Assessment Manual

Department of Engineering and Engineering Technology

College of Professional Studies

Metropolitan State University of Denver

January 14, 2016
This document describes the assessment and evaluation processes utilized by the Department of Engineering and Engineering Technology (EAET) at Metropolitan State University of Denver (MSU Denver) for the purposes of continuous improvement of the engineering and engineering technology programs. This document replaces the all of previous versions of department assessment manual for future EAET assessments starting from spring 2016. The contents of this document are:

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

Program Constituencies

As of spring 2016, the EAET contents three engineering technology programs, i.e. Civil Engineering Technology (CET), Electrical Engineering Technology (EET), and Mechanical Engineering Technology (MET), and one engineering program, i.e. Sustainable Systems Engineering (SSE). EAET/CET/EET/MET/SSE programs’ constituents are identified as: EAET faculty, EAET students, EAET Industrial Advisory Boards (IAB), and MSU Denver Academics and Student Affairs, which are described as following:

i. EAET Faculty
   The major constituent for the EAET program is the EAET faculty. The faculty, both fulltime and affiliate, develop the curriculum and identify its relevance to the program educational objectives and industry demands. The information about courses will be passed to the departmental curriculum committee which consists of professors from all areas of EAET who review the courses and make recommendations for changes to curriculum or courses. EAET department curriculum committee meets at least once each semester. The change of curriculum will be presented to the EAET students and Industrial Advisory Boards (IAB), and will be submitted to the office of Academic and Student Affairs for approval.

ii. MSU Denver EAET Students
   The EAET students who are investing their future in obtaining their education with the department of engineering and engineering technology at MSU Denver are the constituents that also provide inputs to the programs. EAET students play the key role in EAET assessment and evaluation processes. They are the data providers in all EAET courses. They provide feedbacks via students rating instructors (SRI) administrated by MSU Denver and the program senior exit survey administrated by each of EAET programs.
iii. Industrial Advisory Board

Another constituency for the EAET programs is the Industrial Advisory Board (IAB) which is comprised of industry experts who assist the institution with guidance regarding the curriculum. Current EAET student representatives will be included in EAET IAB. EAET IABs have been active for years, and the members have been rotated as needed and maintained as desired. The IABs have by-laws that are agreed upon by the members and published on EAET website: http://www.msudenver.edu/et/aboutet/advisoryboard/.

The EAET IABs have at least three scheduled meetings annually, with two for individual program board meeting and one as a joint meeting with all IAB boards. The meeting agendas are usually produced by the chair of the board with items proposed by the faculty and board members. During the meetings, the board members and faculty, sometimes including student representatives, work on various objectives such as curriculum issues.

IAB meeting records are kept at Y:\ADVISORY BOARDS.

iv. Academic and Student Affairs

The curriculum for all programs at MSU Denver receives guidance from the Office of Academic and Student Affairs. The Academic and Student Affairs maintains all current syllabi electronically and is responsible for the process to change, remove or add course syllabi to the program within the confines of the entire university system. The Office of Academic and Student Affairs also collects and maintains annual assessments and annual reports from each academic program.

EAET annual assessment reports are kept at Y:\ASSESSMENT\Academic Affairs Assessment Reports.

II. Program Educational Objectives and Review Process

Each engineering and engineering technology program has defined the program educational objectives (PEOs). The documents are stored in EAET Y drive: Y:\ASSESSMENT\EAET Assessment Flows\2015 and published on the EAET/Program website:

CET:  http://www.msudenver.edu/cet/
EET:  http://www.msudenver.edu/eet/
MET:  http://www.msudenver.edu/met/
SSE:  http://www.msudenver.edu/sse/

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

Figure 1: EAET Process of reviewing and revision of Program Educational Objectives
Suggestions on modifications of existing PEOs may come from any one of the EAET constituencies, i.e. EAET faculty, EAET students, EAET IABs, and the office of Academic and Student Affairs. The EAET faculty will propose their decisions based upon the suggestions and present to all of the EAET constituencies. The final version will be documented on EAET Y drive Y:\ASSESSMENT\EAET Assessment Flows and published on the EAET website.

III. Student Outcomes and Review Process

The EAET has decided to adopt the ABET student outcomes for engineering and engineering technology programs correspondingly. Each engineering technology program has developed the program specific outcomes based upon the CRITERIA FOR ACCREDITING ENGINEERING TECHNOLOGY PROGRAMS provided by etac-criteria-2013-2014. The documents are stored in the folder of Y:\ASSESSMENT\EAET Assessment Flows\2015. The most up-to-dated student outcomes are published on the EAET website:
http://www.msudenver.edu/et/assessmentprocess/assessmentdocuments/.
The SOs will be reviewed and revised based upon most up-to-date ABET criteria and suggestions from any of the 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 come from any one of the constituencies, i.e. EAET faculty, EAET students, EAET IABs, and the office of Academic and Student Affairs. The EAET faculty will propose their decisions based upon the suggestions and present to all of the EAET constituencies. The final version will be documented in EAET Y drive: Y:\ASSESSMENT\EAET Assessment Flows and published on the EAET website: [http://www.msudenver.edu/et/assessmentprocess/assessmentdocuments/](http://www.msudenver.edu/et/assessmentprocess/assessmentdocuments/).

**IV. Plan for Assessment and Evaluation Processes**

The EAET faculty and constituencies have decided to utilize the following assessment and evaluation processes for its continuous improvement purpose.
Table 1: EAET Assessment and Evaluation Processes

<table>
<thead>
<tr>
<th>Assessment</th>
<th>Frequency</th>
<th>Level of Attainment Expected</th>
<th>Responsible parties</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Specific course results information</td>
<td>Every semester</td>
<td>80% students achieve 70% or better for each student outcome assessed</td>
<td>Professors</td>
</tr>
<tr>
<td>2. Standardized exams</td>
<td>When available</td>
<td>National passing rate of the exams</td>
<td>SME and NCEES</td>
</tr>
<tr>
<td>3. Graduating Senior Exit surveys</td>
<td>Every semester</td>
<td>80% students show satisfaction on student outcome assessed</td>
<td>Senior design II instructors</td>
</tr>
<tr>
<td>4. Faculty Survey</td>
<td>Every semester</td>
<td>For continuous improvement of EAET</td>
<td>Professors</td>
</tr>
<tr>
<td>5. Alumni Survey</td>
<td></td>
<td></td>
<td>Institutional Research</td>
</tr>
</tbody>
</table>

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

i. **Specific course results information:** This assessment and evaluation process is performed every 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.

Each program has developed course report form based upon student outcomes identified by the program for the data collection process. The forms for all programs are stored in Y:\ASSESSMENT\EAET Assessment Flows\2015.

The faculty and program coordinators have developed curriculum maps with respect to the ABET criteria and identified courses to track for each student outcome. The courses identified for reporting are listed in the 2015-2020 ABET assessment plan files in Y:\ASSESSMENT\EAET Assessment Flows\2015. The course report forms will be emailed to professors whose course(s) are selected for data collections each semester.

An EAET assessment day has been defined as the grades due day of each semester, when all the course reports must be done and submitted to the program coordinators and department chair and to be stored in Y:\ASSESSMENT\DATA_CourseAssessment organized by semesters. At the first meeting of each semester, EAET faculty will review data collected from previous semester.
The EAET has documented the assessment plans for all programs shown in table 2. The courses selected from each program for data collection are recorded in Y:\ASSESSMENT\EAET Assessment Flows\2015.

Table 2: Three Year Rotational Plan for Assessing Student Outcomes

<table>
<thead>
<tr>
<th>Year</th>
<th>Spring</th>
<th>Fall</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
<td>ABET a, b, c, d, e</td>
<td>ABET a, b, c, d, e</td>
</tr>
<tr>
<td>2016</td>
<td>ABET f, g, h, i, j, k</td>
<td>ABET f, g, h, i, j, k</td>
</tr>
<tr>
<td>2017</td>
<td>Program Specifics</td>
<td>Program Specifics</td>
</tr>
<tr>
<td>2018</td>
<td>ABET a, b, c, d, e</td>
<td>ABET a, b, c, d, e</td>
</tr>
<tr>
<td>2019</td>
<td>ABET f, g, h, i, j, k</td>
<td>ABET f, g, h, i, j, k</td>
</tr>
<tr>
<td>2020</td>
<td>Program Specifics</td>
<td>Program Specifics</td>
</tr>
</tbody>
</table>

Start next six year iteration

Referring to the following documentations for each program course assessment plan and detailed tracking plans (these documents are stored in Y:\ASSESSMENT\EAET Assessment Flows\2015 and can be found on the website: http://www.msudenver.edu/et/assessmentprocess/assessmentdocuments/):

CET: 2015-2020 ABET Assessment Plan CET.doc
EET: 2015-2020 ABET Assessment Plan EET.doc
MET: 2015-2020 ABET Assessment Plan MET.doc
SSE: 2016-2020 ABET Assessment Plan SSE.doc

The attainment level expected is that 80% participating students achieve 70% or better on each student outcome identified for the course. The assessment method can be any one or a combination of:

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

ii. Standardized Exams: There is no recommended standardized exam for engineering and engineering technology educational units to assess students’ attainment of ABET SOs. Some of the exams are for specific licensure purposes. However, the results are good tracking data for the purpose of 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: (a) an ability to apply knowledge of mathematics, science, and engineering; (b) an ability to design and
conduct experiments, as well as to analyze and interpret data; (c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability; (e) an ability to identify, formulate, and solve engineering problems; (f) an understanding of professional and ethical responsibility; and (k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

1. SME exam results: SME exams are offered by the society of manufacturing engineers. The EET program has been using this assessment and evaluation process for many years. The data collected have shown positive results. The MET started utilize SME exam in fall 2015.

2. NCEES exam results: At this time, EAET does not require students taking the exam. NCEES sends the results to the EAET every spring and fall when data become available. For this assessment process to be valid, EAET will examine the possibility of requiring that all seniors take the exam and give a good-faith effort (but not necessarily pass).

iii. Graduating senior exit survey: This assessment and evaluation process is performed every semester with the CET/EET/MET4110 Senior Design II professors as the responsible data collectors and reporters. Program coordinators and EAET chair will perform the analysis and report to EAET constituencies on an annual basis.

Each program has developed its Senior Survey based upon student outcomes and other program and lab related questions. The surveys are stored in Y:\ASSESSMENT\EAET Assessment Flows\2015 and can be found at [http://www.msudenver.edu/et/assessmentprocess/assessmentdocuments/](http://www.msudenver.edu/et/assessmentprocess/assessmentdocuments/).

The students in the Senior Design II classes will fill out the survey anonymously.

iv. Faculty Survey: this assessment and evaluation process is performed every semester with the professors as the responsible data collectors and reporters. Program coordinators and EAET chair will perform the analysis and report to EAET constituencies on an annual basis.

The faculty survey aims to assess students’ growth through their educational career with EAET at MSU Denver. Performance indicators (PI) are developed to help faculty assessing their classes.
The courses identified for this assessment are the same as indicated in the section of **specific course result information**, which are stored in Y:\ASSESSMENT\EAET Assessment Flows\2015. The document name is “StudentOutcomes and PerformanceIndicators ak”.

The forms will be emailed each semester to the professors whose course(s) are selected for data collections.

v. **Alumni Survey**: The office of institutional research is the responsible data collectors and reporters. Starting in spring 2014, this survey is sent out 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 will no longer require 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 as one important piece in EAET assessment and evaluation processes.

Due to the low response rate, some other assessment and evaluation tool should be discussed in the future for assessment and evaluation purposes. EAET faculty and constituencies will work on this issue in the near future.

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

1. Annual assessment required by MSU Denver Office of Academic and Student Affairs;
2. Program review by Colorado Commission of Higher Education (CCHE);
3. Engineering Technology Accreditation Commission (ETAC) of Accreditation Board for Engineering and Technology (ABET) accreditation;
4. Annual report to the College of Professional Studies Dean’s office.

V. **Continuous Improvement Strategies**:

The SOs and PEOs shall be reviewed by the EAET faculty each semester and shall be reviewed by the industrial advisory boards annually. The following describes meetings designated for EAET continuous improvement activities:

1) The EAET department Assessment Day meeting will be held on the grade due day of each semester. EAET course reports, faculty survey, and senior exit survey will be collected;
2) The first faculty meeting of each semester will be scheduled on the Thursday before a semester starts. Coordinators will check EAET course reports, faculty survey, senior exit survey, and proper course materials and student work are updated in EAET Y drive;
3) Data analysis meetings are set on the last working Friday of each February and September for department chair and program coordinators to meet and analyze data collected.
4) The first joint board meeting of each calendar year will be scheduled in every April. Department chair and program coordinators will report findings to IAB members;

The EAET continuous improvement process includes:
1) Data collection: EAET will collect data as indicated in previous section “Plan for Assessment and Evaluation Processes”. The EAET assessment day meeting and first faculty meeting of each semester will ensure proper data and relative materials collections.
2) Data analysis: Department chair and program coordinators will meet each semester to analyze data collected, and prepare a report to faculty and joint IAB meetings.
3) SOs and PEOs review and revision: In the first joint board meeting, findings from previous semester/academic year will be presented. If any deficiency in student outcomes is found in the data collection and analysis process, one or more of the followings approaches will be taken in closing the loop:
   1. Check the history of EAET assessment to see if it is a continuing problem;
   2. Revisit the identified student outcomes to ensure they are appropriate and measurable;
   3. Check if proper prerequisites are in place to ensure student success;
   4. Modify teaching strategies to improve student learning experience;

Once the strategies for improvement are decided, we will apply them in our teaching practice and collect new data and perform the analysis to see if the improvements are made.

EAET continuous improvement strategies will include re-identifying the program educational objectives to meet the need of industry, which may in turn suggest changes or modifications in student outcomes.

All EAET programs will continue improving the SOs and PEOs as needed. Continuously working on improvement of performance indicators to properly assess students’ growth through their educational career at EAET will be one of the EAET constituents’ ongoing tasks in the future.

The latest SOs and PEOs will be published on each program websites for public access.

The following flowchart shows the EAET process for continuous improvement:
ETS Process for Continuous Improvement