was ineffective at guiding the program into what the Utah based manufacturing industry needs are. The council was revised to include broader industry representation and targeting industry partners with background and experience in Manufacturing Systems Engineering. Additionally, some advisory board members with business backgrounds were removed. The revised industry advisory council member list is included for reference. The following companies have been added to represent the broader industry manufacturing base:

Fresenius Medical Care
Boeing
Northrop Grumman
Lifetime Products
TreeHouse Foods

B.4 REVISE PROGRAM EDUCATIONAL OBJECTIVES

The PEOs that were developed at the inception of the program were not consistent with the mission of the degree and needed to be revised. This revision will allow course curriculum and development to better meet the goals of the degree program. They were reviewed by faculty and industry council members to the following:

1. Technical Competence: Graduates will have a strong foundation in manufacturing engineering principles and systems thinking, which they will use to design and optimize manufacturing processes and systems.

2. Professional Growth: Graduates will continue to develop their technical and leadership skills, pursuing advanced degrees, professional certifications, or industry specific training as appropriate.

3. Effective Communication: Graduates will be able to communicate technical information effectively to diverse audiences, including engineers, managers, and customers.

4. Ethical Behavior: Graduates will demonstrate ethical behavior and responsibility in their professional practice, and contribute positively to society and the environment.

5. Teamwork and Collaboration: Graduates will work effectively in interdisciplinary teams, applying their technical knowledge to solve complex problems.

6. Continuous Improvement: Graduates will engage in continuous learning and improvement, applying innovative approaches to manufacturing processes and systems to enhance competitiveness.

7. Proactive Problem Solving: Graduates will apply their knowledge of manufacturing engineering principles, systems thinking and business skills to create and launch new products and services, or to improve existing ones.

The manufacturing industry in Northern Utah has demonstrated a need for MSE graduates in the state of Utah. Hill Air Force Base initially requested that Weber State University develop an

MSE degree. They saw the need among Northern Utah advanced manufacturing firms for engineers who can understand, analyze and design manufacturing systems involving human and machine interactions. There is no other institution in Utah that offers a manufacturing system engineering bachelor's degree despite the need. Other western states (e.g., Arizona, California, Colorado, Montana, and Oregon) have Manufacturing Engineering programs. Idaho and Nevada do not have MSE programs, making these states a source of potential students for the WSU program.

C. Options

There are no options offered in the program.

D. Program Delivery Modes

Delivery methods include days:

- Traditional lecture/lab
- Hybrid learning (face-to-face & on-line)

E. Program Locations

All of the courses in the program are taught on the Ogden campus of Weber State University.

F. Public Disclosure

The Program Educational Objectives (PEOs), Student Outcomes (SOs), annual student enrollments in the program and graduation data specific to the program may be found on the university's website at https://www.weber.edu/mse/manufacturing.html

G. Deficiencies, Weaknesses or Concerns from Previous Evaluation(s) and the Actions Taken to Address Them

Summarize the Deficiencies, Weaknesses, or Concerns remaining from the most recent ABET Final Statement. Describe the actions taken to address them, including effective dates of actions, if applicable. If this is an initial accreditation, it should be so indicated.

PROGRAM WEAKNESS Criterion 4. Continuous Improvement

This criterion requires that the program must regularly use appropriate, documented processes for assessing and evaluating the extent to which the student outcomes are being attained. It further requires that the results of these evaluations be systematically utilized as input for the continuous improvement actions. However, the program did not demonstrate that the assessment and evaluation methods as a whole are sufficient to definitively assess the extent to which student outcomes are attained, either in the self-study, or during reviews and discussions during the visit. While one of the measurements is a passing score on the SME CMfgT exam as a graduation requirement, evidence of successful accomplishment of that score has been based on the honor system wherein students self-report their successes. Furthermore, the score is only reported in the aggregate, with no evaluation of performance on the sub-elements. Also, when a course is taken together by students from the Manufacturing Systems Engineering program and the Manufacturing Engineering Technology program, student outcome assessment is not separated for each group of students. As a result, opportunities to identify input for the program's continuous improvement actions may not be identified or discovered. Thus, the program lacks the strength of compliance with this criterion.

Program Response:

Cause & Investigation:

MSE Faculty agree that the continuous improvement plan is weak and needs improvement. The team investigated this and found there were numerous elements that needed to be improved in the continuous improvement plan.

Corrective Actions

The MSE faculty identified several corrective actions to address this weakness. These actions are summarized below and further documented in the continuous improvement section criterion 4 in this self-study.

1. The SME exam has been incorporated into an existing MSE course assignment. This will create a placeholder for the exam and eliminate the 'honor system' for taking the exam. Exam results will be collected specifically for MSE students.

2. Relevant SME topics have been identified and linked to MSE coursework. A standard has been created for each relevant topic that can be used to measure the success of selected courses in preparing students with needed skills and associated attainment goals. Exam performance has been compared against standards, assessed and improvement initiatives developed as required. See sample MSE/CMFGT Exam Assessment tool in criterion 4.

3. Customized assessment rubrics have been developed for courses offered jointly to MSE and MFET students. This will allow for student outcome assessment for MSE students specifically. See sample course rubrics in criterion 4.

4. The continuous improvement plan has been revised to include the additional steps and document the process with a flowchart. Refer to criterion 4 for flowchart.

5. LO attainment will be tracked with an assessment summary tool with a link to plan and annual assessment summary and threshold. Document results and analysis of corrective action where appropriate as shown in criterion 4.

6. A Canvas page has been created to monitor and communicate Continuous Improvement activities to faculty and staff as shown in criterion 4.

PROGRAM WEAKNESS Criterion 5. Curriculum

This criterion requires that the curriculum must include a culminating major engineering design experience that incorporates appropriate engineering standards and multiple constraints. However, the program was not able to demonstrate that senior design projects incorporated appropriate engineering standards and multiple constraints in the culminating design experience (MSE 4615, Senior Project Design I/ Lab and MSE 4620, Senior Project Design II/ Lab). Without such experience, graduates may not be adequately prepared for engineering practice. Thus, strength of compliance with this criterion is lacking.

Program Response:

Cause & Investigation:

MSE Faculty agree that the curriculum in the major engineering design experience was weak and needed improvement. The team investigated this and found that the MSE 4615 and MSE 4620 Senior Project Series did not include a method to evaluate student's ability to identify and incorporate appropriate engineering standards and multiple constraints.

Corrective Actions

The MSE 4615 and MSE 4620 syllabus and grading rubric were updated to include an evaluation of ability to identify and incorporate appropriate engineering standards and a discussion of multiple constraints. See revised syllabi and assessment rubric in supporting documentation.

PROGRAM CONCERN Criterion 6. Faculty

This criterion requires the program to demonstrate that faculty members are of sufficient number and have the competencies to cover all of the curricular areas of the program. It further requires there be sufficient faculty to accommodate adequate levels of student-faculty interaction, student advising and counseling, university service activities, professional development, and interactions with industrial and professional practitioners, as well as employers of students. The number and composition of faculty members is sufficient for the current program enrollment, and this criterion is currently satisfied. However, the projected near-term growth in student enrollment indicates the existing faculty size may soon become insufficient to cover all curricular areas of the program while also accommodating adequate levels of student-faculty interaction. Thus, future compliance with this criterion may be jeopardized.

Weber State University's Manufacturing Systems Engineering (MSE) program has undergone significant enhancements to foster a more inclusive and diversified learning environment. A key initiative involves expanding the diversity within the faculty to provide students with a broader range of perspectives and expertise. These efforts include the hiring of a new MSE faculty member, which was approved in spring 2024; hiring efforts are currently underway.

The program has strategically customized course assignments to align with the unique strengths and specialties of faculty members at Weber State. This tailored approach ensures that students benefit from a well-rounded education that reflects the diverse facets of manufacturing systems engineering.

To address ABET concerns directly about faculty support, the MSE program has taken a proactive approach by restructuring pivotal courses. Notably, for the Spring semester of 2024, the program has re-allocated an additional 12 credit hours (MSE 3040, MSE 4600, MSE 4700 and MSE 4620) strategically distributed among a diverse group of faculty, most of whom are either tenured or on the tenure track. This includes reassigning courses to Professor Harwood, Professor Comber, Instructor Hunter, Associate Professor Foss, and Assistant Professor Knighton. Previously, these courses were taught by the same instructor. This deliberate enhancement ensures that students benefit from a more comprehensive and varied educational experience, directly addressing the ABET review concerns and reinforcing the program's commitment to academic excellence.

By embracing these program improvements, Weber State University's MSE degree not only aligns better with industry demands but also promotes a more inclusive and dynamic educational environment, fostering a new generation of manufacturing systems engineers equipped to excel in the evolving landscape of the field.

GENERAL CRITERIA

CRITERION 1. STUDENTS

For the sections below, attach any written policies that apply.

A. Student Admissions

Weber State is an open enrollment institution and there are no specific requirements for admission into the Manufacturing Systems Engineering (MSE) program.

Students who provide a high school GPA and an ACT math score to the Office of Admissions will be placed in the appropriate math course based on the WSU Developmental Math Rubric Score. Those who have less than the acceptable minimum scores must take designated developmental math courses. Students with less than a 17 on the ACT in both English and Reading must take the appropriate developmental English course. Students with at least 17 on the English and Reading and a 23 on the mathematics sections respectively of the ACT (or their equivalents on the SAT) are allowed to take the non-developmental math and English courses in accordance with their degree plan.

If students want to challenge their math placement based on their high school GPA or ACT scores, the scores have expired or they have no placement, they are asked to take a free, proctored ALEKS math placement test. In addition to being a placement test, ALEKS provides the opportunity to review and learn math skills so students can increase their math course placement.

If students did not take the ACT in the past 48 months or they want to challenge their automatic English placement, they must take the ACCUPLACER Reading Comprehension and Sentence Skills tests to find their placement. Depending on the result of this test, students may be required to complete developmental English courses before they complete 60 credit hours.

Until students have completed their developmental courses, they are not allowed to take upper division courses. Once they have completed the required developmental courses with a grade of "C" or above and have made satisfactory progress in their other courses, they are then automatically allowed to take upper division courses.

New students who are accepted into the Manufacturing Systems Engineering Program fall into one of three general categories:

1. Recent high school graduates
2. Current students at WSU
3. Transfer students

Any student who wishes to major in Manufacturing Systems Engineering is first admitted to WSU. The university admission process is handled centrally at the university level. The student then meets with the Manufacturing Systems Engineering Program Coordinator (Advisor), an assigned faculty member who is given three credit hours of release time per semester for this duty. The program coordinator extensively uses Cattracks, a WSU computer-based degree evaluation, and planning tool to provide students individualized program specific advising. CatTracks enables the program coordinator to track the student's progress toward graduation by showing the courses taken and grades received, courses still required, grade point average, transfer credits, and other pertinent information. Students may also meet with one of two EAST advisors assigned to the MSE program to discuss general academic questions and general education questions: Angela Payan (virtual) and Tanya Scott (NB 142P).

1. Recent high school graduates

A recent high school graduate who desires to major in Manufacturing Systems Engineering meets with the program coordinator to discuss their graduation plan. If the student is not prepared to take college-level mathematics courses, developmental mathematics is required to bring the student up to the Calculus I level before the student can take the first course in physics. The program coordinator meets personally with the student to evaluate his or her academic record and to map a plan for coursework. The student is also directed to the EAST advisors who can help them with general education questions. Students are asked to input their graduation plan into CatTracks, but not required to do so. The Manufacturing Systems Engineering major is then officially declared on the student’s record in the WSU Banner system by the EAST advisors or the department administrative assistant.

2. Current students at WSU

Any current student, traditional or non-traditional, at WSU can be accepted into the Manufacturing Systems Engineering Program, as there are no special entrance requirements. However, like the recent high school graduate, if the student is not prepared to take college-level mathematics courses, developmental mathematics is required to bring the student up to the Calculus I level before the student can take the first calculus-based physics course.

The process for accepting recent high school graduates and current WSU students into the program is the same. Paying particular attention to previous courses taken in college-level mathematics, the program coordinator meets personally with the student to evaluate his or her academic record and to map a plan of course work. The Manufacturing Systems Engineering major is then officially declared on the student’s record in the WSU Banner system. After the student has been declared a major in the program the program coordinator may work with the student to determine any formal exceptions to MSE program requirements where courses the student has already taken are deemed equivalent to MSE required courses. All such exceptions are formally recorded in the student’s Cattracks record with the program coordinator documenting the reasons the exception was made.

3. Transfer students

A student who transfers to WSU from another institution meets personally with the program coordinator, who evaluates the student's courses taken at the transfer institution(s). Particular attention is given to transfer courses in engineering, mathematics and science. The majority of transfer students come to WSU from institutions within Utah, where lower-division courses transfer as part of a statewide articulation agreement. If a student transfers from an institution outside Utah or the United States, the program coordinator evaluates each course individually and may ask the student to provide course syllabi, textbooks or other materials to show equivalence with WSU courses. The program coordinator may make exceptions in CatTracks where transfer courses are deemed equivalent to MSE required courses. Again, all exceptions are fully documented in the CatTracks system. Once the transfer courses are recorded in CatTracks, the program coordinator maps a plan of course work for the student, along with the EAST advisors who work with the student regarding general education requirements.

B. Evaluating Student Performance

According to the General University policy, students are required to maintain a cumulative GPA of at least 2.00 for all WSU coursework. Additionally, no more than 20 credit hours of 'D' grades are permissible towards graduation. Furthermore, individual colleges or departments reserve the right to reject 'D' grade coursework applicable to major or minor requirements. This can be found in IIRC ppm 4.1.

For the MSE program, a minimum grade of 'C' is mandatory in both required courses and technical support courses for the major. Grades adhere to the University's grading scale.

In instances where a course prerequisite hasn't been met, students have the option to formally appeal to the faculty teaching the course. If the faculty member teaching the course determines that the student has met the prerequisite through some equivalent course or experience and approves the appeal, proper documentation is required. The faculty must record his ”exception” in the Advisor Notes section of CatTracks, explaining why the exception was made. Typically, an equivalent class or test score (e.g., AP calculus) serves as the prerequisite. The MSE Program Advisor formally requests a report of all faculty-approved overrides to ensure sufficient documentation and documents findings to share with the department. This report is included in the criterion 4 Continuous Improvement.

If the faculty teaching the course denies the prerequisite override, the student may escalate the appeal to the Program Coordinator. The Program Coordinator will collaborate with faculty members to determine whether the student must fulfill the prerequisite or if an alternative course can be taken.

Only the MSE Program Coordinator is authorized to make exceptions to MSE-specific requirements in the CatTracks system. Any exceptions related to general education classes can only be made by the assigned EAST advisors. Any alterations to catalog requirements must be extensively documented within the CatTracks system to provide clear reasoning for the exception.

C. Transfer Students and Transfer Courses

In compliance with the Utah Higher Education Act, Weber State University only accepts transfer credit from accredited colleges and universities. Students transferring to WSU with an Associate of Arts, or an Associate of Science degree earned at any institution within the Utah System of Higher Education (USHE) are considered to have met the WSU general education requirements. Students transferring from a college or university outside USHE will be evaluated on a case-by-case basis for equivalency.

Upon acceptance to the University, transfer students are required to provide official transcripts that are initially evaluated by the admissions office. There are common general education course numbers for math, science and English courses across all USHE schools in the state. Articulation agreements are also available for all of the accredited schools within the state for many other courses. For consistency purposes, the MSE Program Coordinator handles all transfer student evaluations regarding program requirements. Any substitutions or acceptance of transfer credit is noted on student advising notes in the CatTracks system.

D. Advising and Career Guidance

Each faculty member is required to maintain a minimum of five office hours per week for student consultation and advising. Students are encouraged to meet with their program advisor or a College of Applied Science and Engineering (EAST) academic advisor at least once a year to ensure they are on track towards graduation. Students are strongly encouraged to create a formal degree plan in the CatTracks system. Printed degree maps that reflect catalog requirements are available for students in the department office for reference.

The College (EAST) has Kaylene Whicker assigned full-time as the Employment and Internship Advisor. This person is available for one-on-one consultation with students and is also available to visit classes to discuss resumes, interview preparation, career fairs, and internship opportunities. Career opportunities are posted through a free service entitled Wildcat Handshake. Students are also notified about career postings through email and can make advising appointments through their Handshake account.

E. Work in Lieu of Courses

The MSE department does not accept work for life experiences, special examinations, or military experience in lieu of courses. Credit for Calculus I and Calculus II may be granted through Advanced Placement (AP) examinations. These mathematics courses, among others, are required for the BS in Manufacturing Systems Engineering. There are no advanced placement courses for MSE courses per se. Course credit for life experience is not given. While rare, a challenge examination for a course may be given to a student at the discretion of the program coordinator and the faculty member who teaches the course in question.

F. Graduation Requirements

To graduate with a Bachelor of Science degree in Manufacturing Systems Engineering students must meet the following requirements:

A grade of “C” or better in all major courses, support courses, and technical electives is required (a grade of “C-” is not acceptable) in addition to an overall GPA for all courses of 2.50 or higher. General requirements for all degrees, bachelor’s degrees, graduation and the General Education requirements can be found in the WSU catalog.

The BS in Manufacturing Systems Engineering requires 126-127 credit hours, exceeding the WSU minimum requirement of 120 credit hours.

A total of 40 upper division credit hours is required (courses numbered 3000 and above).

All students are required to take a minimum of 30 credit hours at Weber State University to fulfill residency requirements.

Students have the responsibility to apply for graduation, at no additional cost to them. The CatTracks System tracks graduation requirements and a Graduation Roster is created after students have applied for graduation. Departments and advisors can check the application status of each of their graduating students. The list of graduation applicants can be filtered based on major, minor, concentration, unresolved issues, or even the status of their application. This list is checked by academic advisors each semester to proactively resolve graduation issues. Once any identified issues have been resolved, the system will clear the student for graduation.

G. Transcripts of Recent Graduates

Transcripts from recent graduates are provided as Supplemental Materials to the Self Study.

CRITERION 2. PROGRAM EDUCATIONAL OBJECTIVES

A. Mission Statement

Weber State University provides transformative educational experiences for students of all identities and backgrounds through meaningful personal connections with faculty and staff in and out of the classroom. The university promotes student achievement, equity and inclusion, and vibrant community relationships through multiple credentials and degree pathways, experiential learning, research, civic engagement, and stewardship.

Weber State University (WSU) is a comprehensive public university authorized to operate and confer degrees under Utah Code section 53B-6-101 et seq and its mission and roles are governed by Utah State Board of Regents policy 312. The university's mission is approved by the Weber State University Board of Trustees (March 2021) and the Utah Board of Higher Education (July 2021).

The College of Engineering, Applied Science and Technology mission statement is below:

The primary goal of the College of Engineering, Applied Science and Technology is to implement the mission of Weber State University and to prepare students for employment upon graduation by ensuring that they are productive, accountable, and responsible individuals able to function effectively in today's workplace. This goal is achieved by developing in students a cohesive, solid theoretical foundation bolstered by practical, hands-on experiences. The learning environment is further enhanced by extensive contact between faculty and students both in and out of the classroom. In addition, the liberal education component present in all programs equips students for lifelong learning in a changing world.

The mission of the College is to serve the citizens of Northern Utah and the State of Utah by:

- Preparing students for employment upon graduation and ensuring that they are productive, accountable, and responsible individuals able to function effectively in today’s workplace.
- Engaging in scholarly activities which expand the technological education our students receive and provide a service to business and industry.
- Utilizing the College’s resources and faculty expertise to benefit students, business, industry, education, government and society in general.

B. Program Educational Objectives

MSE Program Educational Objectives can be found online at https://www.weber.edu/mse/manufacturing.html

Graduates from the Manufacturing Systems Engineering program are expected to be able to attain these objectives three to five years after graduation:

1. Technical Competence: Graduates will have a strong foundation in manufacturing engineering principles and systems thinking, which they will use to design and optimize manufacturing processes and systems.
2. Professional Growth: Graduates will continue to develop their technical and leadership skills, pursuing advanced degrees, professional certifications, or industry specific training as appropriate.
3. Effective Communication: Graduates will be able to communicate technical information effectively to diverse audiences, including engineers, managers, and customers.
4. Ethical Behavior: Graduates will demonstrate ethical behavior and responsibility in their professional practice, and contribute positively to society and the environment.
5. Teamwork and Collaboration: Graduates will work effectively in interdisciplinary teams, applying their technical knowledge to solve complex problems.
6. Continuous Improvement: Graduates will engage in continuous learning and improvement, applying innovative approaches to manufacturing processes and systems to enhance competitiveness.
7. Proactive Problem Solving: Graduates will apply their knowledge of manufacturing engineering principles, systems thinking and business skills to create and launch new products and services, or to improve existing ones.

C. Consistency of the Program Educational Objectives with the Mission of the Institution

The Program Educational Objectives outlined align well with the mission of Weber State University, which is centered on providing transformative educational experiences, fostering student achievement, promoting equity and inclusion, and cultivating vibrant community relationships. Here's how each objective connects with the university's mission:

1. Technical Competence: WSU aims to provide meaningful personal connections with faculty and staff, facilitating students' acquisition of a strong foundation in manufacturing engineering principles. This aligns with the university's commitment to transformative educational experiences and promoting student achievement.
2. Professional Growth: By encouraging graduates to continue developing their technical and leadership skills through advanced degrees, certifications, or industry-specific training, WSU promotes lifelong learning and personal growth, consistent with its mission of providing transformative educational experiences.
3. Effective Communication: WSU emphasizes meaningful personal connections and engagement with diverse audiences. Graduates' ability to communicate technical information effectively to various stakeholders aligns with the university's commitment to fostering communication skills and vibrant community relationships.
4. Ethical Behavior: The university's mission underscores the importance of equity, inclusion, and stewardship. Graduates demonstrating ethical behavior and responsibility in their professional practice contribute positively to society and the environment, reflecting WSU's values.
5. Teamwork and Collaboration: WSU promotes collaboration and engagement within its community. Graduates' ability to work effectively in interdisciplinary teams echoes the

university's commitment to vibrant community relationships and meaningful personal connections.
6. Continuous Improvement: The university encourages experiential learning and research, emphasizing continuous learning and improvement. Graduates' engagement in innovative approaches to manufacturing processes aligns with WSU's focus on transformative educational experiences and research.
7. Proactive Problem Solving: WSU seeks to foster creativity, innovation, and entrepreneurship. Graduates applying their knowledge to create or improve products and services demonstrate proactive problem-solving, consistent with the university's emphasis on transformative educational experiences and civic engagement.

Overall, the Program Educational Objectives are well-aligned with Weber State University's mission, reflecting its commitment to providing transformative educational experiences, promoting student achievement, fostering equity and inclusion, and cultivating vibrant community relationships.

D. Program Constituencies

The Program Educational Objectives (PEOs) are designed to serve the diverse needs and expectations of MSE students, faculty, and members of the industry advisory board, collectively constituting the program's stakeholders.

1. Technical Competence: The program's emphasis on building a robust foundation in manufacturing engineering principles and systems thinking directly benefits MSE students, faculty, and industry advisory board members alike. This comprehensive knowledge equips graduates to excel in roles within large manufacturing firms, including those prevalent in the local aerospace industry. Faculty members find value in imparting such foundational skills, while industry advisory board members contribute insights to ensure curriculum relevance to current industry needs.
2. Professional Growth: Graduates' continued development of technical and leadership skills resonates with the aspirations of MSE students, faculty, and industry advisory board members. By encouraging lifelong learning and professional advancement, the program ensures graduates remain competitive in the manufacturing industry. Additionally, faculty members are committed to fostering an environment conducive to personal and professional growth, thereby enriching the educational experience for current students and aligning with the industry advisory board's desire for skilled professionals.
3. Effective Communication: The ability to communicate technical information effectively is invaluable for MSE students, faculty, and industry advisory board members. Faculty members' adeptness at conveying complex concepts benefits current students, while industry advisory board members contribute insights into communication expectations within the aerospace industry, ensuring graduates are well-prepared for professional interactions.
4. Ethical Behavior: Upholding ethical standards in professional practice is a shared value among MSE students, faculty, and industry advisory board members. By instilling a sense of responsibility and integrity, the program ensures graduates contribute positively

to society and the environment, aligning with the ethical expectations of all constituents involved.

5. Teamwork and Collaboration: The collaborative nature of interdisciplinary teamwork is emphasized within the program, benefiting MSE students, faculty, and industry advisory board members alike. By fostering an environment where diverse perspectives are valued and teamwork is encouraged, the program prepares graduates to excel in collaborative settings within the manufacturing industry.
6. Continuous Improvement: Engaging in continuous learning and innovation is a shared goal among MSE students, faculty, and industry advisory board members. By promoting a culture of innovation and adaptability, the program ensures graduates remain at the forefront of advancements in manufacturing processes and systems. Additionally, industry advisory board members provide insights into industry trends and advancements, informing curriculum updates and enriching the educational experience for current students.
7. Proactive Problem Solving: The program's focus on proactive problem-solving resonates with MSE students, faculty, and industry advisory board members, as they collectively aspire to address the evolving challenges faced by the manufacturing industry. By equipping graduates with the necessary skills to identify and tackle complex problems, the program empowers them to make meaningful contributions to their respective fields.

E. Process for Review of the Program Educational Objectives

Describe the process that periodically reviews the program educational objectives including how ALL of the program's various constituencies are involved in this process. Describe how this process is systematically utilized to ensure that the program's educational objectives remain consistent with the institutional mission, the program constituents' needs and these Criteria.

The Program Educational Objectives (PEOS) are generated by department faculty and reviewed by the Industrial Advisory Board (IAB), which includes student representation. Only after approval by the IAB are they formalized and published online. The Industry Advisory Board is reminded of the Program Educational Objectives each year and the PEOs are formally reviewed every other year and modified as needed to make certain that they remain consistent with the institutional mission, the program constituents' needs and these criteria. The PEOs were most recently modified and reviewed during the IAB meeting in 2023. This step is documented in the meeting minutes of the annual Industry Advisory Board meeting and for reference a portion of meeting minutes is shown below in Figure 2.1.

Figure 2.1: Sample Meeting Minutes from IAB with review of Program Educational Objectives.

Manufacturing Systems Engineering
Industry Advisory Council Meeting Minutes
31 March 2023-12:18-1:15 p.m.

In attendance:

Industry Members: Tom Francis (Northrup Grumman), Aaron Hagge (Tree House Foods), Dan Zumbo (Parker), Paul White (BAE Systems), Brandon Burke (Northrup Grumman), Brandon Hillegas (Northrup Grumman), Online-John Metcalf (Mitre).

Faculty/Staff: Rick Orr, Mary Foss, Justin Knighton, Sheri Eddington, Online-Mark Baugh, George Comber, and David Wetzel.

1. Introductions-Dr. Mary Foss
2. Purpose of Advisory Council
    a. Need input for curriculum
    b. Required for accreditation-completed in October 2022.
3. Objectives-Review of Program Educational Objectives
    a. White suggested adding Objective Eight-Systems Thinking.
        i. Foss added "Systems Thinking-Apply a systems thinking approach to manufacturing processes."
    b. Objective Three
        i. Zumbo suggested including speaking well and being able to explain complex language.
        ii. Many council members mentioned the importance of technical writing, the ability to breakdown technical language, and needed verbal and non-verbal communication.
    c. Foss asked that each council member consider these changes and make recommendations as needed.
4. Student Outcomes-Foss presented the ABET required outcomes.
5. Program Progress Report
    a. Accreditation occurred in October 2022.
    b. Will conclude Summer of 2023 and will be accredited with the EAC (Engineering Accreditation Commission) branch of ABET. MSE is a true Engineering program.

CRITERION 3. STUDENT OUTCOMES

A. Student Outcomes

The student outcomes for the MSE program are consistent with those listed in Criterion 3 and can be found at https://weber.edu/mse/manufacturing.html.

At the point of graduation, MSE students will be able to demonstrate:

1. An ability to identify, formulate, and solve complex manufacturing engineering problems by applying principles of engineering, science, and mathematics

2. An ability to 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. An ability to communicate effectively with a range of audiences

4. An ability to 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. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives

6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions

7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

B. Relationship of Student Outcomes to Program Educational Objectives

In Table 3.1, each Program Educational Objective is listed in the leftmost column. The corresponding student outcomes are listed in the adjacent cells, grouped under each PEO. Some student outcomes are relevant to multiple PEOs, so they appear under more than one PEO.

Table 3.1 Relationship between Program Educational Objectives and Student Outcomes

	Program Educational Objectives	Student Outcomes
1	Technical Competence	1. An ability to identify, formulate, and solve complex manufacturing engineering problems using engineering principles
		2. An ability to apply engineering design to produce solutions considering various factors
		6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment
		7. An ability to acquire and apply new knowledge using appropriate learning strategies
2	Professional Growth	7. An ability to acquire and apply new knowledge using appropriate learning strategies
3	Effective Communication	3. An ability to communicate effectively with diverse audiences
4	Ethical Behavior	4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments
5	Teamwork and Collaboration	5. An ability to function effectively on a team and provide leadership
6	Continuous Improvement	1. An ability to identify, formulate, and solve complex manufacturing engineering problems using engineering principles
		2. An ability to apply engineering design to produce solutions considering various factors
		7. An ability to acquire and apply new knowledge using appropriate learning strategies
7	Proactive Problem Solving	1. An ability to identify, formulate, and solve complex manufacturing engineering problems using engineering principles
		2. An ability to apply engineering design to produce solutions considering various factors

		4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments
		5. An ability to function effectively on a team and provide leadership
		6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment

The relationships described in the table illustrate how each Program Educational Objective (PEO) aligns with specific student outcomes for the MSE program. Here's a breakdown of the relationship between Program Educational Objectives (PEOs) and Student Outcomes based on the provided data:

1. Technical Competence (PEO 1):
   This PEO emphasizes graduates' proficiency in identifying, formulating, and solving complex manufacturing engineering problems using engineering principles (Outcome 1). Additionally, graduates should demonstrate the ability to apply engineering design to produce solutions considering various factors (Outcome 2) and to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment (Outcome 6). Continuous learning and knowledge application (Outcome 7) are also integral to maintaining technical competence.

2. Professional Growth (PEO 2):
   PEO 2 is closely aligned with Outcome 7, which emphasizes graduates' ability to continuously acquire and apply new knowledge using appropriate learning strategies.

3. Effective Communication (PEO 3):
   This PEO is directly related to Outcome 3, which highlights graduates' proficiency in effectively communicating with diverse audiences.

4. Ethical Behavior (PEO 4):
   PEO 4 is tied to Outcome 4, which emphasizes graduates' ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments.

5. Teamwork and Collaboration (PEO 5):
   This PEO is associated with Outcome 5, which underscores graduates' ability to function effectively on a team and provide leadership.

6. Continuous Improvement (PEO 6):
   PEO 6 shares similarities with Outcome 1 and Outcome 2, emphasizing graduates' proficiency in problem-solving and engineering design, as well as their commitment to continuous learning and improvement.

7. Proactive Problem Solving (PEO 7):
   This PEO encompasses multiple outcomes: Outcome 1, Outcome 2, Outcome 4, Outcome 5, and Outcome 6. It reflects graduates' ability to identify and solve complex engineering problems, apply engineering design, recognize ethical responsibilities, provide leadership within teams, and conduct experimentation effectively.

CRITERION 4. CONTINUOUS IMPROVEMENT

This section of the MSE Self-Study Report documents the processes for regularly assessing and evaluating the extent to which the student outcomes are being attained. This section also documents the extent to which the student outcomes are being attained and describes how the results of these processes are utilized to affect continuous improvement of the program. The MSE program independently assesses all student outcomes; when programs share courses, assessment data must be disaggregated by program in order to ensure the individual program's outcomes are being independently assessed.

Assessment is defined as one or more processes that identify, collect, and prepare the data necessary for evaluation. Evaluation is defined as one or more processes for interpreting the data acquired through the assessment processes in order to determine how well the student outcomes are being attained. In order to clearly communicate the process of assessment and evaluation, the EAC Self-Study Questionnaire template was used.

A. Student Outcomes

1. Listing and description of the assessment processes used to gather the data upon which the evaluation of each student outcome is based: Student work (exams, quizzes, laboratory reports), Course rubrics, Exit Exam (SME Certified Manufacturing Technologist (CMfgT) Exam, IAB Recommendations. For courses with a mix of MSE and MFET students, MSE students are assessed separately. An overview of the assessment processes used is shown in Table 4-1.
2. The frequency with which these assessment processes are carried out: Course specific assessment is completed each time the course is taught (Spring/Fall). The exit exam is offered once per year and IAB is held once per year. An overview of the assessment processes including frequency is shown in Table 4-1.
3. The expected level of attainment for each of the student outcomes is shown in Table 4-2.
4. Summaries of the results of the evaluation process and an analysis illustrating the extent to which each of the student outcomes is being attained is shown in Table 4-3.
5. How the results are documented and maintained: Data is evaluated annually and documented in a report to the department. Documentation is maintained by the department as shown in Table 4-1.

Table 4-1. Overview of Processes for the Assessment of Student Outcomes

Assessment Instrument	Frequency of Application	Expected Level of Attainment	Summary of Results	How results are (1) documented (2) maintained
MSE 3700 Course Rubric	Each time the course is taught	S = 2 [1] X > 2 [2]	Not triggered. See Section B.1	(1) spreadsheet (2) program coordinator
MSE 3850	Each time the course is taught	75% of GRES projects will score 70%	Not triggered. See Section B.1	(1) spreadsheet (2) program coordinator
MSE 3910	Each time the course is taught	75% of DOE projects will score 70%	Not triggered. See Section B.1	(1) spreadsheet (2) program coordinator
MSE 4615	Each time the course is taught	75% of teams score >85% on SP1 75% of Students score > 85% on SP3 75% of teams score > 85% on SP4	Not Triggered See Section 5.B.1.3	(1) spreadsheet (2) program coordinator
MSE 4620	Each time the course is taught	75% of teams score >85% on SP2 75% of Students score > 85% on SP3 75% of teams score > 85% on SP4	Not Triggered See Section 5.B.1.3	(1) spreadsheet (2) program coordinator
Industrial Advisory Board Recommendations	Annually	Improvements as defined	See Section B.3	(1) minutes of IAB meetings (2) department administrative assistant & program coordinator
Assessment Exam	At the end of MSE 4700 (MSE 4620 in fall 2025)	65%	See Section B.4	(1) SME CMfT exam (2) program coordinator

(1) S = Performance Indicator (PI) score for a given student outcome.

(2) X = mean PI score for a given course. After sufficient data collection, the faculty may change the threshold number.

Note: The process for assessment with its instruments described above will require additional students to graduate from the program. The faculty will make changes with the assessment instruments upon larger sample sizes that have some statistical significance affecting the continuous improvement of the program.

Table 4-2 Assessment Plan of Student Outcomes

	Assessment Plan						
Student Outcomes	MSE 3850 Rubric	MSE 3700 Rubric	MSE 3910 Rubric	MSE 4615 Rubric	MSE 4620 Rubric	CMFGT Exit Exam	IAB
1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.	75% of GRES projects (5 points) will score 70% (3.5 points) or higher			75% of SP1>85 75% of SP3>85 75% of SP4>85	>75% of SP2>85 75% of SP3>85 75% of SP4>85	65%*	Satisfied
2. an ability to 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.		>2		>75% of SP1>85 75% of SP3>85 75% of SP4>85	>75% of SP2>85 75% of SP3>85 75% of SP4>85	65%*	Satisfied
3. an ability to communicate effectively with a range of audiences.				>75% of SP1>85 75% of SP3>85 75% of SP4>85	>75% of SP2>85 75% of SP3>85 75% of SP4>85	65%*	Satisfied
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of		>2		>75% of SP1>85 75% of SP3>85 75% of SP4>85	>75% of SP2>85 75% of SP3>85 75% of SP4>85	65%*	Satisfied

engineering solutions in global, economic, environmental, and societal contexts.							
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.				>75% of SP1>85 75% of SP3>85 75% of SP4>85	>75% of SP2>85 75% of SP3>85 75% of SP4>85	65%*	Satisfied
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.			75% of DOE projects (20 points) will score 70% (14 points) or higher.	>75% of SP1>85 75% of SP3>85 75% of SP4>85	>75% of SP2>85 75% of SP3>85 75% of SP4>85	65%*	Satisfied
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.				>75% of SP1>85 75% of SP3>85 75% of SP4>85	>75% of SP2>85 75% of SP3>85 75% of SP4>85		Satisfied

* Certain sections of the exam are used as assessment instruments for each of the SOs. Other sections are identified as informational.

Table 4-3: Summary of the Results of the Evaluation Process.

	Assessment Analysis Corrective Action Summary 2024						
Student Outcomes	MSE 3850 Rubric	MSE 3700 Rubric	MSE 3910 Rubric	MSE 4615 Rubric	MSE 4620 Rubric	CMFGT Exit Exam	IAB
Expected Attainment	75% of GRES projects (5 points) will score 70% (3.5	>2	75% of DOE projects (20 points) will score	>75% of SP1>85 75% of SP3>85	>75% of SP1>85 75% of SP3>85	65%	Satisfied

	points) or higher.				70% (14 points) or higher.		75% of SP4>85		75% of SP4>85					
1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.	X	100 %					X	SP1 90.6 SP3 100 SP4 91.3	X	SP2 89 SP3 85 SP4 91.3	X	1. Investigate training for program coordinators and academic advisors on accepting transfer courses. 2. Investigate feasibility of altering APE courses in first 2 years to better align with Manufacturing outcomes. 3. Investigate SME exam questions and compare to MSE/ENGR/PDD/ECC curriculum. 4. Add in a new module into MSE 3700 on IP protection. 5. Exit exam should be taken in last semester of senior year instead of possibly junior year. Add in exit exam as module for MSE 4625	X	Investigate changing the existing Associates of Pre Engineering (APE) to allow for more curriculum changes.
2. an ability to 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.			X	2.125			X	SP1 90.6 SP3 100 SP4 91.3	X	SP2 89 SP3 85 SP4 91.3	X	1. Add in a new module into MSE 3700 on IP protection. 2. Monitor this subject matter: Drafting. At this point the department does not feel action is necessary. The scores reflect the weighting of a student that does not have a passing grade for MSE 3460. 3. Strengthen module in MSE 3700 design for X. 4. Exit exam should be taken in last semester of senior year instead of possibly junior year. Add in exit exam as module for MSE 4625	X	Investigate changing the existing Associates of Pre Engineering (APE) to allow for more curriculum changes.
3.an ability to communicate effectively with a range of audiences.							X	SP1 90.6 SP3 100 SP4 91.3	X	SP2 89 SP3 85 SP4 91.3	X	1. Monitor this subject matter Drafting. At this point the department does not feel action is necessary. The scores reflect the weighting of a student that does not have a passing grade for MSE 3460. 2. Exit exam should be taken in the last semester of senior year instead of the possibly junior year. Add in exit exam as module for MSE 4620.	X	Investigate changing the existing Associates of Pre Engineering (APE) to allow for more curriculum changes.
4.an ability to 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.			X	2.5			X	SP1 90.6 SP3 100 SP4 91.3	X	SP2 89 SP3 85 SP4 91.3	X	1. Strengthen module in MSE 3700 design for X. 2. Investigate SME exam questions and compare to MSE 3850 curriculum	X	

5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.							X	SP1 90.6 SP3 100 SP4 91.3	X	SP2 89 SP3 85 SP4 91.3	X	Exit exam should be taken in the last semester of senior year instead of possibly junior year. Add exit exam as module for MSE 4625	X	
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.					X	Sp 24 No MSE students.	X	SP1 90.6 SP3 100 SP4 91.3	X	SP2 89 SP3 85 SP4 91.3	X	1. Investigate SME exam questions and compare to MSE 3850 curriculum. 2. Investigate SME exam questions and compare to MSE 3040 curriculum	X	
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.							X	SP1 90.6 SP3 100 SP4 91.3	X	SP2 89 SP3 85 SP4 91.3			X	Investigate changing the existing Associates of Pre Engineering (APE) to allow for more curriculum changes.

*X indicates an assessment instrument followed by the results.
** Detailed results of each assessment instrument and analysis are available for review (CMfgT Analysis).

Student outcomes are assessed every academic year and formally submitted biannually to meet current WSU continuous improvement assessment requirements and since the MSE degree is a new program with very few students and therefore limited data, targets may be further modified. Rubrics targeting specific student outcomes were developed for high impact courses. The Exit Exam was selected to be the SME Certified Manufacturing Technologist (CMfgT) Exam. The Society of Manufacturing Engineers (SME) is the professional organization specific to manufacturing. SME has created a Body of Knowledge related to manufacturing and has developed associated exams which cover in depth that body of knowledge at both the associate degree and baccalaureate degree levels. SME also serves as the lead society for the program criteria for manufacturing and similarly named engineering programs. The body of knowledge required for a successful manufacturing engineer as defined by SME can be found at https://www.sme.org/globalassets/sme.org/training/certifications/technical-certification/technical-certification-body-of-knowledge.pdf. The results from this exam are evaluated by the Program Coordinator or an assigned faculty member each time the exam is administered. Selected sections from the exam and linked to program courses. At this point, the program relies heavily upon an existing Pre-Engineering Associate Degree. Because this degree is not housed within the department, data that links to these courses is being collected for informational purposes and not used for assessment. Results of the exam are also formatted for formal presentation to the Industrial Advisory Board every year.

Additionally, the program relies heavily on Industry Advisory Board suggestions for improvement. The initial IAB in place when the program was developed failed to represent the diverse manufacturing industries represented in Utah and was heavily modified in 2023 to better represent this diversity. The summary of the investigation and corrective action from the IAB is presented in table 4.A.3. The reader will notice the same repeated action item as most of the suggestions for improvement from the IAB were related to curriculum changes during the first 2 years of the program. As a result of these suggestions, the MSE degree faculty have an active investigation on the feasibility of decoupling the first two years of the degree from the existing Associate of Pre-Engineering. This change would allow the MSE faculty to better align courses and curriculum to meet the needs of the IAB.

B. Continuous Improvement

The results of the evaluation processes for the student outcomes and other available information are systematically used as inputs in the continuous improvement of the program. The results of any changes related to data analysis from the 2023-2024 academic year are summarized below in Table 4-4. Additionally significant future program improvement plans based upon recent evaluations are described. A brief rationale for each of these planned changes is provided below.

Table 4-4: Summary of Results of Assessment Analysis.

	Results of Assessment Analysis Summary 2024													
Student Outcomes	MSE 3850		MSE 3700		MSE 3910		MSE 4615		MSE 4620		CMFGT*		IAB	
Expected Attainment	75% of GRES projects (5 points) will score 70% (3.5 points) or higher.		>2		75% of DOE projects (20 points) will score 70% (14 points) or higher.		>2		>2		65%		Satisfied	
1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.	X	M; 100% (1 of 1 project) scored 70% or higher Fall 2023					X	M	X	M	X	NI; 64.15	X	NI
2. an ability to 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.			X	M;			X	M	X	M	X	M; 72.6	X	NI

3. an ability to communicate effectively with a range of audiences.							X	M	X	M	X	NI; 61.7	X	NI
4. an ability to 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.			X	M; 2.5			X	M	X	M	X	M; 67.3	X	NI
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.							X	M	X	M	X	M; 70.2	X	NI
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.					X	(Spring 2024) No MSE students.	X	M	X	M	X	65.1	X	NI
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.							X	M	X	M			X	NI

M* signifies expected attainment met.
NI* signifies expected attainment not met, needs improvement. Reference Subheadings B.1.2 and B.1.3 for discussion of related findings, investigation and corrective action.
*SME CMFT Exam scores are average of the individual sections tied to specific student outcomes.

B.1 2023-2024 Continuous Improvement Corrective Actions by Student Outcomes

B.1.1 Course Rubrics SO 1-7

Course rubrics for MSE 3850, MSE 3700, MSE 3910, MSE 4615, and MSE 4620 met the expectations of the instructors of those courses and therefore there was no trigger for improvement in these courses. An example completed course rubric is shown in Table 4-5. Please note that this rubric is generated from the average of the course rubrics as shown in Table 4-6.

When the MSE program was first established, the faculty spent a great deal of effort defining a matrix of courses and student outcomes. For each course in the curriculum, a level of applicability for each student outcome was assigned. The levels of applicability are low, medium and high in the matrix. Only the student outcomes that ranked high in the matrix were assigned a performance indicator (PI) in the course rubric. Levels of applicability were assigned to courses outside the MSE program as well, but none of them ranked higher than medium, so they were not connected to a PI and are therefore not shown in Table B.1.

After each semester, faculty prepare a rubric for each MSE course indicated in Table 4-5. The levels of achievement are (0) unacceptable, (1) poor, (2) average and (3) good. A recent example of a course rubric for MSE 3700 is shown in Table 4-5.

Table 4-5: Example Course Rubric.

MSE 3700 PROJECT EVALUATION

PROJECT:	Elkquisite Bites
SEMESTER:	Fall 2023
REVIEWER:	Mary Foss
DATE:	12/1/2023

EVALATION SCALE	
3.0	GOOD
2.0	AVERAGE
1.0	POOR
0.0	UNACCEPTABLE

ADEQUATE PROBLEM DEFINITION & PROJECT TECHNICAL DESCRIPTION	APPROPRIATE USE OF EXPERIMENTS, TESTING, MEASUREMENTS, & PROTOTYPING	APPROPRIATE DESIGN ASSUMPTIONS, TECHNIQUES, & ENGINEERING ANALYSIS	APPROPRIATE UTILIZATION OF ENGINEERING TOOLS (ie. CAD SOFTWARE, ANALYSIS SOFTWARE, etc.)	APPROPRIATE USE OF GRAPHS, TABLES, & FIGURES	APPROPRIATE FORMAT, TECHNICAL WRITING TECHNIQUE, & LOGICAL FLOW OF INFORMATION	COMPLETE, ACCURATE REFERENCES	DEMONSTRATED APPLICATION OF ability to 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	DEMONSTRATED APPLICATION OF ability to 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.
2	2	2	3	3	3	3	2	2

This course focuses on effective design and implementation of reliable, economically competitive, and environmentally benign manufacturing processes and systems. Topics will include an overview of the manufacturing systems approach in production, control, quality, automation, an introduction to facilities planning and design, an introduction to operations research and simulation in manufacturing, and engineering economics. Students will also be introduced to DoD systems engineering terminology.
ABET Learning Outcomes Assessed
2) an ability to 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.
4) an ability to 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.

The results of each individual MSE student are then compiled into a summary sheet. An example is shown in Table 4-6.

Table 4-6: MSE 3700 Student Outcome Summary Sheet.

SO		Expected Result	Average (Fall 2023)
2	DEMONSTRATED APPLICATION OF ability to 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	>2	2.125
4	DEMONSTRATED APPLICATION OF ability to 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.	>2	2.5

The faculty will make improvements in the program utilizing this assessment instrument upon larger sample sizes that have some statistical significance affecting the continuous improvement of the program.

The process for using the rubrics to improve courses is illustrated in Figure 4-1. The continuous improvement process for courses occurs on two levels--the course level and the program level.

At the course level, the instructor makes independent improvements to the course. When the score, S, for a given PI is 2 or greater, no action is taken by the instructor to improve the course. When S falls below 2, the instructor identifies corrective actions to implement the next time that he/she teaches the course.

At the program level, the instructor, with input from department faculty, makes improvements to the program by identifying areas of improvement in supporting courses If the mean score for a given course is 2.0 or greater, no action is taken to improve the program, but a mean score of less than 2.0 suggests deficiencies in the course that require discussion and correction by the instructor and/or program faculty and related supporting courses. For the rubric shown in Table 4-6, no program level action is required.

Three of these five courses were taught by new instructors so it is expected that further refinements will be made to these assessment instruments.

B.1.2 CMfT Exam

The CMfT Exam topics linked to student outcomes 1-7 were reviewed and compared against the benchmark. This assessment tool is available for review upon request. Since this is a large assessment tool and would be difficult to read in the format of the self-study, an example section is presented below in Table 4-7 for informational purposes.

Table 4-7: Example Section of CMfT Assessment Tool

Student Outcome	Topic			Course(s)		Expected Attainment %	Results Spring 2024	Investigation	Corrective Action
	Manufacturing Foundations								
1	1	Mathematics		MATH 1210	MATH 1220	Inf	100%		
			Algebra	MATH 1210	MATH 1220				
			Trigonometry	MATH 1210	MATH 1220				
1	2	Print Reading		PDD 1010	PDD 1160	65%	100%		
1	3	Geometric Dimensioning and Tolerancing		PDD 1010	PDD 1160	NA	50%		
			GD&T	PDD 1160		65%	100%		
	4	Engineering Science				Inf	37.5		
1			Chemistry	CHEM 1210		Inf	50	Student 1 was a transfer student from Madison Area Tech college and received a C+ in a course titled 'College Chemistry I'. This course was granted equivalency for CHEM 1210. Investigate how this was done how this course was granted equivalency. Student 2 was granted an exception by a now retired faculty member to accept CHEM 1110 for CHEM 1210.	Investigate training for program coordinators and academic advisors on accepting transfer courses.
1			Physics	PHYS 2210	PHYS 2220	Inf	75		
1			Mechanical Technologies in Statics & Dynamics	ENGR 2140	ENGR 2080	Inf	50	Student 1 received a B in Statics and A- in dynamics. Student 2 received a B+ in dynamics and A- in statics and strengths of materials	Investigate feasibility of altering APE courses in first 2 years to better align with Manufacturing outcomes
1			Electrical Circuits and Electronics	ECE 2210		Inf	0	Student 1 earned a B in electrical eng for non-majors. Student 2 earned an A- .	Investigate feasibility of altering APE courses in first 2 years to better align with Manufacturing
1	5	Environmental Health & Safety				NA	77.3		
1, 2			Human Factors	MSE 4010		65%	83.3		
1			Hazardous Materials	MSE 4010		65%	83.3		
1, 2			Personal Protective Equipment	MSE 4010		65%	50	Student 1 has not taken MSE 4010. Student 2 received an A	Investigate pre-requisites and add in MSE 4010 before students take exit exam.
1			Situational Awareness	MSE 4010		65%	66.7		
1, 2			Ergonomics	MSE 4010		65%	100		
4	6	Ethics		MFET 3550		65%	100		

In areas where the expected outcome was not met, results were flagged with a red color. In areas where the department is analyzing results for information purposes, results are flagged in yellow. In both cases an investigation was performed. The results of the investigation were documented as well as corrective actions necessary. The following is a description of all of the corrective actions identified from sections of the SME exam where the expected attainment was not met and the related Student Outcomes, identified as SO and relevant numbers in the header.

B.1.2.1 Topic 4: Engineering Science, SO 1, Chemistry

The results of this section were well below the expected attainment. Since these courses are support courses and are not housed within the department of M&SE, results are monitored for informational purposes. The investigation found that Student 1 was a transfer student from Madison Area Tech college and received a C+ in a course titled 'College Chemistry I'. This course was granted equivalency for CHEM 1210. After reviewing the catalog description of this course shown in Figure 4-1 and comparing it to CHEM 1210 shown in Figure 4-2, it was determined that this course was granted equivalency.

Figure 4-1: Catalog Description of College Chemistry I.

MADISON AREA | TECHNICAL COLLEGE

Course

Back to Search

20806209 College Chemistry 1

Course Information

Description The first semester of a two-semester sequence in college chemistry that includes the topics of measurement, chemical nomenclature, chemical reactions and stoichiometry, atomic structure, gas laws, thermochemistry, chemical bonding and solution chemistry. This course is for students who need one or two semesters of what is typically considered freshman college chemistry. Laboratory work assists in understanding chemical concepts and developing problem-solving skills. Students may complete the year of general college chemistry with 20-806-212.

Figure 4-2: Catalog description of CHEM 1210.

CHEM 1210 PS - Principles of Chemistry I and

CHEM 1210 PS - Principles of Chemistry I

Credits: (4)
Typically Taught Summer Semester: *1st Blk*
Typically Taught Fall Semester: *Full Sem*
Typically Taught Spring Semester: *Full Sem*
Description: This is the first course in a series designed primarily for science majors and others who will take more than one year of chemistry such as pre-medical students, clinical/medical laboratory scientists, and some engineering students. Course topics include components of matter, stoichiometry, major classes of reactions, gases and kinetic molecular theory, thermochemistry, quantum theory and atomic structure, models of chemical bonding, shapes of molecules, intermolecular forces, and properties of mixtures. The laboratory emphasizes qualitative and quantitative methods of analysis. Four hours of lecture per week.
Pre-requisite(s): MATH 1010 or equivalent and CHEM 1200 or departmental approval.
Co-Requisite(s): CHEM 1215.
Pre-requisite/Co-requisite: MATH 1050, MATH 1080, MATH 1210, MATH 1220, MATH 2210, or equivalent.

Student 2 was granted an exception by a now retired faculty member to accept CHEM 1110 for CHEM 1210. An investigation into these course exceptions was made with the EAST Academic Advising team. The advisors noted that the program coordinator for the Associate of Pre-Engineering allowed a lower Chemistry to count for CHEM 1210. The program coordinator then inquired about training materials required for program coordinators with the associate dean and dean of the college of EAST. During this investigation it was found that there are no formal procedures or training for program coordinators, and they fall under the responsibility of department chairs. As a result of this investigation, the MSE department made a formal recommendation to the Associate Dean and Dean that such procedures be developed. The following is a current status on the expectation of such a procedure that would meet the requirements of the MSE degree program and proposed timeline for its completion.

B.1.2.1.A *Investigate the Development of College-Wide Training Materials for Program Coordinators:*

The role of a program coordinator within the College of Engineering, Applied Science & Technology (EAST) is pivotal in ensuring the smooth operation and academic integrity of degree programs. Program coordinators are responsible for making course exceptions and verifying transfer course equivalencies, tasks that require a deep understanding of institutional policies, academic standards, and curricular requirements. To maintain consistency, fairness, and accuracy in these processes, it is imperative to implement a policy that mandates specialized training for all program coordinators.

Consistency in Decision-Making:

Without standardized training, program coordinators may interpret and apply policies differently, leading to inconsistencies in course exceptions and transfer evaluations. Training ensures that all coordinators have a uniform understanding of policies, fostering consistency across the college.

Accuracy in Transfer Equivalencies:

Evaluating transfer courses requires thorough knowledge of course content, learning outcomes, and accreditation standards. Proper training equips coordinators with the necessary skills to accurately assess whether transfer courses meet the college's academic requirements.

Compliance with Accreditation Standards:

Accrediting bodies require institutions to have clear and consistent processes for course exceptions and transfer evaluations. Training ensures that the college meets these standards, reducing the risk of non-compliance and potential accreditation issues.

Enhanced Student Experience:

Consistent and accurate decision-making directly impacts students' academic journeys. Training coordinators ensure that students receive fair and timely evaluations of their transfer credits and course exception requests, enhancing their overall educational experience.

Professional Development:

Training programs provide professional development opportunities for coordinators, keeping them updated on best practices, new regulations, and evolving academic policies. This ongoing development benefits both the coordinators and the institution as a whole.

In response to irregular findings related to the MSE degree, representatives from MSE and the college of EAST will engage in Policy Development.

The proposed policy will require all program coordinators within the College of EAST to undergo comprehensive mandatory training. This training will cover the processes for making course exceptions and verifying transfer course equivalencies, ensuring that coordinators are well-versed in institutional policies, academic standards, and best practices. All newly appointed and existing program coordinators must complete a standardized training program designed by the college. The training program will include modules on:

1. Understanding institutional and departmental policies
2. Evaluating course content and learning outcomes
3. Assessing transfer course equivalencies
4. Making informed and consistent course exception decisions
5. Documentation and record-keeping standards
6. Ongoing Professional Development:

The effectiveness of the training program will be assessed regularly through feedback from coordinators and a review of decision-making consistency. Adjustments to the training content will be made as needed to address any identified gaps.

Phase 1: Development and Approval - Summer and Fall 2024

Design the training program content and seek approval from relevant college committees and administration.

Phase 2: Pilot Program - Spring 2025

Implement a pilot training program with a small group of coordinators and EAST advisors to gather initial feedback and make necessary adjustments.

Phase 3: Full Implementation - Fall 2026

Roll out the mandatory training program for all program coordinators, ensuring full participation and compliance.

Phase 4: Continuous Improvement - Annually

Establish a feedback loop and continuous improvement process to keep the training program effective and relevant.
By implementing this policy, the College of EAST will ensure that program coordinators are equipped with the knowledge and skills needed to perform their roles effectively. This will lead to greater consistency and accuracy in course exceptions and transfer evaluations, ultimately enhancing the academic experience for students and maintaining the college's high standards of academic integrity.

B.1.2.2 Topic 4: Engineering Science, SO 1, ENGR Courses

Data collected in Topic 4 is for informational purposes since it is linked to courses associated with the Associate of Pre-Engineering. However, a number of these sections were below what the department expected. An investigation was performed to understand student grades in the APE Courses ENGR 2140, ENGR 2080, 2160 and ECE 2210. Student 1 received a B in Statics and A- in Dynamics. Student 2 received a B+ in dynamics and A- in Statics and Strengths of materials. Student 1 earned a B in Electrical Engineering for non-majors. Student 2 earned an A- in Electrical Engineering for non-majors. After reviewing students' scores in these sections and grades in associated courses the department had a discussion. Several faculty members mentioned concern that students may not be motivated to complete questions that might require multiple steps and therefore 'skip' the question. The department recognized that since the outcome of the exam was not linked to a grade, this lower result may not reflect what the students know. As a result of this discussion, the department is unsure if these exam results represent the students' knowledge or instead lack of motivation. The following action items were identified related to this topic: 1) Investigate APE courses syllabi and compare them with the SME Body of Knowledge (BOK); 2) Investigate if students tried to complete this section of the exam through an informal survey.

B.1.2.3 Topic 5: Environmental Health and Safety, SO 1, 2

Data collected in Topic 5 was below the expected attainment for sub-topic 'Personal Protective Equipment'. This topic is linked to the course MSE 4010. An investigation was performed to determine how these students performed in this course. In this investigation it was found that Student 1 has not taken MSE 4010. Student 2 received an A. A further investigation was performed on Student 1 and it was determined that this student had not taken a number of courses and was at Junior status instead of Senior status. As a result, the department decided that the exit exam needed to be taken as a module in a different course that would not have juniors in it. The department reassigned the exit exam to be taken in conjunction with MSE 4620, beginning spring 2025 as a corrective action.

In Spring 2024 the exit exam was administered to two students in conjunction with MSE 4700. One of these students was a senior in the last semester and the second student was a junior. As a result, the results are not as effective at evaluating the effectiveness of the program since one of the students had not yet completed several important courses. After analyzing the results of this exit exam the department finds this an effective tool to evaluate students' knowledge and skills, encompassing all major areas of the curriculum. This allowed the program to identify gaps in learning and areas where students may not be achieving the desired level of proficiency as well as the timing of the exam.

An exit exam administered at the very end of students' studies serves as a critical tool for assessing the overall effectiveness of an academic program. This comprehensive exam evaluates students' mastery of the core concepts, skills, and knowledge that they have acquired throughout their course of study. By identifying specific areas where students may struggle, the exit exam provides valuable insights into potential weaknesses within the program. This feedback loop is essential for continuous improvement and ensuring that the program meets its educational objectives and outcomes.

The results of the exit exam provide concrete data that can be analyzed to pinpoint specific weaknesses within the program as highlighted above. This data-driven approach enables faculty and administrators to make informed decisions about curriculum revisions, instructional methods, and resource allocation. The department discussed several strategies for improving the effectiveness of this exam as an assessment tool and will investigate incorporating these strategies with the next cohort of students.

a. Study Guides and Resources:

Offer comprehensive study guides that outline key concepts, theories, and skills covered in the program. Include practice questions and sample exams to help students familiarize themselves with the exam format and types of questions they can expect as part of the course MSE 4620 beginning spring 2025.

b. Review Sessions:

Schedule review sessions led by faculty members to reinforce critical content areas. These sessions will offer students the opportunity to ask questions, clarify doubts, and receive guidance on effective study strategies as part of the course MSE 4620, beginning spring 2025.

c. Understanding the Significance:

Emphasize the importance of the exit exam not only as a graduation requirement but also as a reflection of their readiness to enter the professional world. Explain how their performance can impact the ongoing improvement of the program and benefit future students as well as add a valuable stackable credential to their resume as part of the course MSE 4620, beginning spring 2025.

B.1.2.4 Topic 7: Material Properties and Applications, SO 1

ENGR 2160 is the course linked to topic 7 on the SME exam. Students scored well on the metals portion of this exam but scored significantly lower on questions related to ceramics, plastics, and composites. An investigation was performed on the content of this course and the catalog description is included below:

ENGR 2160: A lecture course that introduces the fundamentals of atomic and microscopic structure of metals, polymers, ceramics and composite materials, and how these structures affect mechanical, thermal, electrical and optical properties.

This course, however, may not be equally distributed amongst each of these material topics and is likely more heavily weighted towards metals. As further corrective action, the department will investigate the feasibility of altering this APE course to better function as a materials course for manufacturing.

B.1.2.5 Topic 8: Manufacturing Processes, SO 1, 2

Overall, students were above the expected attainment of this topic but there were a few subtopics that were below the threshold. These include Subtractive Manufacturing/Material Removal, Hot and Cold Forming, Treatments (e.g. heat treatment) and Coatings, and Joining, Welding and Assembly. An investigation was performed on the courses associated with these topics. Student 1 received a C in MSE 3360 and student 2 received an A. After investigating this further it was found that the instructor Foss does not implement a plus (+) minus (-) grading scale. This in essence does not allow for precision in grading with a 'C-' student who should not pass the course. As a corrective action, Foss will begin implementing the plus (+) minus (-) grading scale in MSE 3360 beginning Fall 2024.

B.1.2.6 Topic 9: Intellectual Property, SO 1, 2

Scores for students on the topics Intellectual Property and Copyrights were below the expected attainment. An investigation was performed and both students had taken the course MSE 3700 and received an 'A' grade. As corrective action, the module related to intellectual property will be strengthened to match at least the BOK of the SME exam beginning Fall 2024.

B.1.2.7 Topic 10: Computer-Aided Design/Drafting/Engineering Graphics/Modeling/Bill of Materials, SO 1, 2, 3

Scores in Topic 10 were below the expected attainment. An investigation was performed, and it was discovered that student 1 had not yet taken the course PDD 1160 and received a failing grade in the course MSE 3460. As a result, the department will continue to monitor this subject matter. At this point the department does not feel further action is necessary. The scores reflect the weighting of a student that does not have a passing grade for MSE 3460.

B.1.2.8 Topic 11: Concurrent Engineering/Design for X, SO 1, 2, 3

Scores for students on the topic 'Reliability' were below the expected attainment. An investigation was performed and both students had taken the course MSE 3700 and received an 'A' grade. As corrective action, the module related to design for reliability will be strengthened to match at least the BOK of the SME exam beginning Fall 2024.

B.1.2.9 Topic 22: Computer Systems and Networks, SO 1, 2

Scores for students in the subtopic 'Capacity Planning' were below the threshold. An investigation was performed, and it was found that one of the students had not yet taken MSE

4010. The Exit exam should be taken in the last semester of the senior year instead of the junior year. As corrective action the exit exam will be included as a module for MSE 4625 as discussed previously under Topic 5.

B.1.2.10 Topics 26-31: Quality and Continuous Improvement, SO 1, 2, 4, 6

Scores for the subtopics in these sections were below the expected attainment. An investigation was performed, and it was found that Student 1 and 2 received an A in MSE 3850 and Student 1 received a B in MSE 4590 while Student 2 received an A-. As corrective action, the SME BOK was provided to the instructor of these two courses so that a comparison can be made with the curriculum of these courses and the exam subject matter.

B1.2.11 Topic 32: Soft Skills/Personal Effectiveness, SO 3, 5

Scores in this topic were below the threshold. An investigation was performed, and Student 1 had not yet taken MSE 4615 or MSE 4620. As corrective action, the exit exam will be administered in conjunction with MSE 4620, beginning spring 2025, as discussed in Topic 5.

B.1.2.12 Topic 34: Finance, SO 4, 6

Scores in the subtopic ‘Cost Justification’ were below the threshold. Both students had taken the course MSE 3040 and received an A. As corrective action, an investigation of the finance SME exam BOK will be done and compared to the MSE 3040 course curriculum. It may be a matter of terminology used.

B.1.3 Senior Capstone Project Assessment

The Senior Capstone Project Assessment for Manufacturing Systems Engineering seniors is a comprehensive, two-term engineering laboratory course designed to integrate and apply analytical and experimental methods to solve complex research and development problems. This capstone project emphasizes the importance of both written and oral communication of results, with students working in groups of three or more to collaborate on an assigned engineering and design project. Students form teams and are assigned a project that spans both terms. The projects involve real-world engineering problems requiring innovative solutions. Teams employ both analytical techniques and experimental methods to develop their projects. Detailed engineering analysis is conducted to support the design and development of prototypes. Students are expected to follow relevant engineering standards applicable to their project, beginning with ASME Y14.5 and ASME Y14.100 standards for engineering drawings. All manufacturing lab work on prototypes conforms to relevant OSHA industrial CFR 1910 standards.

Prototyping and Testing

- Construction of prototypes based on initial designs.
- Extensive testing of prototypes to evaluate performance and identify areas for improvement.
- Optimization of design parameters and tolerances based on test results.

Economic Analysis

- Economic feasibility studies are conducted to ensure the project is viable.
- Cost estimation, budgeting, and return on investment (ROI) calculations are performed.

Project Management

- Concurrent enrollment in MSE 4610 Project Management for Engineers provides students with essential project management skills.
- Planning, scheduling, and resource allocation are integral parts of the project work.

Communication Skills

- Emphasis on effective communication of project findings through both written reports and oral presentations.
- Teams prepare and present progress reports, interim presentations, and a final design review.

Capstone Project Deliverables

Interim Reports and Presentations

- Regular updates and presentations to demonstrate progress and receive feedback.
- Documentation of analytical and experimental work conducted throughout the project.

Final Design and Prototype

- Submission of a detailed final design report, including engineering analysis, testing data, and optimization results.
- Presentation of a functional prototype that meets the project's requirements and specifications.

Economic and Feasibility Analysis Report

- Comprehensive economic analysis demonstrating the project's feasibility and potential impact.

Final Design Review:

- Formal presentation of the final product to faculty and peers.

- Verification that the final product meets all design and performance requirements.
- Teams must demonstrate the integration of analytical and experimental methods in achieving the project's objectives.

Assessment of ABET Student Outcomes 1-7

Throughout the Senior Capstone Project Assessment, students are evaluated against ABET Student Outcomes 1-7 to ensure they meet the standards of excellence required for engineering professionals. These outcomes include:

- Problem Solving: Students demonstrate their ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
- Design: Teams develop solutions that meet specified needs, considering public health, safety, welfare, as well as global, cultural, social, environmental, and economic factors.
- Communication: Effective communication with a range of audiences is emphasized, with students presenting their findings through written reports and oral presentations.
- Ethics and Professional Responsibility: Students recognize ethical and professional responsibilities, making informed judgments considering the impact of engineering solutions in various contexts.
- Teamwork: Effective functioning on teams is assessed, with students providing leadership, creating collaborative environments, establishing goals, planning tasks, and meeting objectives.
- Experimentation and Analysis: Students conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
- Acquisition of Knowledge: A commitment to ongoing learning and the ability to acquire and apply new knowledge using appropriate learning strategies is demonstrated.

By rigorously assessing these outcomes, the Senior Capstone Project ensures that graduates are not only technically proficient but also prepared to meet the ethical, communicative, and professional demands of the engineering field. An example of the assessment tool is provided below in Figure 4-3. Documentation and associated assessment tools will be available electronically for the review of the evaluation team.

Figure 4-3: Example Assessment Rubric for MSE 4615.

2023-2024 Rubric SP1 - 1st Semester Evaluation - MSE 4615					
Team: Team: Special Needs Rail Car				Date: 12/15/2023	
Faculty Advisor: Justin Knighton/Glen West					
Team Project Documentation	**Grade Weight**	**Grade (0-10)**	**Weighted Grade**	**Comments - All documentation is electronic and needs to be in your assigned Box file location by the due date specified in the semester project assignment**	**Student Outcomes**
Planning & Management					3, 4, 5
Executive Summary	3.0%	10	0.3	Include plans and accomplishments, as well as any graphics that make the project easy to visualize. Update at the end of the semester to tell us what you did by when, how much you spent, what you have left to do and the expected additional costs.	3, 4, 5
Project Plan/Charter & Signed Statement of work	5.0%	10	0.5	Agreed upon (signed) Project Charter that defines overall goals, budget, team rules, significant milestones and relevant engineering requirements.	3, 4, 5
Product Breakdown Structure (PBS) & Work Breakdown Structure (WBS)	5.0%	10	0.5	Overall work that needs to be done in the project with Individual assignments and predecessors - leads to schedule. May require a product breakdown structure to be created first.	3, 5
Project Schedule	4.5%	10	0.405	The Senior Capstone Project Assessment for Manufacturing Systems Engineering seniors is a comprehensive, two-term engineering laboratory course designed to integrate and apply analytical and experimental methods to solve complex research and development problems. This capstone project emphasizes the importance of both written and oral	3, 4, 5
Action Item Log for team & individuals	4.5%	10	0.45	Project Mgmt tool - Action Item log (excel) that demonstrates equal distribution of project tasks required. 10/10 requires overal team status done by lead plus individual action Logs for each team member with aprox 10 action items per team member.	3, 5
Risk Analysis	4.0%	9	0.36	Risk analysis should be done regularly with contingency plans formulated. An alternative is developing a Product & Process FMEA can be a useful risk analysis tool. Evidence of this needs to be documented. OK - strongly suggest revisiting FMEA with info from prototype test. missing process FMEA, add gussets to red areas, fatigue inspection. Tolerance Stackup Analysis.	3, 4
Meeting Minutes	4.0%	10	0.4	Attendance documentation, general meeting minutes to accompany action item log discussion	3, 5
Design & Process Engineering					1, 7
Individual Part Drawings	10%	9.5	0.85	All make parts. For composite parts provide ply and bagging schedule with part. All drwgs need to be signed off and checked and need to comply with applicable ASME/ANSI standards for drawings and GD&T (i.e. ASME Y14.5-2009 & Y14.1 in particular). All drawings need to be available in pdf format. Check Tolerance Stackup, GD&T, Seat hole assembly pattern.	1
Full Assembly & Exploded Assembly with BoM	6.0%	10	0	All drwgs need to be signed off and checked and need to comply with applicable ASME/ANSI standards for drawings and GD&T (i.e. ASME Y14.5-2009 & Y14.1 in particular)	1
Design Calculations	4.0%	10	0.34	reasonable design analysis (will it break), manufacturability analysis. If an FEA is done provide explanation and assumptions.	1, 7
Manufacturing Planning	14%	9	1.4	Routing sheets with operation process planning, standard hrs., and tooling identified. Setup instructions as needed. Required for all make parts. If tooling is required, detailed	1, 7

This assessment tool is most useful in determining areas of improvement. An example of a deficient deliverable and the related continuous improvement of the course is provided below in Figure 4-4. By identifying areas of deficiency in student performance and deliverables, the senior project capstone course is continuously improved.

Figure 4-4: Deficient project deliverable and associated corrective action.

Quality					2, 4, 6	Corrective Action
Quality Plan	5.0%	5	0.5	How are you making sure customer expectations are being met? What is your policy for dealing with nonconforming parts? Missing DCR, DR, NCR, etc. rev control,etc..Quality inspection, documentation and quality protocols.Is there a place we could do some Statistical Quality Analysis?	2	Create modules in the course for quality plan deliverables with instructor review and grading in phase 1 of the project.

B.1.4 Industrial Advisory Board Recommendations

The Industrial Advisory Board (IAB) consists of program faculty and staff members, engineering managers and engineers from local engineering companies and at least one senior MSE student. The primary role of the IAB is to periodically evaluate the MSE program and make recommendations for improvement. Board members sometimes represent the companies with whom our graduates are employed, so they have a unique and direct impact on the direction and educational objectives of the program.

The IAB typically convenes once per year. Topics and issues discussed by this board include, but are not necessarily limited to, the following:

1. Review of program educational objectives
2. Program structure
3. Content of courses
4. Declared majors and course enrollments
5. Graduate projections
6. Internship opportunities
7. Full-time hiring projections
8. Trends in the advancement of technology

Since the program was approved by the WSU we have held annual IAB meetings. In these meetings the MSE program educational objectives have been reviewed, actionable recommendations of the IAB have been reviewed, and to the extent possible, implemented. Table 4-8 is a summary of MSE IAB recommendations over these two years and corresponding actions taken. The program has linked each of the recommendations from the IAB to the relevant SO in the Table and has provided an investigation of the suggestion as well as corrective action.

Overall, the IAB felt that the program was currently meeting their needs but there was room for improvement. In future meetings the IAB's level of satisfaction will be more formally assessed and documented in the meeting minutes.

Table 4-8: MSE Industrial Advisory Board recommendations and actions taken.

IAB Suggestion	Student Outcome	Investigation	Corrective Action
Aurich enjoyed the addition of PLC, Robotics, and Lean, but he suggested teaching these courses during the sophomore year. He wished that he could have taken an intro Computer Science course (2024)	1	The degree was initially approved utilizing an existing Associates of Pre-Engineering program. Which forced most of the MSE courses into the 2nd two years. Altering the first two years would allow for the addition of an introductory Computer Science Course and more advanced controls courses.	Investigate changing the existing Associates of Pre Engineering (APE) to allow for more curriculum changes.
Greenwood suggested a strong foundation in Solidworks, he stated that the program does a good job of teaching design. He would also like to see some kind of programming (Python) and Engineering based Math and Statistics. (2024)	1, 6, 7	The degree was initially approved utilizing an existing Associate of Pre-Engineering program. The department would like to alter the first two years of the program to better align with manufacturing industry needs. This would include adding in programming courses.	Investigate changing the existing Associates of Pre Engineering (APE) to allow for more curriculum changes.
Zumbo stated that Parker uses Solidworks exclusively, but would like to see Catia and NX. (2024)	1, 3	The degree was initially approved utilizing an existing Associate of Pre-Engineering program. By removing this associate degree the department could create some degree options that could involve an advanced CAD/design emphasis and expose students to other CAD technologies.	Investigate changing the existing Associates of Pre Engineering (APE) to allow for more curriculum changes.
Hillegas-Northrop primarily uses NX. (2024)	3	The degree was initially approved utilizing an existing Associate of Pre-Engineering program. By removing this associate degree the department could create some degree options that could involve an advanced CAD/design emphasis and expose students to other CAD technologies.	Investigate changing the existing Associates of Pre Engineering (APE) to allow for more curriculum changes.
Burke-Need advanced CAD classes. New hires are lacking skills in parametric modeling and using VBA macro. Enjoyed MFET 3460 with Harward. (2024)	1, 3	The degree was initially approved utilizing an existing Associate of Pre-Engineering program. By removing this associate degree the department could create some degree options that could involve an advanced CAD/design emphasis and expose students to other CAD technologies.	Investigate changing the existing Associates of Pre Engineering (APE) to allow for more curriculum changes.
Greenwood mentioned a gap in Controls knowledge from graduates.(2024)	1	The degree was initially approved utilizing an existing Associate of Pre-Engineering program. By altering this associate degree students could gain exposure to more curriculum based upon controls	Investigate changing the existing Associates of Pre Engineering (APE) to allow for more curriculum changes.

Anderson would like to see graduates with a knowledge of how electronics work on the line, how do sensors work, how to utilize pair and connect them together. She suggested that we advise students early to help direct students to the appropriate interests and courses. She stated that students have no reference point when they are starting, maybe offer an introductory class in many areas to help find a student's individual interest. (2024)	1	The degree was initially approved utilizing an existing Associate of Pre-Engineering program. This includes a course related to electrical engineering for non-majors. The department feels this course would be more beneficial if it was tailored to a manufacturing student. In this way it could involve a deeper focus on sensors and electronics.	Investigate changing the existing Associates of Pre Engineering (APE) to allow for more curriculum changes.
Francis suggested that we include not only Solidworks, but Catia and NX. (2023)	1,3	The degree was initially approved utilizing an existing Associate of Pre-Engineering program. By removing this associate degree the department could create some degree options that could involve an advanced CAD/design emphasis and expose students to other CAD technologies.	Investigate changing the existing Associates of Pre Engineering (APE) to allow for more curriculum changes.
Hagge stated that a flexible knowledge of all CAD software would be helpful. (2023)	1,3	The degree was initially approved utilizing an existing Associate of Pre-Engineering program. By removing this associate degree the department could create some degree options that could involve an advanced CAD/design emphasis and expose students to other CAD technologies.	Investigate changing the existing Associates of Pre Engineering (APE) to allow for more curriculum changes.
Orr suggested that Catia and NX become electives in the program. (2023)	3	The degree was initially approved utilizing an existing Associate of Pre-Engineering program. By removing this associate degree the department could create some degree options that could involve an advanced CAD/design emphasis and expose students to other CAD technologies.	Investigate changing the existing Associates of Pre Engineering (APE) to allow for more curriculum changes.
Zumbo liked the addition of Systems Thinking and stated that the best engineers are good designers first and then become good engineers. (2023)	2	The degree was designed to have a systems focus on manufacturing topics. This is accomplished with two courses MSE 3700 and MSE 4700. Right now there is not a way of measuring the effectiveness of this focus. There are currently a number of quizzes in MSE 3700 related to Systems Engineering. Consider using these quizzes as assessment tools.	Investigate methods to measure the Systems focus. Include an exam in MSE 4700 to capture the systems elements of the course.
Hagge suggested that we train graduates who are prepared for collaboration and cross-functional teams. He also requested	1, 5, 6	The initial format for graduates of the program was weak on cross-functional teams due to a small number of students.	Allow for MSE students to be partnered with other engineering and engineering technology students to form cross-functional teams where

graduates who have a knowledge of automation, PLCs, robotics, lean manufacturing, Six Sigma. (2023)			appropriate. This was done in MSE 3700, MSE 4600, MSE 4615, and MSE 4620
White would like to see a better understanding of systems thinking. (2023)	4	The degree was designed to have a systems focus on manufacturing topics. This is accomplished with two courses MSE 3700 and MSE 4700. Right now there is not a way of measuring the effectiveness of this focus. There are currently a number of quizzes in MSE 3700 related to Systems Engineering. Consider using these quizzes as assessment tools.	Investigate methods to measure the Systems focus. Include an exam in MSE 4700 to capture the systems elements of the course.
Hagge also suggested that students complete a three to six-month internship. (2023)	5, 7	There is not a formal program for internships specific to MSE. Students are not provided unique opportunities due to their major.	Research the feasibility of offering a regular internship opportunity with selected employers

Faculty members are also charged with reviewing degree documentation regularly. This includes catalog descriptions, prerequisites and overrides from students. In the process of this review, several anomalies were identified and shown in Table 4-9 below.

Table 4-9: Faculty Review of Degree Documentation

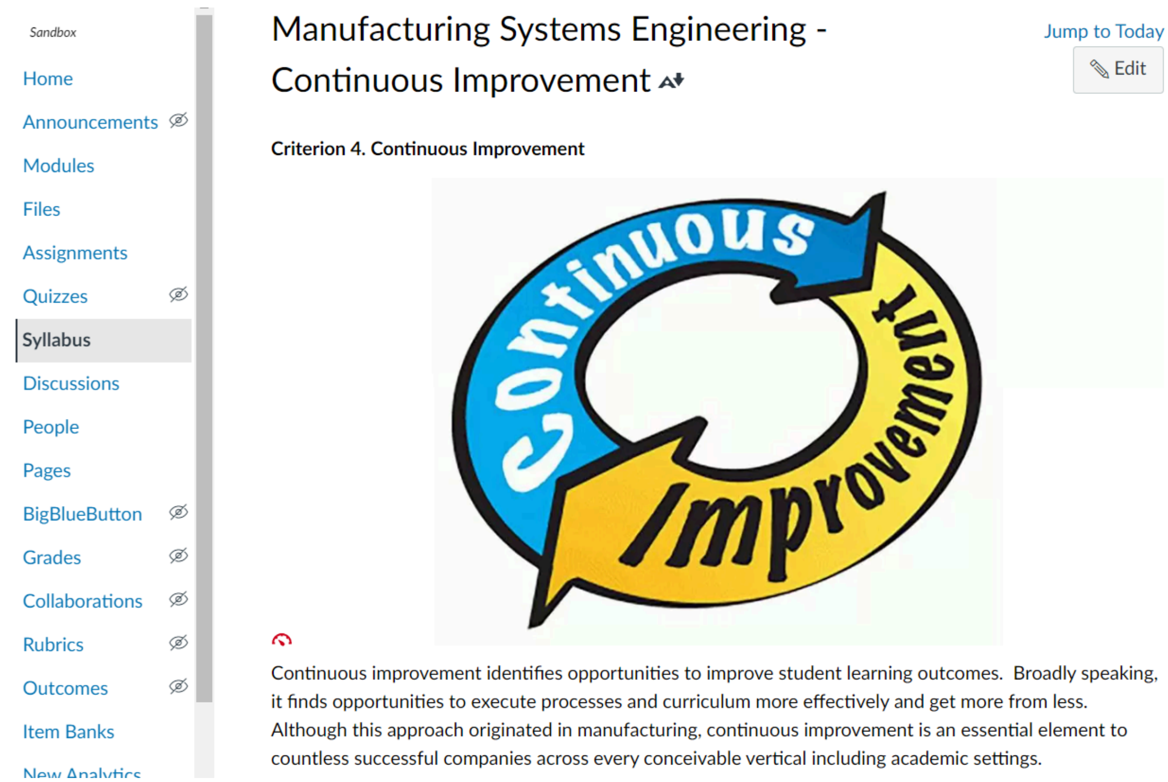
Documentation Review	**Corrective Action**
MSE Grad Map	Several anomalies were discovered during the review of the MSE grad map including; courses in inappropriate semesters relating to course offerings and prerequisites. The grad map was updated to correct these errors.
MSE Grad Map	Through the review of the MSE grad map it was discovered that the APE program initiated a program change to separate the lab portion of the course ENGR 2160. This change was not communicated to the MSE program and therefore the lab portion does not show up as a required course. A curriculum change will be made to the MSE degree to include ENGR 2165 as a degree requirement.
Catalog review: MFET 3550	The course MFET 3550 does not include the necessary prerequisites for the MSE degree. A catalog change will be made so MSE students can enroll in this course without

	needing a registration override.
MSE Grad Map	The MSE grad map included an option for COMM 1020. This course is currently not listed as a requirement in the catalog. Faculty will perform an investigation on the curriculum in this course and determine if it should be added as an option into the catalog.
MSE 4590 Catalog	The prerequisites for this course do not match the degree plan for MSE. The instructor was notified to complete a curriculum change to update the catalog prerequisites to match the degree.
MSE 3700 Catalog	The catalog description lists the prerequisites as MFET 2320 and ENGR 2140. This should be OR. A curriculum change will be made when the curriculum system is available.
Course Overrides	Faculty regularly review course overrides. In the review of Spring 2024, several students were granted prerequisite overrides. This includes the courses MSE 3040, 3710, 4590, 4620, and 4700. The program coordinator investigated why these students were given overrides. In the course of this investigation, several anomalies were identified. In several instances faculty from other departments are listed as giving overrides for MSE courses. The MSE faculty notified the records office and the dean's office to perform an investigation as to what is happening in the override system. As of the time of this submission, this investigation is ongoing.
Course Overrides	In the review of Fall 2023, several students were granted prerequisite overrides. This includes the courses MSE 3360, 3460, 4010, and 4615. The program coordinator investigated why these students were given overrides. In the course of this investigation, several anomalies were identified. In several instances faculty from other departments are listed as giving overrides for MSE courses. The MSE faculty notified the records office and the dean's office to perform an

	investigation as to what is happening in the override system. As of the time of this submission, this investigation is ongoing.

The faculty also regularly review and maintain their continuous improvement canvas page shown below in Figure 4-10. On this page, tasks and assignments are made, scheduled and continuous improvement activities are documented. An example of this canvas page can be found in the figure below.

Figure 4-10: Continuous improvement Canvas Page Example.



C. Additional Information

Copies of any of the assessment instruments or materials referenced in 4.A and 4.B are available for review at the time of the visit. Other information, such as meeting minutes from where the assessment results were evaluated and where recommendations for action were made, are also available.

CRITERION 5. CURRICULUM

A. Program Curriculum

1. Table 5-1 describes the plan of study for students in this program including information on course offerings in the form of a recommended schedule by year and term along with maximum section enrollments for all courses in the program for the last two terms the course was taught. As can be seen from this table, the program provides students with a balanced curriculum. The institution operates on a semester system.

Table 5-1 Curriculum

Name of Program: Manufacturing Systems Engineering Bachelor of Science

Course (Department, Number, Title) List all courses in the program by term starting with the first term of the first year and ending with the last term of the final year.	Indicate whether course is Required, Elective or a Selected Elective by an R, an E or an SE.[1]	*Subject Area (Credit Hours)* Math & Basic Sciences	Engineering Topics; Check if Contains Significant Design (√)	Other	Last Two Terms the Course was Offered: Year and, Semester, or Quarter	Maximum Section Enrollment for the Last Two Terms the Course was Offered[2]
Freshman Fall						
CHEM 1210/1215 PS Principles of Chemistry / Lab	R	5			*24S 23F*	
ECON 2010 SS Principles of Microeconomics	R			*3*	*24S 23F*	
MATH 1210 Calculus I	R	4			*24S 23F*	
American Institutions	SE			*3*	*N/A*	
ENGR 1000 Introduction to Engineering	R		*2*		*24S 23F*	*22, 35*
Freshman Spring						
LIBS 1704 IL Information Navigator	R			*1*	*24S 23F*	
ENGL 2010 EN Intermediate College Writing	R			*3*	*24S 23F*	
PHYS 2210/2219 PS Physics for Scientists & Engineers I / Lab	R	5			*24S 23F*	
MATH 2210 Calculus II	R	4			*24S 23F*	
PDD 1010 Introduction to Engineering & Tech Design	R		*3*		*24S 23F*	*24, 23*
Sophomore Fall						
ECE 2210 Electrical Engineering for Non-Majors	R		*4*		*23F 22F*	
ENGR 2010 Statics	R		*3*		*24S 23F*	*29. 26*
PHYS 2220/2229 Physics for Scientist & Engineers II / Lab	R	5			*24S 23F*	
MATH Technical Elective MATH 2210, MATH 2250*, or MATH 2270	SE	3 - 4			*N/A*	*N/A*
Creative Arts/Diversity	SE			*3*	*N/A*	*N/A*

Sophomore Spring						
ENGR 2160 Materials Science & Engineering	R		*3*		*24S 23S*	*30, 36*
ENGR 2030 Dynamics	R		*4*		*24S 23F*	*30, 17*
ENGR 2140 Mechanics of Materials	R		*3*		*24S 23F*	*26, 8*
PDD 1160 Geo Dimensioning & Tolerancing	R		*3*		*24S, 23F*	*22, 16*
COMM 2110 Communication Elective	SE			*3*	*N/A*	*N/A*
Junior Fall						
MSE 3360 Manufacturing Process & Materials/Lab	R		*3*		*23F 22F*	*3, 0*
MSE 3460 Product Design & Development	R		*3 √*		*23F, 22F*	*5, 3*
MSE 3700 Manufacturing Systems I	R		*3 √*		*23F 22F*	*10, 8*
MATH 3410 Probability & Statistics I	R	3			*N/A*	*N/A*
Creative Arts/Humanities/Diversity	SE			*3*	*N/A*	*N/A*
Junior Spring						
MFET 3550 Manufacturing Supervision	R		*3*		*24S 23F*	*14, 9*
MSE 1210 Metal Processing & Joining for Engineers	R		*3*		*24S 23F*	*11, 13*
MSE 3040 Cost Estimating & Engineering Economic Analysis	R		*3*		*24S, 23S*	*3, 0*
MSE 3850 Statistical Process Control & Reliability	R		*3 √*		*24S, 23F*	*12, 16*
Life Science	SE	3			*N/A*	*N/A*
Senior Fall						
MSE 4010 Facility Design & Material Handling	R		*3 √*		*23F, 22F*	*2, 0*
MSE 4610 Project Management for Engineers	R		*3*		*22S, 21S*	*4, 6*
MSE 4615 Senior Project Design I/Lab	R		*3 √*		*24S, 21S*	*1, 1*
MSE 3910 Six Sigma Methods & Tools	R		*3 √*		*24S, 23F*	*15, 0*
MSE 4590 Lean Manufacturing Systems	R		*3 √*		*24S, 23F*	*10, 4*
Senior Spring						
Social Science/Diversity	SE			*3*	*N/A*	*N/A*
MSE 4620 Senior Project Design II/Lab	R		*3 √*		*24S, 21F*	*1, 1*
MSE 4700 Manufacturing Systems Engineering II	R		*3 √*		*24S, 23S*	*2, 0*
MSE 4600 Production Systems Modeling/Lab	R		*3 √*		*24S, 21F*	*3, 2*
MSE 3710 CAM & Additive Manufacturing/	R		*3*		*24S, 23S*	*2, 0*
Add rows as needed to show all courses in the curriculum.						
TOTALS (in terms of semester credit hours)		32 - 33	*73*	*22*		

Total must satisfy minimum credit hours	Minimum Semester Credit Hours	30 Hours	45 Hours			

1. **Required** courses are required of all students in the program, **Elective** courses (often referred to as open or free electives) are optional for students, and **Selected Elective** courses are those for which students must take one or more courses from a specified group.
2. For courses that include multiple elements (lecture, laboratory, recitation, etc.), indicate the maximum enrollment in each element. For Selected Elective courses, indicate the maximum enrollment for each option.

Instructional materials and student work verifying compliance with ABET criteria for the categories indicated above will be required during the campus visit.

2. Describe how the curriculum aligns with the program educational objectives.

Table 5-2 describes the required courses and alignment with Program Educational objectives. As can be seen in this table, supporting math, science, engineering science, and MSE specific courses are highlighted.

Table 5-2. Alignment of Curriculum with PEOs.

	Program Educational Objectives	Required Courses
1	Technical Competence	MATH 1210, MATH 1220, MATH 3410
		CHEM 1210/1215, PHYS 2010, PHYS 2220, LS
		MSE 3040, MSE 3360, MSE 3460, MSE 3700, MSE 4600
		ENGR 1000, ENGR 2010, ENGR 2030, ENGR 2140, ENGR 2160, MSE 1210, ECE 2210, PDD 1010, PDD 1160
2	Professional Growth	MSE 4610, MFET 3550, ECON 2010, SS/DV, HU/CA
3	Effective Communication	MSE 3360, MSE 3040, MSE 4610, MSE 4615, MSE 4620, MFET 3550, COMM 2120, ENGL 2010
4	Ethical Behavior	MSE 3700, MSE 4615, MSE 4620, MFET 3550
5	Teamwork and Collaboration	MSE 3700, MSE 4615, MSE 4620, MFET 3550
6	Continuous Improvement	MSE 3850, MSE 4590
		MSE 3710, MSE 3700, MSE 4700
		MSE 4600, MSE 4610, MSE 4015, MSE 4620
7	Proactive Problem Solving	MSE 3700, MSE 3040, MSE 3460, MSE 4615, MSE 4620
		ENGR 1000, ENGR 2010, ENGR 2030, ENGR 2140, ENGR 2160,
		ECE 2210
		MSE 4600, MSE 4610, MSE 4010

3. Describe how the curriculum and its associated prerequisite structure support the attainment of the student outcomes.

The curriculum for the Bachelor of Science in Manufacturing Systems Engineering is designed to ensure that students acquire the necessary knowledge and skills to meet the program's student outcomes. The structured sequence of courses and their prerequisites play a crucial role in building a solid foundation of technical expertise, professional skills, and ethical awareness.

Curriculum and Prerequisite Structure:

1. Foundational Courses:

Courses such as MATH 1210 (Calculus I) and CHEM 1210 (Principles of Chemistry I) and other basic math and sciences courses provide the essential mathematical and scientific principles that are prerequisites for more advanced engineering courses. These foundational courses support Student Outcomes 1 and 6 by equipping students with the necessary skills to solve complex engineering problems and conduct experiments.

2. Core Engineering Courses:

Courses such as ENGR 2010 (Statics) and ENGR 2160 (Materials Science and Engineering) build on the foundational courses and introduce students to key engineering concepts and techniques. These courses directly support Student Outcomes 1, 2, and 6 by teaching students to apply engineering principles in real-world contexts.

3. Advanced Technical Courses:

Advanced courses such as MSE 3850 (Statistical Process Control and Reliability) and MSE 3360 (Manufacturing Processes & Materials/Lab) require prerequisites like ENGR2010 and ENGR 2160 and MATH 3410. These courses delve deeper into specialized engineering topics, supporting Student Outcomes 1, 2, and 6 by challenging students to solve complex problems and design solutions that consider various factors.

4. Communication and Professional Skills:

Courses such as COMM 2110 are included to develop students' communication skills. These courses support Student Outcome 3 by training students to effectively convey technical information to diverse audiences.

5. Ethical and Societal Context:

The curriculum includes courses meeting general education requirements of creative arts, diversity, social science, and humanities. These courses provide students with a broader understanding of ethical and societal issues. These courses support Student Outcomes 4 and 5 by fostering an awareness of ethical responsibilities and the societal impact of engineering decisions.

6. Capstone and Team Projects:

The MSE 4610 and MSE 4615 (Senior Project) serve as a capstone course that integrates all aspects of the curriculum. This project-based course requires students to apply their cumulative knowledge to solve real-world engineering problems, supporting Student Outcomes 1-7. It emphasizes teamwork, leadership, and project management, reflecting the collaborative nature of engineering practice.

7. Continuous Learning and Adaptability:

Specialized courses allow students to stay updated with the latest advancements in manufacturing engineering with courses such as MSE 4010 (Facility Design and Material Handling) and MSE 4600 (Production Systems Modeling/Lab). These courses encourage continuous learning and adaptability, supporting Student Outcome 7.

Prerequisite Structure:

The prerequisite structure ensures that students' progress through the curriculum in a logical and coherent manner. Each course builds upon the knowledge and skills acquired in previous courses, creating a scaffolded learning experience. For example:

MATH 1210 (Calculus I) is a prerequisite for PHYS 2210 (Physics for Scientists and Engineers I), which in turn is a prerequisite for ENGR 2010 (Statics). This sequence ensures that students have a solid foundation in mathematics and physics before tackling more complex engineering topics.

ENGR 2160 (Materials Science and Engineering) is a prerequisite for MSE 3360 (Manufacturing Processes & Material/ Lab), ensuring that students understand the properties of materials before learning about manufacturing processes.

By carefully structuring the curriculum and prerequisites, the program ensures that students develop the competencies required to meet the student outcomes. This approach not only prepares students for successful careers in manufacturing systems engineering but also aligns with the Program Educational Objectives (PEOs) of technical competence, professional growth, effective communication, ethical behavior, teamwork, and continuous improvement. The entire MSE degree alignment with Student outcomes can be seen in Table 5-3 below.

Table 5-3: MSE degree alignment with Student outcomes.

Student Learning Outcomes	1	2	3	4	5	6	7
A = Assessed I = Introduced E = Emphasized R = Reinforced	**An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics**	**An ability to 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**	**An ability to communicate effectively with a range of audiences**	**An ability to 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**	**An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives**	**An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions**	**An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.**
ENGR 1000 Introduction to Engineering	I	I	I	I	I		
PDD 1010 Introduction to Engineering & Tech Design	I			I			I
MATH 1210 Calculus I	I						
CHEM 1210 PS Principles of Chemistry I	I					I	
ENGL 2010 EN Intermediate College Writing	R		R	R			
PDD 1160 Geo Dimensioning & Tolerancing	I		R				R

PHYS 2210 PS Physics for Scientists & Engineers I	I					I	
MATH 1220 Calculus II	I						
ECON 2010 SS Principles of Microeconomics				R			
LIBS 1704 IL Information Navigator			R	R			R
ENGR 2010 Statics	I						I
ECE 2210 Electrical Engineering for Non-Majors	I						I
PHYS 2220 Physics for Scientists & Engineers II	I						
MATH MSE Technical Elective: Suggested options: MATH 2210, MATH 2250*, or MATH 2270	I					R	R
Creative Arts (CA)/ Diversity (DV)				R			R
ENGR 2030 Dynamics	E						
ENGR 2140 Mechanics of Materials	E						
ENGR 2160 Materials Science & Engineering	E						
MATH 3410 Probability & Statistics I	E						
COMM 2110 HU Interpersonal & Small Group Com			R	R			

MSE 1210 Metal Processing & Joining for Engineers	I						
MSE 3360 Manufacturing Process & Materials/ Lab	R		E				E
MSE 3700 Manufacturing Systems I	I	I, A		R,A		R	R
MSE 3850 Statistical Process Control & Reliability	A	R	R			R	
MFET 3550 Manufacturing Supervision	E		R	R	R		
MSE 3040 Cost Estimating & Engineering Econ. Analysis	E		**R**	R			R
MSE 3910 Six Sigma Methods & Tools in Manufacturing	R	R	E	R		I, A	
MSE 4010 Facility Design & Material Handling	I	R	R	R			
MSE 4590 Lean Manufacturing Systems	R	R	R	R			
MSE 4610 Project Management for Engineers			R	R	R		
MSE 3460 Product Design & Development	R	R	R			R	
MSE 4615 Senior Project Design I/ Lab	R/A	R/A	R/A	R/A	R/A	R/A	R/A

MSE 4700 Manufacturing Systems Engr. II	**R/A**	**A**	**A**	**A**	**A**	**R,A**	**R**
American Institutions (AI)				R			
Creative Arts (CA)/ Humanities (HU)/ Diversity (DV)				R			
MSE 3710 CAM & Additive Manufacturing/ Lab	R						
MSE 4600 Production Systems Modeling/ Lab	R	R		R		R	R
MSE 4620 Senior Project Design II/ Lab	R/A	R/A	R/A	R/A	R/A	R/A	R/A
Life Science (LS)/ Diversity (DV)				R			R
Social Science (SS)/ Diversity (DV)				R			R

4. Attach a flowchart or worksheet that illustrates the prerequisite structure of the program's required courses.

The following figure 5-1 shows the graduation map that illustrates the prerequisite structure of the program's required courses.

Figure 5-1: MSE Graduation Map.

Manufacturing Systems Engineering - Graduation MAP

This is a suggested plan. Meet with an academic advisor to create a specific plan that best fits your academic needs. Remember, taking an average of 15 credit hours per semester facilitates timely graduation.

atalog Year: 2023-2024 **NAME:** ____________________

☑	Course	Credit Hour	Semeste rOffered	Prerequisites	Milestones & Notes
	Freshman (Semester 1)				
	ENGR 1000 Introduction to Engineering	2	Fa, Sp	Pre/Co-req: MATH 1060 or MATH 1080 or equivalent.	•Declare major in **Associate of Pre-Engineering (APE)** •Overall 2.5 GPA required for MSE majors
	CHEM 1210 (PS) Principles of Chemistry I CHEM 1215 Principles of Chemistry I Lab	5	Fa, Sp, Su	Prereq: MATH 1010 or equivalent and CHEM 1200 or dept. approval Pre/Coreq: MATH 1050 or 1080 or 1210 or 1220 or 2210 or equiv.	
	ECON 2010 (SS) Principles of Microeconomics	3	Fa, Sp, Su	MATH 1010 or 1050 or 1080 or 1090 or 1210	
	MATH 1210 Calculus I	4	Fa, Sp, Su	MATH 1050 & MATH 1060 or MATH 1080 or placement test	
	American Institutions (AI)	3	Fa, Sp, Su		
	Total Semester Credits	**17**			
	Freshman (Semester 2)				
	ENGL 2010 EN2 Intermediate College Writing	3	Fa, Sp, Su	ENGL 1005 or 1010 or equiv.	• LIBS 1504 Information Literacy Exam (1)can be taken in lieu of LIBS 1704
	LIBS 1704 IL Information Navigator	1	Fa, Sp, Su		
	MATH 1220 Calculus II	4	Fa, Sp, Su	MATH 1210	
	PDD 1010 Introduction to Engineering & Tech Design	3	Fa, Sp	MATH 1010 or placement.	
	PHYS 2210 PS Physics for Scientists & Engineers I PHYS 2219 Physics for Scientist & Engineers I Lab	5	Fa, Sp	Prereq: MATH 1060 or1080 or 1210. Coreq: Phys 2019	
		16			
	Total Freshman Credits	**33**			
	Sophomore (Semester 3)				
	ECE 2210 Electrical Engineering for Non-Majors	4	Fa	MATH 1210.	• *MATH 2250 is only offered SpringSemester • Only 3 credits total needed for Diversity(DV) requirement • Recommended for MS in System Engr: MATH 2210 & MATH 2250
	ENGR 2010 Statics	3	Fa	MATH 1210 and PHYS 2210	
	PHYS 2220 Physics for Scientists & Engineers II PHYS 2229 Physics for Scientist & Engineers II Lab	5	Fa, Sp	Prereq: PHYS 2210. CoReq: MATH 1220.	
	MATH MSE Technical Elective: Suggested options: MATH 2210, MATH 2250*, or MATH 2270	3-4	Fa, Sp, Su	MATH 2210 & 2250 pre; MATH 1220. MATH 2270 pre; Math 1220 or 1210 and Math 3110 or 3160.	
	Creative Arts (CA)/ Diversity (DV)	3	Fa, Sp, Su		
	Total Semester Credits	**18-19**			
	Sophomore (Semester 4)				
	ENGR 2160 Materials Science & Engineering ENGR 2165 Materials Science & Engineering Lab	4	Sp	Prereq: CHEM 1210. Coreq: ENGR 2140.	
	ENGR 2030 Dynamics	4	Sp	ENGR 2010	
	ENGR 2140 Mechanics of Materials	3	Sp	ENGR 2010	
	PDD 1160 Geo Dimensioning & Tolerancing	3	Fa, Sp	PDD 1010.	
	COMM 2110 HU Interpersonal & Small Group Com	3	Fa, Sp, Su		
	Total Semester Credits	**16**			
	Total Sophomore Credits	**34-35**			

☑	Course	Credit Hours	Semester Offered	Prerequisites	Milestones & Notes
	Junior (Semester 5)				
	MSE 3360 Manufacturing Process & Materials/ Lab	3	Fa	ENGR 2010, ENGR 2160.	• Declare major in Manufacturing Systems Engineering (MSE)
	MSE 3460 Product Design & Development	3	Fa	ENGR 1000, PDD 1160	
	MSE 3700 Manufacturing Systems I	3	Fa	MFET 2320	
	MATH 3410 Probability & Statistics I	3	Fa, Sp,	MATH 1220	
	Creative Arts (CA)/ Humanities (HU)/ Diversity (DV)	3	Fa		
	Total Semester Credits	**15**			
	Junior (Semester 6)				
	MFET 3550 Manufacturing Supervision	3	Fa, Sp,	MFET 2410 (or MATH 1040)	• Only 3 credits total needed for Diversity (DV) requirement • Apply for senior project
	MSE 1210 Metal Processing & Joining for Engineers	3	Fa, Sp,		
	MSE 3040 Cost Estimating & Engineering Econ. Analysis	3	Sp	MATH 1210, MSE 3700	
	MSE 3850 Statistical Process Control & Reliability	3	Sp	MFET 2410 or MATH 1040 or MATH 3410	
	Life Science LS	3	Fa, Sp, Su		
	Total Semester Credits	**15**			
	Total Junior Credits	**30**			
	Senior (Semester 7)				
	MSE 3910 Six Sigma Methods & Tools in Manufacturing	3	Fa, Sp,	MSE 3850 or MFET 3810	• C or better in all major & support courses.
	MSE 4010 Facility Design & Material Handling	3	Fa	MSE 3360, MSE 3460	
	MSE 4590 Lean Manufacturing Systems	3	Fa	MFET 2300 or MFET 2320.	
	MSE 4610 Project Management for Engineers	3	Fa, Sp,	Prereq: MSE 3040, MSE 3460. Coreq: MSE 4615.	
	MSE 4615 Senior Project Design I/ Lab	2	Fa, Sp,	Coreq: MSE 4610	
	Total Semester Credits	**14**			
	Senior (Semester 8)				
	MSE 3710 CAM & Additive Manufacturing/ Lab	3	Sp	MSE 1210, PDD 1010, PDD 1160 or MSE 3460	• Apply for graduation with BS degree in MSE
	MSE 4600 Production Systems Modeling/ Lab	3	Sp	MSE 3460, MSE 3700	
	MSE 4620 Senior Project Design II/ Lab	3	Fa, Sp,	MSE 4610, MSE 4615	
	MSE 4700 Manufacturing Systems Engineering II	3	Sp	MSE 3040, MSE 3700	
	Social Science (SS)/ Diversity (DV)	3	Fa, Sp,	MSE 1210, PDD 1010, PDD 1160 or MSE 3460	
	Total Semester Credits	**15**			
	Senior (Optional)				
	Total Senior Credits	**29**			
	Total Bachelor Credits	**126-127**			

Gen Ed Breadth Requirements (do not duplicate departments)

▫ HU	▫ CA	▫ HU or CA
▫ SS	▫ SS	
▫ PS	▫ LS	▫ PS or LS
▫ DV (Double dip with breadth course)		

This is a suggested course sequence not an academic contract. Curriculum and program requirements are subject to change without notification. All Manufacturing Systems Engineering students are required to meet with their faculty or academic advisor at least annually for course and program advisement.

Avoid Misadvisement! Consult your Academic Advisor (weber.edu/advisors), the WSU Catalog (weber.edu/catalog), and your CatTracks degree evaluation (log into your eWeber Student Portal).

Program Coordinator: Mary Foss, 801-626-6356, maryfoss@weber.edu
Academic Advisor: eastadvising@weber.edu

Revision Date: 5/23/2024

5. Describe how the program meets the requirements in terms of hours and depth of study for each subject area (Math and Basic Sciences, Engineering Topics) specifically addressed by either the general criteria or the program criteria.

The MSE degree has a minimum of 30 semester credit hours (or equivalent) of a combination of college-level mathematics and basic sciences with experimental experience appropriate to the program. The MSE Degree defines basic sciences as disciplines focused on knowledge or understanding of the fundamental aspects of natural phenomena. Basic sciences consist of chemistry and physics and other natural sciences including life, earth, and space sciences. The MSE degree defines College-level mathematics as mathematics that requires a degree of mathematical sophistication at least equivalent to that of introductory calculus. For illustrative purposes, some examples of college-level mathematics include calculus, differential equations, probability, statistics, linear algebra, and discrete mathematics. Many students will need additional math courses prior to reaching the first math course MATH 1210. Since the MSE degree is built upon the existing Associate of PreEngineering, courses that correspond to this associate degree are marked ‘General’ and those that correspond to the MSE degree program are marked ‘Program’. These courses and their corresponding credit hours are shown in Table 5-4 below:

Table 5-4 : Math and Basic Sciences

Course	Prerequisite	Credit Hours	General/Program
CHEM 1210 PS Principles of Chemistry I AND Lab	MATH 1010 or equivalent and CHEM 1200 or dept. approval	5	General
MATH 1210 Calculus I	MATH 1050 & MATH 1060 or MATH 1080 or placement test	4	General
PHYS 2210 PS Physics for Scientists & Engineers I AND Lab	Prereq: MATH 1060 or1080 or 1210. Coreq; Phys 2019	5	General
MATH 1220 Calculus II	MATH 1210	4	General
PHYS 2220 Physics for Scientists & Engineers II AND Lab	Prereq: PHYS 2210	5	General
MATH MSE Technical Elective: Suggested options: MATH 2210, MATH 2250*, or MATH 2270	MATH 2210 & 2250 pre; MATH 1220. MATH 2270 pre; Math 1220 or 1210 and Math 3110 or 3160.	3-4	Program
Life Science LS*		3	General
MATH 3410 Probability & Statistics I	MATH 1220	3	Program
Total		**32-33**	

*Life Science Courses must meet the four Life Science Learning Outcomes (LOs):
Students will demonstrate their understanding of the following four characteristics of life:

1) Levels of organization: All life shares an organization that is based on molecules and cells and extends to organisms and ecosystems.

2) Metabolism and homeostasis: Living things obtain and use energy, and maintain homeostasis via organized chemical reactions known as metabolism.

3) Genetics and evolution: Shared genetic processes and evolution by natural selection are universal features of all life.

4) Ecological interactions: All organisms, including humans, interact with their environment and other living organisms.

The MSE degree exceeds the minimum of 45 semester credit hours (or equivalent) of engineering topics appropriate to the program, consisting of engineering and computer sciences and engineering design, and utilizing modern engineering tools. Engineering sciences are based on mathematics and basic sciences but carry knowledge further toward creative application needed to solve engineering problems. These studies provide a bridge between mathematics and basic sciences on the one hand and engineering practice on the other. Engineering design is a process of devising a system, component, or process to meet desired needs and specifications within constraints. It is an iterative, creative, decision-making process in which the basic sciences, mathematics, and engineering sciences are applied to convert resources into solutions. Engineering design involves identifying opportunities, developing requirements, performing analysis and synthesis, generating multiple solutions, evaluating solutions against requirements, considering risks, and making trade- offs, for the purpose of obtaining a high-quality solution under the given circumstances. For illustrative purposes only, examples of possible constraints include accessibility, aesthetics, codes, constructability, cost, ergonomics, extensibility, functionality, interoperability, legal considerations, maintainability, manufacturability, marketability, policy, regulations, schedule, standards, sustainability, or usability. The courses corresponding to the category ‘Engineering Topics’ , their associated credit hours, prerequisites and engineering design inclusion are shown in Table 5-5 below.

Table 5-5: Engineering Topics

Course	Prerequisite	Credit Hours	Check if engineering design	General/Program
ENGR 1000 Introduction to Engineering	Pre/Co-req; MATH 1060 or MATH 1080 or equivalent.	2		General
PDD 1010 Introduction to Engineering & Tech Design	MATH 1010 or placement.	3		General
ENGR 2210 Electrical Engineering for Non-Majors	MATH 1210.	4		General
ENGR 2010 Statics	MATH 1210 and PHYS 2210	3		General

ENGR 2160 Materials Science & Engineering	Prereq; CHEM 1210. Coreq; ENGR 2140.	4		General
ENGR 2080 Dynamics	ENGR 2010	4		General
ENGR 2140 Mechanics of Materials	ENGR 2010	3		General
MSE 3360 Manufacturing Process & Materials/ Lab	ENGR 2010, ENGR 2160.	3		Program
MSE 1210 Metal Processing & Joining for Engineers		3		General
MSE 3700 Manufacturing Systems I	ENGR 2140 or* MFET 2320	3	✓	Program
MFET 3550 Manufacturing Supervision	MFET 2410 (or MATH 1040)*	3		General
MSE 4610 Project Management for Engineers	Prereq; MSE 3040, MSE 3460. Coreq; MSE 4615.	3		Program
MSE 3040 Cost Estimating & Engineering Econ. Analysis	MATH 1210, MSE 3700	3		Program
MSE 3850 Statistical Process Control & Reliability	MFET 2410 or MATH 1040 or MATH 3410	3	✓	Program
PDD 1160 Geo Dimensioning & Tolerancing	PDD 1010	3		General
MSE 4010 Facility Design & Material Handling	MSE 3360, MSE 3460	3	✓	Program
MSE 4615 Senior Project Design I/ Lab	Coreq; MSE 4610	2	✓	Program
MSE 3910 Six Sigma Methods & Tools in Manufacturing	MSE 3850 or MFET 3810	3	✓	Program
MSE 3460 Product Design & Development	ENGR 1000, PDD 1160	3	✓	General

MSE 4590 Lean Manufacturing Systems	MFET 2300 or MFET 2320.*	3	✓	Program
MSE 4620 Senior Project Design II/ Lab	MSE 4610, MSE 4615	3	✓	Program
MSE 4700 Manufacturing Systems Engineering II	MSE 3040, MSE 3700	3	✓	Program
MSE 4600 Production Systems Modeling/ Lab	MSE 3460, MSE 3700	3	✓	Program
MSE 3710 CAM & Additive Manufacturing/ Lab	MSE 1210, PDD 1010, PDD 1160 or MSE 3460	3		General
TOTAL		73		

*Catalog change on this verbiage is in work.

6. Describe the broad education component and how it complements the technical content of the curriculum and how it is consistent with the program educational objectives.

The broad education component of the curriculum is designed to complement the technical content by providing students with a well-rounded education that enhances their critical thinking, communication, and ethical reasoning skills. This holistic approach ensures that graduates are not only proficient in technical aspects but also equipped with the broader competencies necessary for professional and personal success. The following courses and their alignment with the Program Educational Objectives (PEOs) demonstrate how this component enriches the curriculum:

Courses and Their Contributions:

ECON 2010 SS Principles of Microeconomics (3 credit hours)

PEOs: 1, 2, 3
Contribution: This course introduces students to the fundamental principles of microeconomics, enhancing their understanding of economic systems and decision-making processes. It supports technical competence (PEO 1) by providing a foundational understanding of economic factors influencing engineering decisions. It fosters professional growth (PEO 2) by emphasizing the importance of economic literacy in professional development. Furthermore, it enhances effective communication (PEO 3) by encouraging students to articulate economic concepts clearly.

American Institutions (3 credit hours)

PEOs: 2
Contribution: This course provides an understanding of the historical and governmental contexts within which engineering practices operate. It supports professional growth (PEO 2) by

fostering an awareness of the civic and institutional frameworks that influence professional practice and leadership roles.

LIBS 1704 IL Information Navigator (1 credit hour)

PEOs: 1
Contribution: This course teaches students effective research and information literacy skills. It directly supports technical competence (PEO 1) by enabling students to locate, evaluate, and use information efficiently, which is critical for problem-solving and continuous learning in engineering.

ENGL 2010 EN Intermediate College Writing (3 credit hours)

PEOs: 3
Contribution: This writing course enhances students' ability to communicate effectively through written text. It supports effective communication (PEO 3) by developing skills in crafting clear, coherent, and persuasive written documents, which are essential for technical documentation and professional correspondence.

Creative Arts (CA)/ Diversity (DV) (3 credit hours)

PEOs: 3, 4, 5
Contribution: Courses in this category expose students to diverse perspectives and creative processes. They support effective communication (PEO 3), ethical behavior (PEO 4), and teamwork and collaboration (PEO 5) by encouraging students to appreciate cultural diversity and engage in creative problem-solving.

COMM 2110 HU Interpersonal & Small Group Communication (3 credit hours)

PEOs: 3
Contribution: These communication courses develop students' oral communication skills. They support effective communication (PEO 3) by teaching students how to present ideas clearly and interact effectively in various settings, including professional environments and team collaborations.

Creative Arts (CA)/ Humanities (HU)/ Diversity (DV) (3 credit hours)

PEOs: 3, 4, 5
Contribution: These courses further students' understanding of human culture and diversity. They support effective communication (PEO 3), ethical behavior (PEO 4), and teamwork and collaboration (PEO 5) by fostering empathy, ethical reasoning, and an appreciation for diverse viewpoints.

Social Science (SS)/ Diversity (DV) (3 credit hours)

PEOs: 3, 4, 5

Contribution: Social science courses broaden students' understanding of societal structures and dynamics. They support effective communication (PEO 3), ethical behavior (PEO 4), and teamwork and collaboration (PEO 5) by providing insights into human behavior, social interactions, and ethical considerations.

Alignment with Program Educational Objectives:

Technical Competence (PEO 1): Courses like ECON 2010 and LIBS 1704 enhance students' understanding of economic principles and information literacy, which are crucial for making informed engineering decisions and solving complex problems.

Professional Growth (PEO 2): Courses such as American Institutions and ECON 2010 support continuous professional development by providing knowledge of economic and civic systems that impact professional practice.

Effective Communication (PEO 3): Courses including ENGL 2010, COMM 1020/2110, and various Creative Arts and Social Science offerings strengthen students' ability to communicate effectively in written and oral forms, essential for professional success.

Ethical Behavior (PEO 4): Diversity and humanities courses promote ethical reasoning and cultural awareness, preparing students to navigate ethical dilemmas and contribute positively to society.

Teamwork and Collaboration (PEO 5): Interpersonal communication and diversity-focused courses develop students' abilities to work effectively in teams, appreciate diverse perspectives, and collaborate towards common goals.

Overall, the broad education component complements the technical content of the curriculum by equipping students with essential skills and knowledge that enhance their technical expertise and prepare them for diverse professional challenges. This integrated approach ensures that graduates are well-rounded individuals capable of excelling in their careers and contributing meaningfully to their communities. This alignment is further demonstrated through Table 5-6 below.

Table 5-6: Broad Educational Courses Alignment with Program Educational Objectives.

Course	Credit Hours	PEO
ECON 2010 SS Principles of Microeconomics	3	1, 2, 3
American Institutions	3	2
LIBS 1704 IL Information Navigator	1	1
ENGL 2010 EN Intermediate College Writing	3	3
Creative Arts (CA)/ Diversity (DV)	3	3, 4, 5

Course	Credit Hours	PEO
COMM 1020 HU Principles of Public Speaking **OR** COMM 2110 HU Interpersonal & Small Group Com	3	3
Creative Arts (CA)/ Humanities (HU)/ Diversity (DV)	3	3, 4, 5
Social Science (SS)/ Diversity (DV)	3	3, 4, 5

7. Describe the major design experience that prepares students for engineering practice. Describe how this experience is based upon the knowledge and skills acquired in earlier coursework and incorporates appropriate engineering standards and multiple design constraints. Provide the titles of all culminating design projects from the most recent graduating class. If multiple teams work on projects with the same title, provide a way to distinguish the projects. New programs requesting two-year retroactive accreditation should provide titles of all projects for the graduating classes from the two most recent years.

The capstone design experience for Manufacturing Systems Engineering (MSE) seniors is a pivotal component of the curriculum, ensuring that students are thoroughly prepared for professional engineering practice. This comprehensive design project is based on the cumulative knowledge and skills acquired in earlier coursework and integrates appropriate engineering standards and multiple design constraints.

Course Description and Objectives:

The capstone design course, taken concurrently with MSE 4610 Project Management for Engineers and continuing into MSE 4620 Senior Project II, emphasizes the integration of analytical and experimental methods to solve manufacturing problems. It also focuses on effective communication of results through written and oral presentations. Students work in groups of three or more over two semesters on an assigned manufacturing engineering project. This experience simulates real-world manufacturing engineering practice, requiring collaboration, project management, and adherence to industry standards. The capstone project emphasizes the engineering design process, which involves identifying opportunities, developing requirements, performing analysis and synthesis, generating multiple solutions, evaluating solutions against requirements, and making trade-offs. This iterative, decision-making process is essential for converting resources into high-quality solutions.
Construction, Testing, and Optimization:

MSE 4615 Deliverables:

Deliverables in MSE 4615 involve the construction, testing, and optimization of the design. This includes:

Detailed engineering analysis and testing of prototypes.
Final parameter and tolerance design.
Economic analysis of the project.
The course culminates in a final design review based on formal student presentations of the documented final product, with verification that the final product meets all requirements.

MSE 4620 Deliverables:

In MSE 4620, students engage in the practical aspects of engineering design, including constructing prototypes, conducting detailed engineering analyses, and performing economic evaluations. This hands-on experience is crucial for understanding the real-world implications of design choices and for honing practical engineering skills.

Incorporation of Engineering Standards and Constraints:

Students are required to consider various engineering standards and constraints throughout their projects. These may include, but are not limited to:

Accessibility: Ensuring designs are usable by people with diverse abilities.
Aesthetics: Considering the visual appeal of the design.
Codes and Regulations: Complying with industry standards and legal requirements.
Cost: Managing the budget and cost-effectiveness of the solution.
Ergonomics: Designing for user comfort and efficiency.
Functionality: Ensuring the design meets the required specifications.
Sustainability: Incorporating environmentally friendly practices and materials.

8. If the program allows cooperative education to satisfy curricular requirements specifically addressed by either the general or program criteria, describe the academic component of this experience and how it is evaluated by the faculty.

The program does not allow cooperative education to satisfy curricular requirements.

9. Describe the materials that will be available for review during and/or prior to the visit to demonstrate achievement related to this criterion. (See APPM Section I.E.5.b.(2))

In accordance with I.E.5.b.(2) Materials – Evaluators may review materials that are sufficient to demonstrate that the program is in compliance with the applicable criteria and policies. Much of this information has been incorporated into the Self –Study Report (see I.D.1.f); additional evidence of program compliance will be made available to evaluators prior to and during the visit, using an on-line storage location (BOX). The program will make the following on-site materials available to the team during the visit, without duplicating materials provided in the Self-Study Report.

- Materials addressing issues arising from the team's review of the Self-Study Report or on-line instructional materials
- Documentation of actions taken by the program after submission of Self-Study Report as being available for review during the visit
- Materials necessary for the program to demonstrate compliance with the criteria and policies
- Representative examples of graded student work including, when applicable, major design or capstone projects

B. Course Syllabi

In Appendix A of the Self-Study Report, a syllabus is included for each course used to satisfy the mathematics, science, and discipline-specific requirements required by Criterion 5.

CRITERION 6. FACULTY

A. Faculty Qualifications

Table 6-1 provides a detailed description of the qualifications of the faculty within the Manufacturing Systems Engineering program at Weber State University, demonstrating how their expertise and experience are adequate to cover all curricular areas and meet program criteria. This table includes the composition, size, credentials, and experience of the faculty. Faculty resumes are included in Appendix B. Faculty appointments are governed by PPM 8-6 https://www.weber.edu/ppm/policies/8-6_facappt.html.

Faculty Qualifications
Composition and Size:

The faculty in the Manufacturing Systems Engineering program consists of a diverse group of professionals with extensive academic and industry experience. The team includes professors, associate professors, assistant professors, and instructors each bringing a unique blend of expertise to the program. The size of the faculty is sufficient to cover the wide range of courses offered, ensuring that each subject area is taught by a knowledgeable and experienced instructor.

Credentials and Experience:

Doctoral Degrees: Many faculty members hold Ph.D. degrees in fields such as Mechanical Engineering and Industrial Engineering, and related disciplines. This level of academic achievement ensures a deep understanding of theoretical concepts and advanced research methodologies.
Professional Experience: Faculty members have significant industry experience, having worked in various sectors of manufacturing, aerospace, automotive, and other engineering fields. This

practical experience is crucial for providing students with real-world perspectives and applications of their learning.

Professional Certifications: Several faculty members hold professional certifications such as Professional Engineer (PE), Certified Manufacturing Engineer (CMfgE), and Six Sigma Black Belt, which are indicative of their expertise and commitment to maintaining high professional standards.

Research and Publications: The faculty is actively engaged in research, contributing to advancements in engineering education and manufacturing systems. Their work is published in reputable journals and presented at national and international conferences.

Teaching Excellence: Faculty members have received awards and recognitions for excellence in teaching, demonstrating their ability to effectively convey complex concepts and engage students in the learning process.

Coverage of Curricular Areas:

The diverse expertise of the faculty ensures comprehensive coverage of the curriculum, including:

Core Engineering Principles: Courses such as Statics, Dynamics, and Materials Science, are covered by faculty with strong backgrounds in Mechanical and Materials Engineering.

Advanced Manufacturing Processes: Faculty with expertise in advanced manufacturing techniques and automation teach courses that delve into modern manufacturing systems and technologies.

Quality Control and Lean Manufacturing: Experienced professionals in industrial engineering and lean methodologies ensure that students learn best practices in quality control and process improvement.

Robotics and Automation: Courses in robotics and automation are taught by faculty with extensive experience in these fields, providing students with hands-on learning opportunities.

The combination of academic qualifications, industry experience, and professional certifications among the faculty members ensures that the program meets all applicable criteria for accreditation and maintains high educational standards. Faculty members' active engagement in research and professional development further enhances their ability to deliver a curriculum that is both current and relevant to the evolving needs of the manufacturing industry.

In summary, the qualifications of the faculty in the Manufacturing Systems Engineering program at Weber State University are well-suited to cover all curricular areas comprehensively, ensuring that students receive a high-quality education that prepares them for successful careers in engineering.

B. Faculty Workload

Table 6-2, Faculty Workload Summary describe this information in terms of workload expectations or requirements. This table is in accordance with several related policies governed by WSU. Weber State University (WSU) has several policies that apply to full-time faculty members, including those that cover teaching loads, evaluations, and responsibilities to students:

PPM 4-6: Faculty Workload
The normal teaching load for Weber State University faculty is 24 semester hours per academic year. As per PPM 4-6, https://www.weber.edu/ppm/Policies/4-6_FacWorkLoad.html; In addition to the normal 24-semester hours of teaching, faculty members are expected to assume other professional responsibilities such as advising students, maintaining office hours, performing public service, engaging in research and other scholarly activities and serving on committees. At the discretion of the departments and colleges, teaching time may be reassigned. Reassigned activities may include specific courses (e.g., student teaching supervision), specific program requirements (e.g., nursing, graduate programs, etc.), specific tasks in faculty governance (e.g., chairing a department or program, chairing major Faculty Senate committees, directing programs initiated by the President or Provost, etc.). The amount of time to be reassigned is to be made in accordance with existing policies of the university.

C. Faculty Size

The Manufacturing Systems Engineering (MSE) program at Weber State University is supported by a faculty team of sufficient size to ensure comprehensive coverage of all curricular areas. The faculty includes professors, associate professors, assistant professors, and instructors with a balanced distribution of teaching responsibilities, research activities, and administrative roles. This balance allows for effective teaching loads, ensuring that each faculty member can provide quality education while maintaining their involvement in other essential academic and professional activities.

Faculty-Student Ratio:

The program maintains a favorable faculty-student ratio, allowing for personalized attention and support for each student. This ratio ensures that students have ample opportunities for one-on-one interactions with faculty, fostering a conducive learning environment.

Extent and Quality of Faculty Involvement
1. Interactions with Students:

Classroom and Laboratory Engagement: Faculty members are actively involved in delivering lectures and supervising laboratory sessions. They employ interactive teaching methods to engage students and facilitate active learning.
Office Hours: Faculty members maintain regular office hours, providing students with opportunities for individual consultations, addressing their academic concerns, and offering additional help with coursework.

2. Student Advising and Counseling:

Academic Advising: Faculty members may serve as academic advisors in addition to dedicated academic advisors for the program. In this role, faculty members can guide students through their course selections, helping them understand degree requirements, and ensuring they stay on track for graduation.

Career Counseling: Faculty advisors also provide career counseling, helping students identify potential career paths, prepare for job searches, and connect with industry professionals. Many faculty members write letters of recommendation for students.

3. University Service Activities:

Committee Participation: Faculty members are actively involved in various university, college, and department committees, contributing to curriculum development, accreditation processes, and policy-making. Their participation ensures that the program aligns with institutional goals and standards.

Student Organizations: Faculty serve as advisors to student organizations related to manufacturing and engineering, such as the Society of Manufacturing Engineers (SME) chapter. They mentor students in organizing events, competitions, and professional development activities.

4. Interactions with Industrial and Professional Practitioners:

Industry Partnerships: Faculty members actively collaborate with industry partners on projects, internships, and co-op programs. These partnerships provide students with practical experiences and exposure to real-world engineering challenges.

Advisory Boards: Faculty serve on industry advisory boards, ensuring that the curriculum remains relevant to current industry needs and standards. These boards include representatives from companies that employ graduates, providing valuable feedback and insights.

Guest Lectures and Workshops: Faculty frequently invite industry professionals to deliver guest lectures and conduct workshops, enriching the educational experience with practical insights and emerging trends in manufacturing systems. For example, in the fall semester session for MSE 3700, Foss invited Senior Master Sergeant Carpenter to provide a guest lecture on his experience with military meals ready to eat (MREs). In this lecture students were able to better understand the customer requirements of service members as they worked on designing and prototyping a custom MRE for the class deliverable.

5. Employers of Students:

Employer Feedback: Faculty maintain strong relationships with employers of graduates, seeking feedback on the performance and preparedness of alumni. This feedback is used to continuously improve the curriculum and ensure that graduates meet the expectations of their employers.

D. Professional Development

Provide detailed descriptions of professional development activities for each faculty member.

Faculty are supported in their professional development efforts by the administration through the following.

- Sabbaticals
- Travel to attend professional conferences and workshops:
- On-campus workshops and seminars
- Professional development funding to pursue continuing education, professional society membership and certifications relevant to their field
- Access to research grants, laboratory facilities, and research assistants for research

Below is an example of the professional development activities for two faculty members. The first example from Dr. Foss provides an example of the service and scholarship activities spanning several years. The second example from Professor Harwood illustrates the annual goal setting activities of each faculty member and the related outcomes.

Dr. Mary Foss
Position: Associate Professor
Degree: Ph.D. in Mechanical Engineering
Field of Expertise: Manufacturing Systems

Professional Development Activities:

Research Projects:

Director, Concept Center. 2017- Present (College Service)

The Weber State University Concept Center leverages the technological expertise that grows at the university to make tangible industry improvements. The WSU Concept Center supplements the university's time-tested mission of teaching by expanding that mission to include the conversion of knowledge into solutions to real world problems. In doing so, creating a supply of graduates with practical experience in solving relevant problems utilizing modern technology and the fundamentals of science. These graduates will complete their academic careers with skills that are in demand and relevant in today's job market. Mary has taken on the role as Director of the Concept Center and in this position has worked to define the mission statement, update the website, organize, plan, and lead meetings with external customers and internal stakeholders, define job descriptions for interns, and develop contractual agreements with external customers. Mary uses her position as faculty to engage interested students and allow students to gain valuable experience as well promote the capabilities of what Weber grads are capable of achieving. The following are examples of some of the work that is done in the Concept Center:

1. Organizing and managing projects
2. Defining work and job duties for interns:
3. Planning, organizing and conducting regularly scheduled meetings

4. Developing strategies and long-term goals for operation
5. Developing test plans and working with customers
6. Developing mission and vision statements and structuring and organizing center:
7. Working with clients on research agreements

Publications: Regularly publishes research findings in peer-reviewed journals.

1. M. Foss, "An Examination of Learning Using Fourier Analysis of Mathematical Models of Consciousness", International Journal on Engineering, Science, and Technology Conference, Las Vegas, NV. 2023.

2. M. Foss, "Project-Based Learning in Non-Traditional Settings in Engineering Education", South Dakota State University. Open Prairie, Doctoral Dissertation. 2022. https://openprairie.sdstate.edu/cgi/viewcontent.cgi?article=1488&context=etd2

3. M. Foss, Y. Liu, S. Yarahmadian, "An Evaluation of Mathematical Models and Stability Analysis of Learning Based on Reaction Kinetics", International Journal on Engineering, Science, and Technology, Vol 4, No 4, 2022. https://ijonest.net/index.php/ijonest/article/view/121Links to an external site.

4. M. Foss, "An Evaluation of Mathematical Models and Stability Analysis of Learning Based on Reaction Kinetics", International Journal on Engineering, Science, and Technology Conference, Austin, TX. 2022.

5. M. Foss, Y-C Liu, S. Yarahmadian, "Project-Based Learning in a Virtual Setting: A Case Study on Materials and Manufacturing Process and Applied Statistics", International Journal of Engineering Education, Volume 38, No. 5(A), 1377-1388, 2022

6. M. Foss and Y.-C. Liu, "Promoting Sustainable Development Goals through Project-Based Learning: A Case Study of the Concept Center", Proceedings of the 1st International Academic Conference of the Sustainable Development Goals In partnership with the Civil Society Unit and the Academic Impact Initiative of the United Nations Department of Global Communications , Utah Valley University, Orem, UT, October 5-7, 2022. https://www.uvu.edu/global/docs/wim22/sdg9/sdg9-foss.pdf.

7. M. Foss, Y-C Liu, S. Yarahmadian, "An Evaluation of Learning Based upon Reaction Kinetics," International Conference on Engineering, Science and Technology, October 13-16, 2022, Austin, Texas.

8. Foss, M., & Liu, Y. (2022, August), Lessons Learned from 5 Years of Parent Daughter Engineering Outreach Paper presented at 2022 ASEE Annual Conference & Exposition, Minneapolis, MN. https://strategy.asee.org/40403

9. M. Foss and Y.-C. Liu, “Creating solutions through project-based and experimental learning: A case study of the Concept Center”, International Journal of Engineering Education, Vol. 37, No. 6, pp. 1-13, 2021. ijee4131 1..13.pdf

10. Foss and Y.-C. Liu, “Developing creativity through project-based learning”, Proceedings of Wasatch Aerospace and Systems Engineering Mini-Conference, virtual conference, April 15-16, 2021. 2nd Place in Championing Change Category Developing Creativity Through Project-Based Learning AIAA_INCOSE FORMAT.docx.pdf

11. Foss and Y.-C. Liu, “Project-based learning center to bridge to students with technology”, Proceedings of 2020 Intermountain Engineering Technology and Computing (IETC), Orem, UT, USA, September 2020. https://ieeexplore.ieee.org/abstract/document/9249156Links to an external site. #1570632846 Project-Based Learning Center to Bridge to Students with Technology.pdf

12. Foss, M. What if Dr. Deming Ran Your Validation Program, INCOSE Western State Regional Conference, September 22, 2018 The History of Quality and the Evolution of the Modern Day Leader AD revision.docx

13. Foss, M. Contributor to Integrated Computational Materials Engineering Website https://icme.hpc.msstate.edu/mediawiki/index.php.1.html,Links to an external site. April, 2019

14. Foss, M., & Deceuster, A. (2017). A History of Quality and The Evolution of the Modern Day Leader. Pharmaceutical Engineering, Volume 37 (1). Pp. 48. A History of Quality and the Evolution of the Modern Day Leader.pdf

15. Foss, M., & Peterson, S. (2017). Tips for Transitioning to Industry. Pharmaceutical Engineering, Volume 37 (4). Pp. 28 https://ispe.org/pharmaceutical-engineering/july-august-2017/tips-graduates-transitioning-pharma-industryLinks to an external site.

Conferences: Presents at national and international conferences, ICONEST, INCOSE, iETC and ASEE. See conference publications in section above.

Certifications: ISO 13485 Lead Auditor, US DOE Qualified Steam Specialist, SME Certified Green Specialist, Environ. Compliance, Advanced Mgmt. of Compressed Air

Kelly Harward
Position: Professor
Degree: M.S. Manufacturing Engineering Technology, Emphasis: Computer-Integrated Manufacturing
Field of Expertise: Manufacturing Systems Design

Teaching:
Developed new top-down design assignments in MfET 2870 Plastics & Composites Product Design Course. Developed statics and mechanics of materials simulations to help students better visualize reaction of various force systems under load. Improved class participation activities using in-class quizzes, discussions, and demonstrations to promote faster comprehension and

retention of important concepts. Co-teaching MSE 4600 S2024 and preparing to teach independently in the future. Developed topics for each course in a clear, systematic, and logical sequence. Practice teaching techniques that focus attention on the subject matter. Receive excellent ratings in all my courses.

Scholarship:
Finished the design and analysis of tooling for United Team Mechanical, a local manufacturing firm. Developed mechanical assemblies in a computer-aided design program using finite element methods for static, buckling, fatigue, and drop test analysis for comparative analysis and validation with manual stress analysis methods. Designed and analyzed a water storage system for WoodCo, LLC.

Service:
Served or continue to serve on the following University, College, or Departmental Committees:
College Tenure and Promotion Committee 2022-23; 2023-24;
Chair of the Hiring Committee for the Manufacturing & Systems Engineering Department 2023.
Department Program Advisory Committee.
Served as MfET Plastics & Composites Emphasis Coordinator last year and now as Production Operations & Controls Emphasis Coordinator
Student Advisor in MfET.
Helped develop recruitment and outreach strategies to ATCs and community colleges.

E. Authority and Responsibility of Faculty

Describe the role played by faculty members with respect to course creation, modification, and evaluation, their role in the definition and revision of program educational objectives and student outcomes, and their role in the attainment of the student outcomes. Describe the roles of others on campus, e.g., dean or provost, with respect to these areas.

PPM 8-11: Evaluation of Faculty Members
Tenured and tenure-track faculty members are evaluated every five years, or more often if the department chair or dean chooses. The evaluation process includes multiple discipline- and role-specific criteria, as well as assessments of scholarly and creative performance, research productivity, and service to the community, school, and profession. An impartial third party also administers and compiles student evaluations.

PPM 9-5: Faculty Responsibilities to Students
Faculty members are responsible for answering relevant questions from students and discussing controversial topics objectively and freely. When advocating a position on controversial matters, faculty members should ensure that students have opportunities to consider other views. They should not reward agreement or penalize disagreement with their views, but they can expect students to learn the rationale behind certain positions.

Table 6-1. Faculty Qualifications

Name of Program

Faculty Name	Highest Degree Earned- Field and Year	Rank[1]	Type of Academic Appointment[2] T, TT, NTT	FT or PT[3]	Years of Experience			Professional Registration/ Certification	Level of Activity[4] H, M, or L		
					Govt./ Ind. Practice	Teaching	This Institution		Professional Organizations	Professional Development	Consulting/summer work in industry
Foss, Mary (MSE 3360/3700)	2022-Ph.D. Mechanical Engineering	ASC	T	FT	8	8	8	ISO 13485 Lead Auditor US DOE Qualified Steam Specialist SME Certified Green Specialist Environ. Compliance Advanced Mgmt. of Compressed Air	M	M	M
Hunter, Samuel (MSE 1210/3040/3710)	2010 - B.S MFET WSU	I	NTT	FT	15	6	6		L	H	H
Knighton, Justin (MSE 1210/4615/4620/4700)	2023 - M.S. Systems Engineering, Weber State University	AST	TT	FT	15	8	8		L	H	M
Wetzel, David (MSE 3850/3910/4010/4590/4610)	12-08-1995: Ph.D. in Industrial and Systems Engineering from The Ohio State University with minors in Management and Human Resources and Industrial and Organizational Psychology.	ASC	TT	FT	24	19	5	Certified Six Sigma Master Black Belt PMI Project Mgmt.			

								Professional			
Supporting Faculty											
Comber, George (MSE 4700, MFET 3550)	1991 - M.S. in Computer-Integrated Manufacturing, BYU	P	T	FT	15	32	23	CPE, CMfgT	L	M	M
Falkenberg, Nicole (MSE 3040/3700/4010/4600/4615/4620/4700)	2003 – Univ. of Michigan, Ann Arbor MSE Master of Engineering Operations Research	I	NTT	FT	16	4	4	Certified Six Sigma Black Belt PGCert in Leadership and Management from Cornell University	L	NA	NA
Harward, Kelly (MSE 4600)	1991 - M.S. Manufacturing Engineering Technology, Emphasis: Computer-Integrated Manufacturing, Brigham Young University	P	T	FT	20	36	35		M	H	H
Usui, Megumi (PDD 1010/1160)	2005 - M.S. Computer Graphics Technology, Purdue University	ASC	TT	FT	5	15	15		M	M	L

Instructions: Complete table for each member of the faculty in the program. Add additional rows or use additional sheets if necessary. Updated information is to be provided at the time of the visit.

1. Code: P = Professor ASC = Associate Professor AST = Assistant Professor I = Instructor A = Adjunct O = Other
2. Code: T = Tenured TT = Tenure Track NTT = Non-Tenure Track
3. FT = Full-Time Faculty or PT = Part-Time Faculty
4. The level of activity (high, medium or low) should reflect an average over the three years prior to the visit.

Other supporting faculty are listed below. Their associated CVs are included in Appendix B.

Hearn, Christian (ECE 2210),
Ho, An (ENGR 1000/2300)
Hurd, Randy (ENGR 2160)
Kent, Randall (ENGR 1000/2010/2160)
Mortensen, Kenneth (MSE 1210)
Nunna, Bharrath Babbu (ENGR 2010/2030/ 2140/2300)
Stenquist, Michael (PDD 1010)
Storey, James (ENGR 2030)

Table 6-2. Faculty Workload Summary

Name of Program

Faculty Member (name)	PT or FT[1]	Classes Taught (Course No./Credit Hrs.) Term and Year[2]	Program Activity Distribution[3]			% of Time Devoted to the Program[5]
			Teaching	Research or Scholarship	Other[4]	
Foss, Mary	FT	Fall Semester 2023 MFET 2150/2151/2152/2153/L-4CR MSE 3360 - 3 CR MFET 2360-3 CR MSE 3700-3CR MSE Program Coordinator-3CR	80%	5%	15% MSE Program Coor.	75%
Foss, Mary	FT	Spring Semester 2024-Sabbatical	N/A	N/A	N/A	N/A
Hunter Samuel	FT	Fall Semester 2023 MFET 2500/2510-5 CR (2-2CR Labs) MFET 4610L-2 CR MFET 4620L-2 CR MSE 1210-3 CR SWI Release-5 CR	75%	0%	25% SWI	15%
Hunter Samuel	FT	Spring Semester 2024 MFET 2500/2510-3 CR (1-2CR Lab) MSE 3040-3 CR MSE 3040-Course Creation 1CR MSE 3710/MFET 3710-4 CR (2-1CR Labs) MFET 4610-3 CR MFET 4620L-2 CR SWI Release-5 CR	75%	0%	25% SWI	33%
Knighton, Justin	FT	Fall Semester 2023 MFET 1000-3 CR MFET 4580/4585-3 CR	80%	0%	20% SWI	25%

		MFET 4620L-2 CR MSE 1210-3 CR MSE 4615-2 CR MSE 4700-3 CR Sr. Project Support-1 CR SWI Release 4 CR ME Sr. Project Support-1 CR				
Knighton, Justin	FT	Spring Semester 2024 MFET 1000-3 CR MFET 4580/4585-5 CR (2-2CR labs) MSE 4620-3 CR MSE 4700-3 CR Sr. Project Support-3 CR SWI Release 3 CR ABET Prep-2 CR ME Sr. Project Support-1 CR	78%	0%	22% SWI and ABET	35%
Wetzel, David	FT	Fall Semester 2023 MFET 2410-3 CR MSE 3850-3 CR MSE 4010-3 CR MSE 4590-3 CR	100%	0%	0%	75%
Wetzel, David	FT	Spring Semester 2024 MFET 2410-3 CR MSE 3850-3 CR MSE 3910-3 CR MSE 4590-3 CR	100%	0%	0%	75%

1. FT = Full-Time Faculty or PT = Part-Time Faculty, at the institution
2. For the academic year for which the Self-Study Report is being prepared.
3. Program activity distribution should be in percent of effort in the program and should total 100%.
4. Indicate sabbatical leave, etc., under "Other."

5. Out of the total time employed at the institution.

The faculty shown below also taught MSE courses or support courses for the MSE program in the 2023/24 academic year (or the last two semesters that the courses were offered). The courses they taught, the semester in which they were taught, and the programs each of them is affiliated with are also shown.

George Comber, M&SE
Spring Semester 2024-MSE 4700 (3)

Nicole Falkenberg, M&SE
Spring Semester 2021-MSE 4615 (2)
Fall Semester 2021-MSE 3700 (3)
Fall Semester 2021-MSE 4600 (3)
Fall Semester 2021-MSE 4620 (3)
Fall Semester 2022-MSE 4010 (3)
Spring Semester 2023-MSE 3040 (3)
Spring Semester 2023-MSE 4700 (3)

Kelly Harward, M&SE
Spring Semester 2024, MSE 4600 (3)

Christian Hearn, ECE
Fall Semester 2023-ECE 2210 (4)

Randy Hurd, ME
Spring Semester 2023-ENGR 2160 (4)

An Ho, ME
Fall Semester 2023-ENGR 1000 (2)
Fall Semester 2023-ENGR 2300 (3)
Spring Semester 2024-ENGR 1000 (2)
Spring Semester 2024-ENGR 2300 (3)

Randall Kent, ME
Fall Semester 2023-ENGR 1000 (2)
Fall Semester 2023-ENGR 2010 (3)
Spring Semester 2024-ENGR 2160 (3)

Kenneth Mortensen, M&SE
Fall Semester 2023-MSE 1210 (3)
Spring Semester 2024-MSE 1210 (3)

Bharath Nunna, ME
Fall Semester 2023-ENGR 2140 (3)
Fall Semester 2023-ENGR 2300 (3)
Spring Semester 2024-ENGR 2010 (3)
Spring Semester 2024-ENGR 2030 (4)
Spring Semester 2024-ENGR 2140 (3)

Michael Stenquist, M&SE (PDD Adjunct)
Fall Semester 2023-PDD 1010 (3)
Spring Semester 2024-PDD 1010 (3)

James Storey, ME
Fall Semester 2023-ENGR 2030 (4)
Spring Semester 2024-ENGR 2030 (4)
Spring Semester 2024-ENGR 2165 (1)

Megumi Usui, M&SE
Fall Semester 2023-PDD 1010 (3)
Spring Semester 2024-PDD 1010 (3)

CRITERION 7. FACILITIES[1]

A. Offices, Classrooms and Laboratories

The following is a summary of each of the program's facilities in terms of their ability to support the attainment of the student outcomes and to provide an atmosphere conducive to learning.

1. Offices (such as administrative, faculty, clerical, and teaching assistants) and any associated equipment that is typically available there.

Each faculty member has an individual office where they can have private conversations as needed. All the offices are located in a central office area with easy access to office supplies and a copy machine along with a departmental conference room and the administrative assistant. Each office is equipped with a networked computer loaded with the software used by the program.

2. Classrooms and associated equipment that are typically available where the program courses are taught.

There are eight main classrooms within the Engineering Technology building that the MSE program has access to classrooms within the Noorda building. The capacity of these rooms ranges from 20 seats to 44 seats. Each classroom is equipped with conference tables and chairs. Each classroom is also equipped with an instructor station with a networked computer, internet access, access to the Canvas Learning Management System, sound system, DVD player, and ceiling mounted projection unit. Several classes are equipped with virtual conference systems to enable online classes. Software on these computers includes standard Microsoft Office software as well as all software loaded on workstations in computer labs (Solidworks, Ansys, Autodesk, Minitab, MS Project, etc.). All classroom workstations are updated approximately every four years.

The Engineering Technology Building currently housing the MSE program will be undergoing some refurbishment from 2022 through 2023. An adjacent new building, the Noorda Engineering Building, was completed in fall 2022. Two computer labs are assigned to PDD courses, a support program to MSE that focuses on CAD. Some of the other approximately 43 new classrooms/labs should be available for scheduling in addition to temporary portable classrooms while the Engineering Technology building is being renovated in sections. Some faculty were relocated to the Noorda building.

3. Laboratory facilities including those containing computers (describe available hardware and software) and the associated tools and equipment that support instruction. Include those facilities used by students in the program even if they are not dedicated to the program and state the times they are available to students. Complete Appendix C containing a listing of the major pieces of equipment used by the program in support of instruction.

[1]Include information concerning facilities at all sites where program courses are delivered.

3.1 Laboratories Containing Computers

Laboratories are maintained at the department level and shared by the different programs within the department. These laboratories are well equipped and kept in good condition. There are four computer labs for primarily CAD/CAM work, each with 19-40 workstations. Each workstation has two displays and is networked to the WSU LMS and the internet. One of these labs is a 21-station computer lab set aside for use with specialized CAD systems (CATIA, Creo). The Noorda building has conjoined electrical and computing engineering and mechanical engineering classrooms and labs. This includes senior project workspace, Anechoic chamber, SEM, materials testing labs including Keyence and Instron machines, four equipped electronics lab/classrooms, power lab, cybersecurity and networking sandbox, User Interface - User Experience lab, Computer Science Teaching Labs, Sales simulation labs, Undergrad mechanical engineering experimentation lab, ME computer lab, ME Controls Lab, and a Linux lab.

Normally CAD & modeling lab computers are replaced every four to five years, depending on required software performance. Other computers in manufacturing labs such as CNC and automation generally receive the older CAD lab computers when they are replaced. All of the computer labs have access to the internet and have Microsoft Office Suite, AutoDesk software (Revit, Inventor, AutoCAD), and Solidworks. In addition, students also have access to Microsoft Project and MINITAB and other course specific software. General computer labs are available to students from 7 a.m. to 10 p.m. Monday through Saturday. Lab aides are available during peak times throughout the week.

3.2 Laboratory facilities: non-computer

Laboratories are maintained at the department level and shared by the different programs within the department. Laboratories are well equipped with current technology and software and kept in good condition. The following labs are available for use by the MSE program.

- The CNC computer lab contains 15 computer workstations for programming, three Haas mills, and several Haas simulators.

- The automation lab has 17 computer workstations connected to 11 LabVIEW workstations and six PLC trainers. Approximately $700k has been spent on automation lab equipment since 2017 for six (7) axis Fanuc robots (200iD/4S), an eight station Amatrol mechatronics line, RF learning system, barcode learning system and eight portable AB PLC trainers.

- Two electronics labs with a combined total of 12 computer workstations are available.

- The machining lab contains five HAAS TL-1 CNC/manual lathes, 10 Bridgeport mills, 10 older manual Nardini lathes, several Haas programming simulators, one Flow industries waterjet, four 3D printers (one large Dimension FDM printer, one SLM machine and several inexpensive smaller FDM printers), as well as general inspection and metrology equipment. Currently the lab also contains a recently purchased (2019)

Instron testing machine which will be moving to the new Noorda Engineering building in 2023.

- The Welding lab is sponsored by Miller Electric who supplies approximately $470k of welding equipment for student use. WSU owns one of two Panasonic welding robots, one large industrial HD plasma cutter, a sub-arc welding machine and built all the welding booths. Miller supplies one robot (exchanged every three years) and approximately 20 current MIG and TIG welders for students to use. A grinding room is adjacent to the lab and contains typical grinding equipment associated with welding.

- The casting lab has one induction furnace, an older gas furnace and a sand blaster.

- The hydraulics lab contains eight typical hydraulic test benches.

- The metallurgy lab contains equipment that enables students to make and inspect samples as well as a laser micro welder and an Object 3D printer. The metallurgy lab will be moving to the new Noorda Engineering building in fall 2022.

- The Plastics lab contains small injection molding machines and one large industrial injection molding machine, one rotational molder, a vacuum forming machine, two precision ovens and miscellaneous equipment related to plastics and composites such as vacuum pumps, freezers, downdraft tables, etc. The current lab is undergoing renovation; lab facilities have been temporarily moved to the new Noorda Engineering building.

- The Composites Lab, under renovation, contains an integrated vacuum system, several standalone vacuum pumps, two chest freezers for prepreg materials, a “dirty” wet layup room with spray booths, a controlled environment dry layup room for bagged assemblies, two 24” x 24” x 24” PID controlled ovens equipped with vacuum lines, hand tools, layout tables, a downdraft table for composite trimming, tables for kitting, trimming & general finishing as well as appropriate PPE for faculty and students. A wide array of traditional and high-performance composite materials is available to work with, including carbon fiber. Students can work with various fiberglass traditional (GRP/PU) wet layups as well as more advanced aerospace epoxy wet resin, resin infusion of and prepreg layups with bagged assemblies on aluminum tooling. A high-speed router is available to trim parts in a B2 model resin infusion molding lab.

The Noorda Building houses a conjoined electrical and computing engineering and mechanical engineering (ME) senior project workspace. Additionally there is lab space dedicated to an Anechoic chamber, Scanning Electron Microscope, and materials testing labs containing Keyence and Instron machines. There are four equipped electronics lab/classrooms, power lab, cybersecurity and networking sandbox, User Interface - User Experience lab, Computer Science Teaching Labs, Sales simulation labs, Undergrad ME experimentation lab, ME computer lab, ME Controls Lab, and a Linux lab.

The MSE Department endeavors to use lab equipment and software that is characteristic of that encountered in an industrial and professional setting. This contributes positively to the program’s ability to attract, retain and assist students in attaining student outcomes. A list of major instructional and laboratory equipment is contained in Appendix C.

B. Computing Resources

Describe any computing resources (workstations, servers, storage, networks including software), in addition to those described in the laboratories in Part A, which are used by the students in the program. Include a discussion of the accessibility of university-wide computing resources available to all students via various locations such as student housing, library, student union, off-campus, etc. State the hours the various computing facilities are open to students. Assess the adequacy of these facilities to support the scholarly and professional activities of the students and faculty in the program.

Students and faculty have access to the Internet through department computers, Ethernet access points, and secured and unsecured Wi-Fi throughout the office, lecture, and laboratory spaces. Many courses also augment lecture material with online resources provided via the university’s server and/or Canvas (online web enhancement tool). Standard Microsoft software packages are also available at all computer terminals. Computing resources also include design, analysis, and development packages such as the current edition of AutoCAD, Revit, 3ds Max Design, Autodesk Inventor, Navisworks Manage, Autodesk 360, PTC Creo Parametric, PTC Creo Modelcheck, PTC Creo Simulate, PTC Creo Direct, PTC Mathcad Prime, Adobe Suite, SolidWorks, eDrawings, SolidWorks Composer Player, SolidWorks Explorer, Workbench, Mechanical APDL, TK Solver, Minitab, QuickTime Player, and Media Player classic.

University-wide computing resources are available to all students at various locations such as student housing, library, student union, and off-campus. The hours the various computing facilities are open to students vary by location. These facilities are adequate to support the scholarly and professional activities of the students and faculty in the program. An on-line resource contains the locations and operating hours of the computing facilities at Weber State University and can be accessed here: https://www.weber.edu/computerlabs. Resources within the department, college, and the University are sufficient to support the scholarly activities of the students and faculty in the program.

C. Guidance

Describe how students in the program are provided appropriate guidance regarding the use of the tools, equipment, computing resources, and laboratories.

The Manufacturing Systems Engineering (MSE) program at Weber State University, students are provided with comprehensive guidance and support to ensure they can effectively use tools, equipment, computing resources, and laboratories. This support is designed to enhance their learning experience, ensure safety, and maximize the educational value of the resources available.

1. Orientation and Training Sessions
Initial Orientation: At the beginning of lab-based courses, students undergo an orientation session that introduces them to the various tools, equipment, computing resources, and laboratory facilities available to them. This session covers the location, purpose, and general rules of each resource.

Safety Training: Specific safety training sessions are mandatory for students before they are allowed to use any laboratory equipment or tools. These sessions cover proper usage, safety protocols, emergency procedures, and the importance of personal protective equipment (PPE).

2. Course-Integrated Instruction
Laboratory Courses: Many core and elective courses within the MSE program include laboratory components. During these courses, instructors provide detailed instructions and demonstrations on the correct and safe use of tools and equipment. Examples include courses like MSE 1210 (Metal Processing & Joining for Engineers) or MSE 3710 (CAM & Additive Manufacturing/ Lab).
Hands-On Projects: In courses with hands-on projects, such MSE 4615/MSE 4620 Senior Project I/II, students receive specific guidance related to their project needs. Instructors and lab technicians offer tailored support to help students understand and utilize the appropriate tools and equipment for their projects.

3. Laboratory Manuals and Guides
Documentation: Each laboratory has comprehensive manuals and guides that detail the operation procedures for all equipment and tools. These documents include step-by-step instructions, safety guidelines, troubleshooting tips, and maintenance schedules.
Online Resources: The program also provides online access to manuals, instructional videos, and troubleshooting guides via the university's learning management system (Canvas). This ensures that students have easy access to information whenever needed.

4. Faculty and Staff Support
Lab Technicians: Experienced lab technicians are available during lab hours to assist students with the setup, operation, and troubleshooting of equipment. They provide on-the-spot guidance and ensure that all safety protocols are followed.
Faculty Office Hours: Faculty members hold regular office hours where students can seek additional help and clarification on the use of tools and resources. Faculty advisors also guide students on how to select and use appropriate resources for their specific research and projects.
5. Computing Resources
Software Training: Students receive training on essential software tools used in manufacturing systems engineering, such as CAD software (SolidWorks), simulation tools, and other specialized software.

Access to Computing Facilities: The university provides well-equipped computer labs with all necessary software pre-installed. Additionally, remote access to computing resources is available, allowing students to work on assignments and projects from off-campus locations.

IT Support: A dedicated IT support team is available to assist students with any technical issues related to computing resources, software installations, and access to online platforms.

6. Continuous Improvement and Feedback
Student Feedback: The program actively seeks feedback from students regarding their experiences with the tools, equipment, and laboratories. This feedback is used to make continuous improvements to the resources and the guidance provided.
Regular Updates: As new tools and technologies are introduced, the program ensures that students receive updated training and resources to stay current with industry standards and advancements.

By providing thorough orientation, integrated course instruction, comprehensive documentation, robust faculty and staff support, extensive training on computing resources, and continuously seeking student feedback, the Manufacturing Systems Engineering program at Weber State University ensures that students are well-prepared and confident in using the tools, equipment, and laboratories essential for their education and future careers. This holistic approach not only enhances their technical skills but also ensures a safe and effective learning environment.

D. Maintenance and Upgrading of Facilities

The department has one FTE technician to take care of much of the equipment and facilities. The college also has a full-time computer technician with several student aides to help maintain all of the computers in the department. In addition, the program uses student aides to help maintain the MSE specific equipment and labs. The faculty determines what upgrades are required and may request any necessary equipment annually through the budgeting process.

E. Library Services

Describe and evaluate the capability of the library (or libraries) to serve the program including the adequacy of the library's technical collection relative to the needs of the program and the faculty, the adequacy of the process by which faculty may request the library to order books or subscriptions, the library's systems for locating and obtaining electronic information, and any other library services relevant to the needs of the program.

The library, through its collections of publications and online access, has more than ample resources to support the program's teaching and learning objectives. The college has an annual library budget of $8,200 for the purchase of library materials and services that the program can access. This fund has been invaluable in helping the department provide needed resources for faculty and students. The library has designated a specific librarian for the college who coordinates the expenditures and manages the library's related technical materials.

1. Technical Collection Adequacy
Technical Collection:

Books and Journals: The library boasts a robust collection of books, journals, and reference materials specific to manufacturing systems engineering, industrial engineering, mechanical

engineering, materials science, and related disciplines. This collection is regularly updated to include the latest editions and research publications.
Electronic Resources: The library provides access to a vast array of electronic resources, including databases such as IEEE Xplore, ScienceDirect, SpringerLink, and ASME Digital Collection. These databases offer extensive archives of technical papers, conference proceedings, and journals essential for both students and faculty research.
Specialized Collections: The library includes specialized collections in areas like automation, robotics, lean manufacturing, quality control, and sustainability, ensuring comprehensive coverage of the field.

The technical collection is comprehensive and current, covering all major areas pertinent to the MSE program. Faculty and students have access to a wide range of materials necessary for their coursework, research, and professional development. The collection aligns well with the curriculum, supporting both foundational and advanced topics. Faculty feedback indicates satisfaction with the availability and quality of resources.

2. Faculty Request Process for Books and Subscriptions
Request Process:

Submission of Requests: Faculty members can request the library to order new books or subscriptions through an easy and streamlined process. Requests can be submitted online via the library's acquisition portal or directly through liaison librarians assigned to the College of Engineering, Applied Science & Technology (EAST).
Review and Approval: The requests are reviewed by the library’s acquisition team, which evaluates them based on relevance to the curriculum, anticipated usage, and budget availability. Faculty can track the status of their requests and receive notifications upon approval and acquisition.
Faculty-Library Collaboration: Regular meetings between faculty representatives and library

The process is efficient and user-friendly, enabling faculty to easily request and receive necessary materials. Turnaround times for acquisitions are reasonable, ensuring timely availability of resources. Faculty reports indicate high levels of satisfaction with the request process, noting that their suggestions are often incorporated into the library’s collection development plans.

3. Systems for Locating and Obtaining Electronic Information
Electronic Systems:

Online Catalog: The library’s online catalog allows users to search for physical and electronic materials with ease. Advanced search features help narrow down results to specific subjects, authors, or publication dates.
Database Access: Students and faculty have access to numerous academic databases through the library’s website. Single sign-on access simplifies the process of logging into multiple databases.
Interlibrary Loan: The interlibrary loan service enables users to borrow books, articles, and other materials from partner institutions if not available in the library’s collection. This service extends the range of accessible materials significantly.

Digital Repositories: The library's digital repositories include institutional research, theses, dissertations, and faculty publications, providing a valuable resource for academic work.

The systems are highly accessible, with user-friendly interfaces and comprehensive help resources. The availability of remote access ensures that students and faculty can obtain information from anywhere. Electronic information retrieval is efficient, with quick search and retrieval processes. The interlibrary loan system effectively bridges any gaps in the library's own collection, ensuring comprehensive access to needed materials.

4. Additional Library Services
Research Support:

Librarian Assistance: Subject-specialist librarians offer personalized assistance with research projects, including guidance on literature reviews, citation management, and data analysis. They conduct workshops and one-on-one sessions tailored to student and faculty needs.
Information Literacy Programs: The library runs information literacy programs designed to enhance students' research skills. These programs cover topics such as database searching, evaluating sources, and avoiding plagiarism.

Study and Collaboration Spaces:

Facilities: The library provides a variety of study environments, including quiet study areas, group study rooms, and collaborative workspaces equipped with necessary technology and resources for group projects and presentations.
Reservations: Spaces can be reserved online, ensuring availability for group work and study sessions.

Technology and Equipment:

Computers and Software: The library is equipped with computers loaded with essential software for engineering studies, including CAD programs, statistical analysis tools, and project management software.
Loanable Equipment: Students can borrow equipment such as laptops, tablets, and multimedia devices, supporting their coursework and project needs.

The additional services provided by the library effectively support the diverse needs of the MSE program's students and faculty. The availability of specialized librarian assistance, robust study environments, and essential technology enhances the overall academic experience. Feedback from students and faculty is overwhelmingly positive, indicating that the library's resources and services significantly contribute to their academic and research success.

CRITERION 8. INSTITUTIONAL SUPPORT

A. Leadership

Describe the leadership of the program and discuss its adequacy to ensure the quality and continuity of the program and how the leadership is involved in decisions that affect the program.

The leadership of the Manufacturing Systems Engineering (MSE) program at Weber State University is structured to ensure the highest standards of quality and continuity. The leadership team includes the Program Coordinator, Department Chair, and faculty committees, each playing a crucial role in maintaining the integrity and effectiveness of the program.

Program Leadership Structure
1. Program Coordinator:

Role and Responsibilities: The Program Coordinator is primarily responsible for overseeing the day-to-day operations of the MSE program. This includes curriculum development, accreditation compliance, faculty coordination, student advising, and managing program resources.
Involvement in Decision-Making: The Program Coordinator works closely with faculty to ensure that the curriculum remains current and relevant to industry needs. They also liaise with university administration and external stakeholders to align the program with broader institutional goals and industry standards.
Qualifications: Typically, the Program Coordinator is a senior faculty member with extensive experience in manufacturing systems engineering, strong academic credentials, and a deep understanding of both educational and industry requirements.
2. Department Chair:

Role and Responsibilities: The Department Chair oversees all programs within the department, including the MSE program. They are responsible for strategic planning, budget management, faculty recruitment and development, and ensuring compliance with university policies and accreditation standards.
Involvement in Decision-Making: The Department Chair collaborates with Program Coordinators and faculty to develop long-term strategies, allocate resources effectively, and implement initiatives that enhance the department's educational offerings and research capabilities.
Qualifications: The Department Chair is an experienced academic leader with a proven track record in education administration, research, and professional practice in engineering or a related field.
3. Faculty Committees:

Role and Responsibilities: Various faculty committees support the leadership in areas such as curriculum development, assessment, student recruitment and retention, and research initiatives.

These committees ensure that diverse perspectives and expertise are incorporated into decision-making processes.
Involvement in Decision-Making: Committees provide recommendations and feedback on program improvements, new course offerings, and policy changes. They play a key role in maintaining the academic rigor and relevance of the program.
Composition: Faculty committees are typically composed of faculty members with specialized knowledge and experience in different areas of manufacturing systems engineering.
Adequacy of Leadership to Ensure Quality and Continuity

Quality Assurance:

Curriculum Oversight: The Program Coordinator and faculty committees regularly review and update the curriculum to reflect the latest advancements in the field and feedback from industry partners. This ongoing review process ensures that the program meets the highest academic and professional standards.
Accreditation Compliance: Leadership ensures that the program adheres to accreditation requirements, conducting regular self-assessments and preparing detailed reports for accreditation bodies. This compliance is crucial for maintaining the program's credibility and recognition.
Faculty Development: Leadership prioritizes faculty development by providing opportunities for professional growth, encouraging research and publication, and supporting attendance at conferences and workshops. This investment in faculty expertise directly translates to high-quality instruction and mentorship for students.

Continuity:

Strategic Planning: The Department Chair and Program Coordinator engage in strategic planning to address future challenges and opportunities, such as changes in industry demand, technological advancements, and student needs. This proactive approach helps ensure the program's sustainability and relevance.
Resource Allocation: Effective resource management by the Department Chair ensures that the program has the necessary funding, facilities, and equipment to deliver a comprehensive educational experience. This includes investments in laboratory upgrades, new software tools, and additional staffing as needed.
Student Support: Leadership fosters a supportive learning environment by implementing robust advising and counseling services, ensuring that students receive the guidance they need to succeed academically and professionally. This support includes academic advising, career counseling, and access to tutoring resources.

Leadership Involvement in Program Decisions
Collaborative Decision-Making:

Regular Meetings: The Program Coordinator, Department Chair, and faculty committees hold regular meetings to discuss program-related matters. These meetings facilitate open communication and collaborative decision-making, ensuring that all voices are heard and considered.

Industry Advisory Board: Leadership engages with an Industry Advisory Board composed of professionals from the manufacturing sector. This board provides valuable insights and feedback on curriculum relevance, industry trends, and job market needs, influencing program decisions.

Student Feedback: Leadership actively seeks and incorporates student feedback through surveys, focus groups, and direct communication. This feedback helps identify areas for improvement and ensures that the program meets student expectations and needs.

The leadership of the Manufacturing Systems Engineering program at Weber State University is well-structured and effective in ensuring the quality and continuity of the program. The Program Coordinator, Department Chair, and faculty committees work collaboratively to make informed decisions that enhance the educational experience, maintain accreditation standards, and align the program with industry needs. Their proactive and strategic approach, combined with a strong commitment to faculty and student support, ensures that the program remains dynamic, relevant, and capable of producing highly skilled graduates ready to excel in the manufacturing industry.

B. Program Budget and Financial Support

1. Describe the process used to establish the program's budget and provide evidence of continuity of institutional support for the program. Include the sources of financial support including both permanent (recurring) and temporary (one-time) funds.

The program budget consists of two main components---salaries and benefits of faculty and staff and operations. Salaries are determined at the time of hire and are allocated by the institution to the various academic divisions. Depending upon state and institutional economic conditions, salaries increase over time with across-the-board cost of living increases, promotions, special bonuses allocated by the administration, performance-based pay raises and equity adjustments. Benefits include retirement, medical and dental insurance, life insurance, unemployment insurance, workers compensation insurance and long-term disability.

Operations include the maintenance and upgrading of equipment and supplies, faculty development, disbursement of financial aid and routine office functions and materials. Maintenance and upgrading of equipment and supplies is funded by course fees as well as grants and special allocations. Faculty development is funded by the department, college or outside entities. The department typically funds registration fees for conferences, seminars and professional courses, whereas the college funds travel expenses for these activities. Faculty may pursue external funding for research or projects through the WSU Office of Sponsored Projects. Internal funding is available for faculty development through the Research, Scholarship and Professional Growth (RS&PG) and Hemingway committees. Routine office functions and materials such as telephones, copy machines, printers, office supplies, advising literature, etc. are covered by the operating budget of the department.

2. Describe how teaching is supported by the institution in terms of graders, teaching assistants, teaching workshops, etc.

Weber State University is primarily an undergraduate institution and, as such, has limited access to students who can serve as graders and TAs in the Manufacturing Systems Engineering Program. Some graduate programs have been recently added to the college, but the graduate students have not widely been used for grading because many are typically employed full-time and have no time available to grade or act as TAs. Consequently, grading and teaching are done by the program faculty.

Faculty are encouraged to participate in the Teaching & Learning Forum, an organization founded by a group of WSU faculty in 1992. The Forum offers retreats, book groups, workshops, collaborative projects, and other initiatives in support of faculty teaching and development. Activities are directed by the Teaching, Learning, and Assessment (TLA) Committee, a standing committee of the WSU Faculty Senate. The Teaching and Learning Forum office is staffed year-round and has a library of books and other materials on teaching and learning. The Forum consists of several learning groups, two of which are particularly applicable to the program: "Technology and Education" and "Issues in Science Education." Program faculty are also encouraged to attend and participate in conferences sponsored by national societies and groups such as the American Society for Engineering Education (ASEE) and The Teaching Professor.

3. To the extent not described above, describe how resources are provided to acquire, maintain, and upgrade the infrastructures, facilities, and equipment used in the program.

Resources for maintaining and upgrading laboratory equipment are described in Criterion 7, Section D. WSU Facilities Management provides the resources for the broader infrastructures and facilities such as building safety, lighting, power, heating and air-conditioning, water, furnishings and cleaning.

4. Assess the adequacy of the resources described in this section with respect to the students in the program being able to attain the student outcomes.

The budgets of the institution, college and department are adequate to facilitate the achievement of student outcomes. The qualifications and number of faculty as well as faculty development in support of teaching are likewise sufficient for the attainment of student outcomes. Finally, student outcomes are appropriately and adequately supported by the infrastructure, facilities and equipment used by the program.

C. Staffing

The Manufacturing Systems Engineering (MSE) program at Weber State University is supported by a dedicated team of administrative, instructional, and technical staff, alongside comprehensive institutional services. These resources are crucial for the effective operation and continuous improvement of the program. Below is a detailed description of the adequacy of the staff and institutional services, as well as the methods used to retain and train staff.

1. Administrative Staff:
Roles and Responsibilities: The administrative staff handles a range of tasks including student guidance, enrollment management, scheduling, record-keeping, and departmental coordination. They also provide critical support for faculty and students, ensuring smooth day-to-day operations. Administrative assistants are available to help students with course registrations, handle inquiries, and coordinate events such as guest lectures and workshops.
Adequacy: The administrative team is adequately staffed with experienced professionals who are well-versed in university policies and procedures. Their efficiency in managing administrative tasks allows faculty to focus on teaching and research.

2. Instructional Staff:
Roles and Responsibilities: Instructional staff, including adjunct faculty and teaching assistants, support the primary faculty by teaching courses, assisting in laboratory sessions, and providing additional academic support to students.
Adequacy: The program ensures that there is a sufficient number of instructional staff to cover all courses, especially those with high enrollment. This helps maintain a low student-to-teacher ratio, enhancing the learning experience.

3. Technical Staff:
Roles and Responsibilities: Technical staff are responsible for maintaining laboratory equipment, assisting with experimental setups, and providing technical support for both faculty and students. They also ensure that all safety protocols are followed in the laboratories. Lab technicians assist students in using CNC machines, 3D printers, and other manufacturing tools, ensuring that students gain practical hands-on experience.
Adequacy: The technical team is composed of skilled technicians who are proficient in handling advanced manufacturing equipment and software. Their expertise ensures that the laboratories are always operational and safe for use.

Institutional Services

1. IT Support:
Roles and Responsibilities: The IT support team provides assistance with hardware and software issues, network connectivity, and other technological needs. They ensure that all computing resources are up-to-date and functioning properly. IT support helps install and update software like CAD tools, simulation programs, and other engineering applications used in coursework and research.
Adequacy: IT support is readily available to address technical issues promptly, minimizing downtime and disruptions. The team also provides training sessions on new software and technologies relevant to the MSE program.

2. Library Services:
Roles and Responsibilities: The library staff provides access to a wide range of academic resources, including books, journals, databases, and digital repositories. They also offer research assistance and information literacy training. Librarians conduct workshops on database

searching and reference management, and they assist in obtaining materials through interlibrary loans if needed.
Adequacy: The library's technical collection and electronic resources are comprehensive and updated regularly. EAST also has an assigned librarian, Diana Meiser, who is available to help students and faculty navigate these resources effectively.

3. Student Support Services:
Roles and Responsibilities: These services include academic advising, career counseling, tutoring, and mental health services. They are designed to support students' academic and personal well-being. Career services offer resume workshops, interview preparation, and job placement assistance specifically tailored to engineering students.
Adequacy: Student support services are robust and well-integrated into the campus community. Advisors and counselors are accessible and provide personalized guidance to help students succeed.

Methods for Retaining and Training Staff
1. Professional Development:
Opportunities: Staff members are encouraged to participate in professional development opportunities such as workshops, seminars, and courses. These activities help them stay current with best practices and technological advancements. The university provides funding and time allowances for staff to pursue these opportunities, demonstrating a commitment to their growth and satisfaction.

2. Recognition and Rewards:
Recognition Programs: The university has formal recognition programs that acknowledge the contributions of staff members. Awards, public recognition, and other incentives help boost morale and job satisfaction. Staff members may receive awards for outstanding service, innovation, or dedication, which are celebrated during departmental meetings or university-wide events.

3. Inclusive Work Environment:
Culture: The university fosters an inclusive and supportive work environment where staff members feel valued and respected. Open communication and collaborative decision-making are encouraged. Regular team meetings and feedback sessions provide a platform for staff to voice their opinions and contribute to departmental improvements.

4. Competitive Compensation and Benefits:
Compensation: Competitive salaries and comprehensive benefits packages help attract and retain high-quality staff. Benefits include health insurance, retirement plans, and tuition assistance. Staff members have access to wellness programs, professional counseling services, and family-friendly policies.
5. Mentorship and Support:
Mentorship Programs: New staff members are paired with experienced mentors who provide guidance and support as they acclimate to their roles. This mentorship helps build confidence and competence. Mentors assist with onboarding, provide training on specific tasks, and offer ongoing support to ensure new staff members succeed in their positions. All staff hires in the

college are trained and mentored by personnel in a similar or related position, until such time the new hire is assessed to be proficient in their job responsibilities, but typically for a minimum of 6 months, which is the duration of the probationary period. Supervisors are also charged with providing regular guidance and support for the new hire.

The Manufacturing Systems Engineering program at Weber State University benefits from a well-rounded and adequately staffed team of administrative, instructional, and technical personnel. These staff members are supported by comprehensive institutional services that enhance their effectiveness and satisfaction. Through professional development, recognition programs, a supportive work environment, competitive compensation, and mentorship, the university ensures the retention and continuous improvement of its staff. This strong support system contributes significantly to the quality and success of the MSE program.

D. Faculty Hiring and Retention

1. Describe the process for hiring of new faculty.

When a faculty position opens in the Manufacturing Systems Engineering (MSE) program at Weber State University, a structured and transparent hiring process is followed to ensure the selection of highly qualified candidates. This process is in accordance with PPM 3-5: Hiring of Salaried Personnel.

1. Formation of the Faculty Search Committee:
A faculty search committee is formed, typically including senior faculty members from the department, such as the Program Coordinator and Department Chair. This committee is responsible for overseeing the recruitment process.

2. Developing the Position Description:
The committee drafts a detailed position description outlining the required qualifications, responsibilities, and expectations for the role. This description is designed to attract candidates with the necessary expertise and experience.

3. Screening Applications:
The committee performs an initial screening of received applications, shortlisting candidates who meet the essential criteria. This involves reviewing resumes, cover letters, and other supporting documents to assess each applicant's qualifications.

4. Interviewing Candidates:
Shortlisted candidates undergo a multi-stage interview process, including:
Phone Interviews: Preliminary interviews to evaluate candidates' communication skills and suitability for the role.
On-Campus Interviews: Selected candidates are invited for on-campus interviews, where they meet with faculty, students, and administrators. These interviews often include teaching demonstrations and research presentations.

5. Final Recommendation:

After completing the interviews, the search committee deliberates and recommends its preferred candidate to the dean through the department chair. The dean then makes the final recommendation to the provost, president, and Board of Trustees for approval.

2. Describe strategies used to retain current qualified faculty.

Weber State University employs several strategies to retain qualified faculty within the MSE program, recognizing the importance of faculty retention for maintaining program continuity and quality.

1. Professional Development Opportunities:
On-Campus Workshops: Various on-campus workshops are offered throughout the year, covering topics such as teaching strategies, research methodologies, grant writing, and technological advancements in engineering education.

Off-Campus Conferences: Most faculty members are given the opportunity to attend at least one off-campus conference annually, providing exposure to the latest research, networking opportunities, and professional growth experiences. Participation in these conferences is often supported by departmental funding and travel grants.

2. Open Campus Atmosphere:
Encouraging Faculty Engagement: WSU fosters an open and inclusive campus atmosphere where faculty are encouraged to express their views and contribute to the operation of their programs. This collaborative environment promotes a sense of community and shared purpose.

Faculty Involvement: Faculty members are actively involved in decision-making processes, curriculum development, and departmental governance, enhancing their sense of ownership and commitment to the program's success.

3. Supportive Work Environment:
Mentorship and Collaboration: New faculty members are paired with experienced mentors who provide guidance and support during their transition into the university. This mentorship fosters collaborative relationships within the department.

4. Work-Life Balance: The university promotes work-life balance through flexible work schedules, family-friendly policies, and support services, contributing to a positive and sustainable work environment.

5. Evaluation and Feedback:
Regular Evaluations: Faculty performance is regularly evaluated through peer reviews, student feedback, and self-assessments. Constructive feedback from these evaluations helps faculty identify areas for improvement and set professional development goals.

6. Recognition and Rewards: Faculty achievements in teaching, research, and service are recognized through awards, promotions, and other forms of acknowledgment, reinforcing the value of their contributions.

By implementing these recruitment and retention strategies, Weber State University ensures that the MSE program attracts and retains highly qualified faculty, maintaining the program's quality and continuity.

E. Support of Faculty Professional Development

Weber State University provides robust support for faculty professional development in the Manufacturing Systems Engineering (MSE) program. The university recognizes that continuous professional growth is essential for maintaining high educational standards and ensuring that faculty remain at the forefront of their fields. Various activities, including sabbaticals, travel, workshops, and seminars, are thoughtfully planned and supported to enhance faculty expertise and effectiveness.

Professional Development Support Mechanisms

1. Sabbaticals:
Purpose: Sabbaticals are offered to tenured faculty to engage in research, advanced study, or other professional activities that enhance their teaching and scholarly capabilities.
Planning and Approval: Tenured faculty members can apply for sabbaticals through a formal proposal process, detailing their planned activities and expected outcomes. Proposals are reviewed and approved by the department chair, dean, and university administration.
Support: During sabbaticals, faculty receive financial support, including salary and sometimes travel funds, ensuring they can focus on their professional development without financial concerns.

2. Travel for Conferences and Workshops:
Purpose: Attending national and international conferences, workshops, and seminars allows faculty to stay updated with the latest research, network with peers, and present their work.
Planning and Support: Faculty members are encouraged to attend at least one off-campus conference annually. The department allocates a budget for travel expenses, covering registration fees, travel costs, and accommodation.
Application Process: Faculty submit requests for travel funds, which are reviewed and approved by the department chair based on the relevance of the event to their professional development and the program's goals.

3. On-Campus Workshops and Seminars:
Purpose: On-campus workshops and seminars provide opportunities for faculty to develop their teaching skills, learn new research methodologies, and stay informed about technological advancements.
Planning and Organization: The university's Center for Teaching and Learning and other academic units organize regular workshops and seminars throughout the year. These events are tailored to address the needs of faculty across different disciplines.
Support: Faculty are notified of upcoming events and are encouraged to participate. Attendance is often facilitated by flexible scheduling and, where necessary, funding for materials or special sessions.

4. Professional Development Funds:
Purpose: Professional development funds are allocated to support individual faculty initiatives such as obtaining certifications, enrolling in online courses, or purchasing specialized research equipment.
Application Process: Faculty members can apply for these funds by submitting a proposal outlining their intended use and the benefits to their professional growth and the program. Proposals are reviewed by the department chair and dean.

Examples of Professional Development Activities
1. Research and Publication:
Faculty are supported in conducting research and publishing their findings in peer-reviewed journals. The university provides access to research grants, laboratory facilities, and research assistants.
2. Certifications and Continuing Education:
Faculty are encouraged to pursue certifications relevant to their field, such as Six Sigma, Project Management Professional (PMP), or Certified Manufacturing Engineer (CMfgE).

3. Collaborative Projects and Industry Partnerships:

The university facilitates partnerships with industry, allowing faculty to engage in collaborative research projects and consultancies.

4. Attendance at Professional Conferences:

Faculty regularly attend and present at major conferences such as the Society of Manufacturing Engineers (SME).

The variety and depth of professional development opportunities available to faculty in the MSE program demonstrates the university's commitment to their continuous growth. By offering a range of activities, from sabbaticals to workshops, the university addresses the diverse needs of faculty members. The planning and approval processes for professional development activities are structured yet flexible, allowing faculty to pursue opportunities that align with their individual career goals and the program's objectives.

The support provided for professional development has a direct positive impact on faculty effectiveness, research output, and teaching quality. Faculty members are able to bring the latest knowledge and skills into the classroom, benefiting students and enhancing the program's reputation.

PROGRAM CRITERIA

The program satisfies applicable program criteria for Manufacturing Engineering and similarly named programs.

The program must include curricular content in the following areas:

(a) materials and manufacturing processes: design of manufacturing processes that result in products that meet specific material and other requirements;
(b) process, assembly and product engineering: equipment, tooling, and environment necessary for their manufacture;
(c) manufacturing competitiveness: creation of competitive advantage through manufacturing planning, strategy, quality, and control;
(d) manufacturing systems design: analyze, synthesize, and control manufacturing operations using statistical methods; and
(e) manufacturing laboratory or facility experience: measurement of manufacturing process variables and development of technical inferences about the process.

The Manufacturing Systems Engineering program at WSU satisfies the program criteria for engineering programs that include the term manufacturing in their title as can be shown by the following matrix, Table 9-1. This matrix shows where each of the required topics listed above is covered in the curriculum and where it is introduced and reinforced.

Further, the program criteria state that the program must demonstrate that faculty members maintain currency in manufacturing engineering practice. It can be seen from the faculty section and the faculty resumes (see section CRITERION 6. FACULTY) that the current faculty has both the appropriate education and the practical experience to assure appropriate technical currency.

Table 9-1 shows how the curriculum addresses the five elements of the program criteria for engineering programs that include "manufacturing" and similar modifiers in their titles.

Table 9-1 Program Criteria

	Program Criteria				
	1	2	3	4	5
I = Introduced, R = Reinforced **Courses:**	(a) materials and manufacturing processes	(b) process, assembly and product engineering;	(c) manufacturing competitiveness	(d) manufacturing systems design	(e) manufacturing laboratory or facility experience

ENGR 1000 Introduction to Engr	I				
PDD 1010 Introduction to Engineering & Tech Design		I			
PDD 1160 Geo Dimensionin g & Tolerancing		I			
ENGR 2010 Statics	I	I			
ENGR 2210 Electrical Engineering for Non-Majors	I	I			
ENGR 2080 Dynamics	I	I			
ENGR 2140 Mechanics of Materials	I	I			I
ENGR 2160 Materials Science & Engineering	I	I			I
MSE 1210 Metal Processing & Joining for Engineers	I	I			
MSE 3360 Manufacturing Process & Materials/ Lab			I	I	I
MSE 3700 Manufacturing Systems I		R	R		
MSE 3850 Statistical Process Control & Reliability					

			R		I
MFET 3550 Manufacturing Supervision			R	R	
MSE 3040 Cost Estimating & Engineering Econ. Analysis			R	R	
MSE 3910 Six Sigma Methods & Tools in Manufacturing					R
MSE 4010 Facility Design & Material Handling	R	R	R	R	R
MSE 4590 Lean Manufacturing Systems		I	R		
MSE 4610 Project Management for Engineers			R		
MSE 3460 Product Design & Development	R	R	R	R	R
MSE 4615 Senior Project Design I/ Lab	R	R	R	R	R
MSE 4700 Manufacturing Systems Engineering II	R	R	R	R	R
MSE 3710 CAM & Additive Manufacturing/ Lab	R	R			R
MSE 4600 Production Systems Modeling/ Lab	R	R	R	R	R
MSE 4620 Senior Project Design II/ Lab	R	R	R	R	R

The department has one full-time and one part-time technician that take care of routine lab equipment maintenance and make certain that the lab equipment is operating safely. WSU's Facilities Department is tasked with maintaining and cleaning facilities. Students are taught how to use the equipment specific to the course and its associated lab that they are enrolled in at the time, beginning with safety instruction including the use of personal protective equipment. Safety continues to be emphasized throughout the lab courses. Students are only allowed to use equipment they have been trained to use. They are also required to always be in the lab with at least one other attentive student and there must be a faculty member available when students are in labs. The required MSDS sheets are available to the ABET team upon request.

The Manufacturing Systems Engineering (MSE) program at Weber State University places a high priority on ensuring that all instructional and learning environments, including facilities, tools, and equipment, are safe for their intended purposes. A comprehensive safety framework is implemented to maintain a safe learning environment. Below are the key elements of this framework, including specific examples and procedures.

Efforts to Maintain Safe Learning Environments

1. Laboratory Safety Management:
Clean and Hazard-Free Laboratories: Regular cleaning schedules are established to ensure that laboratories are clean and free of hazards. Lab technicians and cleaning staff routinely inspect and maintain cleanliness in all laboratory spaces.
Organization: Tools and equipment are organized systematically to prevent accidents and ensure easy access. Clearly labeled storage areas help keep the workspace tidy and minimize clutter.

2. Student Training:
Safety Orientation: At the beginning of each course, students are required to attend a safety orientation session that covers general laboratory safety rules related to that particular course, emergency procedures, and specific hazards associated with the equipment they will use.
Equipment-Specific Training: Before students are allowed to operate any machinery or equipment, they must undergo training specific to that equipment. This includes proper usage techniques, potential hazards, and emergency shutdown procedures.
Continuous Education: safety refresher training is offered by laboratory technicians and faculty to keep students updated on best practices and new safety protocols.

3. Personal Protective Equipment (PPE):
Provision of PPE: The university provides necessary PPE such as safety glasses, gloves, lab coats, and ear protection. PPE stations are strategically located near laboratory entrances and specific workstations. Some courses require the purchase or PPE (such as eye protection) as required course materials.
Mandatory Usage: Use of PPE is mandatory in all laboratories. Students and staff are required to wear appropriate PPE at all times when working with tools and equipment.

4. Safety Policies and Procedures:
Comprehensive Safety Policies: Detailed safety policies are documented and made available to all students and staff. These policies cover all aspects of laboratory safety, including chemical handling, machinery operation, and emergency procedures.
Emergency Procedures: Clearly defined emergency procedures, including evacuation routes, emergency contact numbers, and first aid locations, are posted in all laboratories and classrooms.

5. Enforcement of Safety Policies:
Safety Officers: Designated safety officers, including faculty and lab technicians, are responsible for enforcing safety policies. They conduct regular checks to ensure compliance with safety rules.
Violation Penalties: Non-compliance with safety policies results in penalties, ranging from warnings to suspension of laboratory privileges, depending on the severity of the violation.
Incident Reporting: A robust incident reporting system is in place, allowing students and staff to report safety violations or accidents promptly. Each report is investigated, and corrective actions are implemented as needed.

6. Routine Safety Inspections:
Scheduled Inspections: Routine safety inspections are conducted by safety officers and external auditors to identify potential hazards and ensure compliance with safety standards. These inspections cover equipment functionality, proper storage of materials, and general laboratory conditions.
Maintenance Logs: Detailed logs are maintained for all safety inspections, including any issues found and actions taken to address them. These logs are reviewed regularly to ensure ongoing compliance and continuous improvement.

7. Safety Equipment:
First Aid Kits and Emergency Stations: Fully stocked first aid kits and emergency stations (including eyewash stations and fire extinguishers) are readily accessible in all laboratories.
Safety Signage: Clear and visible safety signage is posted throughout the laboratories, providing instructions and warnings related to specific hazards and safety equipment locations.

8. Campus Environmental Health and Safety:
Environmental Health & Safety provides services to the Weber State community that improve the safety of everyone on and off campus, as well as information and procedures for potential work hazard situations. The group conducts safety assessments and can provide custom safety programs and or training to faculty based on courses and labs taught. They are also responsible for hazardous waste pickup should that occur. University employees are required to immediately report all workplace accidents (or near misses), injuries and illnesses to their supervisors. Employees may also report safety concerns to EHS directly.

Examples of Safety Practices in the MSE Program
Example 1: Machine Shop Safety

Training: Students receive thorough training on each piece of equipment in the machine shop, including lathes, mills, and CNC machines. Training emphasizes safe operating procedures and emergency shut-off mechanisms.
PPE Usage: Students must wear safety glasses, ear protection (when required) and appropriate clothing (e.g., no loose clothing) when operating machinery.
Inspections: Regular inspections ensure that machines are well-maintained and safety guards are in place.

Example 2: Chemical Handling in Materials Science Labs

Chemical Safety Training: Students are trained in proper chemical handling techniques, including the use of fume hoods and proper disposal methods for hazardous materials.
PPE Requirements: Gloves, lab coats, and safety goggles are mandatory when handling chemicals.
Emergency Procedures: Spill kits and emergency showers are readily available, and students are trained in how to use them.

The Manufacturing Systems Engineering program at Weber State University is committed to maintaining a safe and effective learning environment. Through rigorous safety training, strict enforcement of safety policies, regular inspections, and the provision of necessary PPE, the program ensures that students and staff can work safely with tools, equipment, and in laboratory settings. These comprehensive safety measures not only protect individuals but also foster a culture of safety and responsibility within the program.

APPENDICES

Appendix A – Course Syllabi

In a separate attachment, the related course syllabi for the MSE program can be found. This attachment is titled Appendix A - Course Syllabi.

Appendix B – Faculty Vitae

In a separate attachment, the related faculty vitae for the MSE program and supporting programs can be found. This attachment is titled Appendix B - Faculty Vitae.

Appendix C – Equipment

The list of the major pieces of equipment used by the program in support of instruction is found in a separate appendix titled ‘Appendix C - Equipment.

Appendix D – Institutional Summary

The Institutional Summary is found in a separate attachment labeled ‘Appendix D - Institutional Summary.

SUBMISSION ATTESTING TO COMPLIANCE

Only the Dean or the Dean's Delegate can electronically submit the Self-Study Report.

ABET considers the on-line submission as equivalent to that of an electronic signature of compliance attesting to the fact that the program has conducted an honest assessment of compliance and has provided a complete and accurate disclosure of timely information regarding compliance with ABET's *Criteria for Accrediting Engineering Programs* to include the General Criteria and any applicable Program Criteria, and the ABET *Accreditation Policy and Procedure Manual.*