



**METROPOLITAN**  
**STATE UNIVERSITY**<sup>SM</sup>  
**OF DENVER**  
**Engineering and**  
**Engineering Technology**

Assessment Manual

Department of Engineering and Engineering Technology

College of Professional Studies

Metropolitan State University of Denver

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This document describes the assessment and evaluation processes, and continuous improvement strategies implemented by the Department of Engineering and Engineering Technology (EAET) of College of Health and Applied Sciences (CHAS) at Metropolitan State University of Denver (MSU Denver) for the purposes of continuous improvement of EAET programs. This document replaces all previous versions of department assessment manual for future EAET assessment and evaluation starting from Fall 2019.

This revision is based upon the discussions regarding program educational objectives (PEOs), student outcomes (SOs), constituencies, and the assessment process that occurred during the IAB joint meetings in Dec. 8, 2017 and May 4, 2018, and faculty/staff meetings in Fall 2017, Spring 2018, and Fall 2019. The contents of this document include:

1. Program Constituencies;
2. Program Educational Objectives and Review/Revision Process;
3. Student Outcomes and Review/Revision Process;
4. Assessment and Evaluation Processes;
5. Continuous Improvement Strategies.

## **I. Program Constituencies**

As of fall 2019, EAET has three engineering technology programs, i.e. Civil Engineering Technology (CET), Electrical Engineering Technology (EET), and Mechanical Engineering Technology (MET), and three engineering programs, i.e. Computer Engineering (CPE), Environmental Engineering (EVE), and Sustainable Systems Engineering (SSE), as well as a Construction and Project Management (CPM) program. The engineering technology programs are ABET accredited, but the engineering programs are new and have not been accredited by ABET. EAET programs' constituencies are identified as: 1) Students and Alumni, 2) EAET faculty and, 3) Industry as represented by the EAET Industrial Advisory Board (IAB), which are described as following:

### **1. Students and Alumni**

Our most important constituency is our students and alumni. Their education and future career success are our core mission and as a team the EAET faculty and staff seek to ensure that success. Through a variety of surveys and other means the department garners feedback from the students and alumni relative to our defined objectives and the outcomes. That feedback is then used as part of the continuous improvement process.

### **2. EAET Faculty**

Another major constituent for EAET programs is the EAET faculty. EAET faculty, both fulltime and affiliate, develop the curricula and identify their relevance to the program educational objectives and industry demands. EAET faculty own the curricula of all EAET programs and are the sole responsible party for course assessment and evaluation.

The proposals modifying existing and creating new courses or programs will be passed to the departmental curriculum committee which consists of coordinators from all areas of EAET. The Committee reviews the proposals and makes recommendations for changes to curricula.

EAET department curriculum committee meets/discusses curriculum matters at least once each spring and fall semester. Changes of curriculum are presented to EAET IAB and then submitted to the proper authority identified by the new curriculum guideline of MSU Denver. The changes are then published in the University catalog after appropriate approvals.

EAET full-time faculty make final decisions on PEOs and SOs based upon recommendations from the program constituents. They will carry out detailed SOs assessment and evaluation for each EAET required courses and report the results to the program constituents.

### **3. EAET Industrial Advisory Board**

Another constituent for EAET programs is industry as represented by the Industrial Advisory Board (IAB), which is comprised of industry experts and employers who assist the programs with guidance regarding the curricula and lab equipment based upon current and future industry needs. IAB will be involved in proposing changes in PEOs and approval of SOs proposed by the faculty but will not be involved in detailed SOs assessment.

There is one industrial advisory board with subcommittees that represent each engineering technology and engineering program. The three subcommittees include one on Mechanical Engineering Technology, one on Computer Engineering and Electrical Engineering Technology, and a third subcommittee which focuses on Civil Engineering Technology, Environmental Engineering, and Sustainable Systems Engineering.

The EAET IAB will have at a minimum two scheduled meetings annually. Additional meetings may be scheduled by the IAB members and faculty as needed, and subcommittees will meet as needed. The meeting agendas are usually produced by the chair of the board with items proposed by faculty and board members. During the meetings, the board members, faculty, and/or student representatives work on various objectives such as curriculum issues, program educational objectives, and student outcomes.

## **II. Program Educational Objectives and Review/Revision Process**

Each engineering technology program has defined its program educational objectives (PEO). Those documents are published on the EAET website:

<https://www.msudenver.edu/eaet/accreditationassessment/>

The PEOs will be reviewed by EAET faculty on a semester basis and by EAET IAB on an annual basis as a minimum, and will be revised as needed through the process shown in the following flowchart:

# Process of Reviewing and Revision of Program Educational Objectives

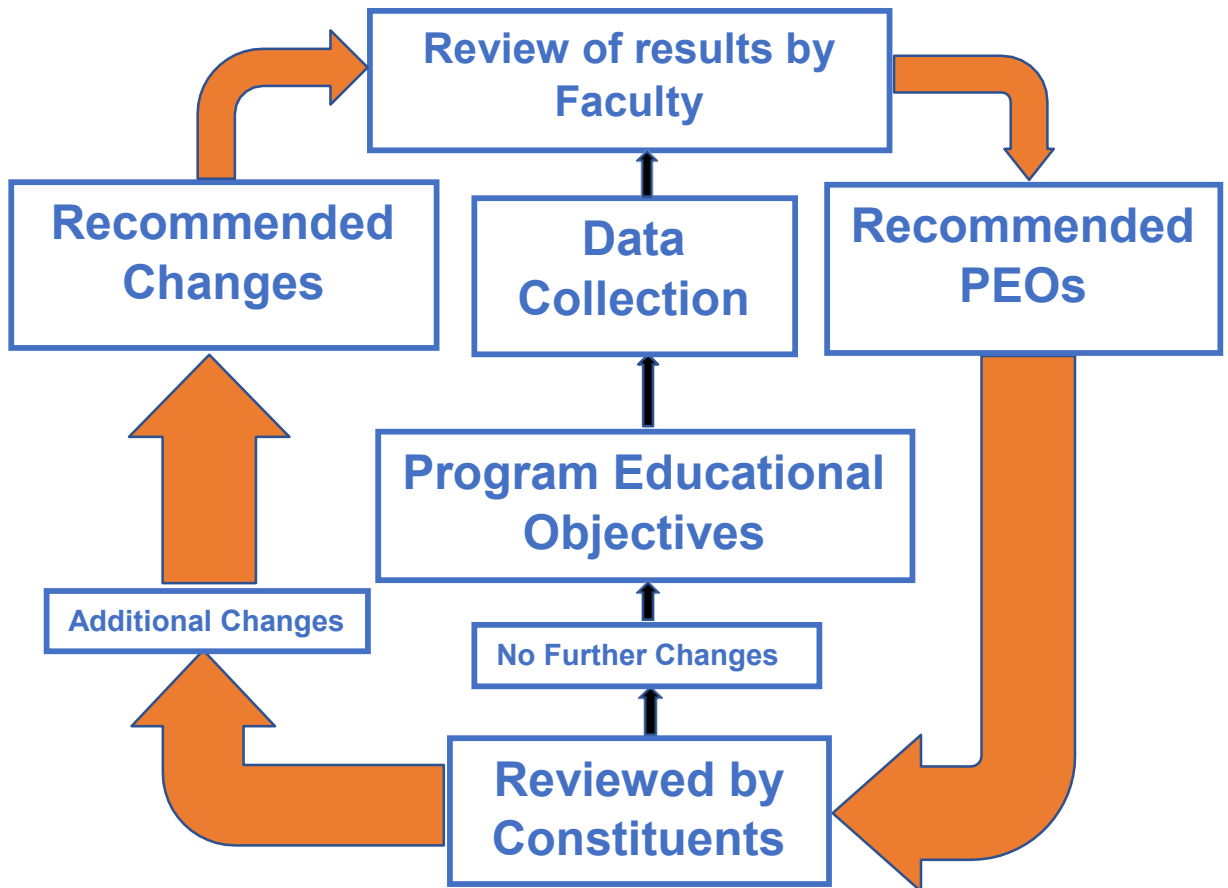


Figure 1: EAET Process of Review and Revision of Program Educational Objectives

Suggestions on modifications of existing PEOs come from any one of EAET constituencies. EAET faculty will present their decisions based upon the suggestions to all EAET constituencies. The final version of each program PEO will be documented and published on the EAET website.

### III. Student Outcomes and Review/Revision Process

Engineering technology programs have decided to adopt the ABET ETAC 2020 student outcomes for engineering technology programs. Engineering programs are not currently accredited by ABET; however, we have begun implementing the ABET continuous improvement process to assess and improve those programs as well. To that end, the engineering programs have adopted the student outcomes as established by the ABET 2020 EAC criteria.

The student outcomes for each program are published on the EAET website:

<https://www.msudenver.edu/eaet/accreditationassessment/>

EAET faculty are the sole responsible party for collecting SOs data and analyzing the results. Our constituents recommend changes of EAET student outcomes based upon ABET requirements and those recommendations are then considered by the faculty

The SOs will be reviewed and revised based upon most up-to-dated ABET criteria and suggestions from any of EAET constituencies. The following flowchart shows the process of review and revision of EAET programs' SOs:

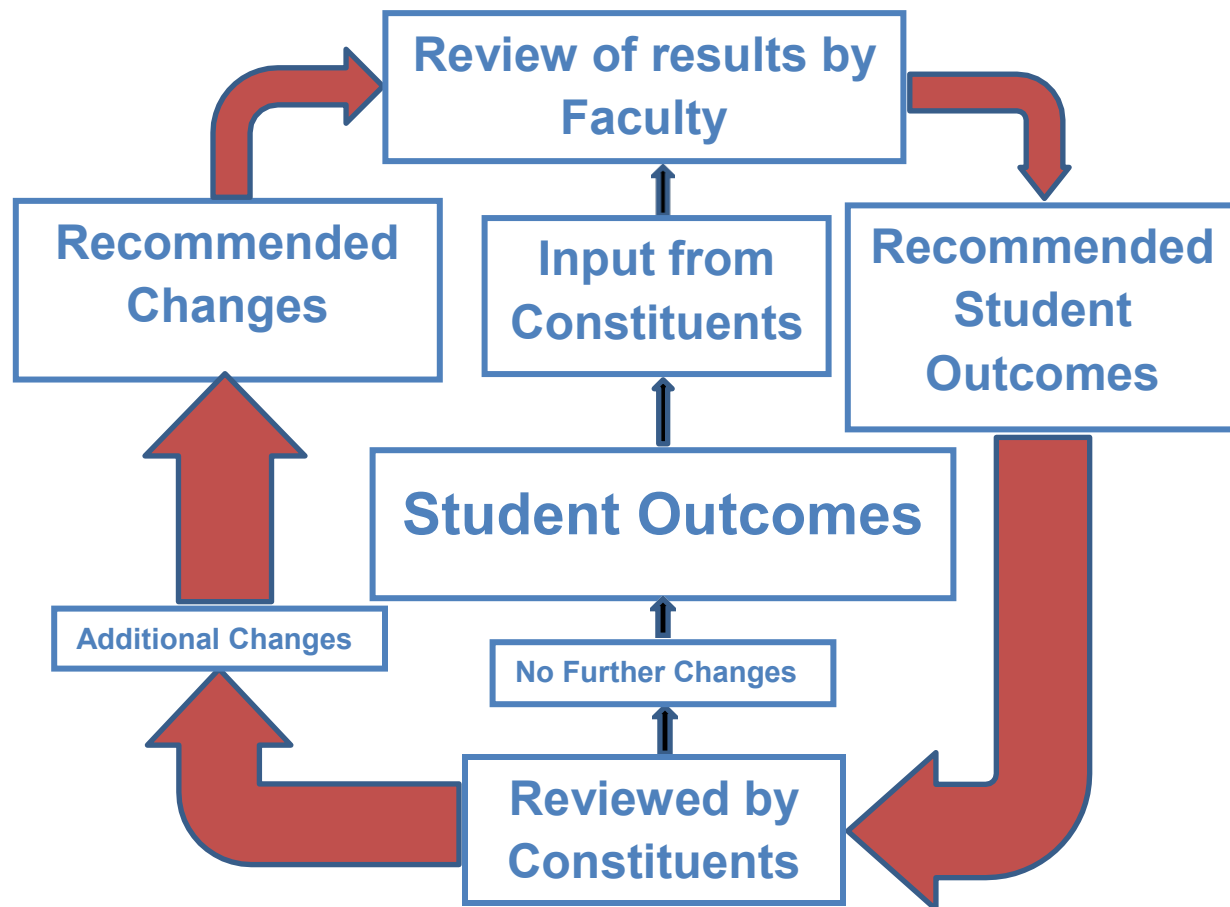


Figure 2: Process of Reviewing and Revising of Student Outcomes

Suggestions on modifications of existing SOs may be from any one of EAET constituencies, and the EAET faculty will present their decisions based upon the suggestions to all EAET constituencies. The final version will be documented and published on EAET website: <https://www.msudenver.edu/eaet/accreditationassessment/>

#### IV. Assessment and Evaluation Processes

EAET constituencies have decided to utilize the following assessment and evaluation processes for program continuous improvement purpose.

**Table 1: EAET Assessment and Evaluation Processes**

<b>Assessment</b>	<b>Frequency</b>	<b>Level of Attainment Expected</b>	<b>Responsible parties</b>
1. Specific Course Results Information	Every spring and fall semester	The level of attainment is set as 70% students achieve 70% or better for each student outcome for assessed classes.	Professors
2. Standardized Exams	When available	National passing rate of the exams.	Data from NCEES
3. Graduating Senior Surveys	Every semester the Senior Project II course is offered	70% students show satisfaction on student outcomes and departmental survey questions.	Senior design II or capstone course instructors
4. Faculty Assessment	Every semester	The level of attainment are set as 70% students achieve 70% or better for each student outcome for assessed senior classes.	Professors
5. Alumni Survey			MSU Denver Institutional Research

Details of each assessment and evaluation process are defined as following:

**Specific course results information:**

This assessment and evaluation process shall be performed every spring and fall semester with the professors as the responsible data collectors and reporters. The program coordinators and EAET chair will perform the analysis and report to EAET constituencies on an annual basis. Participation in the analysis process is required for all full-time faculty.

The EAET faculty have developed curriculum maps with respect to the published student outcomes and identified courses to track for each student outcome. EAET faculty have agreed upon a schedule and courses will be assessed based upon the curriculum maps every spring and fall semester when offered.

The EAET faculty have agreed upon using a new combined form to collect specific course information and to report faculty assessments. They have also developed specific forms for each

course offered by the department based upon curriculum maps. The forms are available to the public at <https://www.msudenver.edu/eaet/resourcesforfaculty/>. The department chair and program coordinators will hold training sessions each semester to ensure that all faculty understands the purpose of assessment and collecting and reporting proper data for analysis.

EAET assessment day has been defined as the day that grades are due for each semester. All the course reports and faculty assessment must be completed by faculty and submitted to EAET office manager, program coordinators and department chair by that date. Several meetings shall be scheduled to verify and analyze collected data which are detailed in the next section “**Continuous Improvement Strategies**”.

The attainment level expected is that 70% participating students achieve 70% or better on each student outcome identified courses assessed, which is in proper alignment with the EAET retention rate. EAET faculty understand that the class final grades shall not be used for assessment of student outcomes, the assessment method can be any one or a combination of:

1. A specific question in an exam or a quiz;
2. A specific classroom discussion;
3. A specific project topic, and/or;
4. A specific assignment.
5. A specific lab activity

### **Standardized Exams:**

Studies have shown that there is no standardized exam that is an appropriate assessment tool for all engineering and engineering technology programs. Some of the exams are for specific licensure purposes. However, the results can be used as an effective tracking tool for comparison and assessment of course effectiveness. Furthermore, as indicated by The National Council of Examiners for Engineering and Surveying (NCEES), FE exam results can be used as one measurement in the assessment of the following student outcomes included in ABET General Criterion 3.

- **NCEES exam results:** Currently, EAET does not require students taking the exam. NCEES sends the results to EAET when data become available for students who elect to take that examination.

### **Graduating Senior Exit Survey:**

This assessment and evaluation process shall be performed every semester the course is offered with the CET/EET/MET4110 Senior Design II professors as the responsible data collectors and reporters. SSE and EVE will conduct this survey in SSE4610, Capstone: Thesis in Sustainable Development. CPE will collect the survey in CPE4800 Senior Design II. Program coordinators and EAET chair will perform the analysis and report to EAET constituencies on an annual basis.

Each engineering technology program has developed its Senior Survey based upon student outcomes and other questions relating to the program and labs.

The students will fill out the survey anonymously and graduating students will be asked to provide their contact information after graduation on a voluntary basis.

### **Faculty Assessment:**

This assessment and evaluation process shall be performed every spring and fall semester with the professors as the responsible data collectors and reporters. Program coordinators and the EAET chair will perform the analysis and report to EAET constituencies on an annual basis.

The faculty assessment is the direct observation and assessment of the class a faculty is teaching and aims to assess students' growth through their educational career with EAET at MSU Denver. Performance indicators (PI) have been developed to help faculty assessing their classes. Four levels of achievement are identified as exemplary (90% or better), satisfactory (70-90%), developing (50-70%), and unsatisfactory (below 50%).

As indicated, EAET faculty have agreed upon using a new combined form to collect specific course information and report faculty assessment. This is required for all courses offered by EAET as indicated in the section of **specific course result information**. EAET staff have developed specific forms for each course offered by the department based upon curriculum maps. The forms are available to the public at: <https://www.msudenver.edu/eaet/resourcesforfaculty/>

### **Alumni Survey:**

The office of institutional research is the responsible data collectors and reporters. This survey is sent out to all graduates at graduation, 6 months after graduation, and 12 months after graduation. Program coordinators and EAET chair will perform the analysis and report to EAET constituencies.

Although ABET no longer requires the assessment of attainment of Program Educational Objectives, which are broad statements that describe what graduates are expected to attain within a few years after graduation, the feedback from alumni is still considered important information in the EAET assessment and evaluation processes.

The above discussed assessment and evaluation processes will form a baseline for the EAET continuous improvement plan. EAET will report that data to the following agents when requested:

1. Annual assessment and annual report required by MSU Denver Office of Academic Affairs;
2. University Program Review every 2 years and full review every 7 years;
3. Program review by Colorado Commission of Higher Education (CCHE);
4. Engineering Technology Accreditation Commission (ETAC) of Accreditation Board for Engineering and Technology (ABET) accreditation;
5. Engineering Accreditation Commission (EAC) of Accreditation Board for Engineering and Technology (ABET) accreditation;
6. Annual report to the College of Professional Studies Dean's office;
7. University High Learning Commission (HLC) accreditation.



## V. Continuous Improvement Strategies

Continuous improvement is the ongoing effort of EAET constituencies to improve EAET educational practices and strategies to meet program PEOs and SOs developed based upon MSU Denver mission and industrial demands. The PEOs and SOs shall be reviewed by EAET faculty/staff each semester and shall be reviewed by IAB annually. To ensure PEOs and SOs are properly defined and met, EAET has developed continuous improvement strategies described below:

- Assessment of Current Situation: Data collection as indicated in previous section “Plan for Assessment and Evaluation Processes”. Identify initial findings from data collection;
- Evaluation and analysis: Examine the root causes and propose changes as required. Those changes may include:
  1. Check historical data to see if the problem has been reoccurring. EAET has developed shortfall tracking matrices for each engineering technology program which keeps a record of past shortfalls;
  2. Examine other courses at the same level to see if the problem is consistent;
  3. Revisit the identified student outcomes to ensure they are appropriate and measurable;
  4. Check if proper prerequisites are in place to ensure student success;
  5. Modify teaching strategies to improve student learning experience.

Program coordinators will work with identified course instructors to plan for future offerings. Program coordinators and the EAET chair will prepare a report to the faculty and for the IAB meeting;
- Sustaining the Continuous Improvement Effort (Closing the Loop): Determine the methods to be used to improve educational practices and strategies, how to implement them, and monitor the results. New data will be collected and analyzed to make sure targeted improvements are achieved.

To ensure the involvement of all constituencies in the continuous improvement process, EAET and programs have identified meetings when EAET constituencies will work on continuous improvement of all programs. The following table shows the meetings designated for EAET continuous improvement activities:

**Table 3:** Scheduled Meetings for EAET Continuous Improvement

Meeting/Required Attendees	Schedule	Continuous Improvement related Topics
EAET department Assessment Day meeting/ All EAET faculty and staff	Grade due day of spring and fall semester	Data collection for the current semester including: Course Reports; Faculty Survey; Senior Exit Survey.
Faculty/staff meetings All EAET faculty and staff	At least once per semester	Assessment of Current Situation, Evaluation and Analysis: Confirmation of previous semester’s data collection; Initial findings identification; PEOs and SOs review.

Data analysis meeting/ Program Coordinators and Chair	At least once per semester	Evaluate and analyze data collected; Locate root causes; Propose changes in educational strategies needed; Prepare report to all constituencies.
IAB Meeting	At least once per semester	Report findings; Propose changes in educational strategies needed; PEOs and SOs reviewed annually.
*Course instructors  Program coordinators EAET Chair	At least once per semester	Sustaining the Continuous Improvement Effort (Closing the Loop): Develop and implement new educational strategies and monitor the results

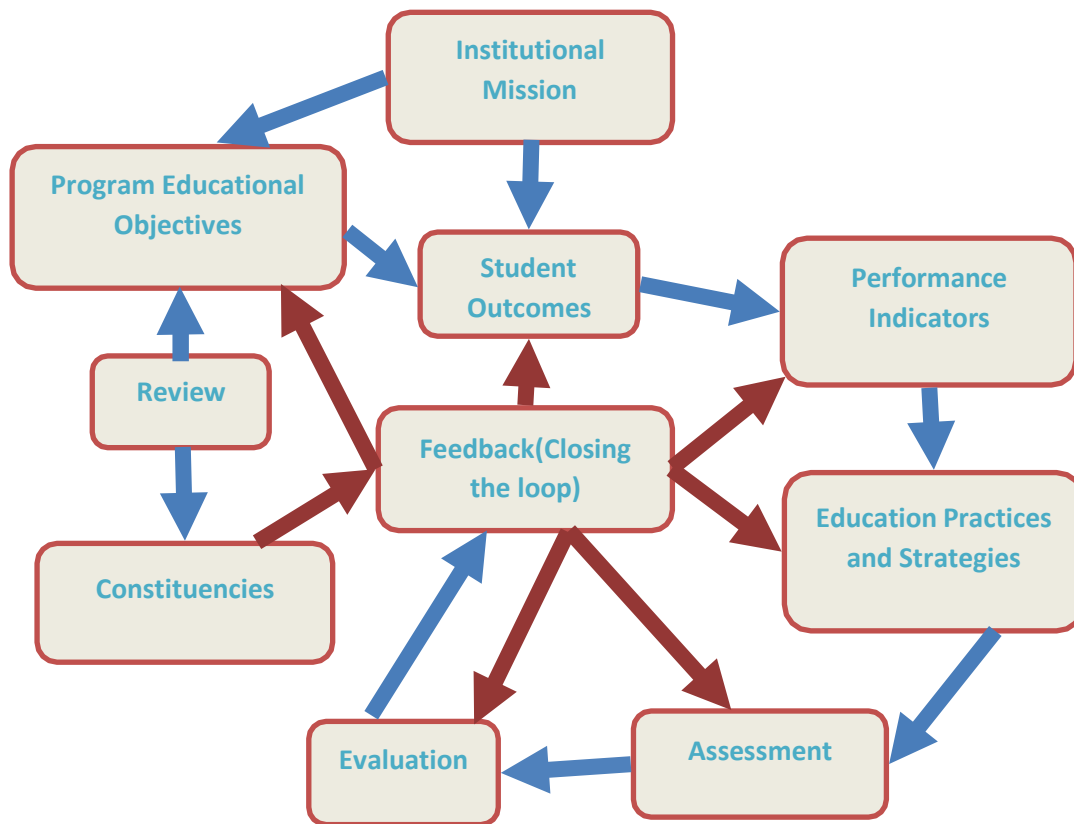
\*Course instructors of identified courses will conduct those courses with modified educational strategies after deficiencies are identified and new educational strategies are approved by EAET chair. Program coordinators and EAET chair will monitor the results to ensure the improvements are achieved.

EAET continuous improvement strategies will include evaluating if the program educational objectives are properly aligned with MSU Denver mission and the needs of industry.

All EAET programs will refine the PEOs and SOs as needed. Continuously working on improvement of performance indicators to properly assess our students' growth through their educational career at EAET will be one of the EAET constituencies' ongoing tasks.

The latest version of PEOs and SOs are available on the EAET website for public access at <https://www.msudenver.edu/eaet/accreditationassessment/assessmentprocess/>.

The flowchart below shows the EAET process for continuous improvement, and Appendix A includes a checklist that is used to ensure each task is completed.



EAET Process for Continuous Improvement

Appendix: Assessment Manual Checklist 2020-2021 AY

<b>Activity</b>	<b>Frequency</b>	<b>Owner(s)</b>	<b>Record</b>	<b>Status</b>
Feedback/Survey from students and Analysis	Each semester	Senior Design II Instructor/Program Coordinator	Graduating Seniors Exit Survey, Survey of students each semester.	
Feedback/Survey from Alumni and Analysis	Six months after graduation and later	MSU Denver Institution Research	Survey	
Relevance of curricula to PEOs and Industry demands	Semester	Full-Time Faculty based on IAB recommendations, and job market.	Program and Faculty Meeting Minutes	
Guidance on curriculum and lab equipment	Semester	IAB	IAB Meeting Minutes	
Review PEOs and discuss SOs	Annually	IAB	Meeting Minutes	
Collect SO data through courses assessments	Semester	All Faculty	Meeting Minutes/ and Supporting Documents	
Perform analysis of SO Data	Semester	Full Time Faculty	Meeting Minutes/ and Supporting Documents	
Review PEOs, discuss SOs and update if needed	Semester	Full-Time Faculty	Department meetings Minutes	
Change of curriculum	When needed based on recommendations of const.	Faculty/ Department Curriculum Comm	Meeting Minutes Catalogue	
IAB Meeting	Semester	Chair	Invitation	
IAB Subcommittee Meetings	Semester	Program Coordinators	Invitation	
Publish PEOs and SOs for each program	As changes are made	Chair/Department Staff	EAET Website	
Graduation Data	Semester	Chair/Department Staff	EAET Website	