

# Manufacturing and Engineering Technology

## Department Mission/Program Goals and Student Learning Outc

**Progress:**

**Reporting Year:**

**Providing Department:** Manufacturing and Engineering Technology

**Department/Unit Contact:** Ahmed Alsawy

**Mission:**

### I. **Department Mission/Vision/Goal Statement**

The BSET program at TTU is a traditional on-campus lecture/laboratory program with on-ground course delivery offered almost exclusively during the day. There currently are no distance learning courses offered by the Manufacturing and Engineering Technology Department. A co-op program is available through the TTU Office of Career Services as an optional (but popular) choice.

*Mission Statement: To graduate innovative Technologists or Applied Engineers who solve technological challenges to meet societal needs.*

#### *Program Educational Objectives*

The Program Educational Objectives (PEOs) for the baccalaureate degree program in engineering technology are as follows:

- **Program Educational Objective 1**

*Graduates should utilize the technical and managerial skills necessary for successful careers in the design, application, installation, manufacturing, testing, documentation, operation, maintenance, analysis, development, implementation, and oversight of production.*

#### **Program Educational Objective 2**

*Graduates should demonstrate the ability to work as effective team members with commanding oral and written communication skills, as well as to advance in their careers and continue their professional development.*

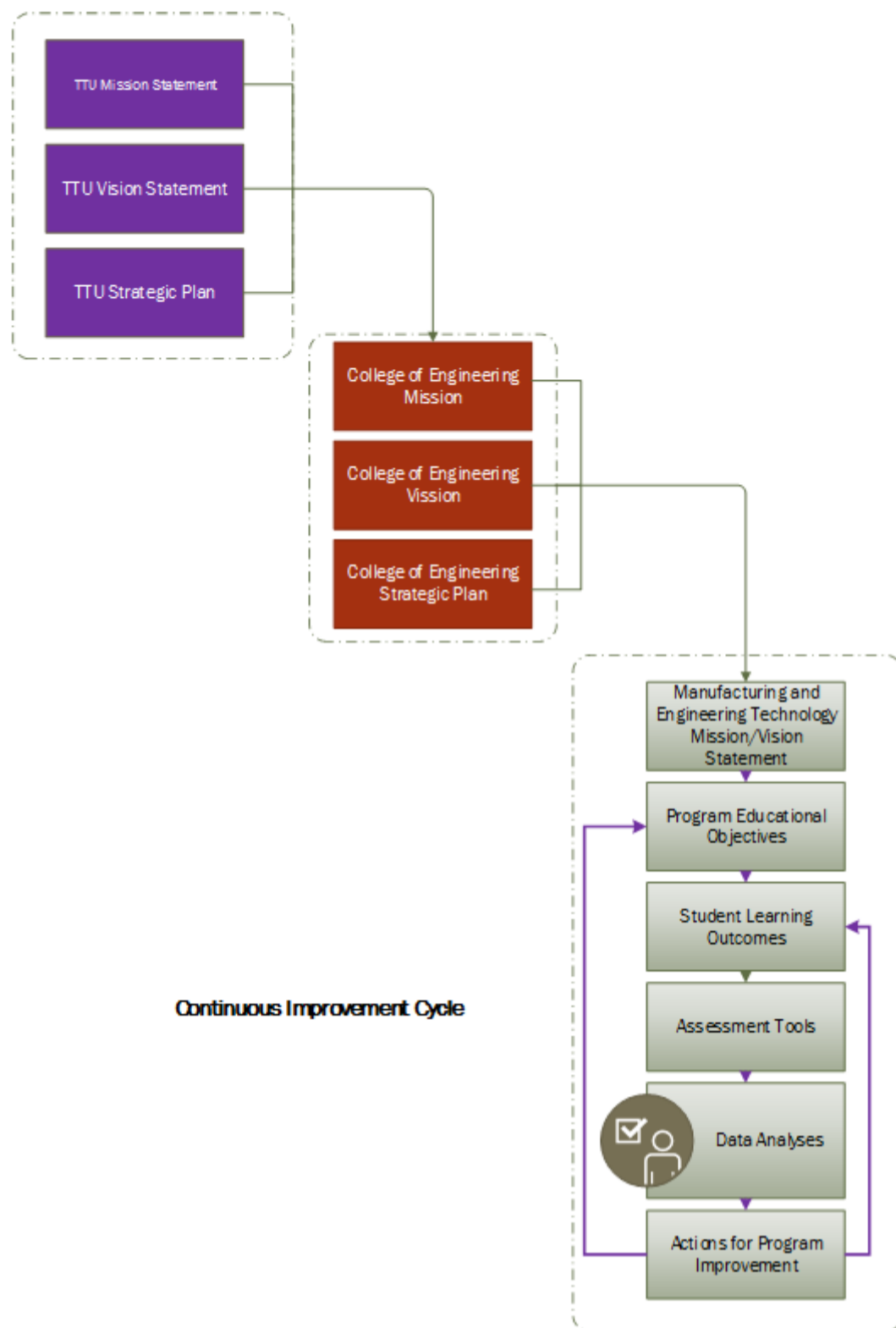
#### **Program Educational Objective 3**

*Graduates should be able to exercise ethics in their profession and to recognize the global impacts of their profession on society.*

#### *Linkage of Educational Objectives to the Institutional Mission*

The BSET Program Educational Objectives are directly linked to the University's mission statement via the mission statements of the Department of Manufacturing and Engineering Technology and the College of Engineering, as illustrated in Fig. 2-1. Specifically, the Program Educational Objectives are linked chain-wise to the mission of the University as follows:

- The BSET Program Educational Objectives indicate that “*Graduates should utilize the technical and managerial skills necessary for successful careers in the design, application, installation, manufacturing, testing, documentation, operation, maintenance, analysis, development, implementation, and oversight of production.*” This objective is consistent with the mission of the MET Department, which is “*to graduate innovative engineering technologists who solve technological challenges to meet societal needs.*” The program prepares its students for productive careers in a competitive, dynamic, technologically based society (in a global and regional context) and for jobs that will serve the societal needs.
- the MET Department, which is “*to graduate innovative engineering technologists who solve technological challenges to meet societal needs.*” The program prepares its students for productive careers in a competitive, dynamic, technologically based society (in a global and regional context) and for jobs that will serve the societal needs.



**Figure 1. Flow Diagram of the MET Department's Continuous Improvement Process**

- The preceding mission statement of the MET Department is, in turn, tied directly to the College of Engineering's mission statement to "graduate innovative engineers who solve technological challenges to meet societal needs."
- Finally, the College of Engineering mission is strongly linked to the overall mission of the University. The opening sentence of the TTU mission statement reads: "Tennessee Technological University's mission as the state's only technological university is to provide leadership and outstanding programs in engineering, the sciences, and related areas that benefit the people of Tennessee and the nation."

## Goal 1: Course and Career Advising

### Define Goal:

### Define Goal

Improved advising has become a top priority for both the College and University, as evidenced by their presence in in the strategic plans of both, and the increased resources and effort being expended in this area. Included among these are:

(1) Formation of a College of Engineering "Student Success Center", with a director, a staff person, two advisors (one part time for international students), and student ambassadors

(2) Four additional permanent advisors being hired for the CoE by the University

**Intended Outcomes / Objectives:**

**Assessment Tool:** Senior Exit Oral Interview

**Goal/ Outcome/ Objective:** Student Outcomes

**Type of Tool:** Focus Group

**Frequency of Assessment:** Each Semester

**Rationale**

The Senior Exit Oral Interview process consists of an open discussion forum of graduating seniors with the MET Chair. It serves as a valuable source of suggestions for program improvement, as well as a source of supporting feedback on student performance. After receiving the feedback from the students, issues of particular or continuing concern are brought to the MET Faculty for further discussion and possible action.

**Student Outcome A: an ability to select and apply the knowledge, techniques, skills and modern tools of the discipline to broadly-defined engineering technology activities**

**Define Goal:**

an ability to select and apply the knowledge, techniques, skills and modern tools of the discipline to broadly-defined engineering technology activities

**Intended Outcomes / Objectives:**

**Student Outcome B: Knowledge of STEM Courses**

**Define Goal:**

an ability to select and apply knowledge of mathematics, science, engineering, and technology to engineering technology problems that require the application of principles and applied procedures or methodologies

**Intended Outcomes / Objectives:**

**Student Outcome C: an ability to conduct standard tests and measurements; to conduct, analyze, and interpret experiments; and to apply experimental results to improve processes;**

**Define Goal:**

an ability to conduct standard tests and measurements; to conduct, analyze, and interpret experiments; and to apply experimental results to improve processes;

**Intended Outcomes / Objectives:**

**Student Outcome D: An ability to design systems, components, or processes for broadly defined Engineering Technology problems appropriate to program educational objectives.**

**Define Goal:**

*D. An ability to design systems, components, or processes for broadly defined Engineering Technology problems appropriate to program educational objectives.*

**Intended Outcomes / Objectives:**

**Student Outcome E: An ability to function effectively as a member or leader on a technical team.**

**Define Goal:**

*E. An ability to function effectively as a member or leader on a technical team.*

**Intended Outcomes / Objectives:**

**Student Outcome F: An ability to identify, analyze, and solve broadly-defined Engineering Technology problems.**

**Define Goal:**

*F. An ability to identify, analyze, and solve broadly-defined Engineering Technology problems.*

**Intended Outcomes / Objectives:**

**Student Outcome G: Knowledge of STEM Courses**

**Define Goal:**

an ability to apply written, oral, and graphical communication in both technical and nontechnical environments; and an ability to identify and use appropriate technical literature;

**Intended Outcomes / Objectives:**

**Student Outcome H: An understanding of the need for and an ability to engage in self-directed continuing professional development.**

**Define Goal:**

*H. An understanding of the need for and an ability to engage in self-directed continuing professional development.*

**Intended Outcomes / Objectives:**

**Student Outcome I: An understanding of and a commitment to address professional and ethical responsibilities including a respect for diversity**

**Define Goal:**

**I. An understanding of and a commitment to address professional and ethical responsibilities including a respect for diversity**

**Intended Outcomes / Objectives:**

**Student Outcome J: Knowledge of STEM Courses**

**Define Goal:**

a knowledge of the impact of engineering technology solutions in a societal and global context;

**Intended Outcomes / Objectives:**

**Student Outcome K: A commitment to quality, timeliness, and continuous improvement.**

**Define Goal:**

**K. A commitment to quality, timeliness, and continuous improvement.**

**Intended Outcomes / Objectives:**

**Student Outcome: An ability to function effectively as a member or leader on a technical team**

**Define Goal:**

**E. An ability to function effectively as a member or leader on a technical team**

**Intended Outcomes / Objectives:**

**Assessment Tool: Co-Op Employer Survey**

**Goal/ Outcome/ Objective:**

**Type of Tool:**

**Frequency of Assessment:** Every Semester

**Assessment Methods:**

**Co-Op Employer Survey:**

Roughly one third of MET students participate in co-ops/internships during their time at TTU. For co-ops that are sponsored through the TTU Office of Career Services, the co-op employers are required to complete a formal evaluation of the performance of each student at the end of the co-op. In addition, for College of Engineering students, the co-op survey also includes program and Student Outcome-related assessment questions. Co-op surveys are a valuable source of feedback directly from employers of our students, providing insight into their performance in-process, i.e., before they graduate. The co-op employer survey employs a 5-point scale (1 to 5), which is then converted to the 0-4 point level-of-attainment scale by subtracting 1 point. A copy of the co-op employer survey, data summary, and the raw data for the last six-year assessment cycle is given in [Appendix F–Co-op Employers Survey](#).

**Assessment Tool: Faculty Course Assessment Report (FCAR)**

**Goal/ Outcome/ Objective:**

**Type of Tool:** Tracking Spreadsheet

**Frequency of Assessment:** Every Semester

**Assessment Methods:**

**Faculty Course Assessment Report (FCAR):**

This assessment tool is new to the program and was added in Spring 2014 after the decision was made to pursue ETAC of ABET Accreditation. This measurement tool provides an assessment of the level-of-attainment of the students in a class with regard to the course's instructional outcomes. The assessment is done by the course instructor at the completion of the course. It consists of a detailed analysis of the extent to which the instructional outcomes are achieved, as evidenced by student performance on specific test and homework problems, and other course assignments. Mapping of course instructional outcomes to Student Outcomes is shown in [Table 4.1](#), where instructional outcomes that are highly related to a Student Outcome are marked with an upper case "X"; instructional outcomes with a moderate relationship are marked with a lower case "x"; and instructional outcomes with little or no relationship to a Student Outcome are unmarked. Each of the instructional outcomes associated with a Student Outcome is scored on the Faculty Course Assessment Report using a 0-4 point level-of-attainment scale.

**Assessment Tool: Grades Received in STEM, General Education, and Communication Courses**

**Goal/ Outcome/ Objective:**

**Type of Tool:** Annual Unit Report  
Tracking Spreadsheet

**Frequency of Assessment:** Once a year

**Assessment Methods:****Grades Received in STEM, General Education, and Communication Courses:**

This is a new assessment tool added after the decision was made to change accreditation to ETAC of ABET. The grades earned by BSET graduates in STEM, General Education, Writing, and Speech courses (Appendix J) can be used as a direct, independent source of evidence for several of the ETAC of ABET Student Outcomes, in particular 3(b), 3(g), and 3(j):

3(b): an ability to select and apply current knowledge and adapt to emerging applications of mathematics, science, engineering and technology to Engineering Technology problems that require the principles and applied procedures or methodologies.

3(g): an ability to apply written, oral, and graphical communication in both technical and nontechnical environments; and an ability to identify and use appropriate technical literature.

3(j): a knowledge of the impact of engineering technology solutions in a societal and global context.

Course grades are directly converted to the 0-4 point level-of-attainment scale as follows:

- “A” → level of attainment = 4 (Excellent)
- “B” → level of attainment = 3 (Good)
- “C” → level of attainment = 2 (Satisfactory)
- “D” → level of attainment = 1 (Low)
- “F” → level of attainment = 0 (Negligible)

**Assessment Tool: Graduating Senior Exit Surveys/Interviews****Goal/ Outcome/ Objective:**

**Type of Tool:** Tracking Spreadsheet

**Frequency of Assessment:** Every Semester

**Assessment Methods:****Graduating Senior Exit Surveys/Interviews:**

Since the last ATMAE accreditation visit in 2009, the format of the Senior Exit Survey/ Interview was changed. A written survey is one part of the Graduating Senior Exit Interview process. The newly designed Senior Exit Survey for the BSET allows graduating seniors to provide feedback regarding the faculty, the department, Career Services, and their perceived attainment of the ETAC of ABET Student Outcomes. The Graduating Senior Exit Survey uses a 1-5 point “satisfaction” scale, which is then converted to the 0-4 point level-of-attainment scale. A copy of the Senior Exit Written Survey, the raw data, and a data summary can be found in [Appendix I–Senior Exit Survey](#). The second part of this survey process is that each graduating senior schedules an interview meeting with the department chair. In this confidential interview meeting, the chair discusses with the students their responses. The gathered information serves as a valuable source of suggestions for program improvement, as well as a source of supporting feedback on student performance. After receiving the feedback from the students, issues of particular or repeated concern are brought to the MET faculty for further discussion and possible action. A summary listing of the main items of student comments and concerns is given in Appendix I-Graduating Senior Exit Surveys/Interviews.

**Assessment Tool: Overall GPAs of MET courses**

**Goal/ Outcome/ Objective:** Overall GPAs of MET courses

**Type of Tool:**

**Frequency of Assessment:**

**Assessment Methods:**

**Overall GPAs of MET courses:**

When faculty members prepare their FCARs at the end of each semester, one of the statistics calculated is average GPA for the class, based on an average of the student quality points earned per semester credit-hour. Course GPAs are tracked as an alternative assessment measure for the quality of the curriculum.

## Assessment Tools: Alumni Survey

**Goal/ Outcome/ Objective:** Assessment Tools used to Assess Students' Learning Outcomes

**Type of Tool:**

**Frequency of Assessment:**

**Assessment Methods:**

### 1. Alumni Survey:

Historically, alumni surveys have been used for program assessments since the first National Association of Industrial Technology (NAIT) accreditation in 1982. The accreditation body was changed from NAIT to the Association of Technology, Management, and Applied Engineering (ATMAE), and the ATMAE format was used for alumni surveys in the current accreditation cycle beginning in 2009. The department administered the assessment instruments, analyzed and summarized the data, and presented the summary to the Faculty Assessment Committee for discussions, suggestions, and identification of necessary actions. When the decision was made to change to ETAC of ABET accreditation, the department faculty changed the format of the alumni survey to assess ETAC of ABET Student Outcomes 3(a)-(k) and provide information related to the Program Educational Objectives. It was also decided to conduct the survey every 3-5 years so we can evaluate the professional growth of our graduates. The first ETAC of ABET online alumni survey was sent to the last known email addresses for the graduates of the BSET in Spring 2014. The alumni survey employs a 5-point "agree/disagree" scale (1 to 5), which is converted to a 0-4 point level-of-attainment scale by simply subtracting 1 point.

[Appendix E–Alumni Survey](#) provides a copy of the questionnaire used, a data summary, and raw data from the most recent alumni survey conducted in July 2014.

## Result: Level-of-Attainment: Student Outcome H

**Results:**

*H. an understanding of the need for and an ability to engage in self-directed continuing professional development.*

- **Alumni Survey (20%):** The alumni responses indicated a level of attainment of "3.4" for H.
- **Senior Exit Survey (20%):** An average level of attainment of "3.42" was obtained on the senior exit survey.
- **Faculty Course Assessment Reports (60%):** The faculty assessment of the instructional outcomes related to SO H in MET 4310-Plant Layout and materials Handling (3), MET 4615-Engineering Technology Ethics and Professionalism (4), and MET 4620-Senior Projects (4) averaged "3.67."

Taken together, the average assessment tools indicate an overall level-of-attainment for SO 3(h) of "3.57."

**Attachments:** Attached Files

[Alumni Survey](#)

[Faculty Course Assessment Report](#)

[Senior Exit Survey](#)

## Results: Level-of-Attainment: Student Outcome A

**Results:**

*An ability to select and apply the knowledge, techniques, skills and modern tools of the discipline to broadly-defined engineering technology activities.*

- **Alumni Survey (20%):** The alumni responses indicated a level of attainment of "3.36" for SLO A.
- **Senior Exit Survey (20%):** The student responses indicated a level-of-attainment of "3.38" for SLO A.
- **Faculty Course Assessment Reports S14 (60%):** The faculty course assessment scores related to SLO A of "3.63" was obtained from MET 3301 CAD for Technology (4.0), MET 4200 Industrial Electronics (3.0) and MET 4310 Plant Layout and Materials Handling (4.0).

**Attachments:**

## Results: Level-of-Attainment: Student Outcome B





**Results:**

**Student Outcome B:** an ability to select and apply a knowledge of mathematics, science, engineering, and technology to engineering technology problems that require the application of principles and applied procedures or methodologies.

**Results;**

- **Alumni Survey (15%):** An average level-of-attainment of “3.29” was obtained on this survey instrument of the alumni BSET program.
- **Senior Exit Survey (15%):** The student responses indicated a level-of-attainment of “3.34” for SO 3(b).
- **Faculty Course Assessment Reports (60%):** The faculty course assessment form related to SO 3(b) of “3.17” was obtained from MET 3301 – CAD for Technology (3), MET 3200 – Applied Electricity and Electronics (3.5) and MET 4310 - Plant Layout and Materials Handling (3).
- **Student Grades in STEM Courses:** The average grade for all students graduating from the BSET program for Fall 2013 to Spring 2015 Fall in STEM courses (Math, Chemistry, Physics, Engineering) was a “2.4”. See GPA in Selected Course Areas for details.

Taken together, the average assessment tools indicate an overall level-of-attainment for SO 3(b) of “3.06.”

-  [Alumni Survey](#)
-  [Appendix E - Grades Received in STEM, General Education, and Communication Courses](#)
-  [Faculty Course Assessment Report](#)
-  [Senior Exit Survey](#)

**Attachments:**





**Results: Level-of-Attainment: Student Outcome D**

**Results:**

*D. an ability to design systems, components, or processes for broadly defined Engineering Technology problems appropriate to program educational objectives.*

- **Alumni Survey (20%):** The alumni responses indicated a level of attainment of “3.32” for SLO D.
- **Senior Exit Survey (20%):** An average level of attainment of “3.29” was obtained on the senior exit survey.
- **Faculty Course Assessment Reports (60%):** The faculty assessment of the instructional outcomes related to SLO D in MET 2400-Statics and Strength of Materials (3), MET 3730-Quality Assurance (3), 4620-Senior Projects (4) averaged “3.67.” (See Appendix H.)

Taken together, the average assessment tools indicate an overall level-of-attainment for SLO D of “3.52.”

-  [Alumni Survey](#)
-  [Appendix C - Co-op Employers Survey](#)
-  [Faculty Course Assessment Report](#)
-  [Senior Exit Survey](#)

**Attachments:**

**Results: Level-of-Attainment: Student Outcome E**

**Results:**

*E. an ability to function effectively as a member or leader on a technical team.*

- **Alumni Survey (10%):** The alumni responses indicated a level of attainment of “3.79” for SO E.
- **Senior Exit Survey (10%):** An average level of attainment of “4.67” was obtained on the senior exit survey.
- **Co-op Employers Survey (20%):** On the question of working effectively with other employees, the BSET students scored “3.28.”
- **Faculty Course Assessment Reports (60%):** The faculty assessment of the instructional outcomes related to SO E in MET 3301– CAD for Technology (3), MET 4615-Engineering Technology Ethics and Professionalism (3), and MET 4620-Senior Projects (3) averaged “3.33.”

Taken together, the average assessment tools indicate an overall level-of-attainment for the SO E of “3.41.”

**Attachments:**

**Results: Level-of-Attainment: Student Outcome F**

**Results:**

*F. an ability to identify, analyze, and solve broadly-defined Engineering Technology problems.*

- **Alumni Survey (20%):** The alumni responses indicated a level of attainment of “3.57” for SO F.
- **Senior Exit Survey (20%):** An average level of attainment of “3.46” was obtained on the senior exit survey.
- **Faculty Course Assessment Reports (60%):** The faculty assessment of the instructional outcomes related to SO F in 4620-Senior Projects (3) averaged “3.0.” (See Appendix H.)

Taken together, the average assessment tools indicate an overall level-of-attainment for SO F of “3.78.”

**Attachments:** Attached Files

- [Alumni Survey](#)
- [Faculty Course Assessment Report](#)
- [Senior Exit Survey](#)

## Results: Level-of-Attainment: Student Outcome G

**Results:**

***G. an ability to apply written, oral, and graphical communication in both technical and nontechnical environments; and an ability to identify and use appropriate technical literature.***

- **Alumni Survey (10%):** The alumni responses indicated a level of attainment of “3.68” for SLO G.
- **Senior Exit Survey (10%):** An average level of attainment of “4.17” was obtained on the senior exit survey.
- **Faculty Course Assessment Reports (50%):** The faculty assessment of the instructional outcomes related to SLO G in MET 3301-CAD for Technology (4), 4310-Plant Layout and Materials Handling (4), and MET 4620-Senior Projects (3) averaged “3.67.”
- **Co-op Employer Survey Writing Communications (10%):** On the question regarding “produce effective written communications,” the BSET students scored “3.6.”
- **Co-op Employer Oral Presentations (10%):** On the question regarding “deliver effective oral presentations,” the BSET students scored “3.76.”
- **General Education Grades (10%):** The average grade in courses in Writing (3.1) and Oral Communication (3) was “3.05.”

Taken together, the average assessment tools indicate an overall level-of-attainment for SLO G of “3.58.”

**Attachments:** Attached Files

- [Alumni Survey](#)
- [Average GPA of ET Graduates](#)
- [Faculty Course Assessment Report](#)
- [Senior Exit Survey](#)

## Results: Level-of-Attainment: Student Outcome I

**Results:**

***I. an understanding of and a commitment to address professional and ethical responsibilities including a respect for diversity.***

- **Alumni Survey (20%):** The alumni responses indicated a level of attainment of “3.36” for SLO I.
- **Senior Exit Survey (10%):** The student responses indicated a level-of-attainment of “3.34” for SLO I.
- **Co-op Employer Survey (30%):** The average score for SLO I was “3.57.”
- **Faculty Course Assessment Reports (40%):** The faculty assessment of the instructional outcomes related to SLO I in MET 4310-Plant Layout and materials Handling (3), MET 4615-Engineering Technology Ethics and Professionalism (4), and MET 4620-Senior Projects (4) averaged “3.67.”

Taken together, the above assessment tools indicate an overall level-of attainment for SLO I of “3.54.”

**Attachments:** Attached Files

- [Alumni Survey](#)
- [Co-op Employer Reports](#)
- [Faculty Course Assessment Reports](#)
- [Senior Exit Survey](#)

## Results: Level-of-Attainment: Student Outcome J

**Results:**

***J. a knowledge of the impact of engineering technology solutions in a societal and global context.***





- **Alumni Survey (20%):** The alumni responses indicated a level of attainment of “3.2” for SLO J.
- **Senior Exit Survey (20%):** The student responses indicated a level-of-attainment of “3.89” for SLO J.



- **Faculty Course Assessment Reports (50%):** The faculty assessment of the instructional outcomes related to SLO J in MET 3000-Principles of Metal Casting (3) and MET 4620 (3) averaged “3.0.”
- **All HUFA & SBS (10%):** The average grade for all students graduating from the BSET program from Fall 2013 to Spring 2015 in all HUFA (Humanities and Fine Arts) and SBS (Social and Behavioral Science) related to social and global context was a “2.8.”

Taken together, the above assessment tools indicate an overall level-of attainment for SO 3(j) of “3.04.”

**Attachments:** Attached Files

-  [Alumni Survey](#)
-  [Average GPA of ET Graduates](#)
-  [Faculty Course Assessment Report](#)
-  [Senior Exit Survey](#)

## Results: Level-of-Attainment: Student Outcome K




**Results:**

*K. a commitment to quality, timeliness, and continuous improvement.*

- **Alumni Survey (20%):** The alumni responses indicated a level of attainment of “3.7” for SLO K.
- **Senior Exit Survey (20%):** The student responses indicated a level-of-attainment of “3.89” for SLO K.
- **Faculty Course Assessment Reports (60%):** The faculty assessment of the instructional outcomes related to SLO K in MET3710 (4) and MET 4620-Senior Projects (3) averaged “3.5.”

Taken together, the above assessment tools indicate an overall level-of attainment for SLO K of “3.74.”

**Attachments:** Attached Files

-  [Alumni Survey](#)
-  [Faculty Course Assessment Reports](#)
-  [Senior Exit Survey](#)




## Results: Level-of-Attainment: Student Outcome: C

**Results:**

*C. an ability to conduct standard tests and measurements; to conduct, analyze, and interpret experiments; and to apply experimental results to improve processes.*

- **Alumni Survey (20%):** An average level-of-attainment of “3.4” was indicated for this SLO from the survey.
- **Senior Exit Survey (20%):** The student response to this question indicated a level-of-attainment of “3.89” for SLO C on this tool.
- **Faculty Course Assessment Report (60%):** The faculty assessment of the instructional outcomes related to SO C in MET 2400-Statics and Strength of Materials (3), MET 3000-Principles of Metal Casting (2), and MET 4310 – Plant Layout and Materials Handling (4) averaged “3.0”

Taken together, the average assessment tools indicate an overall level-of-attainment for SO 3(c) of “3.26.”

-  [Alumni Survey](#)
-  [Faculty Course Assessment Report](#)
-  [Senior Exit Interview](#)

**Attachments:**